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and Dean of the Graduate School

# NUCLEAR POWER PLANT STATUS DIAGNOSTICS USING SIMULATED CONDENSATION: AN AUTO-ADAPTIVE COMPUTER LEARNING TECHNIQUE

A Dissertation

Presented for the

Doctor of Philosophy

Degree

The University of Tennessee, Knoxville

Eric Bruce Bartlett

August 1990

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Dedicated to Emerald and Choco

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## ABSTRACT

The application of artificial neural network concepts to engineering analysis involves training networks, and therefore computers, to perform pattern classification or function mapping tasks. This training process requires the near optimization of network inter-neural connections. A new method for the stochastic optimization of these interconnections is presented in this dissertation. The new approach, called simulated condensation, is applied to networks of generalized, fully interconnected, continuous perceptrons. Simulated condensation optimizes the nodal bias, gain, and output activation constants as well as the usual interconnection weights. This approach is shown to provide a more complete and faster optimization than standard techniques such as backpropagation. The method also adjusts the network nodal architecture to give faster learning and better generalization results. Because of this dynamic node architecture feature, the appropriate network architecture need not be known before the learning process is initiated. The simulated condensation methodology simply builds the network required for the learning task at hand.

In this work, the simulated condensation network paradigm is applied to nuclear power plant operating status recognition. A set of standard problems such as the exclusive-or problem and others are also analyzed as benchmarks for the new methodology. The objective of the nuclear power plant accident condition diagnosis effort is to train a network to identify both safe and potentially unsafe power plant conditions based on real time plant data. The data is obtained from computer generated accident scenarios. A simulated condensation network is trained to recognize seven nuclear power plant accident conditions as well as the normal full power operating condition. These accidents include, hot and cold leg loss of coolant, control rod ejection and steam generator tube leak accidents. Twenty-seven plant process variables are used as input to the neural network. Results show the feasibility of using simulated condensation as a method for diagnosing nuclear power plant conditions. The method is general and can easily be applied to other types of plants and plant processes.

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## LIST OF SYMBOLS

| | |
|---|---|
| A1 | Constant |
| a | Constant |
| $a_{\tilde{n}}$ | Polynomial coefficient |
| arctan(·) | Inverse tangent of (·) |
| b | Constant |
| $b1_{i,j}$ | Nodal bias for node i, j |
| $C_1$ | Constant |
| $c^*$ | Globally extreme cost |
| $c_n(W)$ | Cost from exemplar n |
| cos(·) | Cosine of (·) |
| $c^s(W)$ | Lowest cost obtained during a simulation |
| $c^{s-1}(W)$ | Cost function at time t-1 if the cost at t is the lowest cost obtained during a simulation |
| c(W) | Network cost function |
| $c(W^*)$ | Globally extreme cost |
| DR | Sampling interval |
| d | Total derivative operator |
| dR | Uniform random number on (-DR,DR) |
| exp(·) | value e raised to the power (·) |
| E(·) | Expected value of (·) over the training set |
| F(W) | Cumulative distribution function |

| | |
|---|---|
| $f_p(W)$ | Functional constraint |
| $f(W)$ | Probability density function |
| $G(W)$ | Gradient vector |
| $gl_{i,j}$ | Nodal gain for node i, j |
| $H(W)$ | Hessian matrix |
| $h(W)$ | Constant |
| $I$ | Number of network layers excluding the input layer |
| $I(x_{i,j})$ | Importance of node i, j |
| $i$ | Network layer index |
| $J$ | Number of network outputs |
| $J'$ | Number of network inputs |
| $J(i)$ | Number of nodes in layer i |
| $j$ | Node in layer i index |
| $K$ | Number of nodes in layer i-1 |
| $k$ | Index of nodes in layer i-1 |
| $kl_{i,j}$ | Output activation constant for node i, j |
| $M_{I+1}$ | Network input-output mapping |
| $N$ | Number of exemplars in the training set |
| $N_n$ | Number of nodes in the network |
| $N_t$ | Number of stochastic function evaluation trials |
| $N_w$ | Number of weights in the network |
| $n$ | Index of exemplars in the training set |
| $n_t$ | Index of stochastic function evaluation trials |

| | |
|---|---|
| $P$ | Number of functional constraints |
| $P(\cdot)$ | Probability of $(\cdot)$ |
| $P_{\bar{N}}$ | Polynomial of order $\bar{N}$ |
| $p$ | Index of functional constraints |
| $Q$ | Number of regional constraints |
| $q$ | Index of regional constraints |
| $R$ | Uniform random number on (0,1) |
| $r_q(W)$ | Regional constraint |
| $t$ | Time or iteration number |
| $u_{i,j}$ | Nodal input for node i, j (Section 3) or averaged nodal input for node i, j (Section 4) |
| $u_{i,j,n}$ | Nodal input from exemplar n for node i, j |
| $W$ | Weight vector |
| $wd$ | Desired weight value |
| $w_{i,j,k}$ | Weight connecting node i, j and node i-1, k |
| $w^{max}$ | Regional weight constraint |
| $X_i$ | Vector of nodal outputs in layer i (Section 3) or vector of average nodal outputs in layer i (Section 4) |
| $X_{i,n}$ | Vector of nodal outputs in layer i from exemplar n |
| $x_{i,j}$ | Output of node i, j (Section 3) or average output of node i, j (Section 4) |
| $x_{i,j,n}$ | Output of node i, j from exemplar n |
| $XD_i$ | Vector of desired nodal outputs in layer i (Section 3) or vector of average desired nodal outputs in layer i (Section 4) |

| | |
|---|---|
| $XD_{i,n}$ | Vector of desired nodal outputs in layer i from exemplar n |
| $xd_{i,j}$ | Desired output of node i, j (Section 3) or average desired output of node i, j (Section 4) |
| $xd_{i,j,n}$ | Desired output of node i, j from exemplar n |
| $Y_i$ | Vector of continuous functions |
| $y_{i,j,k}$ | Continuous function |
| $Z_i$ | Vector of desired network mappings to nodes in layer i |
| $\underline{Z}_i$ | Vector of stochastic estimates of desired network mappings to nodes in layer i |
| $z_{i,j}$ | Desired network mapping to node i, j |
| $\underline{z}_{i,j}$ | Stochastic estimate of desired network mapping to node i, j |
| $Æ(\cdot)$ | Continuous function of $(\cdot)$ |
| $\alpha(t)$ | Stochastic estimate of DR |
| $\beta$ | Constant |
| $\Gamma(\cdot)$ | Function of $(\cdot)$ |
| $\varsigma$ | Number of optimization parameters |
| $\varsigma$ | Index of optimization parameters |
| $\delta$ | Partial derivative operator |
| $\delta t$ | Small change in time |
| $\epsilon$ | Arbitrarily small real number |
| $\epsilon_1$ | Arbitrarily small real number |
| $\epsilon_2$ | Arbitrarily small real number |

| | |
|---|---|
| $\Theta(\cdot)$ | Function of $(\cdot)$ |
| $\mu$ | Small real number |
| $\mu 1$ | Small real number |
| $\mu 2$ | Small real number |
| $\mu 3$ | Small real number |
| $\mu 4$ | Small real number |
| $\tilde{N}$ | Polynomial order |
| $\tilde{n}$ | Polynomial index |
| $\pi$ | Value pie |
| $\Sigma$ | Summation operator |
| $\sigma^2_{j,n}$ | Sample variance for exemplar n |
| $\sigma^{2\ mean}_{j,n}$ | Variance of the mean for exemplar n |
| $\tau$ | Temperature |
| $\Phi(\cdot)$ | Function of $(\cdot)$ |
| $\phi$ | Independent variable |
| $\Omega_1$ | Vector of training set inputs |
| $\Omega_{1,j}$ | Vector of training set inputs |
| $\Omega_{1,j,n}$ | Training set input for exemplar n |
| $\Omega_{1,n}$ | Vector of training set inputs for exemplar n |
| $\Omega_{I+1}$ | Vector of training set outputs |
| $\Omega_{I+1,j}$ | Vector of training set outputs |
| $\Omega_{I+1,j,n}$ | Training set output for exemplar n |
| $\Omega_{I+1,n}$ | Vector of training set outputs for exemplar n |

| | |
|---|---|
| $[\cdot]^T$ | Transpose of a matrix or vector |
| $(\cdot)^t$ | $(\cdot)$ at time t |
| $(\cdot)^*$ | Optimum value of $(\cdot)$ |
| $\|\cdot\|$ | Absolute value of $(\cdot)$ |
| $\infty$ | Infinity |

# 1. INTRODUCTION

Artificial neural networks may contribute to nuclear power plant safety in the area of accident condition diagnostics. Although promising, application of these connectionist methods is difficult due to certain characteristic limitations inherent in their approach. These difficulties restrict wide spread industrial exploitation. Connectionist methods which are more serviceable must be developed if artificial neural network technology is to contribute to future productivity.

Many authors have addressed the need for, and possible methods of obtaining, better supervised learning techniques for layered feed-forward artificial neural networks [Ba10,Co2,Da1,Ko3,Ko6,Ku2,Ma3,Ng2,Pa4, Sa2,Se1,Sh1,Si1,St4,We3,We5,Wh1,Ya1]. Neural network learning is equivalent to multidimensional, nonlinear, under-constrained optimization [Wa2,Wi4 p14]. Optimization of this type is very complex for problems with more than a few independent variables [Le2,Pa2,Ru2, Wi4]. Add to this the fact that few network cost (energy, error, merit, objective) functions are convex [Mc1,Pa2 p1], and most training techniques can be

considered intractable [Ho2,Pa2 p343,Wi4]. The memorization problem alone is intractable [Ju1]. Yet in order to perform inductive tasks networks must not simply memorize specific patterns, they must generalize them into abstract rules and relationships among pattern classes [Ma5]. Networks are trained with a finite set of known exemplars. They are expected to generalize this data into mappings between much larger sets [De3 p17,Hi2 p536,Ti1]. These general class characteristics must be found during the training process [He4,Ti1,We4]. Optimization with incomplete information requires special treatment [Gu1,Ti1].

Since the solution to the neural network training problem is not guaranteed tractable for deterministic methods [Ju1], either a nondeterministic (probabilistic, stochastic) approach should be used, or the problem should be changed in a way to facilitate the analysis [Ho2,Ki1]. It is possible to use both of these approaches toward the optimization of neural network parameter sets. A dynamic network architecture scheme can be used to change the complexity of the training problem [As1,Hi3,Is1,Ju1,Pa2 p156] and a stochastic optimization procedure can be used in the training method [Ma4,Ru3,Ru4,Sh2,Ta1]. Changing the network

architecture during the training process effectively changes the number of independent variables. A change in the network architecture during training would allow the system to escape local convergence traps [As1,Mc1] and can make a solution easier to obtain. Furthermore, stochastic optimization can be very effective at obtaining solutions to otherwise difficult or intractable problems [Ak1,Ju1,Ka3,Ki1,Le1,Ma4,Pr1,Ru4].

The objective of this research is to investigate the learning and generalization behavior of artificial neural networks, develop a more serviceable network paradigm and apply the new paradigm to a nuclear power plant accident diagnostics problem. This objective is satisfied by the application of the new simulated condensation paradigm to seven computer generated nuclear power plant accident scenarios. The following approach is taken. Seven accident scenarios plus the normal full power steady state condition are taught to an artificial neural network using the simulated condensation methodology. The network learns each of the conditions from a single time step of data. The accidents analyzed are:

1. Total loss of offsite power;
2. Main feedwater line break;

3. Main steam line break;

4. Control rod ejection;

5. Hot leg loss of coolant accident;

6. Cold leg loss of coolant accident;

7. Steam generator tube leak.

Within each data set the accident condition is preceded by a period of normal full power operation. The problem is to use a simulated condensation network to recognize and distinguish each of the eight plant conditions based on the given data. This dissertation provides documentation of the investigation which led to the successful completion of this problem.

The contributions that this work provides are threefold. First, a new auto-adaptive stochastic neural network learning paradigm is developed. This paradigm optimizes the nodal bias, gain, and activation constants as well as the usual interconnection weights. Secondly the new method, called simulated condensation, employs a new dynamic node architecture scheme which varies the number of hidden nodes in the network during the training process. This dynamic node architecture increases the network learning speed and generalization capabilities as well as determining the appropriate network size needed for the training task at hand.

Finally, this dissertation demonstrates the feasibility of using simulated condensation in particular and neural networks in general for nuclear power plant safety diagnostics.

The organization of this dissertation is as follows. The first section gives a brief introduction to neural networks and the problem to be investigated. Also discussed in the first section are the objectives and contributions of the work and a brief outline of each of the sections of the dissertation. Section 2 covers the theoretical background necessary not only to put the new method into proper perspective but also to aid in the understanding of the subsequent sections. Section 3 describes the nodes and networks used in the dissertation. Section 3 also shows a proof of the ability of these networks to model continuous functions. Section 4 gives a complete description of the theory of the new simulated condensation methodology, including nodal optimization and the dynamic node architecture scheme. Section 5 contains the nuclear power plant diagnostic analysis including a description of both the problem and the method of solution. Section 6 contains the conclusions and suggestions for further work. There are also six separate appendixes. Appendix A contains

the benchmark analysis which shows a comparison between the simulated condensation and the backpropagation methodologies. Appendix B provides a description of the computer generated nuclear power plant accident data. Appendix C shows the files used in the analysis of Section 5. Appendix D contains tabulated results of the investigation. Appendix E lists all of the computer codes used in the dissertation. Finally, Appendix F is an index of the computer files used.

# 2. THEORETICAL BACKGROUND

This section contains some of the background information needed to put the later sections into proper perspective. Below is a general discussion of both continuous and discrete optimization. Also discussed are two common procedures which can be used for the optimization of neural networks.

## 2.1 Optimization

Optimization is the process of obtaining close approximations, or indeed finding the solution, $W^*$ for a cost function, $c(W)$ such that,

$$c^* = c(W^*). \tag{2-1}$$

Where $c^*$ is the absolute maximum, or minimum, of a real valued function $c \in R^1$, with domain $W \in R^{\varsigma}$, where

$$W = (w_1, w_2, \ldots, w_{\varsigma}, \ldots, w_{\varsigma})^T. \tag{2-2}$$

Constraints on this process can be functional,

$$f_p(W) = 0 \quad ; \quad p=1,2,\ldots,P, \tag{2-3}$$

or regional,

$$r_q(W) \leq 0 \quad ; \quad q=1,2,\ldots,Q. \tag{2-4}$$

Problems of interest are under-constrained, such that,

$$\varsigma > P, \tag{2-5}$$

and therefore have many solutions [Sh2 p14,Wi4 p8].

## 2.2 Combinatorial Optimization

Each $w_\varsigma$ takes on only discrete values in combinatorial optimization. These discrete optimization problems have finite or countably infinite numbers of states [Pa2 p3]. One of the most infamous combinatorial optimization problems is the traveling salesman problem [Hu1,Ki1,Pa2,Pr1]. In this problem there are a finite number of possible routes between cities on a salesman's itinerary, and the question is, which is the shortest? Since an exhaustive search is always successful, the global minima is both decidable and realizable [Pa2 p345]. An exhaustive search, however, is not tractable since the number of tours of n cities is (n-1)!/2 [Pa2 p157]. The traveling salesman problem is, therefore, in the class of NP-complete problems [Pa2]. Solutions to NP-complete problems require more than a polynomial number of elementary operations as a function of

increasing problem size [Pa2 p342]. Many large traveling salesman problems are, however, solved with nondeterministic methods such as simulated annealing [Ki1,Ma4,Pr1,Ru4]. Training discrete activation networks is equivalent to solving the traveling salesmen problem [Ki1,Ru4]. Because deterministic solutions are NP-complete, heuristic algorithms are the best choice for large problems of this type [Ki1].

## 2.3 Continuous Optimization

Continuous optimization is a generalization of discrete optimization in that each $w_c$ may be any finite real number. Optimization problems over continuous cost functions have been investigated extensively and are subject to a similar tractability quandary as those in combinatorial optimization [Hi1, Le2,Ru3,Sh2,Wi4]. Continuous activation training methodologies use continuous optimization techniques to obtain optimal weight sets for continuous neural networks.

## 2.4 Direct Optimization

Direct search methods use cost function evaluations and deterministic or probabilistic step sizes to obtain

optimal solutions [Ru3 p174,Wi4 p39]. Virtually all of these approaches require unimodal cost functions or are computationally expensive [Sh2 p28]. The exhaustive search of combinatorial optimization as well as the golden section search of continuous optimization use these direct methodologies [Pr1 p274,Sh2 p36,Wi4 p39].

## 2.5 Newton's Methods

The Newton's method approaches utilize a number of derivatives of c(W) to obtain a next estimate of $W^*$ [Pa4,Pr1 p269,Wi4 p38]. The Taylor series expansion of c(W) is,

$$c(W+dW) = c(W) + G^T(W)\cdot dW + (1/2)dW^T\cdot H(W)\cdot dW + \ldots, \tag{2-6}$$

where G is the gradient vector,

$$G = \delta c/\delta W = \begin{bmatrix} \delta c/\delta w_1 \\ \vdots \\ \delta c/\delta w_C \end{bmatrix}, \tag{2-7}$$

and H is the Hessian matrix,

$$H = \begin{bmatrix} \frac{\delta^2 c}{\delta w_1^2} & \frac{\delta^2 c}{\delta w_1 \delta w_2} & \cdots & \frac{\delta^2 c}{\delta w_1 \delta w_\varsigma} \\ \vdots & \vdots & & \vdots \\ \frac{\delta^2 c}{\delta w_\varsigma \delta w_1} & \cdots & \cdots & \frac{\delta^2 c}{\delta w_\varsigma^2} \end{bmatrix}. \qquad (2\text{-}8)$$

These equations can be solved for dW and applied iteratively such that at time t, the next estimate of W is found as,

$$W^{t+1} = W^t + dW^t. \qquad (2\text{-}9)$$

The process is stopped when, $c(W^t) \approx c(W^*)$.

The method of steepest decent is obtained by ignoring second and higher order terms [Wi4 p39]. For a local minima

$$G(W^*) = 0 \qquad (2\text{-}10)$$

and

$$dW^T \cdot H(W^*) \cdot dW \qquad (2\text{-}11)$$

is positive definite. Then with

$$W^* = W + dW, \tag{2-12}$$

$$c(W^*) = c(W) + G^T(W) \cdot dW, \tag{2-13}$$

and differenciated with respect to W yields

$$0 = G(W^*) = G(W) + H(W) \cdot dW. \tag{2-14}$$

This implies

$$dW = - H^{-1}(W) \cdot G(W), \tag{2-15}$$

and for steepest descent,

$$dW = - \mu \cdot G(W). \tag{2-16}$$

Where $\mu$ is the step size [Pr1 p301,Sh2 p85]. The recursion,

$$W^{t+1} = W^t - \mu \cdot G(W^t), \tag{2-17}$$

iterates towards a local minimum. Gradient descent methods are used extensively in cases where the first derivative of the cost function is available [Pr1,Sh2, Wi4]. The various backpropagation algorithms minimize a root-mean-square-error cost function in this way.

The above method can be improved upon by calculating the second order derivatives and inverting the Hessian matrix [De2 p89,Pr1 p294,Wi4 p40],

$$W^{t+1} = W^{t} - H^{-1}(W^{t}) \cdot G(W^{t}). \qquad (2\text{-}18)$$

However, this approach requires large amounts of computer memory and time [Pa4,Ru4,Wi4 p40]. It should be mentioned that iterative Newton's methods exhibit chaotic behavior [Pe3 p93]. The presence of chaos dictates that many random starting points must be analyzed if the global extremum is desired [De3 p50].

## 2.6 Heuristic Techniques

Heuristic algorithms are empirical and usually problem specific optimization techniques. There are two basic strategies for heuristic methods [Ki1]. The first is the divide and conquer approach, where a problem is divided into small manageable parts which are then solved separately. The challenge of this approach is to reunify the problem so that the errors made in the process do not offset the gains obtained. The other approach is iterative improvement [Ru3 p174], which searches the problem domain for better solutions. Heuristic methods can be either adaptive or nonadaptive [Ru3 p130]. Nonadaptive heuristic methods do not alter their approach during the course of the calculation. Uniform random searches are nonadaptive heuristic

methods [Sh2 p65]. Alternatively, adaptive search methods adapt themselves to best solve particular problems [Co3,Go1,Ru3 p184,St2]. These are the most effective methods, however, the success of an adaptive algorithm depends on a productive adaptation scheme [Ma4].

## 2.7 Simulated Annealing

This adaptive heuristic finds the global optimum by applying the principles of statistical mechanics [Ki1]. The algorithm proceeds as follows. Starting at a given condition a small random change $dw_\varsigma$ is added to the value of a randomly selected independent variable $w_\varsigma$. The resulting system cost (energy) change, dc, is then calculated. If $dc \leq 0$, the displacement is accepted and this new configuration is used as the starting point for the next step. If $dc > 0$, the new state is accepted with probability, P(dc), such that,

$$P(dc) = \exp\{-dc(W)/k\tau\}. \qquad (2\text{-}19)$$

This is the familiar Boltzmann distribution, where k is a constant and $\tau$ is the temperature variable [Pr1 p327]. The rejection technique is used for this, up hill, step in the simulation [Ki1,St1 unit3]. A uniformly

distributed random number, R, is generated on the interval (0,1). If P(dc) $\geq$ R, then the new state is accepted, if not it is rejected. The repetition of these steps simulates the thermal motions of atoms at temperature $\tau$. Enough time should be spent at each temperature, and the temperature changes should be small enough, to ensure that thermal equilibrium is attained before each next temperature change. The speed and amount of this temperature change is called the annealing schedule and is of prime importance. An annealing schedule which is too fast or too slow will not give a globally optimal solution. The annealing schedule adapts the algorithm as the system approaches a solution. Unfortunately the annealing schedule, in most simulations, must be determined by trial and error [Pr1 p328].

# 3. NEURAL NETWORK CHARACTERISTICS

## 3.1 Continuous Layered Feed-Forward Networks

Many different artificial neural network paradigms have been proposed [Ac1,Ak1,An1,Au1,Ca1,Ca6,Co2,Gr2,He2, Kl1,Ko5,Li1,Mu1,Pa1,Ru4,We3]. In general, however, a neural network is a collection of nodes (artificial neurons, processing elements, units) each having many inputs and any number of outputs, usually connected in layers. In most cases each unit takes a weighted sum of its inputs, performs a nonlinear transformation on this sum, and sends the transformed sum to its outputs.

Networks of the layered continuous type can be described as follows. A mapping, $M_{I+1}$, such that

$$M_{I+1}(X_1) = X_{I+1} \tag{3-1}$$

is modeled by a network of layered nodes as shown in Figure 1, where

$$X_1 = (x_{1,1}, x_{1,2}, \cdots, x_{1,J},) \tag{3-2}$$

is the input vector and

$$X_{I+1} = (x_{I+1,1}, x_{I+1,2}, \cdots, x_{I+1,J}) \tag{3-3}$$

is the output vector, which corresponds to the output of

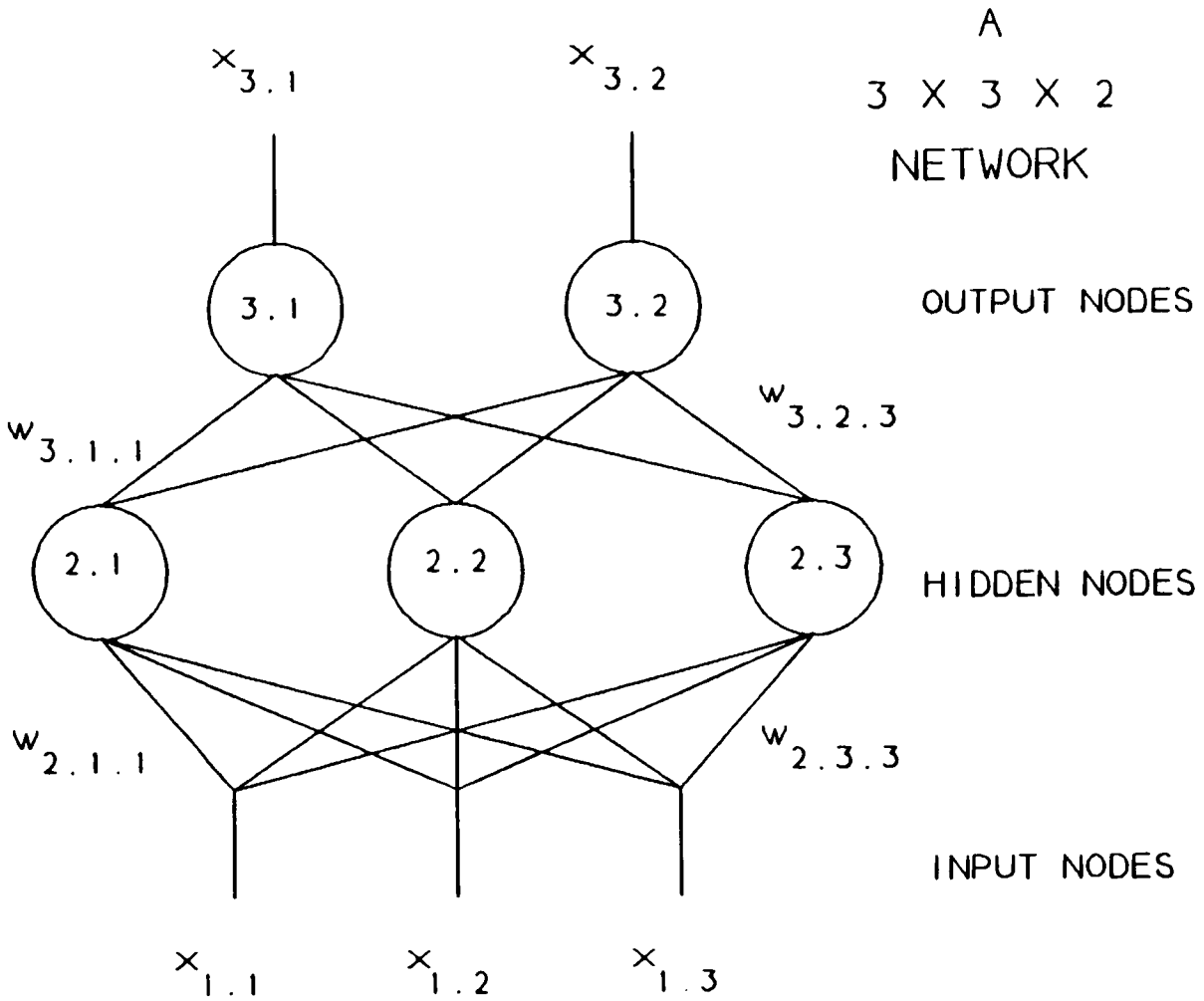



**Figure 1. An Example Network**

the I'th layer of nodes, and J' and J are the dimension of the input and output vectors respectively. Each node can have the following generalized input-output relation, as shown in Figure 2,

$$x_{i,j} = k1_{i,j} \cdot \{ (1/\pi) \cdot \arctan(u_{i,j}) + 1/2 \}, \qquad (3\text{-}4)$$

$$u_{i,j} = g1_{i,j} \cdot \sum_{k=1}^{K} (w_{i,j,k} \cdot x_{i-1,k}) + b1_{i,j} \cdot \qquad (3\text{-}5)$$

Where $x_{i,j}$ is the output activation of node i, j, $u_{i,j}$ is a nodal input, $b1_{i,j}$ is a bias, $g1_{i,j}$ is a gain, $k1_{i,j}$ is an output activation constant, and $w_{i,j,k}$ is an interconnection weight. And, i, j, k, are the layer, node in layer i, and node in layer i-1, indices respectively.

The perceptrons used here are more general than those used in the common backpropagation paradigm [He4]. Not only do the nodes used here have more adjustable parameters, but they also use the arctangent rather than the usual sigmoid function. The common backpropagation sigmoid function has the following form,

$$x_{i,j} = \frac{1}{1 + \exp(-u_{i,j})}. \qquad (3\text{-}6)$$

The reason for the switch to the arctangent function

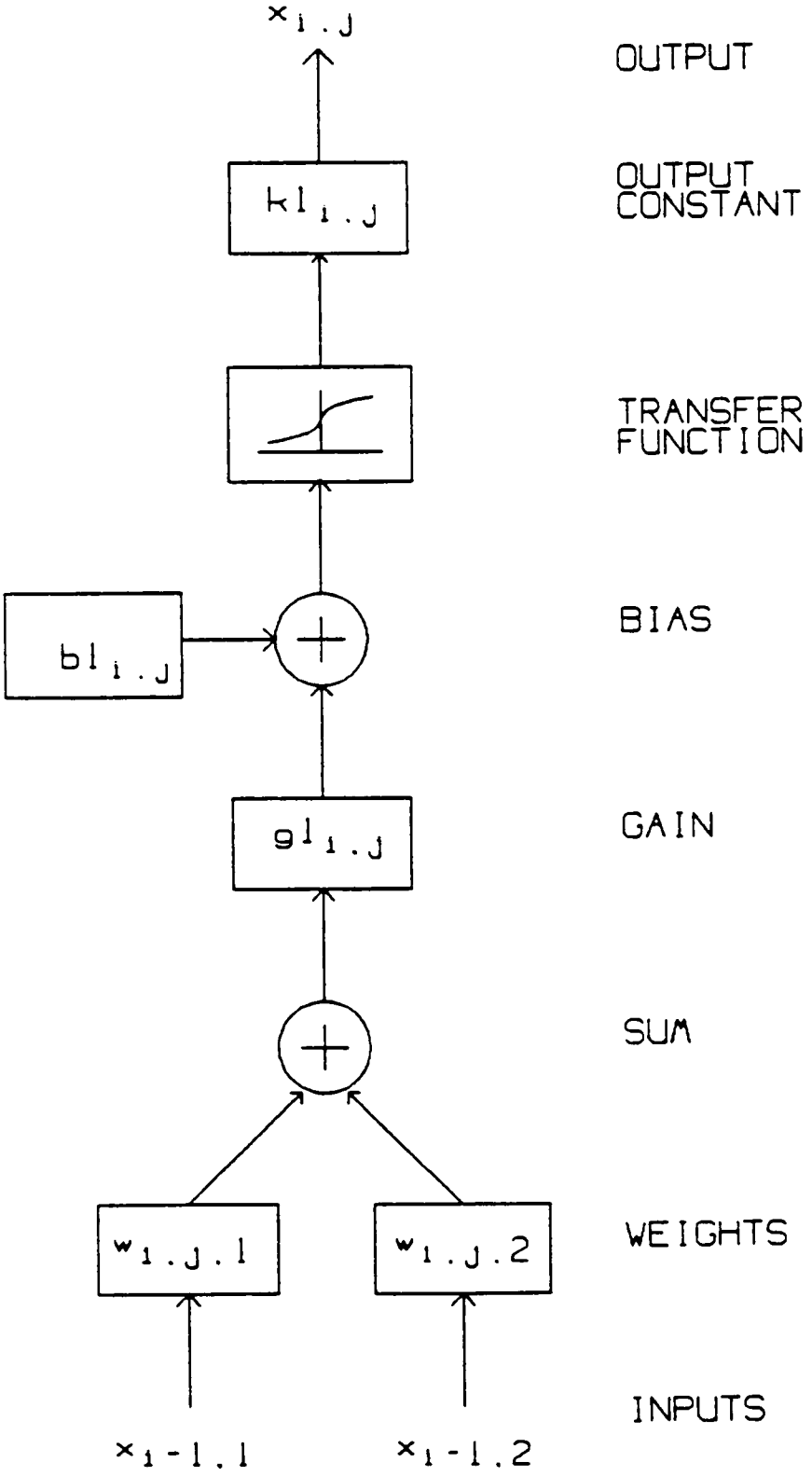



**Figure 2. An Enlarged Generalized Node**

in this dissertation is as follows. If $u_{i,j}$ is large and negative then $\exp(-u_{i,j})$ can be very large and may reach or surpass machine infinity. This will cause a fatal error and the program will stop. These errors can become annoying. The arctangent function was selected to avoid this annoyance.

The cost function can have the form,

$$c(W) = \{(1/(N \cdot J)) \cdot \sum_{n=1}^{N} \cdot [\sum_{j=1}^{J} (\Omega_{I+1,j} - x_{I+1,j})^2 ]\}^{1/2}, \quad (3\text{-}7)$$

Where N is the number of training exemplars in the training set, $\{\Omega_1, \Omega_{I+1}\}$. Note that $\{\Omega_1\}$ is a subset of all possible inputs $\{X_1\}$, and $\{\Omega_{I+1}\}$ is a subset of all correct or desired outputs $\{XD_{I+1}\}$ associated with $\{X_1\}$. The problem is to reconstruct or approximate the desired mapping $Z_{I+1}$, such that,

$$XD_{I+1} = Z_{I+1}(X_1), \quad (3\text{-}8)$$

from $\{\Omega_1, \Omega_{I+1}\}$. There are, however, many solutions $M_{I+1}$, which satisfy the training set

$$\Omega_{I+1} = M_{I+1}(\Omega_1), \quad (3\text{-}9)$$

none of which are necessarily the desired solution

$$\Omega_{I+1} = Z_{I+1}(\Omega_1). \quad (3\text{-}10)$$

## 3.2 Function approximation

The existence of an approximate neural network function solution can be shown as follows. The derivative of arctan{$\phi$}, for some independent variable $\phi$, is

$$\frac{d(\arctan\{\phi\})}{d\phi} = \frac{1}{(1+\phi^2)}. \qquad (3\text{-}11)$$

This can be expanded in a binomial series, [Ge1 p491] for $\phi^2 \leq 1$, as

$$\frac{1}{(1+\phi^2)} = 1 - \phi^2 + \phi^4 - \phi^6 + \phi^8 - \ldots . \qquad (3\text{-}12)$$

Integrating term by term yields,

$$\arctan\{\phi\} = \phi - \phi^3/3 + \phi^5/5 - \phi^7/7 + \ldots + C_1, \qquad (3\text{-}13)$$

where arctan{0} = 0, so $C_1 = 0$. Or,

$$\arctan\{\phi\} = \sum_{n=0}^{\infty} (-1)^n \cdot \frac{\phi^{(2n+1)}}{(2n+1)} \quad ; \phi^2 \leq 1. \qquad (3\text{-}14)$$

Similarly,

$$\arctan\{\phi\} = (\pi/2) + \sum_{n=0}^{\infty} (-1)^{n+1} \cdot \frac{\phi^{-(2n+1)}}{(2n+1)} \quad ; \phi > 1,$$

and,

$$\arctan\{\phi\} = -(\pi/2) + \sum_{n=0}^{\infty} (-1)^{n+1} \cdot \frac{\phi^{-(2n+1)}}{(2n+1)} \quad ; \phi < -1.$$

(3-15)

Thus, the $\arctan\{\phi\}$ can be written as a convergent infinite polynomial series, or approximated as a finite polynomial [Be3 p350,Ge1 p491]. Substituting this for $\arctan(u_{i,j})$ yields

$$x_{i,j} = kl_{i,j} \cdot \{ (1/\pi) \cdot [ \sum_{n=0}^{\infty} (-1)^{n} \cdot \frac{u_{i,j}^{2n+1}}{(2n+1)} ] + 1/2 \}$$

$$; \phi^2 \leq 1, \quad (3\text{-}16)$$

which can be approximated as

$$x_{i,j} \approx kl_{i,j} \cdot \{ (1/\pi) \cdot [ \sum_{\tilde{n}=0}^{\tilde{N}} (-1)^{\tilde{n}} \cdot \frac{u_{i,j}^{2\tilde{n}+1}}{(2\tilde{n}+1)} ] + 1/2 \},$$

$$; \phi^2 \leq 1, \quad (3\text{-}17)$$

where $\tilde{N}$ is some finite number. Similar relations hold

for the other ranges of $u_{i,j}$. In this way each node in the network implements a high order polynomial of its input. For multilayer networks, $u_{i,j}$ is a function of $x_{i-1,k}$, but substitution of another series for $u_{i,j}$ will simply yield another, larger and more complex polynomial and so forth. Therefore, neural networks implement multidimensional polynomial functions. A theorem due to Weierstrass [Lo1 p3] states that for each continuous function $Æ(\phi)$ on (a,b) there is a polynomial such that for an arbitrarily small $\epsilon_1 > 0$,

$$| Æ(\phi) - P_{\tilde{N}}(\phi) | < \epsilon_1 \; ; \quad a < \phi < b, \tag{3-18}$$

where

$$P_{\tilde{N}}(\phi) = \sum_{\tilde{n}=0}^{\tilde{N}} a_{\tilde{n}} \cdot \phi^{\tilde{n}}, \tag{3-19}$$

and $a_{\tilde{n}}$ are unknown coefficients. Therefore if the function $Æ(\phi)$ is continuous, then a good polynomial approximation exists and a neural network can implement this approximation.

# 4. THE THEORY OF SIMULATED CONDENSATION

## 4.1 Introduction

A description of the generalized nodes and networks considered in this section is given below and is diagrammed in Figures 1 and 2 of Section 3.1. Each node is described functionally as

$$u_{i,j,n} = gl_{i,j} \cdot \sum_{k=1}^{J(i-1)} (w_{i,j,k} \cdot x_{i-1,k,n}) + bl_{i,j}, \tag{4-1}$$

$$x_{i,j,n} = kl_{i,j} \cdot \{ (1/\pi) \cdot \arctan(u_{i,j,n}) + 1/2 \}, \tag{4-2}$$

where $bl_{i,j}$, $gl_{i,j}$, $kl_{i,j}$, and $w_{i,j,k}$ are trainable parameters; i, j, k, are the layer, node in layer i, and node in layer i-1, indices respectively. And n, is the training set exemplar (input-output pattern) number. Also, $x_{i,j,n}$ is the output (activation) of node i, j, from input n,

$$X_{1,n} = (x_{1,1,n}, x_{1,2,n}, \cdots, x_{1,J(1),n})^T, \tag{4-3}$$

is the network input vector for the $n^{th}$ exemplar, and

$$X_{I+1,n} = (x_{I+1,1,n}, x_{I+1,2,n}, \cdots, x_{I+1,J(I+1),n})^T \tag{4-4}$$

is the network output vector from input n. Where J(1), and J(I+1), are the number of inputs and output nodes respectively and J(i) is the number of nodes in layer i. Finally, $u_{i,j,n}$ is called the nodal input for node i, j. The basic cost function is defined as

$$c(W) = \{(1/(N \cdot J(I+1))) \cdot \sum_{n=1}^{N} \cdot [\sum_{j=1}^{J(I+1)} (\Omega_{I+1,j,n} - x_{I+1,j,n})^2 ]\}^{1/2}, \tag{4-5}$$

where N is the total number of exemplars in the training set, $\Omega_{I+1,j,n}$ is the correct output and $x_{I+1,j,n}$ is the actual network output from input n. Cost functions may also include other demand terms, such as weight demands. For example,

$$\mu 1 \cdot \sum_{i} \cdot \sum_{j} \cdot \sum_{k} (wd - w_{i,j,k})^2, \tag{4-6}$$

could be added to the cost function, where wd is some

desired average interconnection weight and $\mu 1$ is a small positive constant. Alternatively some regional constraint can be placed on the weights if it is desired that they remain within certain limits.

It is required to find the minimum of the cost function by adaptation of the adjustable parameters. There are many ways to approach this optimization problem.

Simulated condensation is a unique approach because it employs stochastic search techniques and differs from established probabilistic methods in that:

1. Increased cost function parameter sets are not accepted unless the network architecture is changed;
2. Continuous node activations are used. This allows the modeling of continuous mappings;
3. The network is not annealed on recall like Boltzmann machines. Recall is fast and simple;
4. Learning is auto-adaptive. The network learns how to learn better as learning proceeds;
5. During learning the network is trained in parts, one parameter set at a time;
6. A dynamic node architecture scheme is used to enhance learning and generalization.

An outline of the simulated condensation procedure is as follows:

1. Make two initial random parameter set guesses and evaluate c(W) for each;
2. Store the best parameter set, discard the worst;
3. Make a small random change to the parameter set and evaluate the cost function at this new time step, $c^{t+1}(W)$. If $c^{t+1}(W) < c^{t}(W)$ continue to 4, if not, go to 2;
4. change the parameter selection criteria based on 3;
5. Apply the same, successful, parameter changes again. If $c^{t+1}(W) < c^{t}(W)$ go to 5, repeat a fixed number of times, if not, go to 2;
6. Apply the algorithm, 1 through 5, in turn to each adaptable parameter set, $\{b1_{i,j}\}$, $\{g1_{i,j}\}$, $\{k1_{i,j}\}$, and $\{w_{i,j,k}\}$;
7. If the network learning is slow, expand the network architecture by adding a node to the most important layer;
8. If the total cost is acceptable, such that $c^{t}(W) < \epsilon_2$ for some desired $\epsilon_2$, then reduce the network size by deleting the least important node;
9. Go to 2.

The simulated condensation method is a nondeterministic auto-adaptive heuristic algorithm. The method's physical analogy is that of a crystal condensate which forms from a gas. A common example of this process is the formation of ice crystals on the inside of a window on a very cold day. When using simulated condensation, the network is usually started with only a few nodes. Thus, as the network is trained, more nodes are added and the final network can be thought of as the condensate of the process. The stochastic evaluation of integrals procedure [Ri1 p119] is used in the derivation of simulated condensation. This integral evaluation procedure provides the optimal probability density function from which to select future estimates of the parameters being optimized [Ri1 p122]. Learning is adapted by the algorithm itself through the use of internal learning parameters which control the system dynamics by continually updating the system estimate of the optimal probability density function, supplied by the theory. This approach is more effective than the externally determined annealing schedule of simulated annealing [Ki1]. The dynamic learning parameters are updated during code execution as more and better information is gained about their appropriate

values. The learning parameters are used by the network only during the learning phase and have no effect on the simplicity of the recall process. Application of these learning parameters significantly improves code learning efficiency. The mathematical bases and derivation of the simulated condensation method is given in the subsections below.

## 4.2 Nodal Optimization

If it is assumed that an exact solution, or equivalently a mapping with vanishingly small error, exists and is realizable, then

$$XD_{I+1,n} = Z_{I+1}(X_{1,n}) \tag{4-7}$$

where

$$Z_i = (z_{i,1}, z_{i,2}, \cdots, z_{i,J(i)})^T \tag{4-8}$$

is a vector function which describes the desired network mapping to, and the activation of, all the nodes in the network. Equivalently define a new function $Y_i$, such that

$$xd_{I+1,j,n} = z_{I+1,j}(X_{1,n}) = \int_{-\infty}^{+\infty} y_{I+1,j,k}(W, X_{1,n}) \cdot dW, \tag{4-9}$$

where

$$Y_i = (y_{i,1,k}, y_{i,2,k}, \cdots, y_{i,J(i),k})^T, \tag{4-10}$$

and the desired output vector is

$$XD_{I+1,n} = (xd_{I+1,1,n}, xd_{I+1,2,n}, \cdots, xd_{I+1,J(I+1),n})^T. \tag{4-11}$$

The domain of each $w_{i,j,k}$ can be restricted to $-w^{max} \leq w_{i,j,k} \leq w^{max}$ without significant loss of realizability and Equation (4-9) becomes,

$$z_{I+1,j}(X_{1,n}) = \int_{-w^{max}}^{w^{max}} y_{I+1,j,k}(W, X_{1,n}) \cdot dW. \tag{4-12}$$

Thus, $z_{I+1,j}(X_{1,n})$ may be estimated stochastically [Ri1 p119] as,

$$x_{I+1,j,n} = \underline{z}_{I+1,j}(\Omega_{1,n}, N_t)$$

$$= (2 \cdot w^{max}/N_t) \cdot \sum_{n_t=1}^{N_t} y_{I+1,j,k,n_t}(W, \Omega_{1,n}), \tag{4-13}$$

where $N_t$ is the total number of $y_{I+1,j,k}$ function

evaluation trials, each trial being $y_{I+1,j,k,n_t}$, and

$$\underline{Z}_{I+1}(\Omega_{1,n}, N_t) = X_{I+1,n} \tag{4-14}$$

is a stochastic estimate of $Z_{I+1}$. The sample variance estimate is [Ri1 p120]

$$\sigma^2_{j,n} = (1/N_t) \cdot \sum_{n_t=1}^{N_t} \{ \underline{z}_{I+1,j}(\Omega_{1,n}, N_t) - 2 \cdot w^{max} \cdot y_{I+1,j,k,n_t}(W, \Omega_{1,n}) \}^2, \tag{4-15}$$

for each individual exemplar, n. The variance estimate of the reproducibility of the mean, $\underline{z}_{I+1,j}$, for each exemplar is [Ri1 p142]

$$\sigma^2_{j,n}{}^{mean} = (1/N_t) \cdot \sigma^2_{j,n}$$

$$= (1/N_t) \cdot \sum_{n_t=1}^{N_t} \{ \underline{z}_{I+1,j}(\Omega_{1,n}, N_t) - z_{I+1,j}(\Omega_{1,n}) \}^2. \tag{4-16}$$

The strong law of large numbers states that if the defining integral, Equation (4-9), exists then as $N_t$ approaches infinity [Pa3 p263],

$$P\{ \mid \underline{z}_{I+1,j}(\Omega_{1,n},N_t) - z_{I+1,j}(\Omega_{1,n}) \mid < \epsilon \} = 1, \tag{4-17}$$

for each exemplar and arbitrarily small positive $\epsilon$. Noting that the stochastic function, $\underline{Z}_{I+1}(\Omega_{1,n},N_t)$, is the output estimate of $Z_{I+1}(\Omega_{1,n})$, then

$$c_n^2(W) = (1/J(I+1)) \cdot \sum_{j=1}^{J(I+1)} \{ z_{I+1,j}(\Omega_{1,n}) - \underline{z}_{I+1,j}(\Omega_{1,n},N_t) \}^2, \tag{4-18}$$

or equivalently,

$$c^2(W) = (1/(N \cdot J(I+1))) \cdot \sum_{n=1}^{N} \cdot \sum_{j=1}^{J(I+1)} \{ \Omega_{I+1,j,n} - x_{I+1,j,n} \}^2, \tag{4-19}$$

where c(W) is the cost function to be minimized. It is therefore clear that in order to minimize c(W) it is necessary to minimize the variance of the means and vice versa. To this end $Y_{I+1}(W)$ could be generated stochastically and the integral could be found.

However, $Y_{I+1}(W)$ is as yet unknown, and even if it were, this would be a tedious process at best. But since by definition,

$$X_{I+1,n}(W,X_{1,n}) = \int_{-w^{max}}^{W} Y_{I+1}(W',X_{1,n})\cdot dW', \qquad (4\text{-}20)$$

and if it is assumed that all the generalized weights are fixed except one, say $w_{i,j,k}$, and dropping the explicit notation for the dependence of $X_{I+1,n}$ on $X_{1,n}$, then,

$$X_{I+1,n}(W) = \int_{-w^{max}}^{w_{i,j,k}} Y_{I+1}(W',X_{1,n})\cdot dw'_{i,j,k}. \qquad (4\text{-}21)$$

Equation (4-21) can be generalized to include every node activation,

$$X_{i,n}(W) = \int_{-w^{max}}^{w_{i,j,k}} Y_{i}(W',X_{1,n})\cdot dw'_{i,j,k}, \qquad (4\text{-}22)$$

and therefore, for each node, exemplar and weight,

$$y_{i,j,k}(W,X_{1,n}) = \frac{dx_{i,j,n}}{dw_{i,j,k}}$$

$$= \frac{k1_{i,j}}{\pi(1 + u_{i,j,n}^{2})} \cdot \frac{du_{i,j,n}}{dw_{i,j,k}} \cdot$$

(4-23)

Thus, an iterative technique can be devised in which previous stochastic estimates of $Z_{I+1}$, can be used to infer future estimates of $Z_{I+1}$, which more closely approximate the desired $Z_{I+1}$.

Within the training set the value of $Z_{I+1}(X_{1,n})$ is known as $\Omega_{I+1,n} = Z_{I+1}(\Omega_{1,n})$. Therefore the stochastic evaluation of the integral can be dispensed with and the cost function can be found in a more direct manner. However, the form of the integral in Equation (4-9) can be used to provide the optimal probability density function from which to select the weights. In this way the stochastic search can be self-adapted to provide a quick workable solution to the particular training problem being attempted.

For each node, exemplar and generalized weight,

$$z = \int y(W)\cdot dW = \int \frac{y(W)}{f(W)}\cdot f(W)\cdot dW$$

$$= \int h(W)\cdot f(W)\cdot dW = \int h(W)\cdot dF(W), \qquad (4\text{-}24)$$

where,

$$F(W) = \int_{-\infty}^{W} f(W')\cdot dW', \qquad (4\text{-}25)$$

and if $h(W) \equiv 1.0$, then,

$$z = \int dF(W) = F(W). \qquad (4\text{-}26)$$

The integral in Equation (4-26) is much easier to evaluate than Equation (4-9) since it is the integral of a total derivative. Substituting unity for h(W) yields,

$$f(W) = y_{i,j,k}(W), \qquad (4\text{-}27)$$

where the dependence of $y_{i,j,k}$ on $x_{1,j,n}$ is omitted for convenience. In order to produce random variables, R, with density function f(W), the following relation is applied [Ci1 p10,Ri1 p59],

$$R = F(W), \tag{4-28}$$

which can be reduced to,

$$R_{i,j,k} = F(w_{i,j,k}), \tag{4-29}$$

if all the generalized weights are held constant except one $w_{i,j,k}$. This can be rearranged to yield,

$$w_{i,j,k} = F^{-1}(R_{i,j,k}), \tag{4-30}$$

where, by Equations (4-7) and (4-27), it is seen that F(W) is also a function of $X_{1,n}$,

$$F(w_{i,j,k}) = k1_{i,j} \cdot \{ (1/\pi) \cdot \arctan(u_{i,j,n}) + 1/2 \}. \tag{4-31}$$

However, this equation infers a different random number distribution for each exemplar, which is clearly inappropriate since the desired mapping is independent of the exemplar number and applies equally to all exemplars. A convenient way to accommodate the dependence of F(W) on $X_{i,n}$ is to average the value of $X_{i,n}$, over the training set to obtain $X_i$. Thus,

$$F(w_{i,j,k}) = k1_{i,j} \cdot \{ (1/\pi) \cdot \arctan(u_{i,j}) + 1/2 \}, \tag{4-32}$$

so,

$$R_{i,j,k} = k1_{i,j} \cdot \{ \ (1/\pi) \cdot \arctan(u_{i,j}) + 1/2 \ \}, \tag{4-33}$$

where $R_{i,j,k}$ is a uniformly distributed random number on the interval (0,1) and,

$$x_{i,j} = E[x_{i,j,n}], \tag{4-34}$$

is the expected values of $x_{i,j,n}$ over the training set, and $u_{i,j}$ is the resulting nodal input found by using this average in Equation (3-5) or (4-1) as,

$$u_{i,j} = g1_{i,j} \cdot \sum_{k=1}^{J(i-1)} (w_{i,j,k} \cdot x_{i-1,k}) + b1_{i,j} \cdot \tag{4-35}$$

Therefore, $w_{i,j,k}^{t+1}$ can be sampled effectively from the inverse of $F(w_{i,j,k})$, $F^{-1}(R_{i,j,k})$, as,

$$w_{i,j,k}^{t+1} = \left[ \frac{1}{x_{i-1,k}} \cdot \left[ \frac{1}{g1_{i,j}} \cdot [\tan\{\pi \cdot (\frac{R_{i,j,k}}{k1_{i,j}} - 1/2)\} - b1_{i,j}] - \sum_{\substack{m=1 \\ m \neq k}}^{J(i-1)} w_{i,j,m} \cdot x_{i-1,m} \right] \right]^{t}, \tag{4-36}$$

where m is not equal to k, and t is the iteration number. Equation (4-36) samples from the entire domain of $w_{i,j,k}$ and will lead to a large variance of the means for a given number of selections. The search domain can be limited to a neighborhood, or stratification interval, about the most recent estimate of $W^t$, since to first order,

$$w_{i,j,k}^{t+1} = w_{i,j,k}^{t} + dw_{i,j,k}^{t}$$

$$= F^{-1}(X_i^t) + f^{-1}(X_i^t)\cdot dx_{i,j}^{t}$$

$$= w_{i,j,k}^{t} + f^{-1}(X_i^t)\cdot dR^t, \qquad (4\text{-}37)$$

where $f^{-1}$ is the derivative of $F^{-1}$ with respect to $x_{i,j}$ and $dR^t$ represents a specific random number selection at time t. And,

$$\frac{dw_{i,j,k}}{dx_{i,j}} = \frac{d}{dx_{i,j}}\cdot\left[\frac{1}{x_{i-1,k}}\cdot\left[\frac{1}{g1_{i,j}}\cdot[\tan(\pi\cdot(\frac{x_{i,j}}{k1_{i,j}} - 1/2)\right.\right.$$

$$\left.\left. - b1_{i,j}\ ]\ - \sum_{\substack{m=1 \\ m\neq k}}^{J(i-1)} w_{i,j,m}\cdot x_{i-1,m}\ \right]\ \right], \qquad (4\text{-}38)$$

which is,

$$dw_{i,j,k} = \frac{\pi \cdot dx_{i,j}}{k1_{i,j} \cdot g1_{i,j} \cdot x_{i-1,k} \cdot \cos^2\{\pi \cdot (x_{i,j}/k1_{i,j} - 1/2)\}},$$

(4-39)

and after substitution of dR for dx, yields

$$dw_{i,j,k} = \frac{\pi \cdot dR_{i,j,k}}{k1_{i,j} \cdot g1_{i,j} \cdot x_{i-1,k} \cdot \cos^2\{\pi \cdot (x_{i,j}/k1_{i,j} - 1/2)\}}.$$

(4-40)

Sampling from Equation (4-36) produces random deviates which have the optimal probability density function for the selection of the interconnection weights. Selecting the weight set from Equation (4-40) provides a stratified sampling methodology which reduces the variance of the means [Co4,St1,St2]. Sampling in this way significantly improves the learning efficiency.

The approach for $b1_{i,j}$ is similar to that of $w_{i,j,k}$. Given Equations (3-4) and (4-35), then solving for $b1_{i,j}$, yields,

$$b1_{i,j} = \tan\{\pi \cdot (x_{i,j}/k1_{i,j} - 1/2)\} - g1 \cdot \sum_{k=1}^{J(i-1)} w_{i,j,k} \cdot x_{i-1,j} \cdot$$

(4-41)

Then taking the derivative with respect to $x_{i,j}$, of Equation (4-41),

$$\frac{db1_{i,j}}{dx_{i,j}} = \frac{\pi}{kl_{i,j}\cdot\cos^2\{\pi\cdot(x_{i,j}/kl_{i,j} - 1/2)\}},$$

(4-42)

and substituting $dR_{i,j}$ for $dx_{i,j}$, yields

$$db1_{i,j} = \frac{\pi\cdot dR_{i,j}}{kl_{i,j}\cdot\cos^2\{\pi\cdot(x_{i,j}/kl_{i,j} - 1/2)\}}.$$

(4-43)

Similarly, for $g1_{i,j}$, solve Equation (3-4) and (4-35) for $g1_{i,j}$ and

$$g1_{i,j} = \frac{\tan\{\pi\cdot(x_{i,j}/kl_{i,j} - 1/2)\} - b1_{i,j}}{\sum_k(w_{i,j,k}\cdot x_{i-1,k})}.$$

(4-44)

Taking the derivative with respect to $x_{i,j}$, of Equation (4-44),

$$\frac{dg1_{i,j}}{dx_{i,j}} = \frac{\pi}{kl_{i,j}\cdot\sum_k(w_{i,j,k}\cdot x_{i-1,k})\cdot\cos^2\{\pi(x_{i,j}/kl_{i,j}-1/2)\}},$$

(4-45)

and substituting $R_{i,j}$, for $x_{i,j}$, yields

$$dg1_{i,j} = \frac{\pi \cdot dR_{i,j}}{k1_{i,j} \cdot \Sigma_k (w_{i,j,k} \cdot x_{i-1,k}) \cdot \cos^2\{\pi (x_{i,j}/k1_{i,j} - 1/2)\}}. \quad (4\text{-}46)$$

Similarly, solve Equation (3-4) and (4-35) for $k1_{i,j}$ and

$$k1_{i,j} = \frac{x_{i,j}}{\arctan\{ g1_{i,j} \cdot \Sigma_k (w_{i,j,k} \cdot x_{i-1,k}) \}/\pi + 1/2}. \quad (4\text{-}47)$$

Differentiating with respect to $x_{i,j}$ and substituting $dR_{i,j}$ for $dx_{i,j}$, yields

$$dk1_{i,j} = \frac{dR_{i,j}}{\arctan\{ g1_{i,j} \cdot \Sigma_k (w_{i,j,k} \cdot x_{i-1,k}) \}/\pi + 1/2}. \quad (4\text{-}48)$$

Each parameter is then selected by,

$$w_{i,j,k}^{t+1} = w_{i,j,k}^{t} + dw_{i,j,k}^{t}, \quad (4\text{-}49)$$

$$b1_{i,j}^{t+1} = b1_{i,j}^{t} + db1_{i,j}^{t}, \quad (4\text{-}50)$$

$$g1_{i,j}^{t+1} = g1_{i,j}^{t} + dg1_{i,j}^{t}, \quad (4\text{-}51)$$

and,

$$k1_{i,j}^{t+1} = k1_{i,j}^{t} + dk1_{i,j}^{t}. \qquad (4\text{-}52)$$

The iterative optimization scheme samples from these equations based on the most recent estimates of the needed variables. As the cost function decreases, the estimates of the desired trainable parameters become better and therefore the estimate of the optimal sampling functions from which the parameters are selected become more precise. In this way the methodology adapts itself to best solve the optimization task at hand.

## 4.3 Determining the Sampling Interval

In the above discussion, the problem of determining the appropriate limits on the uniform distribution for dR is ignored. This problem is equivalent to determining the sampling neighborhood or stratification interval. Below is one solution to this problem.

Let the sample interval be DR, and let the actual random number selection be dR. Then set

$$dR = 2 \cdot DR \cdot ( R - 1/2 ), \qquad (4\text{-}53)$$

where R is a uniformly distributed random number on the interval (0,1). In this way, dR is uniform on the interval (-DR,+DR), and can be used in Equations (4-40),

(4-43), (4-46), (4-48), and (4-49) through (4-52) of Section 4.2 to sample the trainable parameters. This subsection will describe a method for obtaining DR and thus sampling db1, dg1, dk1 and dw by using the best estimates of the needed variables at the time of the estimate.

For a single output node and one exemplar,

$$c(W) = |x - xd|. \tag{4-54}$$

Then,

$$dc(W) = dx = dR. \tag{4-55}$$

For a single exemplar and more than one output node,

$$c^2(W) = \Gamma(X) = (1/J) \cdot \sum_j (X - XD)^2, \tag{4-56}$$

and if for convenience J is chosen to represent the number of nodes in the output layer I+1, then

$$\delta\Gamma(X)/\delta x = (2/J) \cdot (x - xd). \tag{4-57}$$

Setting all dx's to zero except one,

$$\frac{d\Gamma(X)}{dx} = \frac{d(c^2)}{dx} = 2 \cdot c \cdot \frac{dc}{dx}. \tag{4-58}$$

Thus

$$dc/dx = (x - xd)/(c \cdot J), \tag{4-59}$$

and

$$dR = \frac{J \cdot c(W) \cdot dc(W)}{(x - xd)}. \tag{4-60}$$

For the case of more than one exemplar, and one output node,

$$c^2(W) = (1/N) \cdot \sum_{n=1}^{N} (xd - x)^2$$

$$= E[(xd - x)^2]$$

$$= E[x^2] - 2 \cdot E[x \cdot xd] + E[xd^2], \tag{4-61}$$

where $E[\cdot]$ is the expected value over the training set. But,

$$2 \cdot c \cdot \frac{dc}{dx} = \frac{d}{dx} \cdot \left[ E[x^2] - 2 \cdot E[x \cdot xd] + E[xd^2] \right]$$

$$= 2 \cdot E[x] - 2 \cdot E[xd], \tag{4-62}$$

and

$$dR = \frac{c(W) \cdot dc(W)}{E[x] - E[xd]}. \tag{4-63}$$

The relation which applies in the general case of more than one exemplar and more than one output node is

$$dR = \frac{J \cdot c(W) \cdot dc(W)}{E[x] - E[z]}. \qquad (4\text{-}64)$$

But, dR and dc(W) vary much faster than the other terms and so to a first approximation

$$\frac{J \cdot c(W)}{E[x] - E[z]} \approx \text{constant} = A1, \qquad (4\text{-}65)$$

and

$$dR \approx A1 \cdot dc(W). \qquad (4\text{-}66)$$

Note that if $-dc(W) = c(W)$ then the algorithm is finished with the search with the next weight selection since $c(W) = 0$ at the next time step. For this reason it is desired to set DR to give $|dc(W)| \leq c(W)$. Since the biggest reasonable $|dc(W)|$ is $c(w)$, it might seem obvious to set

$$DR^t = A1 \cdot c^t(W). \qquad (4\text{-}67)$$

However, this allows no memory and may vary widely about the appropriate value of DR since $c^t(W)$ may have high variance. Previous successful selection histories can

be used to anticipate future selections in the following way.

Let $\alpha(t)$ be some stochastic approximation of DR,

$$\alpha(t) \approx DR, \tag{4-68}$$

and require that $\alpha(t)$ approach DR as t approaches infinity. Then define $\theta(t)$, such that

$$DR = \int_0^t \theta(t') \cdot dt'. \tag{4-69}$$

Then,

$$\alpha(t) = C_1 \exp\{-(1-\beta)t\} + \int_0^t \theta(t') \cdot dt', \tag{4-70}$$

satisfies the asymptotic requirement when $C_1$ and $0 < \beta < 1$ are constants. Equation (4-70) becomes

$$\alpha(t) = C_1 \exp\{-(1-\beta)t\} + \exp\{-(1-\beta)t\} \cdot \int_0^t \Phi(t') \cdot \exp\{(1-\beta)t'\} \cdot dt', \tag{4-71}$$

for some other function $\Phi(t)$. With this definition $\alpha(t)$

is the solution to

$$\frac{\delta\alpha(t)}{\delta t} + (1-\beta)\cdot\alpha(t) = (1-\beta)\cdot\Phi(t). \qquad (4\text{-}72)$$

But this equation is the same as

$$\frac{\delta\alpha(t)}{\delta t} = (1-\beta)\cdot\Phi(t) - (1-\beta)\cdot\alpha(t), \qquad (4\text{-}73)$$

which can be approximated by

$$\alpha(t) - \alpha(t-1) = (1-\beta)\cdot\Phi(t-1) - (1-\beta)\cdot\alpha(t-1), \qquad (4\text{-}74)$$

with $\delta t = 1$ iteration. Rearranging yields

$$\alpha(t) = (1-\beta)\cdot\Phi(t-1) + \beta\cdot\alpha(t-1), \qquad (4\text{-}75)$$

where $\beta$ is a constant and $\Phi(t)$ is the forcing function which drives the process. If the time derivative of $\alpha(t)$ is small, then

$$0 \approx \frac{d\alpha(t)}{dt} = (1-\beta)\cdot\{\ \Phi(t) - \alpha(t)\ \}, \qquad (4\text{-}76)$$

and

$$\Phi(t) \approx \alpha(t), \qquad (4\text{-}77)$$

Then, the forcing function,

$$\Phi(t) \approx \alpha(t) \approx dR_{max} = DR. \tag{4-78}$$

Thus, approximate $\Phi$ as

$$\Phi \approx \left| \frac{J \cdot c(W) \cdot dc(W)}{E[x] - E[z]} \right|$$

$$\approx A1 \cdot c^{s-1}(W). \tag{4-79}$$

The estimate of DR proceeds as follows:

1. At each successful selection, $c^{s}(W)$, apply force on $\alpha(t)$ in the direction of the cost which led to that successful selection, $c^{s-1}$;
2. Update $\Phi(t)$ based on the $c^{s-1}(W)$, the cost at the time step immediately preceding the latest successful selection. In other words, if the cost varies widely and a successful selection is obtained then a large DR is best and vice versa.
3. Then apply

$$\alpha(t+1) = (1-\beta) \cdot \Phi(t) + \beta \cdot \alpha(t), \tag{4-80}$$

and set

$$DR(t+1) = \alpha(t+1). \tag{4-81}$$

With this DR and the equations of Section 4.2 the network can adapt to a solution and the parameter sets $\{bl_{i,j}\}$, $\{gl_{i,j}\}$, $\{kl_{i,j}\}$, and $\{w_{i,j,k}\}$ are approximated with increasing utility.

## 4.4 Dynamic Node Architecture

Artificial neural networks used in an engineering context must be able to generalize information gained through training. Without the ability to generalize, neural networks would be of little interest since a table-lookup would be more efficient. Thus, network paradigms must be evaluated on not only their speed and depth of convergence but also their generalization capabilities. Minimization of the recall set error is the ultimate goal, however the recall set is rarely known a priori. Minimization of the error over the training set does not necessarily imply minimization over the recall set [Ma3,Mu2]. Minimization over an unknown recall set implies an inductive generalization of things learned from the smaller training set. More than a simple optimization over a training set must be accomplished if good generalization characteristics are to be obtained. This can be seen mathematically by comparing Equations (3-8) and (3-9) of Section 3.

Generalization is the ability to have knowledge of a thing never encountered before based on its similarities with things already known. This implies that the generalizer can separate out the similar characteristics of a thing. It is difficult for computers to do this since computers cannot inherently distinguish between specifics and generalities. Indeed, for a given problem they have no knowledge base to accomplish this. However, if a thing is not learned in detail then these details will not be confused with the general characteristics of the thing. The objective, therefore, is to teach the computer only the important characteristics -- those which set apart the classes of interest. The mathematical analogy to this is to reduce the number of ways to interpret details. In the network implementation, reduce the number of weights and nodes [As1,Is1,Kr2]. This does not, however, imply reducing the detail of the exemplars since any detail has the potential to be common among a class of interest. This approach seems reasonable since, when approximating functions, researchers use polynomials of reasonable degree because high power polynomials tend to oscillate about the desired interpolation values [Pr1 p79]. In this sense the size of a neural network can be likened

to the degree of an interpolation polynomial. But since the appropriate number of nodes is unknown, at the beginning of the training process, a variable node architecture must be used. The learning process can be started with small numbers of nodes and the network size can be increased or decreased until the network can successfully identify all classes in the training set with the minimum number of nodes and interconnections. The final network should be a better generalizer because it has the fewest ways to distinguish the classes learned. The network learns to distinguish between classes at the most basic level. Therefore, seek to minimize both c(W) and the number of nodes, $N_n$.

The stochastic approach used for minimizing c(W) relies on the ability to change the trainable parameters and obtain an immediate evaluation of the effectiveness of that change. Adjusting the network architecture is not so simple. Proceed as follows. Set the cost function to

$$c(W) = \{(1/(N \cdot J)) \cdot \sum_{n=1}^{N} \cdot ( \sum_{j=1}^{J} (\Omega_{I+1,j,n} - x_{I+1,j,n})^2 )\}^{1/2}$$

$$+ \mu 1 \cdot \{ \sum_{i} \cdot \sum_{j} (b1_{i,j})^2 \}^{1/2}$$

$$+ \mu 2 \cdot \{ \sum_{i} \cdot \sum_{j} (g1_{i,j})^2 \}^{1/2}$$

$$+ \mu 3 \cdot \{ \sum_{i} \cdot \sum_{j} (k1_{i,j})^2 \}^{1/2}$$

$$+ \mu 4 \cdot \{ \sum_{i} \cdot \sum_{j} \cdot \sum_{k} (w_{i,j,k})^2 \}^{1/2},$$

(4-82)

where $\mu 1$, $\mu 2$, $\mu 3$, $\mu 4$, are small, positive constants. This approach will tend to reduce the magnitude of the trainable parameters. As the system learns, the unnecessary parameters tend toward zero. Start the network with only a few nodes. Since the network is most likely too small to learn the mapping,

$$\Omega_{I+1} = M_{I+1}(\Omega_1, W^*, N_w^*, N_n^*), \qquad (4\text{-}83)$$

then add nodes until the network learns the training set to the desired accuracy. Once this is achieved, eliminate a node which has near zero nodal importance, thus eliminating a useless node. If the resulting cost

function is larger than desired, retrain this smaller network and repeat. The final network should give a more general implementation of the desired mapping.

The local importance of a node can be shown to be a function of the other nodes in the network. The nodal average transfer function is

$$x_{i,j} = k1_{i,j} \cdot \{ (1/\pi) \cdot \arctan(u_{i,j}) + 1/2 \}. \quad (4\text{-}84)$$

If a small change in the value of a nodal input changes the output of that node more than a similar change in the other inputs, then that input is more important to the dynamic function of the network than the others. Since the input to any hidden or output node is the output of a node in the layer below it, an estimate of the importance of any hidden node can be obtained by summing the effects of a change in the output of that node on the outputs of the nodes in the layer above it. So, set the importance function to,

$$I(x_{i-1,k}, x_{i,j}) = \left| \frac{\delta x_{i,j}}{\delta x_{i-1,k}} \right|. \quad (4\text{-}85)$$

The change in $x_{i,j}$ due to a change in $x_{i-1,k}$ is,

$$\frac{\delta x_{i,j}}{\delta x_{i-1,k}} = \frac{kl_{i,j}}{\pi \cdot (1 + u_{i,j}^{2})} \cdot \frac{\delta u_{i,j}}{\delta x_{i-1,k}}$$

$$= \frac{kl_{i,j} \cdot gl_{i,j} \cdot w_{i,j,k}}{\pi \cdot (1 + u_{i,j}^{2})}, \qquad (4\text{-}86)$$

which is used to find the importance of node $x_{i-1,k}$ with respect to node $x_{i,j}$. The total importance of node $x_{i-1,k}$ is the sum of the importance of that node over all nodes which use its output as input,

$$I(x_{i-1,k}) = \sum_{j} I(x_{i-1,k}, x_{i,j}). \qquad (4\text{-}87)$$

If a node has little affect on the output of any node to which its output is an input then it is of little value in the network and has little importance. This nodal importance function is used in the dynamic node architecture scheme of the simulated condensation methodology set forth herein.

# 5. NUCLEAR POWER PLANT DIAGNOSTICS

## 5.1 Introduction

Nuclear electric power generating stations require careful control. Complex corrective actions must be applied whenever potentially unsafe conditions occur. Control of these situations requires knowledge of existing conditions as well as knowledge of the changes made during the control process. Plant variables, which are monitored continuously, have to be resolved into concise summaries of system conditions. Malfunctions and changes in plant capabilities need to be identified as they occur. The diagnoses of a potentially unsafe plant condition should be quick and accurate. The objective of a plant diagnostic system in any potentially unsafe operating scenario is to give plant operators sufficient time to formulate, confirm, initiate and perform the appropriate corrective actions. The diagnostic effort required for this objective becomes more difficult when degraded monitoring systems give noisy, incomplete or intermittent data. Neural networks may help improve diagnostic capabilities under such conditions. Another difficulty encountered during

this control effort is the resolution of uncertainties associated with predicted plant behavior. It is impossible to predict the exact events which take place during any particular accident sequence. Many of the conditions which need to be recognized have never actually occurred. These conditions must be modeled by computer simulation. Even if simulated plant behavior is indistinguishable from actual plant behavior, all possible plant failures or unsafe operating scenarios cannot be anticipated. Unsafe scenarios which have not been anticipated or simulated beforehand must also be recognized. Steps toward the exploitation of the generalization characteristics of neural networks with respect to the solution of these difficulties will be a significant contribution to nuclear plant safety.

Diagnoses of plant conditions can be a very complex problem. Networks which are capable of learning classifications of this type may be very large. Determination of the appropriate network size for a given problem is difficult and the processes involved are not well understood. Unfortunately most training methods require network size to be known and set before modeling is initiated. Most researchers pick network size by rules of thumb. No general procedure exists for

the prediction of network size prior to training. Simulated condensation circumvents this problem. Simulated condensation determines the network size, based on the particulars of each application, by using its dynamic node architecture features. The simulated condensation algorithm finds the smallest network which models the training set. The smallest network can be expected to perform the given task with the most generality since it has fewer variables with which to distinguish the required classes.

This section applies the technology of artificial neural networks and the simulated condensation paradigm to nuclear power plant unsafe condition diagnosis.

## 5.2 Description of Problem

As a first step toward the realization of the rather general objectives stated in Section 5.1, the following approach is taken. Seven accident scenarios plus the normal full power steady state operating condition are taught to an artificial neural network using the simulated condensation paradigm. The network learns these conditions from descriptions of each accident scenario in the form of plant variable data. Nuclear power plant simulator data from the Watts Bar

Nuclear Power Station [Wa3,Wa4] is used in lieu of actual measured data. The accidents analyzed are:

1. Total loss of offsite power (ED1);
2. Main feedwater line break (F23);
3. Main steam line break (MS1);
4. Control rod ejection (RD6);
5. Hot leg loss of coolant accident (TH1);
6. Cold leg loss of coolant accident (TH2);
7. Steam generator tube leak (TH5).

These accident scenarios are described in Appendix B.3. The variables output by the simulator are described in Appendix B.2. The data for each accident scenario is contained in a separate computer file. These files are the raw data sets. The raw data set for each scenario contains 81 plant process variables at intervals of 1/2 or 1/4 second for between 250 and 700 seconds. Within each raw data set the accident condition is preceded by a period of normal full power operation. The problem is to use an artificial neural network to recognize and distinguish each of the eight plant conditions based on the given data.

## 5.3 Method of Solution

Simulated condensation as executed by the computer code SCN.FOR, shown in Appendix E.4, is applied to the power plant data described above and in Appendix B. The raw data must be manipulated into a form usable by the SCN.FOR computer code. The computer codes used for this purpose are shown in Appendixes E.5, E.6 and E.8 through A.12, and are explained in each appendix. The training and recall data sets contain 27 plant process variables. These variables are shown in Appendix B.1. The raw data sets are reduced from 81 to 27 variables by averaging those variables associated with each of the four reactor primary coolant loops and eliminating ten of the 37 reduced variables, through the use of the WB7.INX file shown in Appendix C.4. The result of this variable reduction effort is effectively a single loop plant. The reason for this effort is the reduction of both the amount of redundant data input to the network and the size of the input vector. The data is normalized so that a value of one is equivalent to 100% of a variable's meter reading in the control room [Wa4]. Thus, all variables have values from approximately zero to approximately one. The network is trained to recognize each condition based on a single time step of

data. A single time step containing 27 variables is assumed to contain the required information to determine the plant condition. This approach has many advantages over those approaches which require data as a function of time or frequency. The most important advantage is simplicity of execution. A single time step of data, which can be averaged over some small time interval to reduce noise, say one or two seconds, can be fed into the network and the diagnosis can be accomplished in real time. A disadvantage of this approach, however, is that the temporal information is lost.

Each plant condition is assigned a boolean function of the activation of the network output as shown in Table 1. The network is trained to respond to each of the plant conditions in the specified way. In order to better simulate actual plant conditions, Gaussian or uniform noise can be added to the simulated data. Five percent added uniform noise is used in the training set for the diagnostic network trained here. This noise is added in such a way that the maximum added noise is equal to 5% of the actual no-noise value of each variable. The training set consists of two distinct parts, a no-noise part and a 5% uniform added noise part. The no-noise portion of the training set is

TABLE 1. Desired Network Output Layer Activation, Time of Start of Transient and Reactor SCRAM Time for Each of the Trained Scenarios.

| Plant Condition | Desired Output Node Activation 1 | 2 | 3 | Transient Start Time(sec) | Reactor SCRAM Time(sec) |
|---|---|---|---|---|---|
| ED1: Total Loss of Offsite Power | 1 | 1 | 1 | 20.58 | 29.58 |
| F23: Main Feedwater Line Break | 1 | 1 | 0 | 32.92 | 48.42 |
| MS1: Main Steam Line Break | 1 | 0 | 1 | 46.83 | 57.83 |
| RD6: Control Rod Ejection | 1 | 0 | 0 | 30.08 | 74.08 |
| TH1: Hot Leg Loss of Coolant | 0 | 1 | 1 | 15.58 | 19.58 |
| TH2: Cold Leg Loss of Coolant | 0 | 1 | 0 | 14.58 | 19.08 |
| TH5: Steam Generator Tube Leak | 0 | 0 | 1 | 31.58 | 411.08 |
| Full Power Normal Operation | 0 | 0 | 0 | - | - |

generated by using file SMA.TIM (Appendix C.2) and program TSG.FOR (Appendix E.5). The 5% uniform noise portion of the training set is generated by using file BIG.TIM (Appendix C.1) and program TSGN.FOR (Appendix E.6). These two portions are combined, by using a simple copy command, into the WB7.DDI file used for the network training. See Appendix C.3 for a listing of the no-noise portion of file WB7.DDI.

## 5.4 Results

Figures 3 through 16 show the results of this investigation. Each of the accident scenarios has two figures associated with it. The first is a graph of the network output for the no-noise case. The second is a graph of each recall case with 2% added Gaussian noise. The results of the no-noise cases are tabulated in Appendix D. A fourth line on each graph has binary values and shows the correct output for each active node. This line, and the associated transient time, can be identified by the right angle bend near the upper left of the graph. The 2% Gaussian noise cases are generated by computer code WBSIGN.FOR to have added noise with a Gaussian distribution and a standard deviation of 2% of the actual no-noise value. Files for

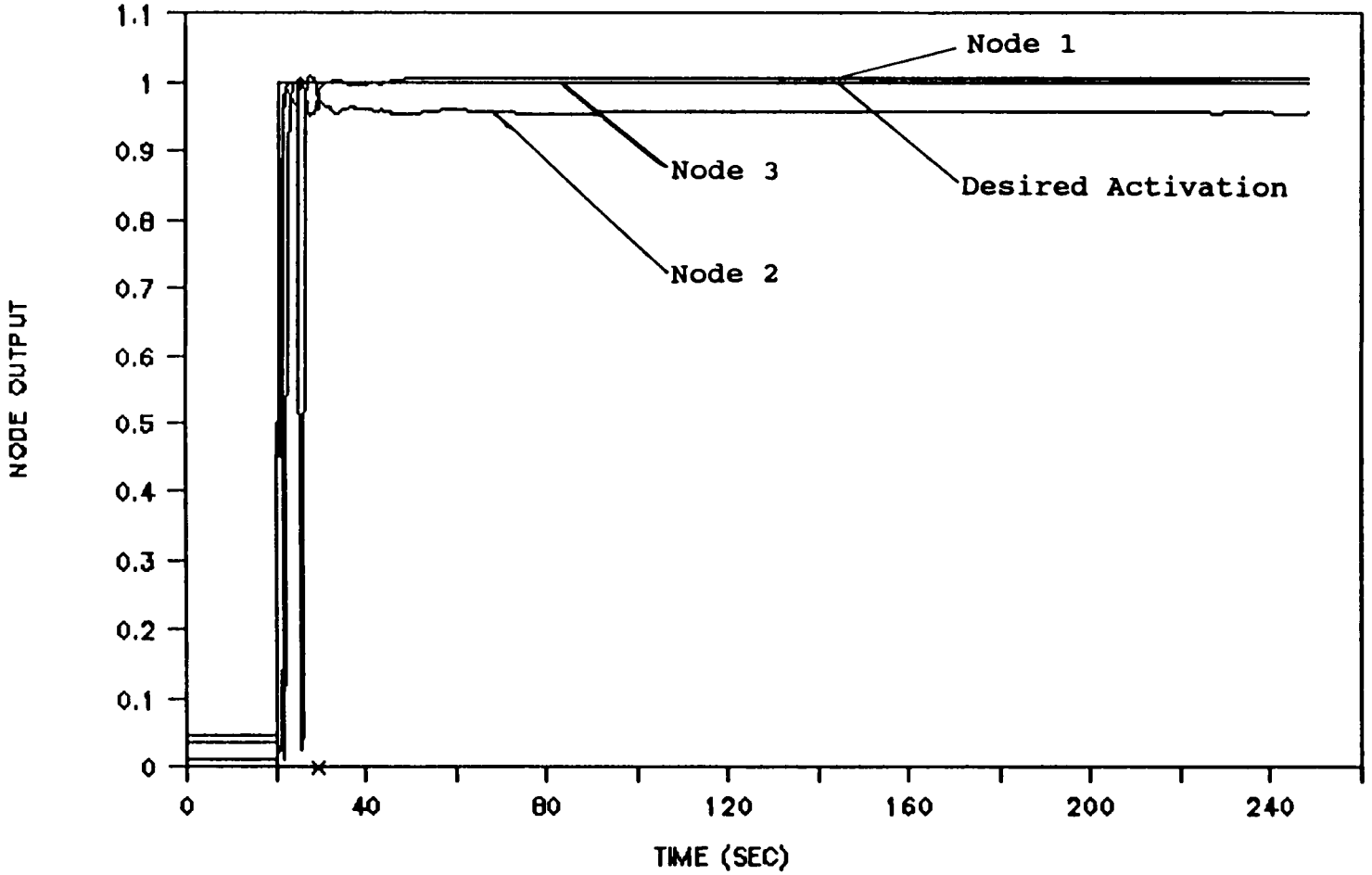



Figure 3. Activation of the Network Output Layer as a Function of Time in Response to Accident Scenario ED1 (Total Loss of Offsite Power), Desired Response: (1,1,1), Without Added Noise

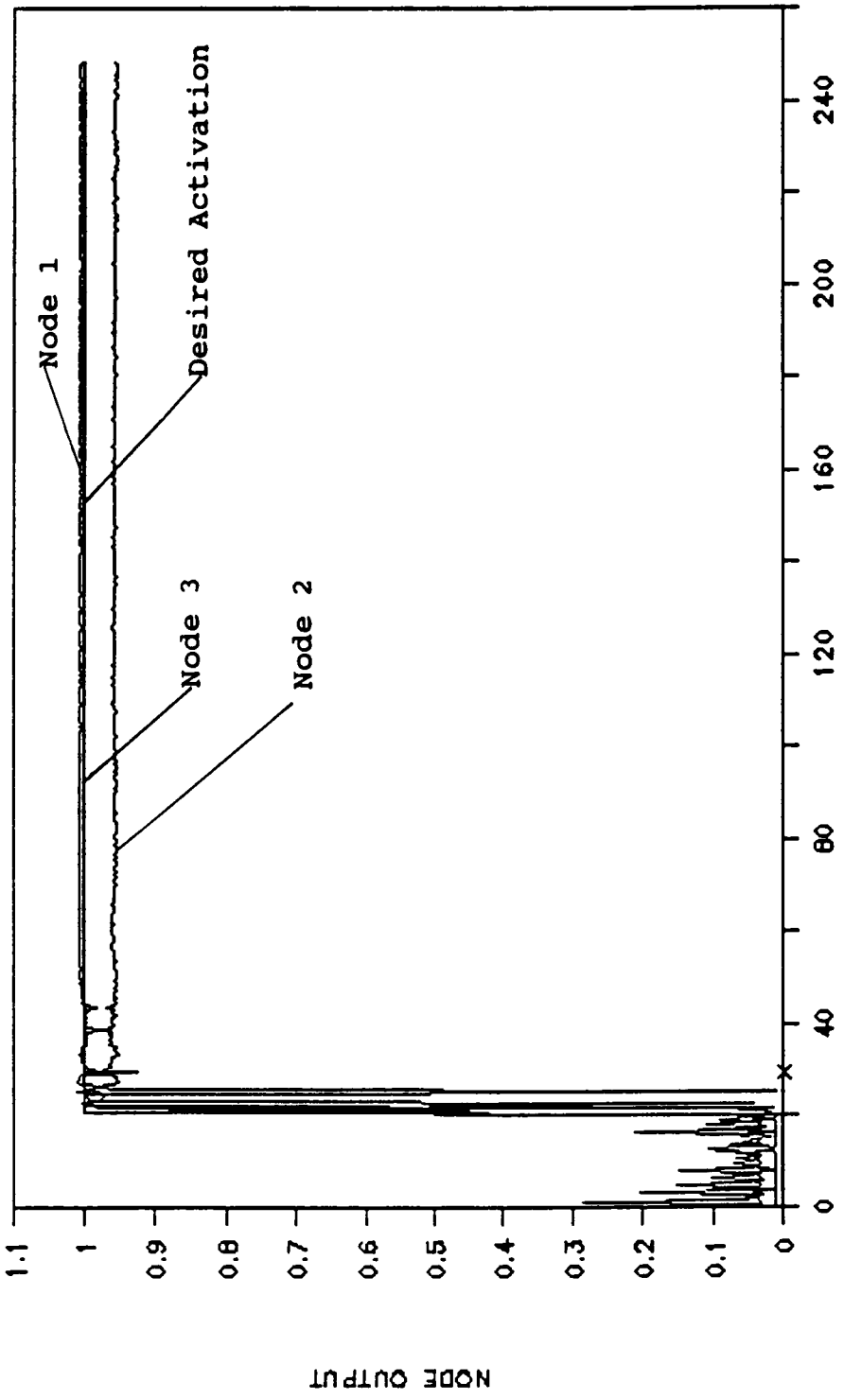



Figure 4. Activation of the Network Output Layer as a Function of Time in Response to Accident Scenario ED1 (Total Loss of Offsite Power), Desired Response: (1,1,1), With 2% Added Noise

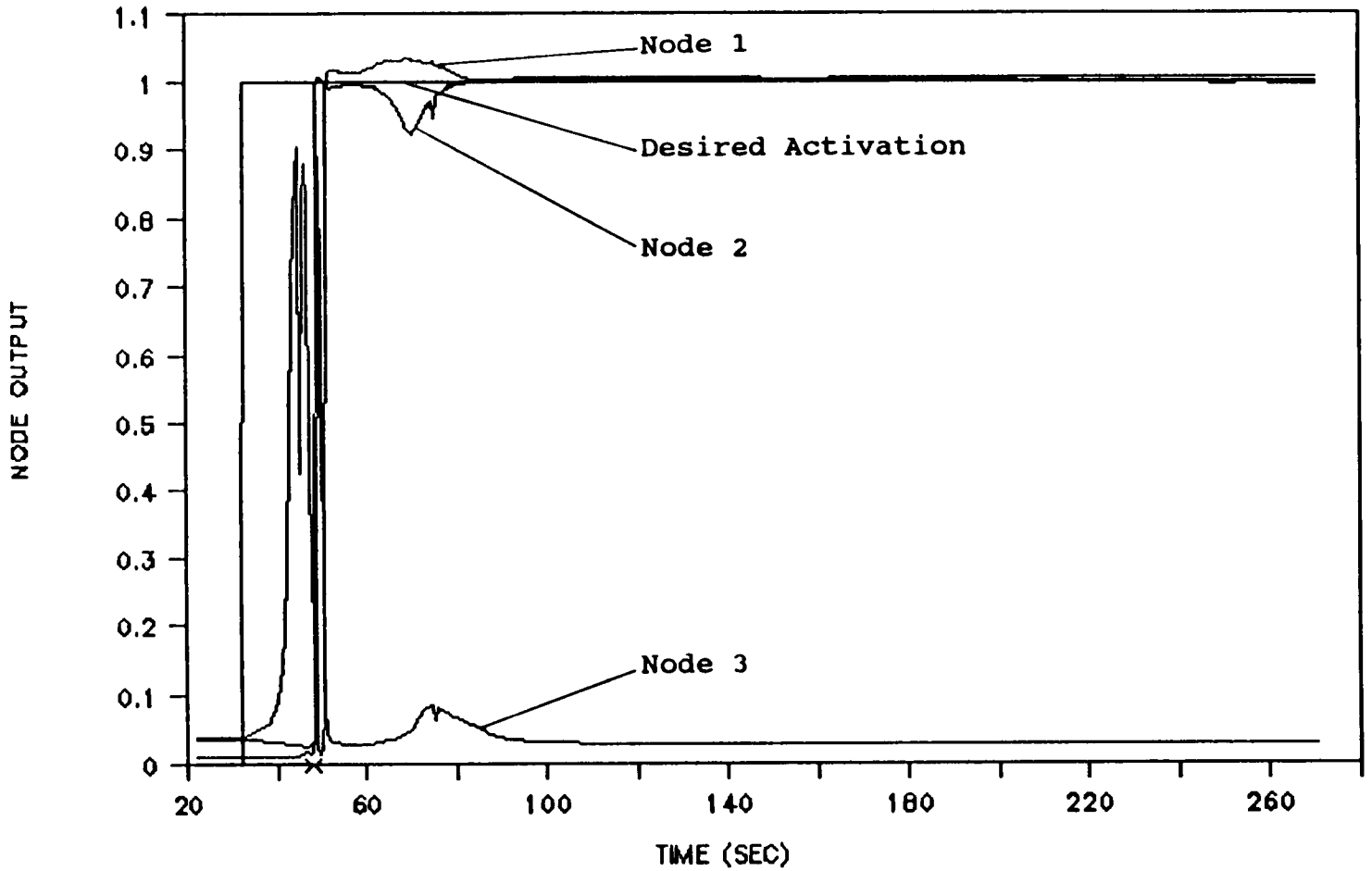



Figure 5. Activation of the Network Output Layer as a Function of Time in Response to Accident Scenario F23 (Main Feedwater Line Break), Desired Response: (1,1,0), Without Added Noise

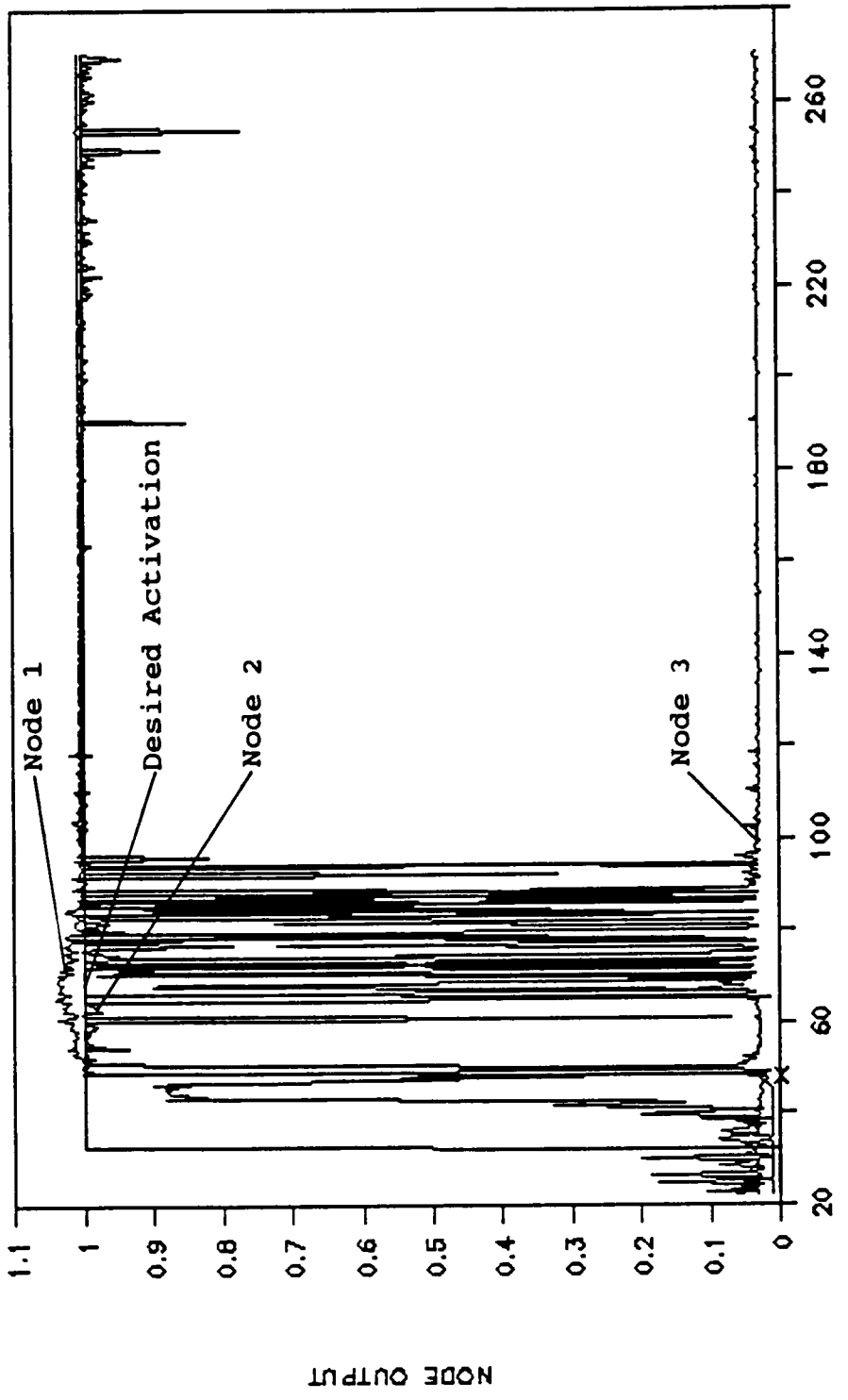



Figure 6. Activation of the Network Output Layer as a Function of Time in Response to Accident Scenario F23 (Main Feedwater Line Break), Desired Response: (1,1,0), With 2% Added Noise

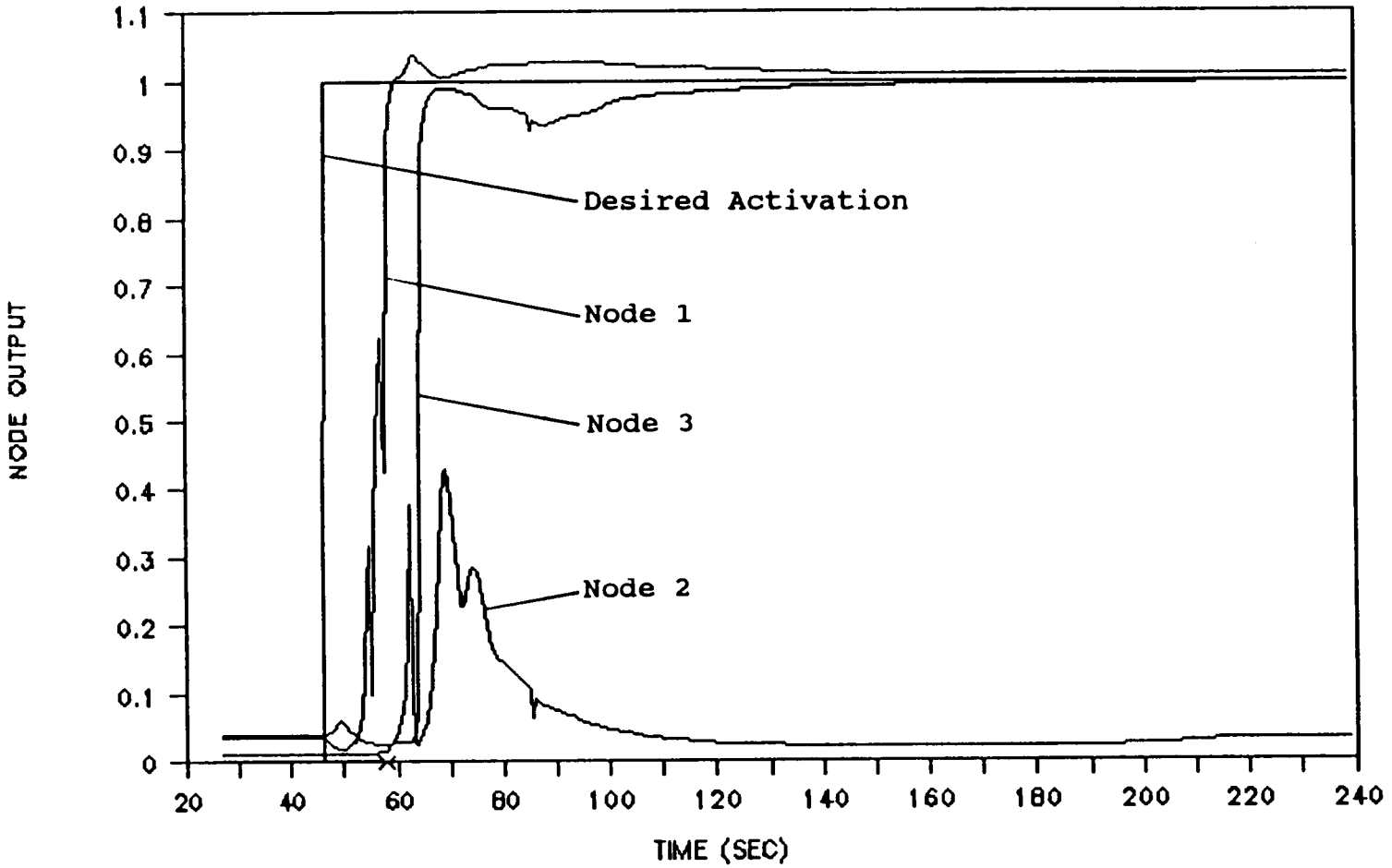



Figure 7. Activation of the Network Output Layer as a Function of Time in Response to Accident Scenario MS1 (Main Steam Line Break), Desired Response: (1,0,1), Without Added Noise

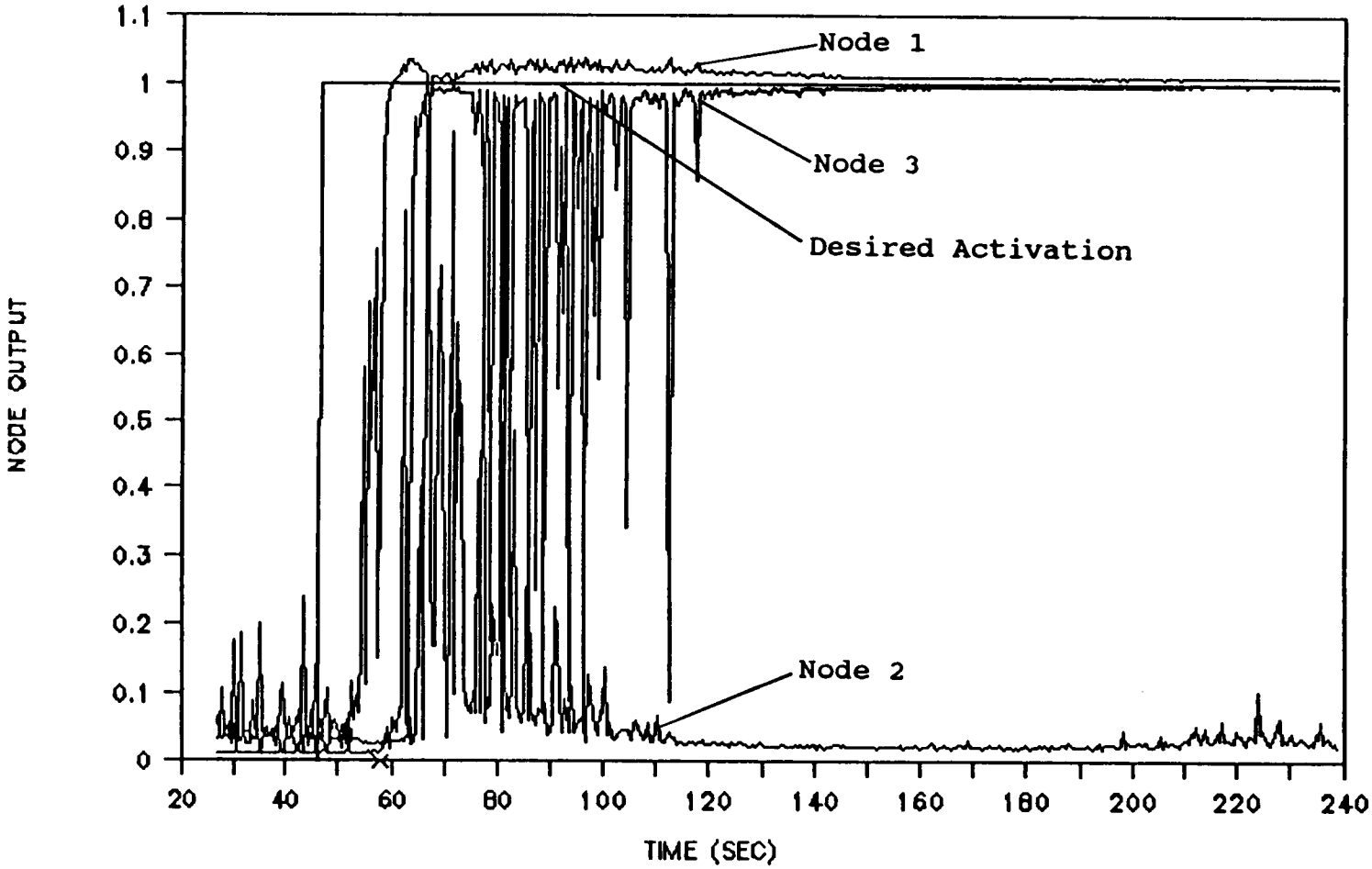



Figure 8. Activation of the Network Output Layer as a Function of Time in Response to Accident Scenario MS1 (Main Steam Line Break), Desired Response: (1,0,1), With 2% Added Noise

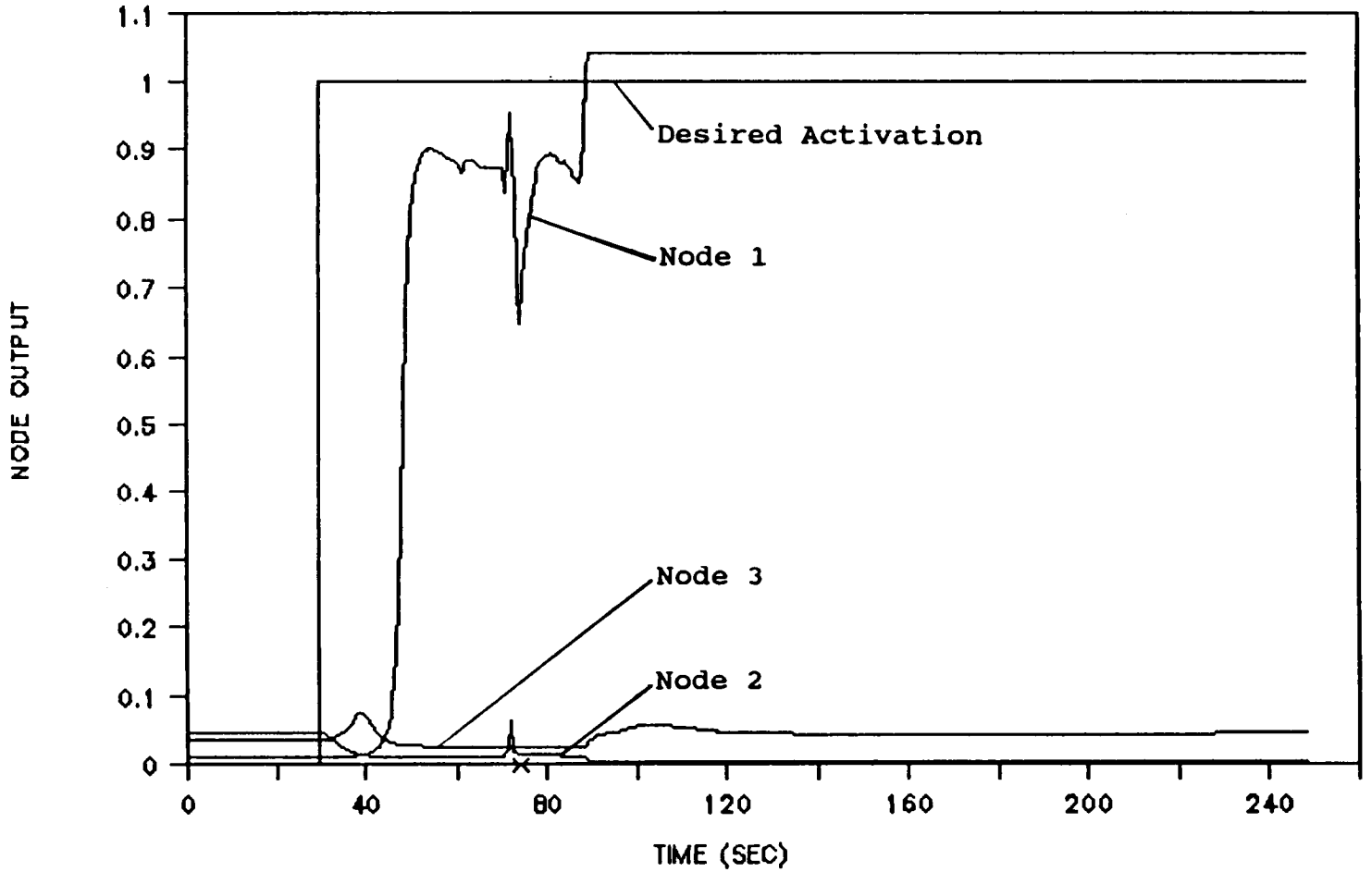



Figure 9. Activation of the Network Output Layer as a Function of Time in Response to Accident Scenario RD6 (Control Rod Ejection), Desired Response: (1,0,0), Without Added Noise

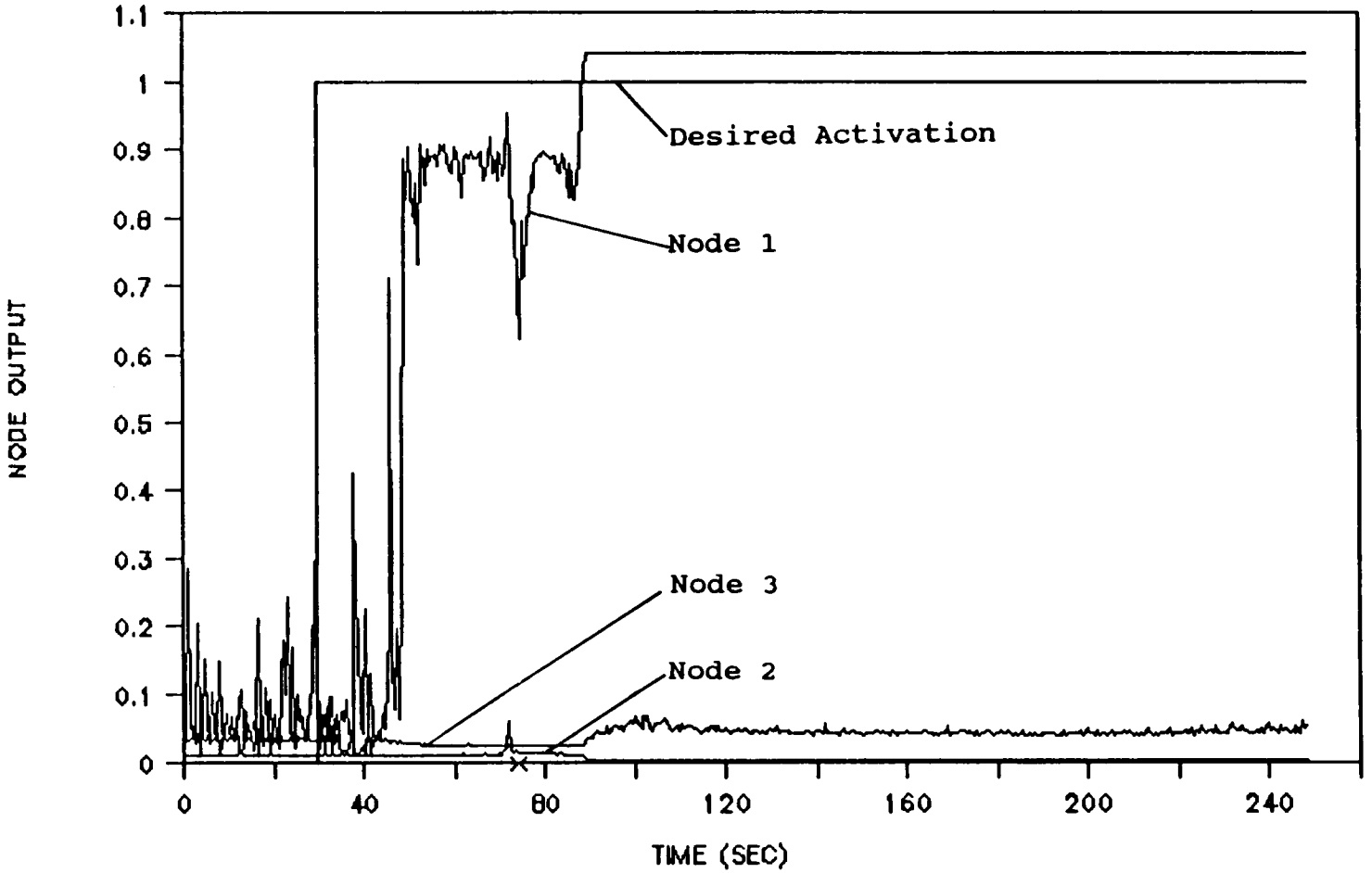



Figure 10. Activation of the Network Output Layer as a Function of Time in Response to Accident Scenario RD6 (Control Rod Ejection), Desired Response: (1,0,0), With 2% Added Noise

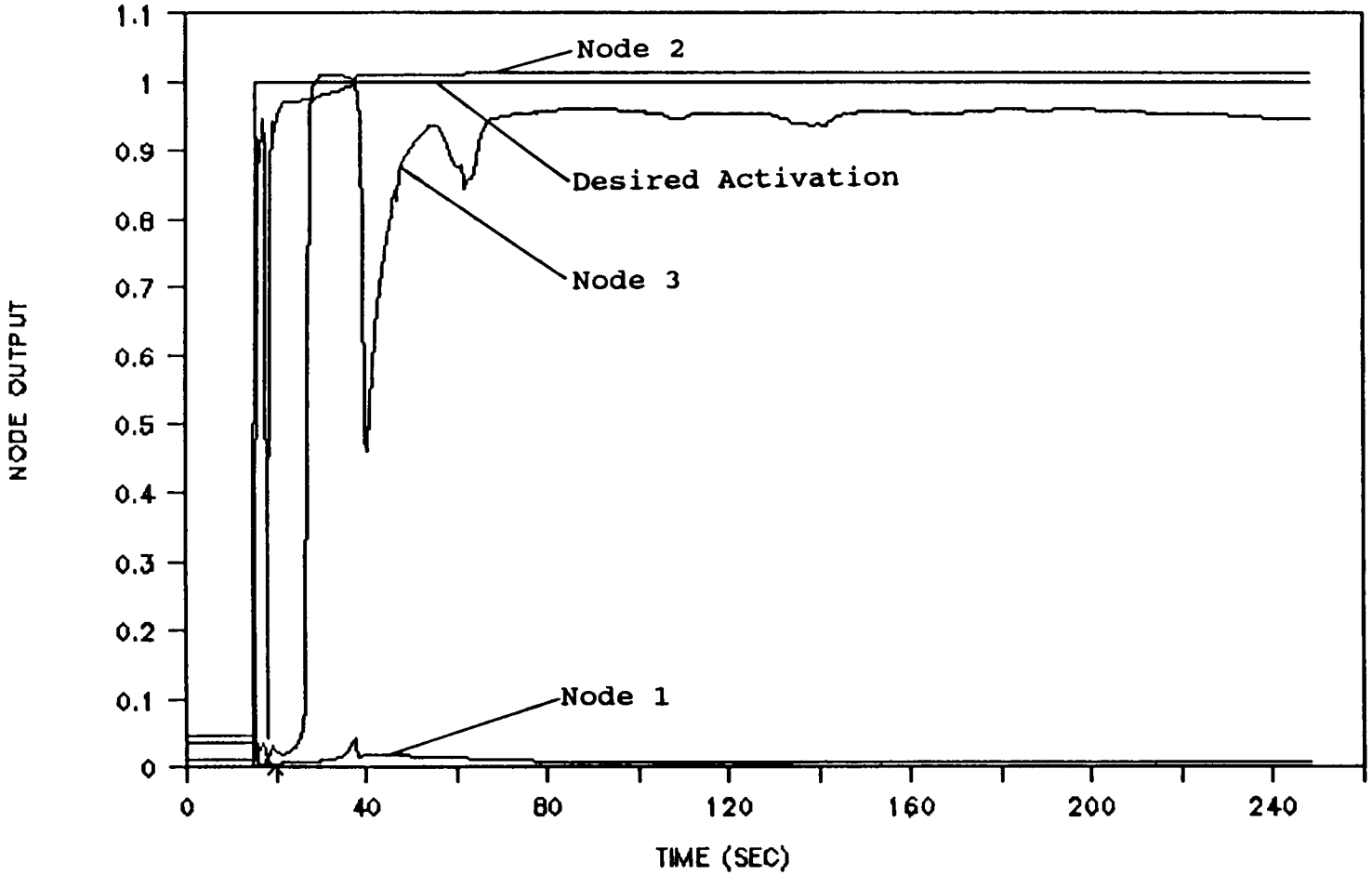



Figure 11. Activation of the Network Output Layer as a Function of Time in Response to Accident Scenario TH1 (Hot Leg Loss of Coolant Accident), Desired Response: (0,1,1), Without Added Noise

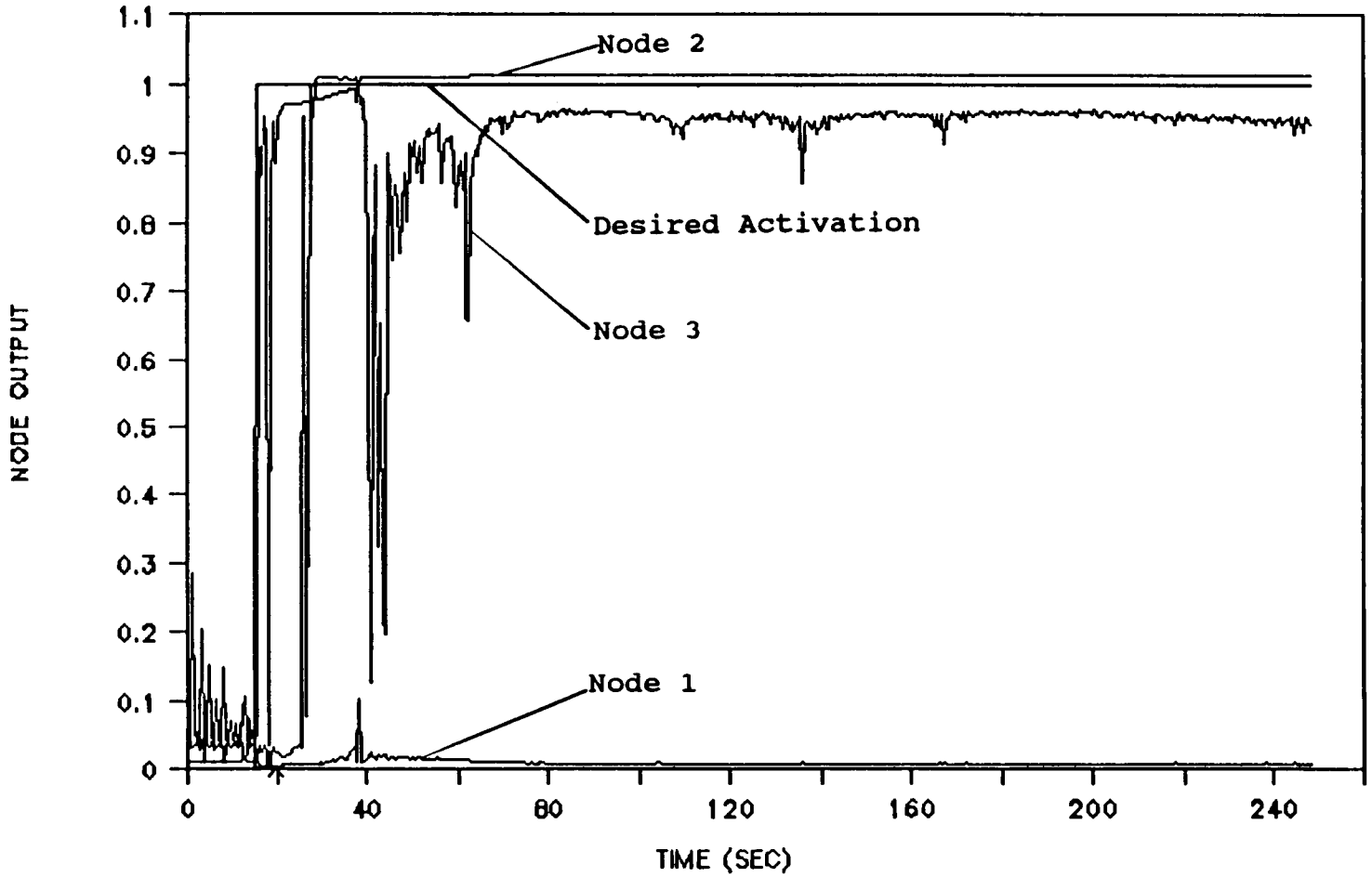



Figure 12. Activation of the Network Output Layer as a Function of Time in Response to Accident Scenario TH1 (Hot Leg Loss of Coolant Accident), Desired Response: (0,1,1), With 2% Added Noise

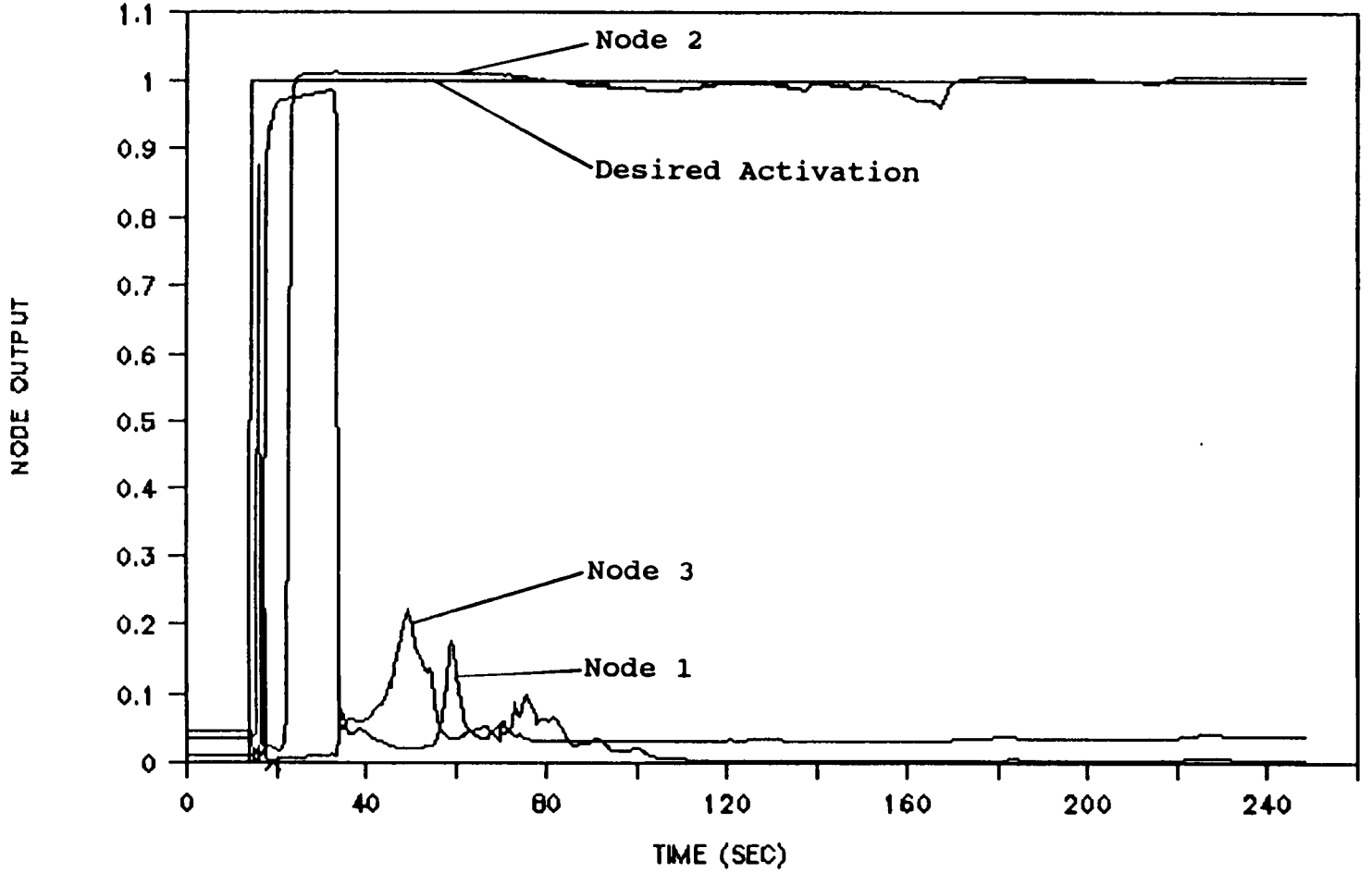



Figure 13. Activation of the Network Output Layer as a Function of Time in Response to Accident Scenario TH2 (Cold Leg Loss of Coolant Accident), Desired Response: (0,1,0), Without Added Noise

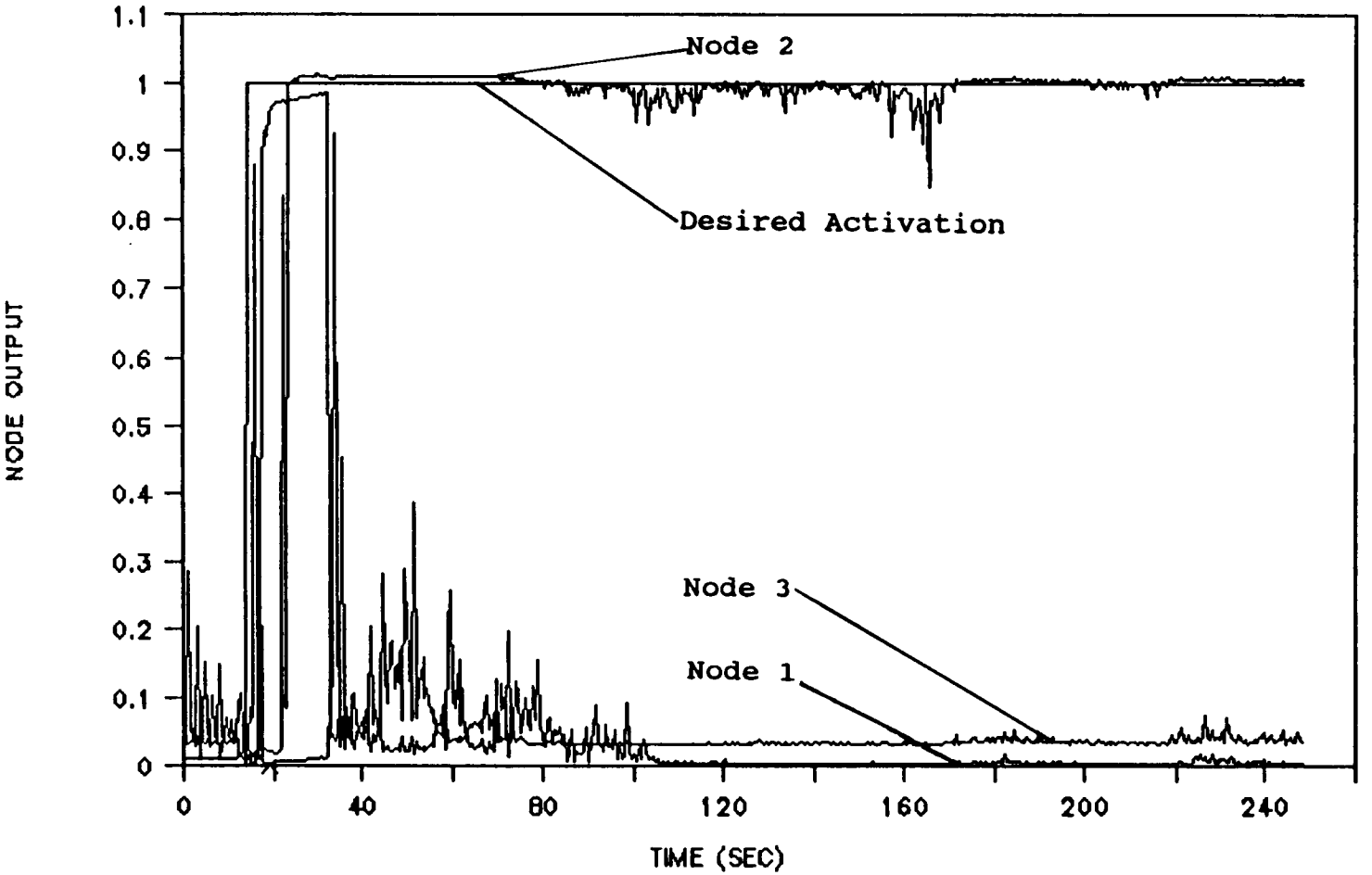



Figure 14. Activation of the Network Output Layer as a Function of Time in Response to Accident Scenario TH2 (Cold Leg Loss of Coolant Accident), Desired Response: (0,1,0), With 2% Added Noise

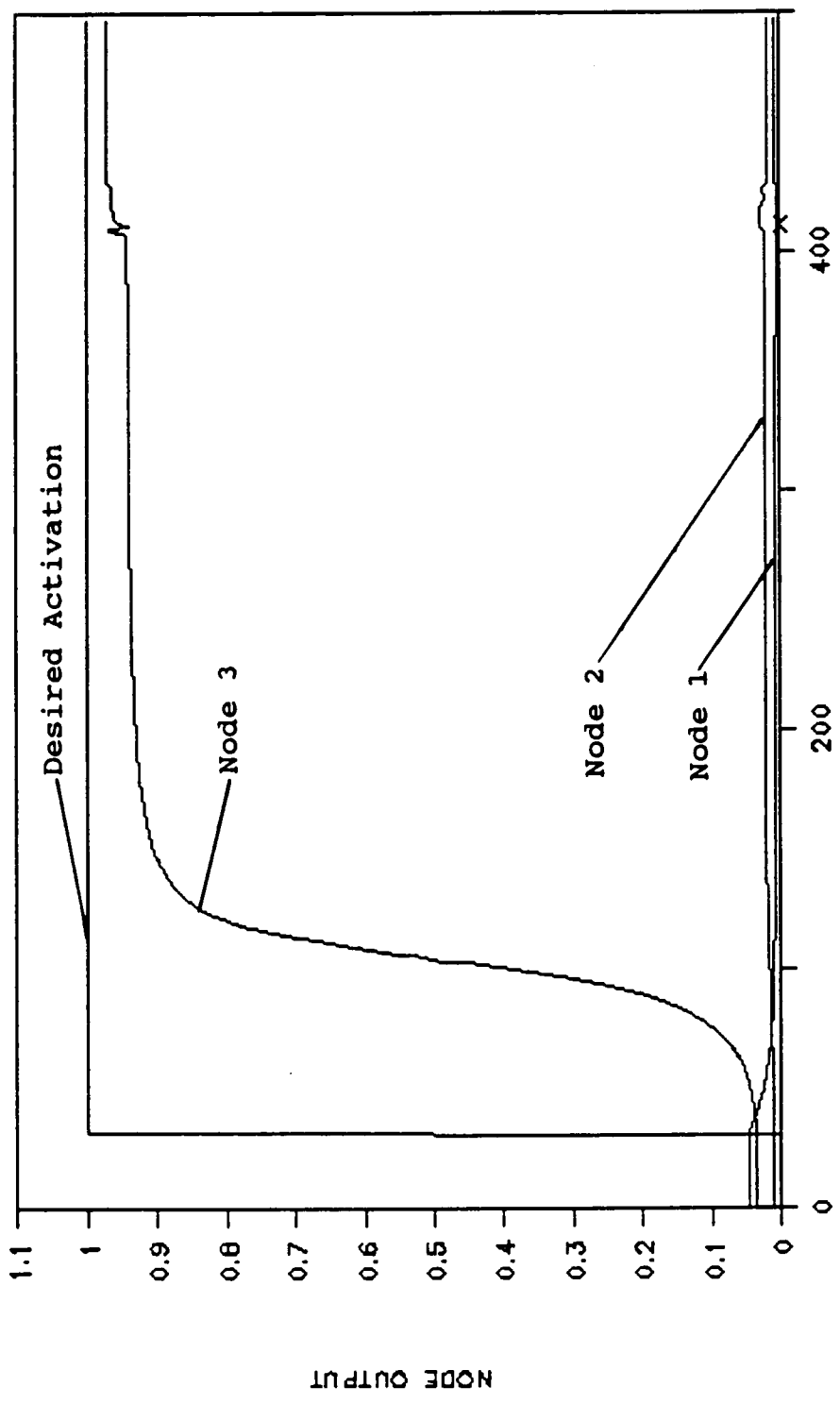



Figure 15. Activation of the Network Output Layer as a Function of Time in Response to Accident Scenario TH5 (Steam Generator Tube Leak), Desired Response: (0,0,1), Without Added Noise

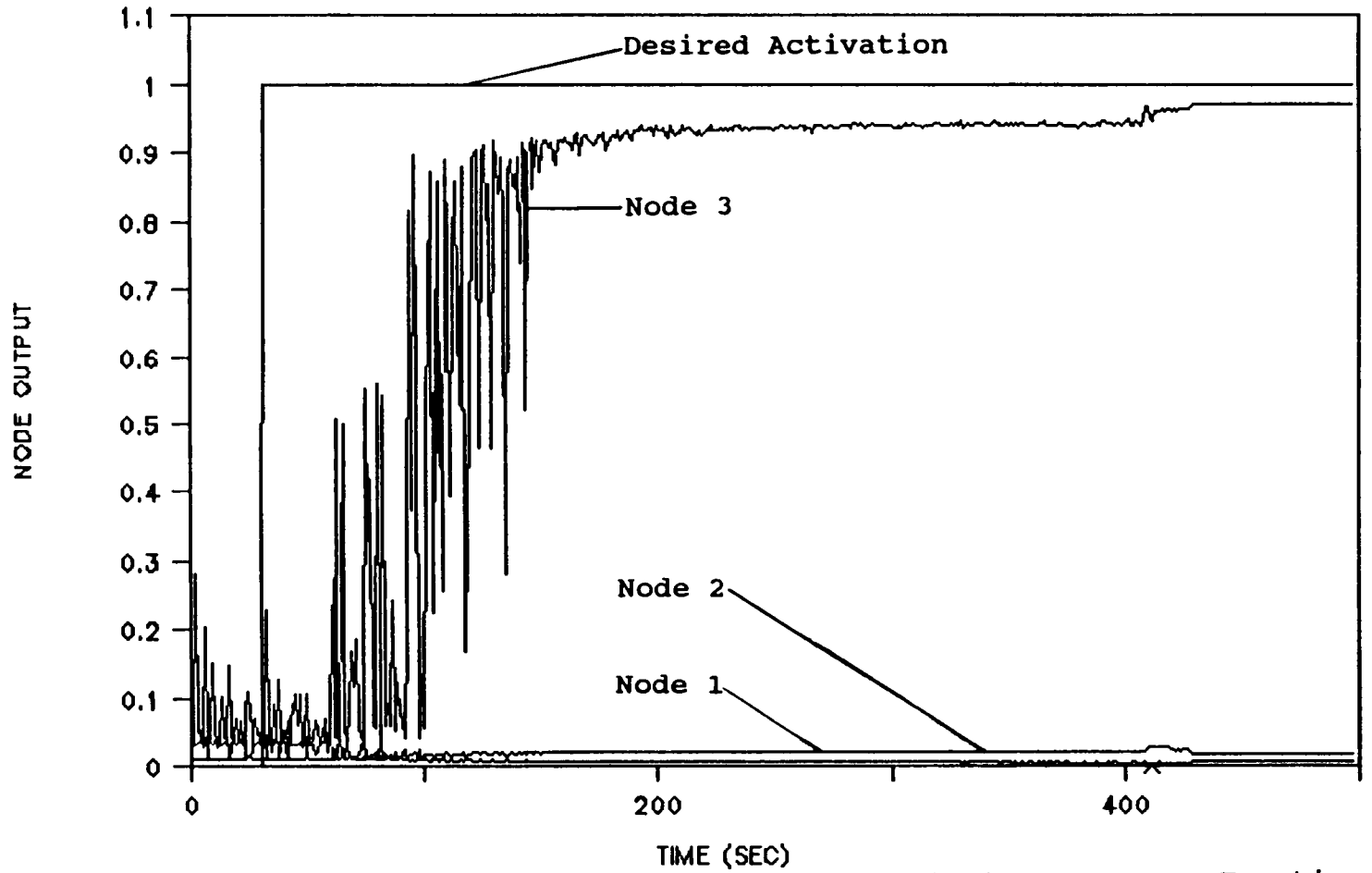



Figure 16. Activation of the Network Output Layer as a Function of Time in Response to Accident Scenario TH5 (Steam Generator Tube Leak), Desired Response: (0,0,1), With 2% Added Noise

this analysis are stored as WB7.*. The recall data sets contain values for all 27 variables with one-half or one second time intervals. The network is started as a 27 X 1 X 1 X 1 X 3 network. The network obtained by the SCN.FOR code is a 27 X 19 X 12 X 5 X 3 network. Thus, in the final architecture there are 27 input nodes, corresponding to the 27 input variables, 19 nodes in the first hidden layer, 12 nodes in the second hidden layer, five nodes in the third hidden layer and three output nodes.

It can be seen from the graphs and Appendix D that the network responds very quickly to the onset of most of the accident conditions. One exception is the steam generator tube leak. Note however, that this is a rather slow accident sequence and that the network classifies the accident well in advance of the reactor SCRAM, which occurs at 411 seconds. The reactor SCRAM times are indicated on each graph by an "x" on the time axis. Another significant result is the graceful degradation of network performance with noise as illustrated by the graphs of the 2% noise cases. Table 2 Summarizes these results. The transient recognition times given in Table 2 assume a dead zone for network output between 0.25 and 0.75. If the activation of any output node in

TABLE 2. Time From Start of Accident to Transient Recognition and Reactor SCRAM for Each of the Trained Scenarios.

| Plant Condition | Time to Diagnose Transient (sec) | | Time to Reactor SCRAM (sec) |
|---|---|---|---|
| | No-Noise | 2% Noise | |
| ED1: Total Loss of Offsite Power | 6.0 | 5.5 | 9.0 |
| F23: Main Feedwater Line Break | 18.5 | 62.0 | 15.5 |
| MS1: Main Steam Line Break | 29.0 | 66.0 | 11.0 |
| RD6: Control Rod Ejection | 20.0 | 19.0 | 44.0 |
| TH1: Hot Leg Loss of Coolant Accident | 29.0 | 47.5 | 4.0 |
| TH2: Cold Leg Loss of Coolant Accident | 19.5 | 37.5 | 4.5 |
| TH5: Steam Generator Tube Leak | 86.0 | 113.0 | 379.5 |

the network falls within this interval the network is considered to be in an undecided state.

# 6. CONCLUSIONS

A new artificial neural network paradigm called simulated condensation is shown to be a serviceable connectionist methodology. The method uses generalized continuous perceptrons in a dynamic architecture to learn not only the environmental task at hand but also the appropriate internal network structure required for that task. In this work, simulated condensation is benchmarked against a standard paradigm and is applied to the problem of nuclear power plant condition diagnoses. The feasibility of using artificial neural network technology as a diagnostic tool for nuclear power plant safety is demonstrated.

There are, however, related areas of investigation which could advance these results. Below are some suggestions for further research. These suggestions include two distinct areas. The first area includes improvements to the training algorithm. Improvements in this area could make learning faster and allow the training of very large networks. The second area for possible improvements includes research which could make the accident diagnostic effort better under actual plant

conditions. Below is a discussion of these suggestions.

Possible improvements to the training algorithm which could make the training process faster include, training only the useful weights, improvements in the dynamic node architecture, and retaining more history information for adaptively adjusting the weights. If an equation for the importance of a single weight could be found then those weights which occupy unimportant places in the network architecture could be eliminated. This could lead to a not-fully-connected network and faster training. It could also be used to create a dynamic weight architecture. Other improvements to the dynamic architecture could be realized by using a dynamic layer architecture. This approach would allow the network to determine the appropriate number of layers for a given problem. If more history information is stored about the dynamic behavior of, for example each weight, then a better estimate of the probability density function from which to select the future weights could be obtained. The required computer storage for this effort should be off set by the increase in training speed obtained.

Possible improvements in the implementation of the approach under actual plant conditions could be obtained by using more input variables, training more accidents,

and using an expert system to verify the results obtained by the network. The use of more variables would allow the training of many more accident conditions and would therefore make the approach more applicable and useful. Ultimately, the diagnostic system could be tied into the plant's safety parameter display system and all of the variables associated with that system could be at the disposal of the diagnostic network. The problem of diagnosis verification and validation could be addressed by using an expert system to check the network diagnosis. An expert system which is designed only to check if a given accident has actually occurred could be fast and simple and therefore the process of diagnosis and verification could, together, be accomplished in real time.

The investigation of these areas could significantly improve upon the utility, under actual nuclear power plant conditions, of the approach introduced by the research described in this dissertation.

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# APPENDIXES

# APPENDIX A.

## BENCHMARK CALCULATIONS

This appendix describes the benchmark calculations used in the development of the simulated condensation methodology. Listed are the training and recall data sets as well as the input and output files for both the simulated condensation (SCN.FOR) and the backpropagation (BPN.FOR) codes. The results from SCN.FOR are compared to those of BPN.FOR. It can be seen that simulated condensation is a more serviceable network training methodology.

### A.1 The Exclusive-Or Problem

The input file XOR.DDI is shown in Figure A-1. The first four of the input-output patterns defines the exclusive-or problem. These four patterns are used as the training set for the training of the benchmark network. The entire set of eight patterns is used for the recall set. This recall set gives an indication of the noise tolerance capabilities of the network as trained by the different methods. The benchmark network

is a 2 X 3 X 1 network, thus it has two input (dummy) nodes, three hidden nodes and one output node. Figures A-2 and A-3 show the parameter input files for the SCN.FOR and the BPN.FOR codes respectively. Notice that the dynamic node architecture option is not used in the simulated condensation run for this problem since B(4) is set equal to 0.99. Figures A-4 and A-5 show the results of the two methods. In each case the network was trained for the same amount of computer time. Figure A-6 shows a comparison of the training set learning curves for the two methods.

```
i    .0000   .0000     1
d   1.0000
i   1.0000  1.0000     2
d   1.0000
i   1.0000   .0000     3
d    .0000
i    .0000  1.0000     4
d    .0000
i    .1000   .1000     5
d   1.0000
i    .9000   .9000     6
d   1.0000
i    .9000   .1000     7
d    .0000
i    .1000   .9000     8
d    .0000
```

Figure A-1. Data Input File XOR.DDI.

```
!  XOR.NNI BENCHMARK
!   3   4 9991  15   5   5   5   4   7   4  20   0
!   2   3   1
!     1.05      0.55      10.0      0.99      2.00      0.60      0.1  0.
!     0.98      0.98      90.0      .001      1.02      1.02      1.5  .01
```

Figure A-2. SCN.FOR Parameter Input File XOR.NNI.

```
!  XOR.NNB BENCHMARK
!     3     2     4 9994    20     1    50     1     8
!     2     3     1
!         1.0         1.0
```

Figure A-3. BPN.FOR Parameter Input File XOR.NNB.

```
 0      1 1.0000000 1.0003760 -.0003761      1
 0      2 1.0000000  .9988997  .0011003      1
 0      3  .0000000  .0071868 -.0071868      1
 0      4  .0000000  .0056432 -.0056432      1
 0      5 1.0000000 1.0069950 -.0069954      1
 0      6 1.0000000 1.0027320 -.0027323      1
 0      7  .0000000  .0076517 -.0076517      1
 0      8  .0000000  .0056353 -.0056353      1
ISETS  IDPR    XD        X        ERROR     IO
RECALL SET SIZE                     8
RECALL SET ERROR RMS              .005380
MAX BIAS OR WEIGHT               90.0000
MAX GAIN OR CONSTANT              2.0000
FINAL NETWORK ARCHITECTURE       2  3  1
```

Figure A-4. SCN.FOR Output File XOR.PRN.

```
 0      1 1.0000000  .8720861  .1279139      1
 0      2 1.0000000  .9036222  .0963778      1
 0      3  .0000000  .1102401 -.1102401      1
 0      4  .0000000  .1102321 -.1102321      1
 0      5 1.0000000  .6725188  .3274812      1
 0      6 1.0000000  .8992153  .1007847      1
 0      7  .0000000  .1205036 -.1205036      1
 0      8  .0000000  .1203314 -.1203314      1
ISETS  IDPR    XD        X        ERROR     IO
RECALL SET SIZE                       8
RECALL SET ERROR RMS                .156667
GAIN IS                            1.000000
RATE IS                            1.000000
NETWORK ARCHITECTURE          2  3  1
```

Figure A-5. BPN.FOR Output File XOR.PRB.

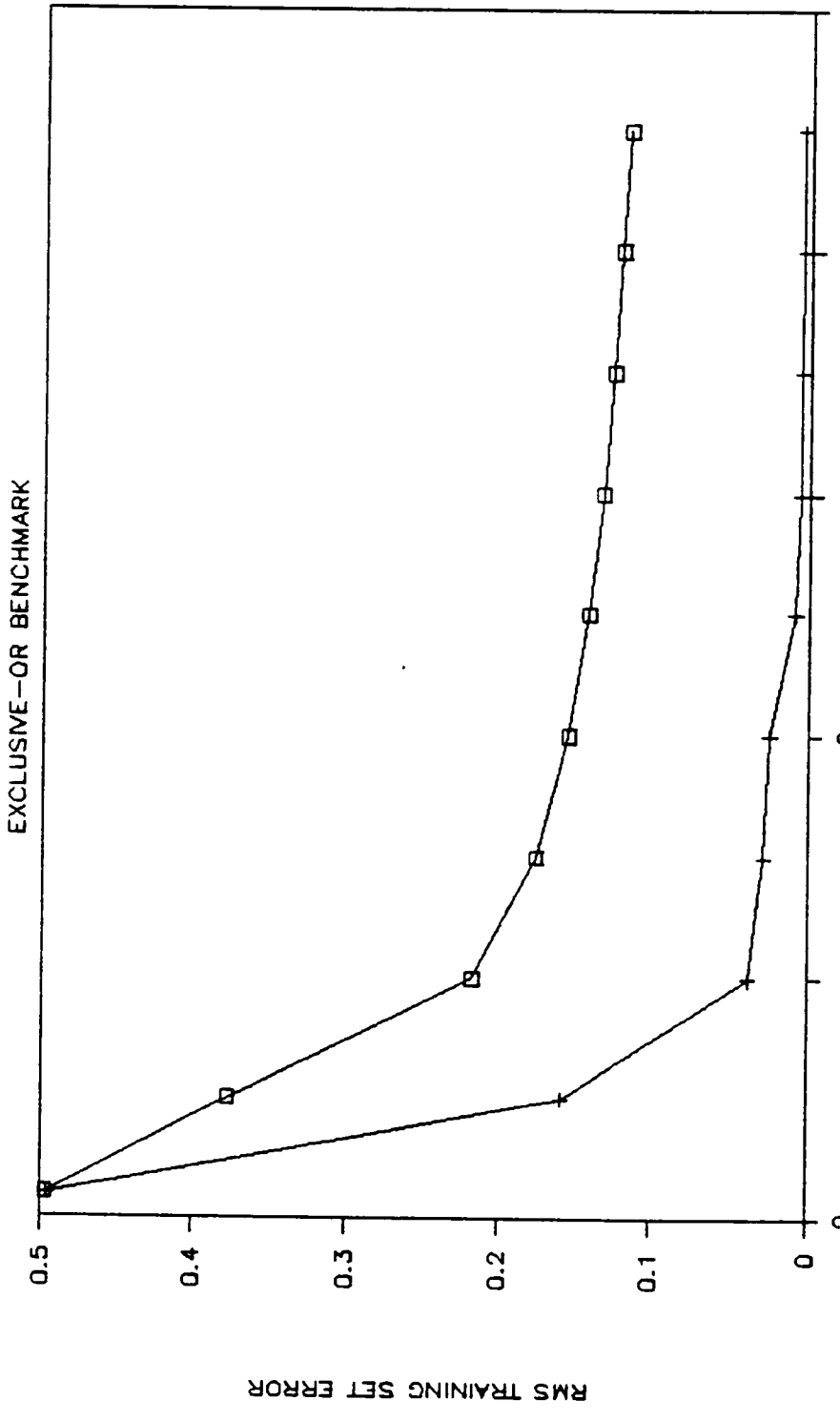



Figure A-6. A Comparison Of The Exclusive-Or Learning Curves.

## A.2 A Simple Sample Problem

Input file SSP.DDI is shown in Figure A-7. The first seven of these input-output patterns define the simple sample problem. These seven patterns are used as the training set for the learning of the benchmark network. The entire set of 21 patterns is used for the recall set. This recall set gives an indication of the noise tolerance capabilities of the network as trained by the different methods. The benchmark network is a 2 X 5 X 3 X 1 network. Figures A-8 and A-9 show the parameter input files for the SCN.FOR and BPN.FOR codes. Notice that the dynamic node architecture option is not used in the simulated condensation run for this problem. Figures A-10 and A-11 show the recall set results from the two methods. Each training method was given the same amount of computer time. Figure A-12 shows a comparison of the training set learning curves.

```
i    .1000   .2000     1
d    .3000
i    .2000   .3000     2
d    .4000
i    .3000   .4000     3
d    .5000
i    .4000   .5000     4
d    .6000
i    .5000   .6000     5
d    .7000
i    .6000   .7000     6
d    .8000
i    .7000   .8000     7
d    .9000
i    .1100   .2100     8
d    .3000
i    .2100   .3100     9
d    .4000
i    .3100   .4100    10
d    .5000
i    .4100   .5100    11
d    .6000
i    .5100   .6100    12
d    .7000
i    .6100   .7100    13
d    .8000
i    .7100   .8100    14
d    .9000
i    .0900   .1900    15
d    .3000
i    .1900   .2900    16
d    .4000
i    .2900   .3900    17
d    .5000
i    .3900   .4900    18
d    .6000
i    .4900   .5900    19
d    .7000
i    .5900   .6900    20
d    .8000
i    .6900   .7900    21
d    .9000
```

Figure A-7. Data Input File SSP.DDI.

```
!   SSP.NNI BENCHMARK
!   4   7 991  15   5   5   5   4   7   7  20   0
!   2   5   3   1
!     1.05      0.55      10.0      0.99      2.00      0.60      0.1  0.
!     0.98      0.98      90.0      .001      1.02      1.02      1.5 .01
```

Figure A-8. SCN.FOR Parameter Input File SSP.NNI.

```
!   SSP.NNB  BENCHMARK
!     4     2     7 9994    20     0    20     1    20
!     2     5     3     1
!         0.1         1.0
```

Figure A-9. BPN.FOR Parameter Input File SSP.NNB.

```
 0      1   .3000000   .2999994   .0000006      1
 0      2   .4000000   .4000241  -.0000241      1
 0      3   .5000000   .4838290   .0161710      1
 0      4   .6000000   .6064329  -.0064329      1
 0      5   .7000000   .7174095  -.0174095      1
 0      6   .8000000   .8081399  -.0081399      1
 0      7   .9000000   .8785815   .0214185      1
 0      8   .3000000   .2994862   .0005138      1
 0      9   .4000000   .3997357   .0002643      1
 0     10   .5000000   .4961200   .0038800      1
 0     11   .6000000   .6182801  -.0182800      1
 0     12   .7000000   .7274464  -.0274464      1
 0     13   .8000000   .8160502  -.0160502      1
 0     14   .9000000   .8846440   .0153559      1
 0     15   .3000000   .3004162  -.0004162      1
 0     16   .4000000   .4016842  -.0016842      1
 0     17   .5000000   .4716477   .0283523      1
 0     18   .6000000   .5944612   .0055388      1
 0     19   .7000000   .7071605  -.0071605      1
 0     20   .8000000   .8000257  -.0000257      1
 0     21   .9000000   .8723522   .0276478      1
ISETS   IDPR     XD         X         ERROR     IO
RECALL SET SIZE                        21
RECALL SET ERROR RMS                .014443
MAX BIAS OR WEIGHT                  90.0000
MAX GAIN OR CONSTANT                 2.0000
FINAL NETWORK ARCHITECTURE          2  5  3  1
```

Figure A-10. SCN.FOR Output File SSP.PRN.

```
 0      1   .3000000   .5974374 -.2974374      1
 0      2   .4000000   .5975173 -.1975173      1
 0      3   .5000000   .5975970 -.0975970      1
 0      4   .6000000   .5976765  .0023235      1
 0      5   .7000000   .5977558  .1022442      1
 0      6   .8000000   .5978348  .2021652      1
 0      7   .9000000   .5979136  .3020864      1
 0      8   .3000000   .5974454 -.2974454      1
 0      9   .4000000   .5975253 -.1975253      1
 0     10   .5000000   .5976049 -.0976049      1
 0     11   .6000000   .5976844  .0023156      1
 0     12   .7000000   .5977637  .1022363      1
 0     13   .8000000   .5978427  .2021573      1
 0     14   .9000000   .5979214  .3020785      1
 0     15   .3000000   .5974295 -.2974294      1
 0     16   .4000000   .5975093 -.1975093      1
 0     17   .5000000   .5975890 -.0975890      1
 0     18   .6000000   .5976685  .0023315      1
 0     19   .7000000   .5977479  .1022521      1
 0     20   .8000000   .5978269  .2021731      1
 0     21   .9000000   .5979057  .3020943      1
ISETS  IDPR    XD        X        ERROR     IO
RECALL SET SIZE                      21
RECALL SET ERROR RMS                .199855
GAIN IS                             .100000
RATE IS                            1.000000
NETWORK ARCHITECTURE      2  5  3  1
```

Figure A-11. BPN.FOR Output File SSP.PRB.

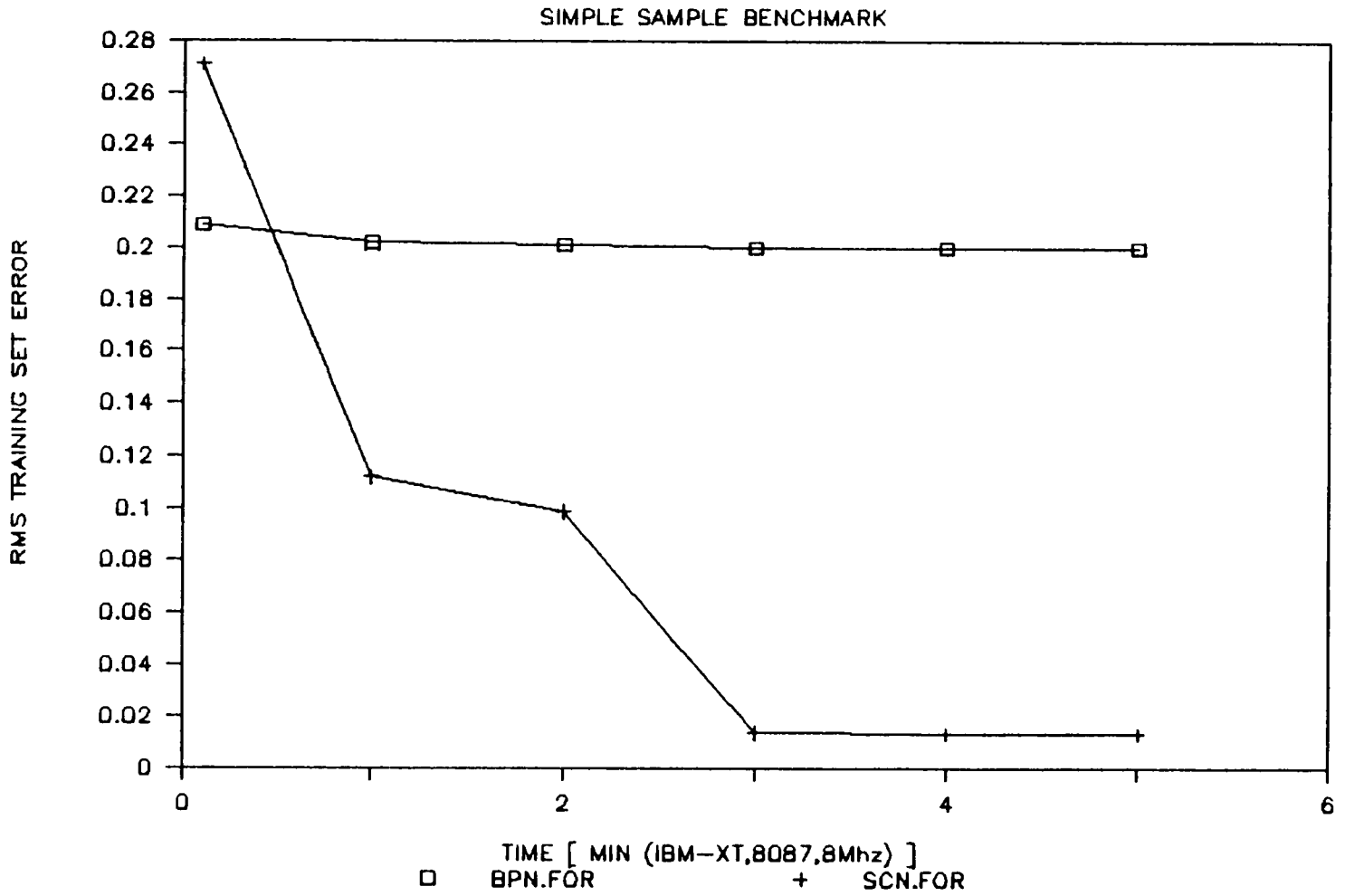



Figure A-12. A Comparison of the Simple Sample Problem Learning Curves.

## A.3 Uniform Distribution Separation

Input file UDS.DDI is shown in Figure A-13. The first ten of the input-output patterns in the data input file are used as the training set for the learning of the benchmark network. The entire set of 20 patterns is used for the recall set. This recall set gives an indication of the generalization capabilities of the network as trained by the different methods. The benchmark network is a 5 X 9 X 2 network. Figures A-14 and A-15 show the parameter input files for the SCN.FOR and the BPN.FOR codes respectively. Notice that the dynamic node architecture option is not used in the simulated condensation run for this problem. Figure A-16 and A-17 show recall set results for equal time length training attempts. Figure A-18 shows a comparison of the learning curves.

```
i   .4698  .3221  .3330  .3165  .4531   1
d  1.0000  .0000
i   .6899  .5411  .6869  .5748  .6185   2
d   .0000 1.0000
i   .3987  .4626  .3239  .4634  .3282   3
d  1.0000  .0000
i   .5323  .6560  .6468  .6185  .6516   4
d   .0000 1.0000
i   .3933  .4576  .4250  .4428  .4247   5
d  1.0000  .0000
i   .6514  .5701  .5947  .5057  .6504   6
d   .0000 1.0000
i   .3426  .4629  .4585  .3434  .4980   7
d  1.0000  .0000
i   .6696  .5721  .6861  .6587  .5038   8
d   .0000 1.0000
i   .4020  .3006  .3134  .3209  .3704   9
d  1.0000  .0000
i   .6758  .6177  .5432  .5662  .5674  10
d   .0000 1.0000
i   .3939  .4596  .3450  .3975  .3308  11
d  1.0000  .0000
i   .6256  .5290  .6549  .5840  .6634  12
d   .0000 1.0000
i   .4070  .4954  .3757  .4620  .3347  13
d  1.0000  .0000
i   .5410  .5949  .5769  .5342  .6807  14
d   .0000 1.0000
i   .3970  .4303  .4944  .4700  .4043  15
d  1.0000  .0000
i   .5111  .5710  .5312  .5057  .5749  16
d   .0000 1.0000
i   .3861  .3531  .4567  .4438  .4285  17
d  1.0000  .0000
i   .6914  .6795  .6069  .6540  .5681  18
d   .0000 1.0000
i   .4631  .4195  .4846  .4722  .3630  19
d  1.0000  .0000
i   .5040  .6093  .5594  .6014  .5493  20
d   .0000 1.0000
```

Figure A-13. Data Input File UDS.DDI.

```
!  UDS.NNI BENCHMARK
!    3   10 9991   15    5    5    5    4    7   10   20    0
!    5    9    2
!      1.05       0.55       10.0       0.99       2.00       0.60       0.1   0.
!      0.98       0.98       90.0       .001       1.02       1.02       1.5  .01
```

Figure A-14. SCN.FOR Parameter Input File UDS.NNI.

```
!    UDS.NNB   BENCHMARK
!      3     5    10 9994    20     0    20     1    20
!      5     9     2
!          1.0         1.0
```

Figure A-15. BPN.FOR Parameter Input File UDS.NNB.

```
 0      1 1.0000000 1.0143730 -.0143734      1
 0      1  .0000000  .0395933 -.0395933      2
 0      2  .0000000  .0658500 -.0658500      1
 0      2 1.0000000  .9716288  .0283712      2
 0      3 1.0000000 1.0545540 -.0545541      1
 0      3  .0000000  .1251477 -.1251477      2
 0      4  .0000000  .0782172 -.0782172      1
 0      4 1.0000000 1.0240640 -.0240638      2
 0      5 1.0000000  .9619672  .0380328      1
 0      5  .0000000  .2185161 -.2185161      2
 0      6  .0000000  .0832744 -.0832744      1
 0      6 1.0000000  .8567920  .1432080      2
 0      7 1.0000000 1.0800500 -.0800505      1
 0      7  .0000000  .1929042 -.1929042      2
 0      8  .0000000  .0845427 -.0845427      1
 0      8 1.0000000  .9787734  .0212266      2
 0      9 1.0000000 1.0889170 -.0889174      1
 0      9  .0000000  .0438934 -.0438934      2
 0     10  .0000000  .0749641 -.0749641      1
 0     10 1.0000000  .8851953  .1148047      2
 0     11 1.0000000 1.0659200 -.0659202      1
 0     11  .0000000  .1147249 -.1147249      2
 0     12  .0000000  .0736816 -.0736816      1
 0     12 1.0000000  .9665214  .0334786      2
 0     13 1.0000000  .9991254  .0008746      1
 0     13  .0000000  .1854574 -.1854574      2
 0     14  .0000000  .1136905 -.1136905      1
 0     14 1.0000000  .9281849  .0718151      2
 0     15 1.0000000  .8690265  .1309735      1
 0     15  .0000000  .3349402 -.3349402      2
 0     16  .0000000  .1522190 -.1522190      1
 0     16 1.0000000  .8004318  .1995682      2
 0     17 1.0000000  .9893587  .0106413      1
 0     17  .0000000  .1736861 -.1736861      2
 0     18  .0000000  .0609938 -.0609938      1
 0     18 1.0000000 1.0121260 -.0121260      2
 0     19 1.0000000  .8879759  .1120241      1
 0     19  .0000000  .2455492 -.2455492      2
 0     20  .0000000  .1006763 -.1006763      1
 0     20 1.0000000  .9501759  .0498241      2
ISETS  IDPR    XD        X        ERROR     IO
RECALL SET SIZE                    20
RECALL SET ERROR RMS             .120127
MAX BIAS OR WEIGHT               90.0000
MAX GAIN OR CONSTANT              2.0000
FINAL NETWORK ARCHITECTURE       5  9  2
```

Figure A-16. SCN.FOR Output File UDS.PRN.

```
 0      1 1.0000000  .8617378  .1382622      1
 0      1  .0000000  .1391031 -.1391031      2
 0      2  .0000000  .1481207 -.1481207      1
 0      2 1.0000000  .8527453  .1472547      2
 0      3 1.0000000  .8648670  .1351330      1
 0      3  .0000000  .1338324 -.1338324      2
 0      4  .0000000  .4857744 -.4857744      1
 0      4 1.0000000  .5112054  .4887946      2
 0      5 1.0000000  .7664308  .2335692      1
 0      5  .0000000  .2323988 -.2323988      2
 0      6  .0000000  .3452654 -.3452654      1
 0      6 1.0000000  .6565681  .3434319      2
 0      7 1.0000000  .8283701  .1716299      1
 0      7  .0000000  .1717791 -.1717791      2
 0      8  .0000000  .1284990 -.1284990      1
 0      8 1.0000000  .8717244  .1282756      2
 0      9 1.0000000  .8259348  .1740652      1
 0      9  .0000000  .1749550 -.1749550      2
 0     10  .0000000  .3708742 -.3708742      1
 0     10 1.0000000  .6278197  .3721803      2
 0     11 1.0000000  .7993010  .2006990      1
 0     11  .0000000  .1990930 -.1990930      2
 0     12  .0000000  .2328210 -.2328210      1
 0     12 1.0000000  .7685225  .2314775      2
 0     13 1.0000000  .7453041  .2546959      1
 0     13  .0000000  .2514725 -.2514725      2
 0     14  .0000000  .8074030 -.8074030      1
 0     14 1.0000000  .1921519  .8078482      2
 0     15 1.0000000  .3274947  .6725054      1
 0     15  .0000000  .6729474 -.6729474      2
 0     16  .0000000  .7097241 -.7097241      1
 0     16 1.0000000  .2890555  .7109445      2
 0     17 1.0000000  .5083102  .4916898      1
 0     17  .0000000  .4942254 -.4942254      2
 0     18  .0000000  .2357482 -.2357482      1
 0     18 1.0000000  .7629346  .2370654      2
 0     19 1.0000000  .2224752  .7775248      1
 0     19  .0000000  .7782252 -.7782252      2
 0     20  .0000000  .5916280 -.5916280      1
 0     20 1.0000000  .4040880  .5959120      2
ISETS  IDPR    XD        X        ERROR    IO
RECALL SET SIZE                     20
RECALL SET ERROR RMS               .430566
GAIN IS                           1.000000
RATE IS                           1.000000
NETWORK ARCHITECTURE      5  9  2
```

Figure A-17. BPN.FOR Output File UDS.PRB.

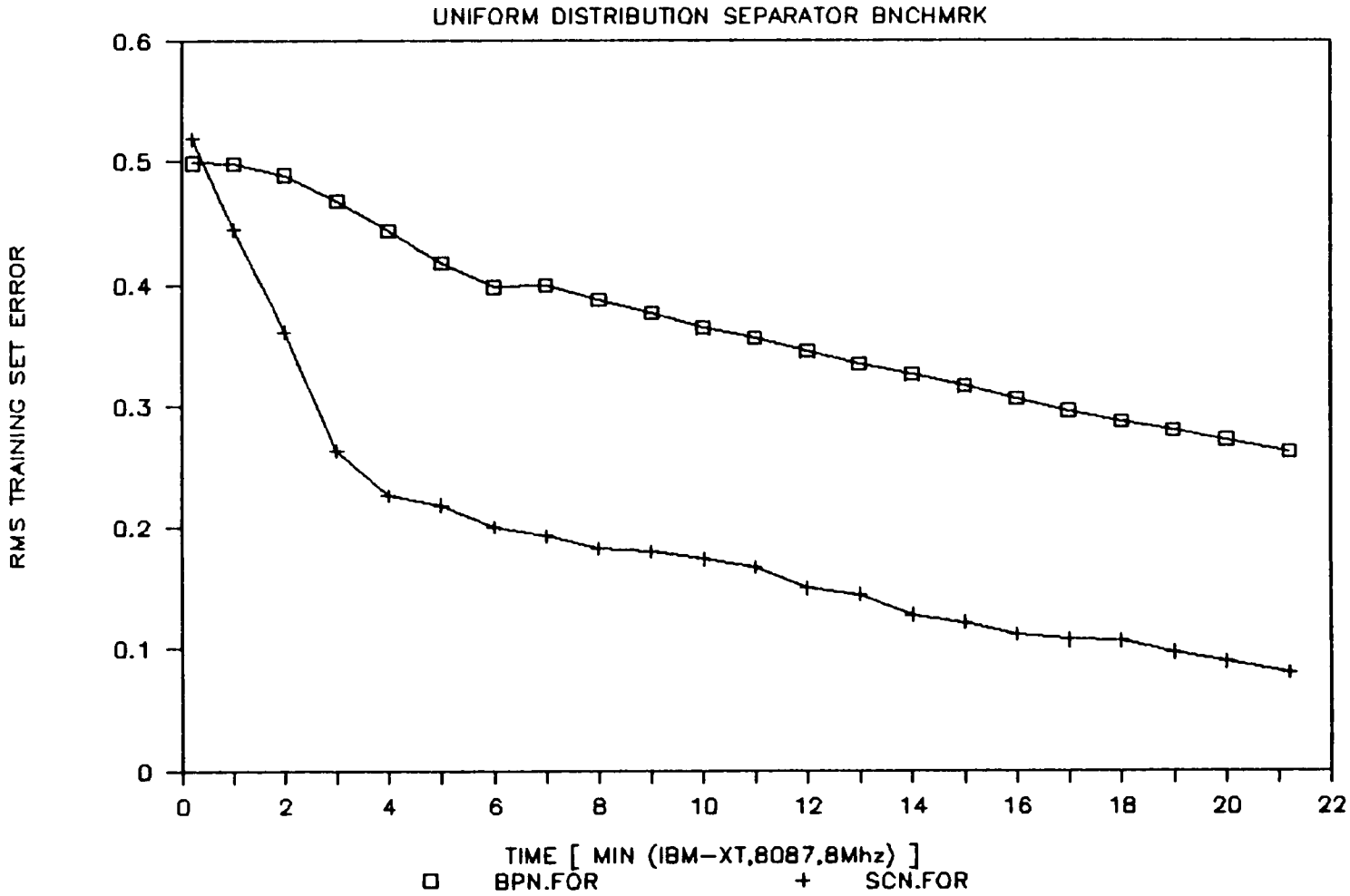



Figure A-18. A Comparison of the Uniform Distribution Separator Learning Curves.

## A.4 Gaussian Distribution Separation

Input file GDS.DDI is shown in Figure A-19. The first 20 of the input-output patterns in the data input file are used as the training set for the learning of the benchmark network. The entire set of 40 patterns is used for the recall set. This recall set gives an indication of the generalization capabilities of the network as trained by the different methods. The benchmark network is a 5 X 4 X 1 network. Figures A-20 and A-21 show the parameter input files for the SCN.FOR and the BPN.FOR codes respectively. In this example the dynamic node architecture option is used in the simulated condensation run. The network was started as a 5 X 1 X 1 network. Figure A-22 shows the GDS.DNA file output by SCN.FOR. This file shows, in the first numerical column, the most resent (instantaneous) network training error obtained by the network in its present architecture. The second numerical column shows the lowest error obtained during the simulation regardless of the network architecture. This best trainable parameter set is stored as file GDS.WTS. The third numerical column shows the present value of $w^{max}$ and $b1^{max}$. The fourth numerical column shows the present value of $g1^{max}$ and $k1^{max}$. These are the

regional constraints imposed on the trainable parameters. The final four columns show the present state of the network nodal architecture. Figure A-23 and A-24 show the recall set results from equal time training attempts. Figure A-25 shows a comparison of the training set learning curves.

```
i   .2992  .3949  .4739  .3733  .2804    1
d  1.0000
i   .8346  .6081  .6707  .4650  .5755    2
d   .0000
i   .3796  .3880  .4172  .2840  .3443    3
d  1.0000
i   .4519  .6373  .6055  .5346  .4797    4
d   .0000
i   .3406  .3318  .4616  .6410  .3962    5
d  1.0000
i   .5784  .6526  .5508  .5237  .6557    6
d   .0000
i   .3254  .3917  .4103  .2119  .3201    7
d  1.0000
i   .6796  .5932  .8022  .6165  .5716    8
d   .0000
i   .3347  .3474  .4502  .4883  .3693    9
d  1.0000
i   .6741  .6495  .5675  .6239  .4688   10
d   .0000
i   .4308  .4321  .4433  .4193  .4534   11
d  1.0000
i   .6946  .7992  .5351  .6472  .6987   12
d   .0000
i   .3072  .3032  .3418  .3716  .2564   13
d  1.0000
i   .4626  .5510  .5670  .7073  .5415   14
d   .0000
i   .4718  .3623  .4700  .2429  .2311   15
d  1.0000
i   .6228  .6214  .7356  .4907  .6137   16
d   .0000
i   .3302  .4074  .2933  .4431  .3879   17
d  1.0000
i   .5505  .6375  .5332  .6513  .6123   18
d   .0000
i   .2188  .5611  .1730  .4033  .3138   19
d  1.0000
i   .6615  .4744  .4770  .5555  .5610   20
d   .0000
```

Figure A-19. Data Input File GDS.DDI.

```
!  GDS.NNI BENCHMARK
!   3   20 9991   7   3   3   3   4   7   20   20   0
!   5    1    1
!     1.04      0.55      10.0      1.10      3.00      0.60      0.1  100.
!     0.98      0.98      30.0      .010      1.02      1.02      1.5  .01
```

Figure A-20. SCN.FOR Parameter Input File GDS.NNI.

```
!    GDS.NNB   BENCHMARK
!      3     5    20 9994    20     0    20     1    40
!      5     4     1
!         1.0         1.0
```

Figure A-21. BPN.FOR Parameter Input File GDS.NNB.

```
RMSG,L,WT,KN     .0000  10.0000  30.0000   3.0000 ARCH  5  1  1
RMSG,L,WT,KN     .2852    .2852  30.0000   3.0000 ARCH  5  1  1
RMSG,L,WT,KN     .2705    .2705  30.0000   3.0000 ARCH  5  2  1
RMSG,L,WT,KN     .2498    .2498  30.0000   3.0000 ARCH  5  2  1
RMSG,L,WT,KN     .2434    .2434  30.0000   3.0000 ARCH  5  3  1
RMSG,L,WT,KN     .0894    .0894  30.0000   3.0000 ARCH  5  3  1
RMSG,L,WT,KN     .0663    .0663  30.0000   3.0000 ARCH  5  3  1
RMSG,L,WT,KN     .0416    .0416  30.0000   3.0000 ARCH  5  3  1
RMSG,L,WT,KN     .0286    .0286  30.0000   3.0000 ARCH  5  3  1
RMSG,L,WT,KN     .0284    .0284  30.6000   3.0600 ARCH  5  4  1
RMSG,L,WT,KN     .0265    .0265  30.6000   3.0600 ARCH  5  4  1
```

Figure A-22. SCN.FOR output file GDS.DNA

```
 0     1 1.0000000 1.0096490 -.0096494     1
 0     2  .0000000  .0196653 -.0196653     1
 0     3 1.0000000 1.0011030 -.0011029     1
 0     4  .0000000  .0422545 -.0422545     1
 0     5 1.0000000 1.0083840 -.0083843     1
 0     6  .0000000  .0193486 -.0193486     1
 0     7 1.0000000 1.0046030 -.0046026     1
 0     8  .0000000  .0246457 -.0246457     1
 0     9 1.0000000 1.0075050 -.0075053     1
 0    10  .0000000  .0302209 -.0302209     1
 0    11 1.0000000  .9518394  .0481606     1
 0    12  .0000000  .0140468 -.0140468     1
 0    13 1.0000000 1.0140120 -.0140117     1
 0    14  .0000000  .0635050 -.0635050     1
 0    15 1.0000000 1.0074610 -.0074612     1
 0    16  .0000000  .0206607 -.0206607     1
 0    17 1.0000000 1.0026830 -.0026828     1
 0    18  .0000000  .0238587 -.0238587     1
 0    19 1.0000000 1.0024280 -.0024282     1
 0    20  .0000000  .0438590 -.0438590     1
 0    21 1.0000000  .9594512  .0405488     1
 0    22  .0000000  .0253194 -.0253194     1
 0    23 1.0000000 1.0121960 -.0121959     1
 0    24  .0000000  .0471942 -.0471942     1
 0    25 1.0000000  .9999076  .0000924     1
 0    26  .0000000  .0457571 -.0457571     1
 0    27 1.0000000  .9988084  .0011916     1
 0    28  .0000000  .0198371 -.0198371     1
 0    29 1.0000000 1.0017300 -.0017301     1
 0    30  .0000000  .0448834 -.0448834     1
 0    31 1.0000000  .5270587  .4729413     1
 0    32  .0000000  .0590016 -.0590016     1
 0    33 1.0000000  .9394865  .0605135     1
 0    34  .0000000  .0243655 -.0243655     1
 0    35 1.0000000  .9884408  .0115592     1
 0    36  .0000000  .0589795 -.0589795     1
 0    37 1.0000000  .9991742  .0008258     1
 0    38  .0000000  .0191992 -.0191992     1
 0    39 1.0000000  .1371070  .8628930     1
 0    40  .0000000  .0339525 -.0339525     1
ISETS  IDPR    XD        X        ERROR    IO
RECALL SET SIZE                    40
RECALL SET ERROR RMS             .158457
MAX BIAS OR WEIGHT              30.6000
MAX GAIN OR CONSTANT             3.0600
FINAL NETWORK ARCHITECTURE       5  4  1
```

Figure A-23. SCN.FOR Output File GDS.PRN.

```
 0      1 1.0000000   .7830431   .2169569      1
 0      2  .0000000   .2656265  -.2656265      1
 0      3 1.0000000   .5505009   .4494991      1
 0      4  .0000000   .6087952  -.6087952      1
 0      5 1.0000000   .6793208   .3206792      1
 0      6  .0000000   .3046852  -.3046852      1
 0      7 1.0000000   .6211473   .3788527      1
 0      8  .0000000   .3969834  -.3969834      1
 0      9 1.0000000   .6614544   .3385456      1
 0     10  .0000000   .3783170  -.3783170      1
 0     11 1.0000000   .4398345   .5601655      1
 0     12  .0000000   .2659225  -.2659225      1
 0     13 1.0000000   .6877792   .3122208      1
 0     14  .0000000   .5167419  -.5167419      1
 0     15 1.0000000   .6012264   .3987736      1
 0     16  .0000000   .3624757  -.3624757      1
 0     17 1.0000000   .5119081   .4880919      1
 0     18  .0000000   .3508339  -.3508339      1
 0     19 1.0000000   .6969310   .3030690      1
 0     20  .0000000   .2747238  -.2747238      1
 0     21 1.0000000   .3477919   .6522081      1
 0     22  .0000000   .2310874  -.2310874      1
 0     23 1.0000000   .7456264   .2543736      1
 0     24  .0000000   .2949367  -.2949367      1
 0     25 1.0000000   .3268379   .6731621      1
 0     26  .0000000   .3439036  -.3439036      1
 0     27 1.0000000   .7236297   .2763703      1
 0     28  .0000000   .2697279  -.2697279      1
 0     29 1.0000000   .4069066   .5930934      1
 0     30  .0000000   .4295366  -.4295366      1
 0     31 1.0000000   .6803544   .3196456      1
 0     32  .0000000   .5428369  -.5428369      1
 0     33 1.0000000   .3874380   .6125619      1
 0     34  .0000000   .4991917  -.4991917      1
 0     35 1.0000000   .4145060   .5854940      1
 0     36  .0000000   .2444195  -.2444195      1
 0     37 1.0000000   .6552408   .3447592      1
 0     38  .0000000   .2945165  -.2945165      1
 0     39 1.0000000   .4525056   .5474944      1
 0     40  .0000000   .5536189  -.5536189      1
ISETS  IDPR    XD        X        ERROR     IO
RECALL SET SIZE                      40
RECALL SET ERROR RMS                .422369
GAIN IS                            1.000000
RATE IS                            1.000000
NETWORK ARCHITECTURE      5  4  1
```

Figure A-24. BPN.FOR Output File GDS.PRB.

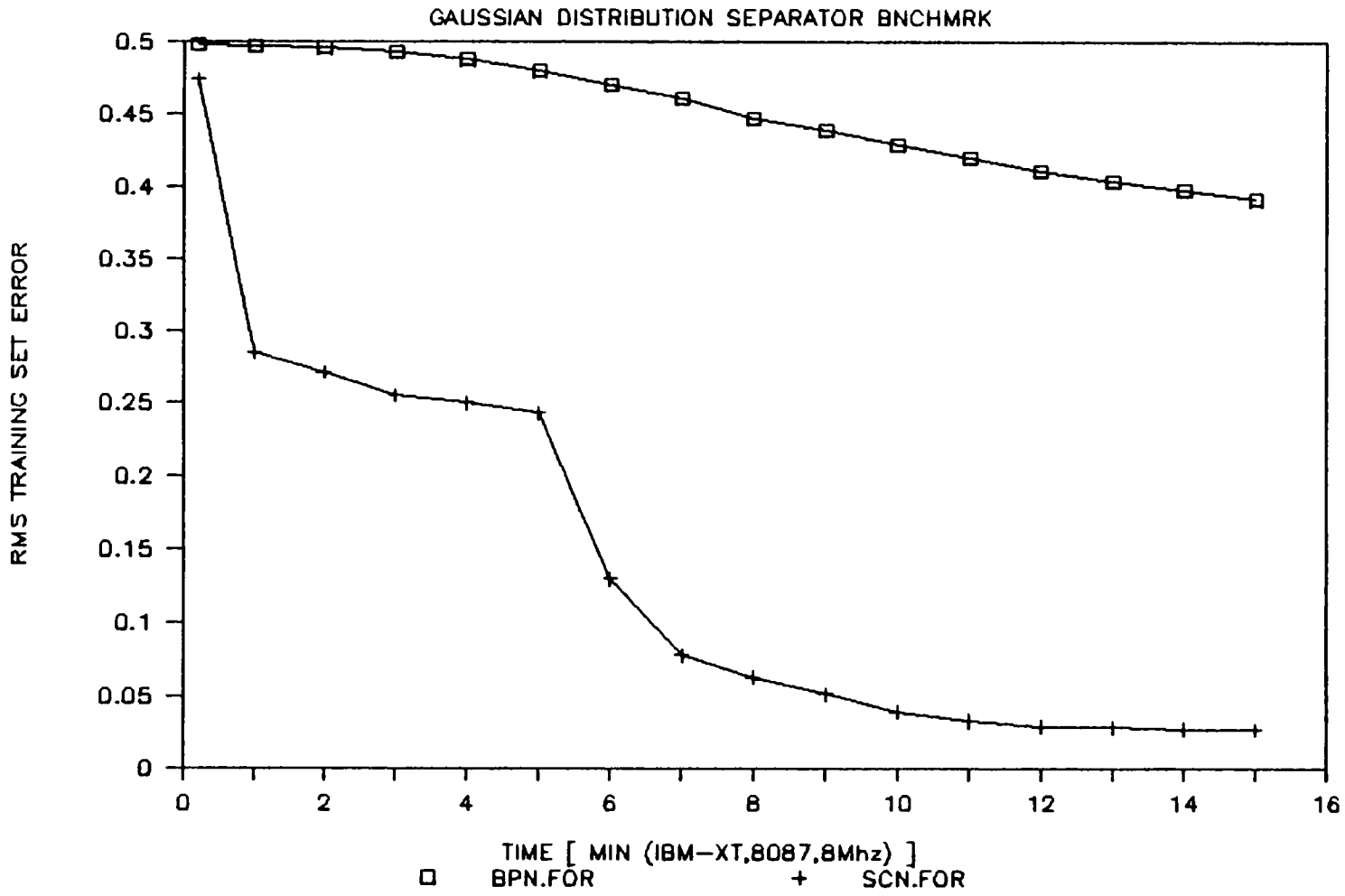



Figure A-25. A Comparison of the Gaussian Distribution Separator Learning Curves.

## A.5 A Continuous Function Mapping Problem

In this example the network is trained to map the continuous function,

$$\text{network output} = 0.5 \cdot \cos(2 \cdot \pi \cdot \text{input}) + 0.5.$$

The training portion of input file CFM.DDI is shown in Figure A-26. These first fifty of the input-output patterns are used in the data input file as the training set for the learning of the benchmark network. A set of 250 patterns is used for the recall set. This recall set gives an indication of the continuous function generalization capabilities of the network as trained by the different methods. Figures A-27 and A-28 show the parameter input files for the SCN.FOR and the BPN.FOR codes respectively. The simulated condensation benchmark network is started as a 1 X 1 X 1 X 1 network. The method then builds its own network architecture. Figure A-29 shows file CFM.DNA. This file contains a dynamic record of the architecture changes which occur during the training process as explained in Appendix A.4 and Appendix F.2. The BPN.FOR network is trained using the final architecture arrived at by the SCN.FOR code. Thus, the comparison is between building and

training a network by simulated condensation verse simply training a given network by backpropagation. Figures A-30 and A-31 show recall set results from equal time lengths of training by the different methods. Figure A-32 shows a comparison of the training set learning curves.

```
     0    1
1.0000
0.0200    2
0.9961
0.0400    3
0.9843
0.0600    4
0.9649
0.0800    5
0.9382
0.1000    6
0.9045
0.1200    7
0.8645
0.1400    8
0.8187
0.1600    9
0.7679
0.1800   10
0.7129
0.2000   11
0.6545
0.2200   12
0.5937
0.2400   13
0.5314
0.2600   14
0.4686
0.2800   15
0.4063
0.3000   16
0.3455
0.3200   17
0.2871
0.3400   18
0.2321
0.3600   19
0.1813
0.3800   20
0.1355
0.4000   21
0.0955
0.4200   22
```

Figure A-26. The Training Portion of Data Input File CFM.DDI.

```
0.0618
0.4400   23
0.0351
0.4600   24
0.0157
0.4800   25
0.0039
0.5000   26
0.0000
0.5200   27
0.0039
0.5400   28
0.0157
0.5600   29
0.0351
0.5800   30
0.0618
0.6000   31
0.0955
0.6200   32
0.1355
0.6400   33
0.1813
0.6600   34
0.2321
0.6800   35
0.2871
0.7000   36
0.3455
0.7200   37
0.4063
0.7400   38
0.4686
0.7600   39
0.5314
0.7800   40
0.5937
0.8000   41
0.6545
0.8200   42
0.7129
0.8400   43
0.7679
0.8600   44
```

Figure A-26. (Continued)

```
0.8187
0.8800    45
0.8645
0.9000    46
0.9045
0.9200    47
0.9382
0.9400    48
0.9649
0.9600    49
0.9843
0.9800    50
0.9961
```

Figure A-26. (Continued)

```
!  CFM.NNI BENCHMARK
!   4   50 9991   11    5    5    5    4   17   50   30    0
!   1    1    1    1
!     1.17      0.55       1.0     1.005      3.00      0.50       0.1   10.
!     0.90      0.90      30.0      .035      1.10      1.10       0.5  .0001
!          .00000001
```

Figure A-27. SCN.FOR Parameter Input File CFM.NNI.

```
!   CFM.NNB  BENCHMARK
!     4     5    5099994    50     0    50     0    50
!     1     4     7     1
!        1.0         1.0
```

Figure A-28. BPN.FOR Parameter Input File CFM.NNB.

```
RMSG,L,WT,KN    0.0000   10.0000   30.0000    3.0000 ARCH  1  1  1  1
RMSG,L,WT,KN    0.3448    0.3448   30.0000    3.0000 ARCH  1  1  1  1
RMSG,L,WT,KN    0.3395    0.3395   30.0000    3.0000 ARCH  1  1  1  1
RMSG,L,WT,KN    0.3249    0.3249   30.0000    3.0000 ARCH  1  1  1  1
RMSG,L,WT,KN    0.3008    0.3008   30.0000    3.0000 ARCH  1  1  1  1
RMSG,L,WT,KN    0.2909    0.2909   30.0000    3.0000 ARCH  1  1  1  1
RMSG,L,WT,KN    0.2907    0.2907   30.0000    3.0000 ARCH  1  1  2  1
RMSG,L,WT,KN    0.2892    0.2892   30.0000    3.0000 ARCH  1  1  2  1
RMSG,L,WT,KN    0.2887    0.2887   30.0000    3.0000 ARCH  1  1  3  1
RMSG,L,WT,KN    0.2830    0.2830   30.0000    3.0000 ARCH  1  1  3  1
RMSG,L,WT,KN    0.2513    0.2513   30.0000    3.0000 ARCH  1  1  3  1
RMSG,L,WT,KN    0.2394    0.2394   30.0000    3.0000 ARCH  1  1  3  1
RMSG,L,WT,KN    0.0651    0.0651   30.0000    3.0000 ARCH  1  1  3  1
RMSG,L,WT,KN    0.0596    0.0596   30.0000    3.0000 ARCH  1  1  3  1
RMSG,L,WT,KN    0.0574    0.0574   30.0000    3.0000 ARCH  1  1  3  1
RMSG,L,WT,KN    0.0549    0.0549   30.0000    3.0000 ARCH  1  1  3  1
RMSG,L,WT,KN    0.0538    0.0538   30.0000    3.0000 ARCH  1  1  3  1
RMSG,L,WT,KN    0.0524    0.0524   30.0000    3.0000 ARCH  1  1  3  1
RMSG,L,WT,KN    0.0510    0.0510   30.0000    3.0000 ARCH  1  1  3  1
RMSG,L,WT,KN    0.0505    0.0505   30.0000    3.0000 ARCH  1  1  3  1
RMSG,L,WT,KN    0.0497    0.0497   30.0000    3.0000 ARCH  1  1  3  1
RMSG,L,WT,KN    0.0494    0.0494   30.0000    3.0000 ARCH  1  1  3  1
RMSG,L,WT,KN    0.0486    0.0486   30.0000    3.0000 ARCH  1  1  3  1
RMSG,L,WT,KN    0.0479    0.0479   30.0000    3.0000 ARCH  1  1  3  1
RMSG,L,WT,KN    0.0477    0.0477   33.0000    3.3000 ARCH  1  1  4  1
RMSG,L,WT,KN    0.0967    0.0477   33.0000    3.3000 ARCH  1  1  4  1
RMSG,L,WT,KN    0.0484    0.0477   33.0000    3.3000 ARCH  1  1  4  1
RMSG,L,WT,KN    0.0481    0.0477   33.0000    3.3000 ARCH  1  1  4  1
RMSG,L,WT,KN    0.0478    0.0477   33.0000    3.3000 ARCH  1  1  4  1
RMSG,L,WT,KN    0.0472    0.0472   33.0000    3.3000 ARCH  1  1  4  1
RMSG,L,WT,KN    0.0469    0.0469   33.0000    3.3000 ARCH  1  1  4  1
RMSG,L,WT,KN    0.0469    0.0469   33.0000    3.3000 ARCH  1  2  4  1
RMSG,L,WT,KN    0.1026    0.0469   33.0000    3.3000 ARCH  1  2  4  1
RMSG,L,WT,KN    0.0715    0.0469   33.0000    3.3000 ARCH  1  2  4  1
RMSG,L,WT,KN    0.0470    0.0469   33.0000    3.3000 ARCH  1  2  4  1
RMSG,L,WT,KN    0.0469    0.0469   36.3000    3.6300 ARCH  1  2  5  1
RMSG,L,WT,KN    0.0464    0.0464   36.3000    3.6300 ARCH  1  2  5  1
RMSG,L,WT,KN    0.0458    0.0458   36.3000    3.6300 ARCH  1  2  5  1
RMSG,L,WT,KN    0.0455    0.0455   36.3000    3.6300 ARCH  1  2  5  1
RMSG,L,WT,KN    0.0452    0.0452   36.3000    3.6300 ARCH  1  2  5  1
RMSG,L,WT,KN    0.0451    0.0451   36.3000    3.6300 ARCH  1  3  5  1
RMSG,L,WT,KN    0.0432    0.0432   36.3000    3.6300 ARCH  1  3  5  1
RMSG,L,WT,KN    0.0431    0.0431   39.9300    3.9930 ARCH  1  3  6  1
RMSG,L,WT,KN    0.0708    0.0431   39.9300    3.9930 ARCH  1  3  6  1
RMSG,L,WT,KN    0.0420    0.0420   39.9300    3.9930 ARCH  1  3  6  1
RMSG,L,WT,KN    0.0416    0.0416   39.9300    3.9930 ARCH  1  3  6  1
RMSG,L,WT,KN    0.0408    0.0408   39.9300    3.9930 ARCH  1  3  6  1
RMSG,L,WT,KN    0.0407    0.0407   43.9230    4.3923 ARCH  1  4  6  1
```

Figure A-29. SCN.FOR output file CFM.DNA

```
RMSG,L,WT,KN   0.0908   0.0407   43.9230   4.3923 ARCH  1  4  6  1
RMSG,L,WT,KN   0.0871   0.0407   43.9230   4.3923 ARCH  1  4  6  1
RMSG,L,WT,KN   0.0845   0.0407   43.9230   4.3923 ARCH  1  4  6  1
RMSG,L,WT,KN   0.0831   0.0407   43.9230   4.3923 ARCH  1  4  6  1
RMSG,L,WT,KN   0.0779   0.0407   43.9230   4.3923 ARCH  1  4  6  1
RMSG,L,WT,KN   0.0761   0.0407   43.9230   4.3923 ARCH  1  4  6  1
RMSG,L,WT,KN   0.0756   0.0407   43.9230   4.3923 ARCH  1  4  6  1
RMSG,L,WT,KN   0.0740   0.0407   43.9230   4.3923 ARCH  1  4  6  1
RMSG,L,WT,KN   0.0729   0.0407   43.9230   4.3923 ARCH  1  4  6  1
RMSG,L,WT,KN   0.0726   0.0407   48.3153   4.8315 ARCH  1  4  7  1
RMSG,L,WT,KN   0.0550   0.0407   48.3153   4.8315 ARCH  1  4  7  1
RMSG,L,WT,KN   0.0408   0.0407   48.3153   4.8315 ARCH  1  4  7  1
RMSG,L,WT,KN   0.0386   0.0386   48.3153   4.8315 ARCH  1  4  7  1
RMSG,L,WT,KN   0.0372   0.0372   48.3153   4.8315 ARCH  1  4  7  1
RMSG,L,WT,KN   0.0367   0.0367   48.3153   4.8315 ARCH  1  4  7  1
RMSG,L,WT,KN   0.0346   0.0346   43.4838   4.3484 ARCH  1  4  6  1
RMSG,L,WT,KN   0.0682   0.0346   43.4838   4.3484 ARCH  1  4  6  1
RMSG,L,WT,KN   0.0659   0.0346   43.4838   4.3484 ARCH  1  4  6  1
RMSG,L,WT,KN   0.0654   0.0346   43.4838   4.3484 ARCH  1  4  6  1
RMSG,L,WT,KN   0.0638   0.0346   43.4838   4.3484 ARCH  1  4  6  1
RMSG,L,WT,KN   0.0628   0.0346   43.4838   4.3484 ARCH  1  4  6  1
RMSG,L,WT,KN   0.0604   0.0346   43.4838   4.3484 ARCH  1  4  6  1
RMSG,L,WT,KN   0.0601   0.0346   43.4838   4.3484 ARCH  1  4  6  1
RMSG,L,WT,KN   0.0596   0.0346   43.4838   4.3484 ARCH  1  4  6  1
RMSG,L,WT,KN   0.0587   0.0346   43.4838   4.3484 ARCH  1  4  6  1
RMSG,L,WT,KN   0.0577   0.0346   43.4838   4.3484 ARCH  1  4  6  1
RMSG,L,WT,KN   0.0577   0.0346   47.8321   4.7832 ARCH  1  4  7  1
RMSG,L,WT,KN   0.0578   0.0346   47.8321   4.7832 ARCH  1  4  7  1
RMSG,L,WT,KN   0.0535   0.0346   47.8321   4.7832 ARCH  1  4  7  1
RMSG,L,WT,KN   0.0486   0.0346   47.8321   4.7832 ARCH  1  4  7  1
RMSG,L,WT,KN   0.0479   0.0346   47.8321   4.7832 ARCH  1  4  7  1
RMSG,L,WT,KN   0.0445   0.0346   47.8321   4.7832 ARCH  1  4  7  1
RMSG,L,WT,KN   0.0427   0.0346   47.8321   4.7832 ARCH  1  4  7  1
RMSG,L,WT,KN   0.0410   0.0346   47.8321   4.7832 ARCH  1  4  7  1
RMSG,L,WT,KN   0.0399   0.0346   47.8321   4.7832 ARCH  1  4  7  1
RMSG,L,WT,KN   0.0383   0.0346   47.8321   4.7832 ARCH  1  4  7  1
RMSG,L,WT,KN   0.0372   0.0346   47.8321   4.7832 ARCH  1  4  7  1
RMSG,L,WT,KN   0.0361   0.0346   47.8321   4.7832 ARCH  1  4  7  1
RMSG,L,WT,KN   0.0356   0.0346   47.8321   4.7832 ARCH  1  4  7  1
RMSG,L,WT,KN   0.0349   0.0346   43.0489   4.3049 ARCH  1  4  6  1
RMSG,L,WT,KN   0.0510   0.0346   43.0489   4.3049 ARCH  1  4  6  1
RMSG,L,WT,KN   0.0503   0.0346   43.0489   4.3049 ARCH  1  4  6  1
RMSG,L,WT,KN   0.0497   0.0346   43.0489   4.3049 ARCH  1  4  6  1
RMSG,L,WT,KN   0.0479   0.0346   43.0489   4.3049 ARCH  1  4  6  1
RMSG,L,WT,KN   0.0478   0.0346   47.3538   4.7354 ARCH  1  4  7  1
RMSG,L,WT,KN   0.0471   0.0346   47.3538   4.7354 ARCH  1  4  7  1
RMSG,L,WT,KN   0.0463   0.0346   47.3538   4.7354 ARCH  1  4  7  1
RMSG,L,WT,KN   0.0459   0.0346   47.3538   4.7354 ARCH  1  4  7  1
```

Figure A-29. (continued)

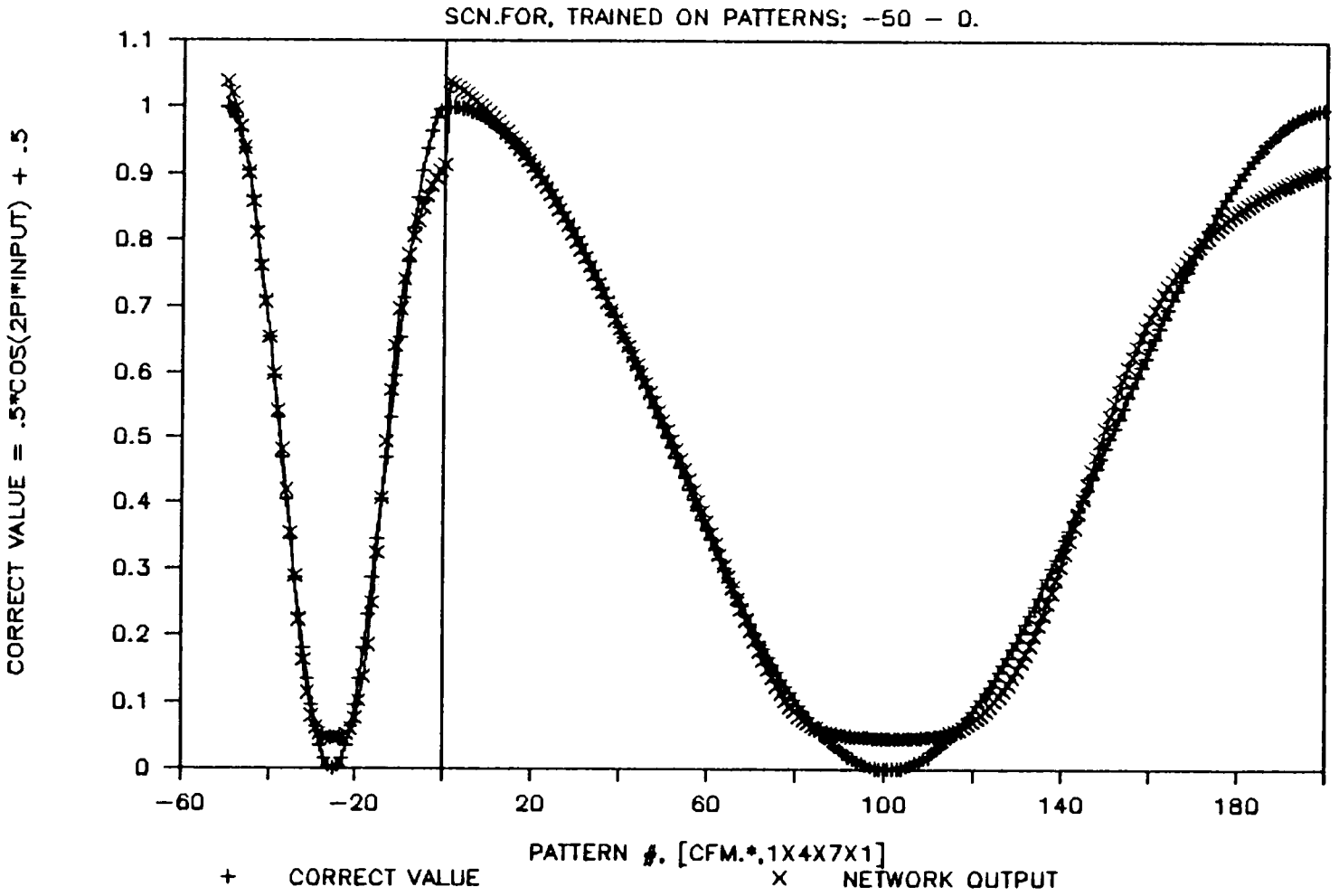



Figure A-30. Graph of SCN.FOR output file CFM.PRN.

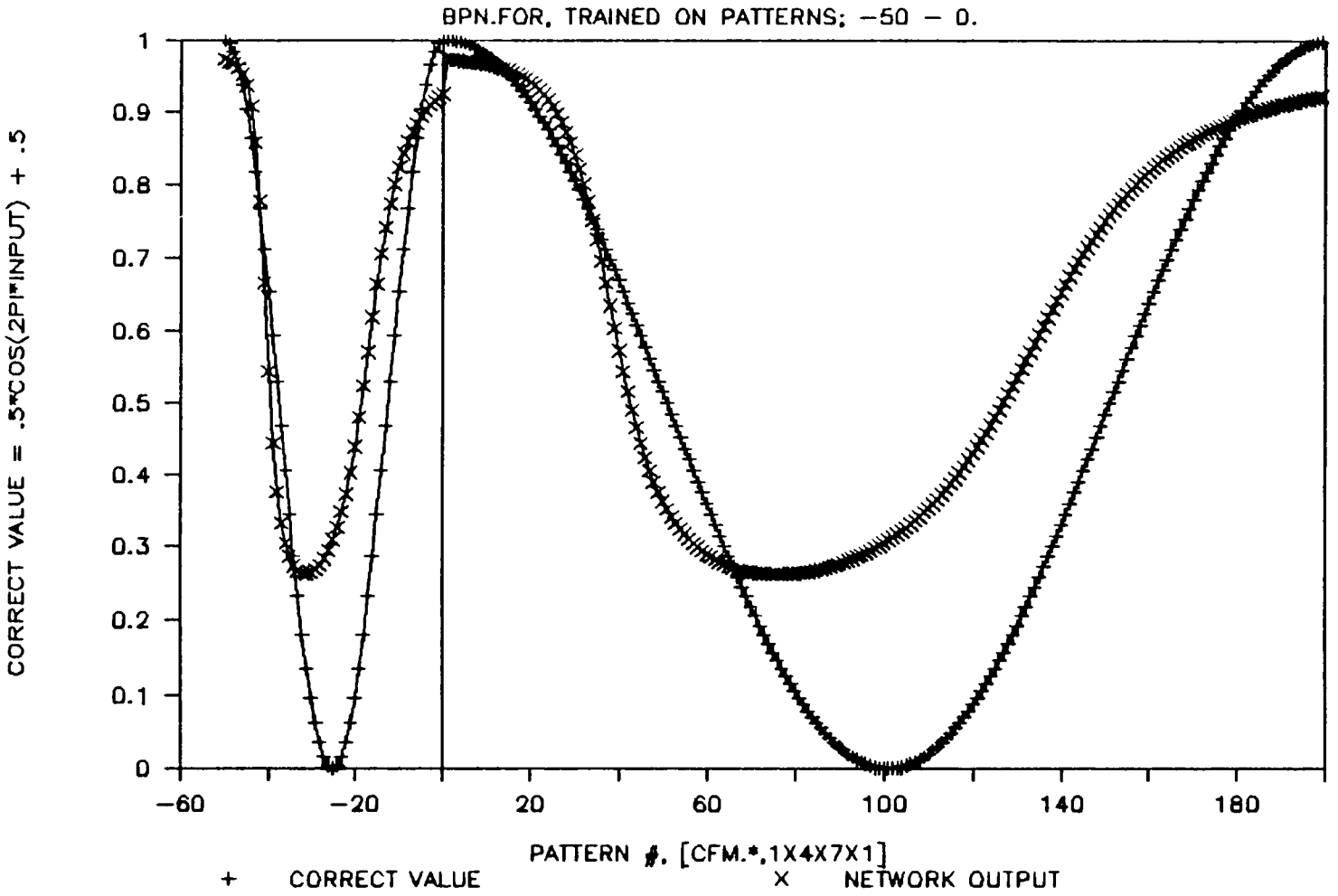



Figure A-31. Graph of output file CFM.PRB.

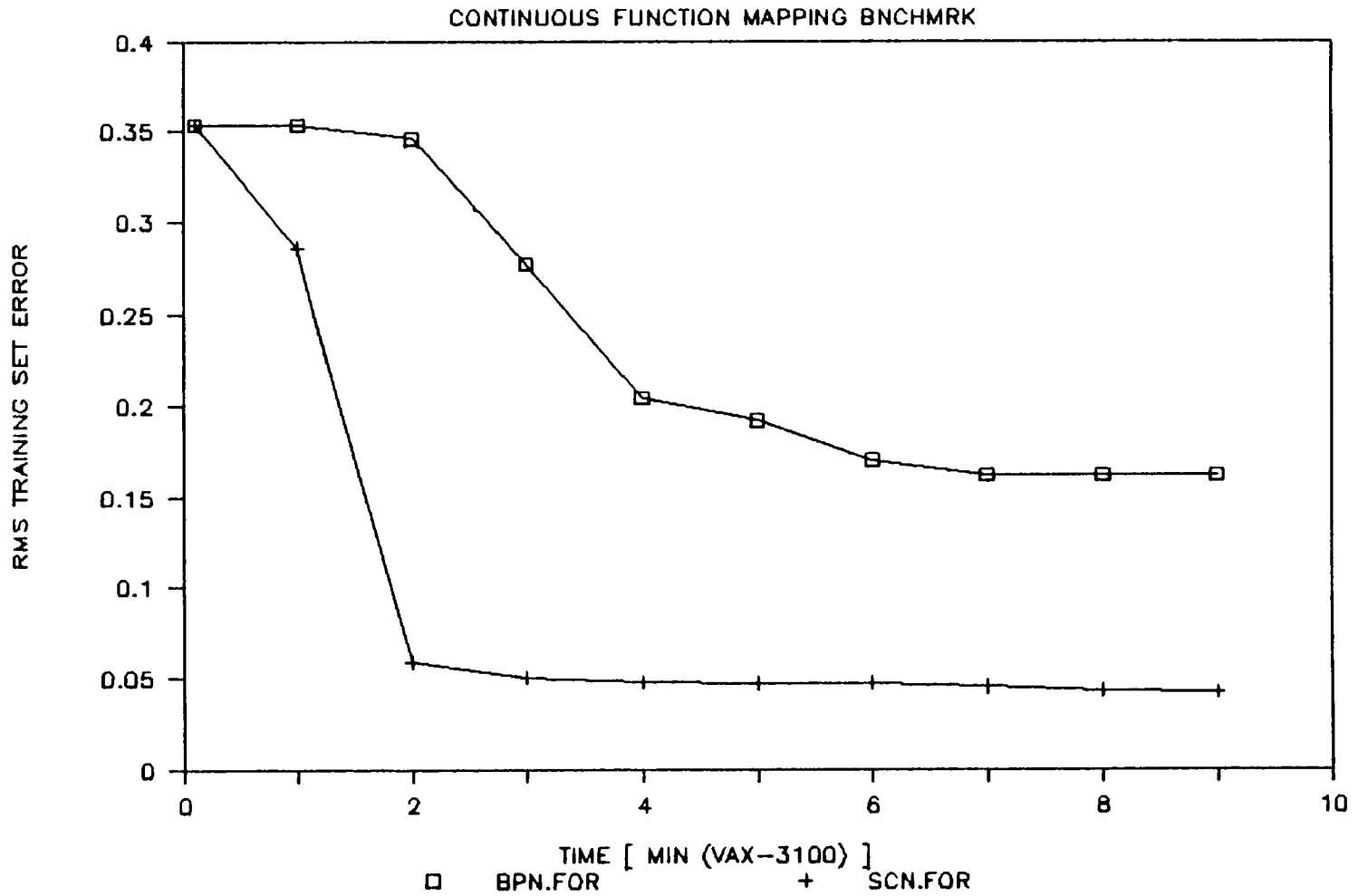



Figure A-32. A Comparison of the continuous function mapping learning Curves.

# APPENDIX B.

## DESCRIPTION OF SIMULATED POWER PLANT DATA

### B.1 Plant Variables Used

Below is an ordered list of the 27 reduced variables used in the analysis of Section 5.

1. CONTROL ROD SHUTDOWN BANK POSITION
2. NUCLEAR POWER LEVEL
3. PLANT MEGAWATT OUTPUT
4. VOLUME CONTROL TANK LEVEL
5. REACTOR BUILDING EQUIPMENT DRAIN LEVEL
6. CONTAINMENT PRESSURE
7. FLUX AXIAL OFFSET
8. STEAM GENERATOR STEAM FLOW
9. STEAM GENERATOR MAIN STEAM PRESSURE
10. STEAM GENERATOR FEED WATER INLET FLOW
11. STEAM GENERATOR FEED WATER PRESSURE
12. STEAM GENERATOR AUXILIARY FEED WATER FLOW
13. STEAM GENERATOR WATER LEVEL
14. PRESSURIZER WATER LEVEL
15. PRESSURIZER PRESSURE
16. PRESSURIZER SURGE LINE TEMPERATURE
17. REACTOR COOLANT SYSTEM LOOP SPRAY TEMPERATURE
18. REACTOR COOLANT SYSTEM HOT-LEG PRESSURE
19. REACTOR COOLANT SYSTEM COLD-LEG TEMPERATURE
20. REACTOR COOLANT SYSTEM HOT-LEG TEMPERATURE
21. REACTOR COOLANT SYSTEM AVERAGE TEMPERATURE
22. REACTOR COOLANT SYSTEM LOOP COOLANT FLOW
23. REACTOR COOLANT SYSTEM LOOP DELTA TEMPERATURE
24. STEAM GENERATOR BUILDING LIQUID SAMPLE MONITOR
25. CONTAINMENT LIQUID EFFLUENT RADIATION MONITOR
26. CONTAINMENT BUILDING LOWER COMPARTMENT RADIATION MONITOR
27. CONTAINMENT BUILDING UPPER COMPARTMENT RADIATION MONITOR

## B.2 Raw Data Plant Variables

Below is an ordered list of the 81 variables in the raw data sets [Wa4]. The data was generated by the Watts Bar Nuclear Power Station Simulator [Wa3].

RCS POWER CONTROL

| | | | |
|---|---|---|---|
| 1. | CMD ZAOGI1 | SHUTDOWN BANK A ARRAY POS IND | STPS |
| 2. | CMD ZAOGI2 | SHUTDOWN BANK B ARRAY POS IND | STPS |
| 3. | CMD ZAOGI3 | SHUTDOWN BANK C ARRAY POS IND | STPS |
| 4. | CMD ZAOGI4 | SHUTDOWN BANK D ARRAY POS IND | STPS |
| 5. | CMD ZAOGI6 | CONTROL BANK A ARRAY POS IND | STPS |
| 6. | CMD ZAOGI7 | CONTROL BANK B ARRAY POS IND | STPS |
| 7. | CMD ZAOGI8 | CONTROL BANK C ARRAY POS IND | STPS |
| 8. | CMD ZAOGI9 | CONTROL BANK D ARRAY POS IND | STPS |
| 9. | CMD ZAOLI3225 | NUCLEAR POWER LEVEL | 0-100% |
| 10. | CMD ZAOEI5716A | UNIT MEGAWATTAGE OUTPUT | 0-1500 MW |
| 11. | CMD ZAOLI62129 | VOL CONTROL TANK LVL | 0-100% |
| 12. | CMD ZAOLI77410 | RB FL & EQUIP DRAIN LEVEL | 0-100% |
| 13. | CMD ZAOPI30310 | CONTAINMENT PRESS | -5,60 PSI |
| 14. | CMD ZAONI303 | P.R. % FULL PWR AO ARRAY | 0-120% |
| 15. | CMD ZAONI41C | N41 % FLUX DIFF AO | -30,30 % |
| 16. | CMD ZAONI42C | N42 % FLUX DIFF AO | -30,30 % |
| 17. | CMD ZAONI43C | N43 % FLUX DIFF AO | -30,30 % |
| 18. | CMD ZAONI44C | N44 % FLUX DIFF AO | -30,30 % |

STEAM FLOW INDICATORS

| | | | |
|---|---|---|---|
| 19. | CMD ZAOFI13A | SG #1 STEAM FLOW CH 1 MTR | PPH |
| 20. | CMD ZAOFI110A | SG #2 STEAM FLOW CH 1 MTR | PPH |
| 21. | CMD ZAOFI121A | SG #3 STEAM FLOW CH 1 MTR | PPH |
| 22. | CMD ZAOFI128A | SG #4 STEAM FLOW CH 1 MTR | PPH |

STEAM PRESS

| | | | |
|---|---|---|---|
| 23. | CMD ZAOPI11C | SG #1 MAIN STEAM HDR PRESS | 0-1300 PSIG |
| 24. | CMD ZAOPI112 | SG #2 MAIN STEAM HDR PRESS | 0-1300 PSIG |
| 25. | CMD ZAOPI119C | SG #3 MAIN STEAM HDR PRESS | 0-1300 PSIG |
| 26. | CMD ZAOPI126C | SG #4 MAIN STEAM HDR PRESS | 0-1300 PSIG |

FEEDWATER

| | | |
|---|---|---|
| 27.CMD ZAOFI335A | SG #1 FW INLET FLOW | PPH |
| 28.CMD ZAOFI348A | SG #2 FW INLET FLOW | PPH |
| 29.CMD ZAOFI390A | SG #3 FW INLET FLOW | PPH |
| 30.CMD ZAOFI3103A | SG #4 FW INLET FLOW | PPH |
| 31.CMD ZAOPI337 | STEAM GEN #1 FW SUPPLY PRESS | 0-1300 PSIG |
| 32.CMD ZAOPI350 | STEAM GEN #2 FW SUPPLY PRESS | 0-1300 PSIG |
| 33.CMD ZAOPI392 | STEAM GEN #3 FW SUPPLY PRESS | 0-1300 PSIG |
| 34.CMD ZAOPI3105 | STEAM GEN #4 FW SUPPLY PRESS | 0-1300 PSIG |
| 35.CMD ZAOFI3163A | SG #1 AUX FW INLET FLOW | 0-150 GPM |
| 36.CMD ZAOFI3155A | SG #2 AUX FW INLET FLOW | 0-150 GPM |
| 37.CMD ZAOFI3147A | SG #3 AUX FW INLET FLOW | 0-150 GPM |
| 38.CMD ZAOFI3170D | SG #4 AUX FW INLET FLOW | 0-150 GPM |

STEAM GENERATOR LEVEL IND

| | | |
|---|---|---|
| 39.CMD ZAOLI338 | SG #1 LEVEL INDICATOR | 0-100% |
| 40.CMD ZAOLI343B | SG #1 LEVEL WIDE LEVEL IND | 0-100% |
| 41.CMD ZAOLI351 | SG #2 LEVEL INDICATOR | 0-100% |
| 42.CMD ZAOLI356B | SG #2 LEVEL WIDE LEVEL IND | 0-100% |
| 43.CMD ZAOLI393 | SG #3 LEVEL INDICATOR | 0-100% |
| 44.CMD ZAOLI398B | SG #3 LEVEL WIDE LEVEL IND | 0-100% |
| 45.CMD ZAOLI3106 | SG #4 LEVEL INDICATOR | 0-100% |
| 46.CMD ZAOLI3111B | SG #4 LEVEL WIDE LEVEL IND | 0-100% |

RCS PRESSURIZER

| | | |
|---|---|---|
| 47.CMD ZAOLI68320 | RCS PRESSURIZER LEVEL | 0-100% |
| 48.CMD ZAOLI68321 | RCS PRESSURIZER LEVEL (CC) | 0-100% |
| 49.CMD ZAOPI68337C | RCS PZR PRESS | 1700-2500PSIG |
| 50.CMD ZAOPI68342A | RCS PZR WIDE RANGE PRESS AO | 0-3000PSIG |
| 51.CMD ZAOTI68318 | RCS PZR SURGE LINE TEMP | 100-700 DEGF |
| 52.CMD ZAOTI68317 | RCS LOOP #1 SPRAY TEMP | 100-700 DEGF |
| 53.CMD ZAOTI68316 | RCS LOOP #2 SPRAY TEMP | 100-700 DEGF |
| 54.CMD ZAOLI68300 | RCS PRT LEVEL | 0-100% |
| 55.CMD ZAOPI68311C | RCS PRT PRESS | 0-10 PSI |

COOLANT LOOPS DATA

| | | |
|---|---|---|
| 56.CMD ZAOPI6863 | RCS LP 1 HOT-LEG PRESS | 0-3000 PSIG |
| 57.CMD ZAOPI6864 | RCS LP 3 HOT-LEG PRESS | 0-3000 PSIG |
| 58.CMD ZAOTI6818 | RCS LOOP 1 COLD-LEG TEMP | 0-700 DEGF |
| 59.CMD ZAOTI681 | RCS LOOP 1 HOT-LEG TEMP | 0-700 DEGF |
| 60.CMD ZAOTI682E | RCS LOOP 1 TAVG | 530-630 DEGF |
| 61.CMD ZAOFI686A | RCS LOOP 1 COOLANT FLOW | 0 - 110% |

| | | |
|---|---|---|
| 62.CMD ZAOTI6841 | RCS LOOP 2 COLD-LEG TEMP | 0-700 DEGF |
| 63.CMD ZAOTI6824 | RCS LOOP 2 HOT-LEG TEMP | 0-700 DEGF |
| 64.CMD ZAOTI6825E | RCS LOOP 2 TAVG | 530-630 DEGF |
| 65.CMD ZAOFI6829A | RCS LOOP 2 COOLANT FLOW | 0 - 110% |
| 66.CMD ZAOTI6860 | RCS LOOP 3 COLD-LEG TEMP | 0-700 DEGF |
| 67.CMD ZAOTI6843 | RCS LOOP 3 HOT-LEG TEMP | 0-700 DEGF |
| 68.CMD ZAOTI6844E | RCS LOOP 3 TAVG | 530-630 DEGF |
| 69.CMD ZAOFI6848B | RCS LOOP 3 COOLANT FLOW | 0 - 110% |
| 70.CMD ZAOTI6883 | RCS LOOP 4 COLD-LEG TEMP | 0-700 DEGF |
| 71.CMD ZAOTI6865 | RCS LOOP 4 HOT-LEG TEMP | 0-700 DEGF |
| 72.CMD ZAOTI6867E | RCS LOOP 4 TAVG | 530-630 DEGF |
| 73.CMD ZAOTI6867A | RCS LOOP 4 DELTA TEMP % FULL PWR | 0-150 % |
| 74.CMD ZAOFI6871D | RCS LOOP 4 COOLANT FLOW | 0 - 110% |

RADIATION MONITORING

| | | |
|---|---|---|
| 75.CMD ZA01RI90120A | SG BLDN LIQUID SAMPL MON | 1-1E7 CPM |
| 76.CMD ZA01RI90123A | CC LIQUID EFFLUENT MONITOR | 1-1E7 CPM |
| 77.CMD ZA01RI90275 | RC DRAIN TANK RAD MON | 1-1E5 mR/hr |
| 78.CMD ZA01RI90277 | RC EQUIP DRAIN SUMP RAD MON | 1-1E5 mR/hr |
| 79.CMD ZA01RR90104 | RCS LTDWN LIQ RAD MON | 1-1E7 CPM |
| 80.CMD ZA01RI90106A | CNTMT BLDG LWR COMP RAD DET | 1E1-1E7 CPM |
| 81.CMD ZA01RI90112A | CNTMT BLDG UPR COMP RAD DET | 1E1-1E7 CPM |

## B.3 Accident Scenario Descriptions

Below is a description of each of the seven accident scenarios used in Section 5 of this dissertation [Wa3].

Scenario: ED01 or ED1
Name: Total loss of offsite power
Cause: Close in ground fault
Description:

Loss of all offsite power. Power is unavailable from the 500 Kv yard. Power is lost to all shutdown boards. A reactor-turbine trip is initiated. All diesel generators automatically start and energize their respective 6.9 Kv boards. The black-out sequence is initiated. The loss of all reactor coolant pumps initiates reactor coolant system natural circulation. Station power and support are available using the diesel generators.

Scenario: FW23 or F23
Name: Main feed water line break inside containment
Cause: Pipe break at steam generator inlet
Severity: 3000 gpm at normal operating pressure
Description:

Steam generator inlet pipe breaks at input

severity. Steam generator pressure decreases. Mass lost from steam generator blows out into reactor containment which increases containment pressure, humidity and sump level. Loss of steam generator level will cause feedwater isolation. High containment pressure will cause initiation of safety injection, containment isolation and containment spray. Steam generator blow down to containment together with safety injection leads to a solid plant condition.

Scenario: MS01 or MS1

Name: Main steam line break inside containment

Cause: Pipe failure upstream of flow element

Severity: 1.5E6 lbs/hr ~2200 GPM

Description:

Main steam line breaks inside containment at input severity. Steam flow and steam generator pressure decrease and level increase. Reactor coolant system average temperature increases, resulting in pressurizer pressure and level decrease while reactor power increases. Containment pressure, temperature and humidity increase.

Scenario: RD06 or RD6

Name: Control rod ejection

Cause: Failure of the rod drive assembly housing

Description:

Single rod housing failure; Reactor core control assembly ejection. Reactor core control assembly F06 housing assembly fails. Reactor coolant pressure ejects Reactor core control assembly F06 from the core. The rod position indicator will indicate that the rod has dropped. Reactor power will respond to the available positive reactivity.

Scenario: TH01 or TH1

Name: Hot leg loss of coolant accident

Cause: Pipe failure at reactor vessel nozzle

Severity: 50% severance

Description:

Hot leg breaks at input severity. Reactor coolant system depressurizes and flashes into containment volume. Containment radiation, temperature, humidity, pressure and sump level increase. Reactor trips, safety injection activates, high containment pressure isolates containment. Reactor pumps cavitate, charging, safety injection, residual heat removal pumps and cold leg

accumulators will reflood the core. Ice condenser doors open to help condense the steam.

Scenario: TH02 or TH2

Name: Cold leg loss of coolant accident

Cause: Pipe failure at reactor vessel nozzle

Severity: 50% severance

Description:

Cold leg nozzle breaks at input severity. Results similar to to TH01 except that core will heat up at a faster rate due to decrease in cooling flow.

Scenario: TH05 or TH5

Name: Steam generator tube leak

Cause: Tube failure

Severity: 500 gpm

Description:

Steam generator tube rupture at top of bundle at input severity. Pressurizer level and pressure decrease. Steam generator activity, level and pressure increase.

# APPENDIX C.

## POWER PLANT DIAGNOSTIC FILES

Below is a listing of some of the computer files used in Section 5 of this dissertation.

### C.1 File BIG.TIM

This file is used with the 5% uniform noise data to create the noise portion of the training set WB7.DDI. The 5% uniform noise portion is created by using WBSIUN.FOR along with TSGN.FOR, to create the second part of the WB7.DDI file used to train the power plant diagnostic network of Section 5.

```
F23   MS1   RD6   TH1   TH2   ED1   TH5
36    41    42    35    45    30    33
  52.42
  52.92
  53.42
  59.92
  60.42
  60.92
  66.42
  66.92
  67.42
  67.92
  68.92
  69.92
  70.92
  71.92
```

72.92
82.92
83.42
83.92
100.42
101.42
102.42
150.42
151.42
152.42
208.92
209.42
209.92
233.92
234.42
234.92
264.92
265.42
265.92
269.92
270.42
270.92
32.33
32.83
33.33
34.33
35.33
36.33
37.33
38.33
39.33
40.33
41.33
42.33
60.83
61.33
61.83
62.33
69.33
77.33
77.83
78.33
84.33
84.83
85.33
100.83
101.33
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201.08
202.08
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140.08
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160.08
161.08
162.08
400.08
401.08
402.08
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412.08
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418.08
419.08
420.08
424.08
425.08
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427.08
428.08
429.08
430.08
431.08
432.08
440.08
441.08
442.08
470.08
472.08
473.08
490.08
491.08
492.08

## C.2 File SMA.TIM

This file is used with the no-noise files, created by using WBSIFG.FOR along with TSG.FOR, to create the first part of the WB7.DDI file used to train the power plant diagnostic network of Section 5.

```
F23   MS1   RD6   TH1   TH2   ED1   TH5
12    15    14    12    17    10    11
  52.42
  59.92
  66.42
  69.92
  70.92
  82.92
 100.42
 150.42
 208.92
 233.92
 264.92
 269.92
  32.33
  33.33
  34.33
  35.33
  60.83
  62.33
  69.33
  77.33
  84.33
 100.83
 121.83
 150.33
 195.83
 213.83
 238.83
   5.58
   6.08
   7.08
   8.08
  50.58
  60.08
```

72.08
74.08
80.08
87.58
120.08
187.08
212.08
248.08
34.58
39.58
40.58
46.08
63.08
72.58
110.08
138.08
187.08
197.08
212.08
244.08
17.08
34.08
35.08
40.08
50.58
58.58
64.08
68.08
70.58
85.08
100.08
150.08
167.58
187.08
200.08
212.08
227.58
30.08
35.58
65.58
74.58
90.08
120.08
150.08
187.08
212.08
248.08
120.08
160.08

400.08
411.08
418.08
424.08
425.08
430.08
440.08
470.08
490.08

## C.3 File WB7.DDI

Below is a listing of the no-noise portion of the WB7.DDI file used to train the network of Section 5.

```
0.0408 0.1745 0.0604 0.2464 0.8330 0.1076 0.4928 0.4215 0.8280 0.0000
0.8268 0.0014 0.5585 0.5474 0.5655 0.9126 0.7702 0.7314 0.8037 0.8519
0.5313 0.8253 0.7067 0.1736 0.0007 0.1667 0.1667
1.0000 1.0000 0.0000 0.5242
0.0408 0.1700 0.0610 0.2363 0.9955 0.1043 0.4998 0.2501 0.8074 0.0000
0.8174 0.0950 0.5114 0.4590 0.4701 0.9103 0.7693 0.7021 0.8005 0.8193
0.4058 0.8378 0.7067 0.1736 0.0007 0.1667 0.1667
1.0000 1.0000 0.0000 0.5992
0.0408 0.1700 0.0615 0.2364 0.9955 0.1000 0.5004 0.0862 0.8084 0.0000
0.8154 0.2884 0.4692 0.4176 0.4332 0.9070 0.7632 0.6874 0.7956 0.8054
0.3228 0.8462 0.7067 0.1736 0.0007 0.1667 0.1667
1.0000 1.0000 0.0000 0.6642
0.0408 0.1700 0.0616 0.2364 0.9955 0.0978 0.5004 0.0433 0.8141 0.0000
0.8196 0.3410 0.4605 0.4095 0.4269 0.9060 0.7614 0.6840 0.7944 0.8023
0.2995 0.8483 0.7067 0.1736 0.0007 0.1667 0.1667
1.0000 1.0000 0.0000 0.6992
0.0408 0.1700 0.0616 0.2364 0.9955 0.0973 0.5004 0.0353 0.8158 0.0000
0.8211 0.3483 0.4583 0.4085 0.4261 0.9058 0.7611 0.6834 0.7942 0.8016
0.2948 0.8485 0.7067 0.1736 0.0007 0.1667 0.1667
1.0000 1.0000 0.0000 0.7092
0.0408 0.1700 0.0641 0.2365 0.9955 0.0985 0.5003 0.0073 0.8287 0.0000
0.8351 0.3916 0.4541 0.4150 0.4389 0.9049 0.7611 0.6847 0.7950 0.7992
0.2790 0.8475 0.7058 0.1736 0.0007 0.1667 0.1667
1.0000 1.0000 0.0000 0.8292
0.0408 0.1700 0.0641 0.2367 0.9955 0.1060 0.5000 0.0268 0.8337 0.0000
0.8413 0.4588 0.4452 0.4323 0.4616 0.9048 0.7630 0.6914 0.7966 0.8001
0.2878 0.8454 0.7038 0.1736 0.0007 0.1667 0.1667
1.0000 1.0000 0.0000 1.0042
0.0408 0.1700 0.0641 0.2372 0.9955 0.0997 0.5000 0.0207 0.8322 0.0000
0.8396 0.5721 0.4214 0.4563 0.4771 0.9026 0.7625 0.6958 0.7963 0.7989
0.2832 0.8467 0.7067 0.1736 0.0007 0.1667 0.1667
1.0000 1.0000 0.0000 1.5042
0.0408 0.1700 0.0641 0.2378 0.9955 0.0986 0.5000 0.0148 0.8298 0.0000
0.8369 0.5821 0.4032 0.4848 0.5071 0.8908 0.7623 0.7039 0.7959 0.7981
0.2792 0.8480 0.7067 0.1736 0.0007 0.1667 0.1667
1.0000 1.0000 0.0000 2.0892
0.0408 0.1700 0.0641 0.2380 0.9955 0.0989 0.5000 0.0133 0.8285 0.0000
0.8355 0.5833 0.3967 0.4966 0.5194 0.8858 0.7621 0.7073 0.7957 0.7979
0.2775 0.8486 0.7067 0.1736 0.0007 0.1667 0.1667
1.0000 1.0000 0.0000 2.3392
0.0408 0.1700 0.0641 0.2384 0.9955 0.0993 0.5000 0.0106 0.8259 0.0000
```

0.8329 0.5849 0.3900 0.5114 0.5350 0.8799 0.7618 0.7114 0.7954 0.7974
0.2750 0.8495 0.7067 0.1736 0.0007 0.1667 0.1667
1.0000 1.0000 0.0000 2.6492
0.0408 0.1700 0.0641 0.2384 0.9955 0.0994 0.5000 0.0100 0.8255 0.0000
0.8325 0.6010 0.3890 0.5136 0.5373 0.8791 0.7618 0.7120 0.7954 0.7973
0.2745 0.8497 0.7067 0.1736 0.0007 0.1667 0.1667
1.0000 1.0000 0.0000 2.6992
0.9592 0.5438 0.8315 0.2587 0.2648 0.0762 0.4017 0.8376 0.7584 0.8207
0.7669 0.0000 0.6472 0.5960 0.6695 0.9148 0.7649 0.7479 0.7985 0.8803
0.5757 0.8320 0.7067 0.1736 0.0007 0.1456 0.1456
0.0000 0.0000 0.0000 0.3233
0.9592 0.5438 0.8315 0.2587 0.2648 0.0762 0.4017 0.8377 0.7584 0.8207
0.7669 0.0000 0.6472 0.5960 0.6695 0.9148 0.7649 0.7479 0.7985 0.8803
0.5757 0.8320 0.7067 0.1736 0.0007 0.1456 0.1456
0.0000 0.0000 0.0000 0.3333
0.9592 0.5438 0.8315 0.2587 0.2648 0.0762 0.4017 0.8376 0.7584 0.8207
0.7669 0.0000 0.6472 0.5960 0.6695 0.9148 0.7649 0.7479 0.7985 0.8803
0.5757 0.8320 0.7067 0.1736 0.0007 0.1456 0.1456
0.0000 0.0000 0.0000 0.3433
0.9592 0.5438 0.8315 0.2587 0.2648 0.0762 0.4017 0.8377 0.7584 0.8207
0.7669 0.0000 0.6472 0.5961 0.6692 0.9148 0.7649 0.7479 0.7985 0.8803
0.5757 0.8320 0.7067 0.1736 0.0007 0.1456 0.1456
0.0000 0.0000 0.0000 0.3533
0.0408 0.2400 0.0603 0.2487 0.9955 0.1223 0.4858 0.4349 0.7744 0.0000
0.7711 0.0000 0.6081 0.5190 0.5283 0.9142 0.7598 0.7229 0.7941 0.8598
0.5266 0.8391 0.7067 0.1736 0.0007 0.1667 0.1667
1.0000 0.0000 1.0000 0.6083
0.0408 0.1746 0.0606 0.2454 0.9955 0.1224 0.4936 0.2854 0.7704 0.0000
0.7743 0.0000 0.5903 0.4945 0.4963 0.9138 0.7610 0.7146 0.7959 0.8476
0.4978 0.8365 0.7067 0.1736 0.0007 0.1667 0.1667
1.0000 0.0000 1.0000 0.6233
0.0408 0.1700 0.0614 0.2354 0.9955 0.1192 0.4999 0.0010 0.8137 0.0000
0.8156 0.0210 0.4989 0.4285 0.4413 0.9093 0.7610 0.6908 0.7960 0.8133
0.3648 0.8438 0.7067 0.1736 0.0007 0.1667 0.1667
1.0000 0.0000 1.0000 0.6933
0.0408 0.1700 0.0616 0.2355 0.9955 0.1137 0.5004 0.0005 0.8127 0.0000
0.8217 0.3150 0.5027 0.4068 0.4213 0.9065 0.7567 0.6824 0.7946 0.8022
0.2979 0.8482 0.7067 0.1736 0.0007 0.1667 0.1667
1.0000 0.0000 1.0000 0.7733
0.0408 0.1700 0.0615 0.2355 0.9955 0.1090 0.5003 0.0005 0.8085 0.0000
0.8175 0.3626 0.4939 0.3954 0.4080 0.9050 0.7526 0.6785 0.7927 0.7990
0.2763 0.8512 0.7067 0.1736 0.0007 0.1667 0.1667
1.0000 0.0000 1.0000 0.8433
0.0408 0.1700 0.0641 0.2357 0.9955 0.1075 0.5000 0.0005 0.7951 0.0000
0.8043 0.4271 0.4913 0.3707 0.3763 0.9026 0.7452 0.6701 0.7882 0.7936
0.2409 0.8588 0.7067 0.1736 0.0007 0.1667 0.1667
1.0000 0.0000 1.0000 1.0083
0.0408 0.1700 0.0641 0.2359 0.9955 0.1121 0.5000 0.0005 0.7821 0.0000
0.7910 0.5360 0.4858 0.3339 0.3294 0.9000 0.7370 0.6576 0.7814 0.7862
0.1921 0.8692 0.7067 0.1736 0.0007 0.1667 0.1667

1.0000 0.0000 1.0000 1.2183
0.0408 0.1700 0.0641 0.2362 0.9955 0.1178 0.5000 0.0004 0.7673 0.0000
0.7760 0.6076 0.4727 0.2834 0.2657 0.8966 0.7262 0.6404 0.7721 0.7764
0.1251 0.8838 0.7067 0.1736 0.0007 0.1667 0.1667
1.0000 0.0000 1.0000 1.5033
0.0408 0.1700 0.0641 0.2366 0.9955 0.1142 0.5000 0.0005 0.7455 0.0000
0.7540 0.6098 0.4559 0.2113 0.1717 0.8906 0.7104 0.6148 0.7583 0.7620
0.0394 0.9061 0.7067 0.1736 0.0007 0.1667 0.1667
1.0000 0.0000 1.0000 1.9583
0.0408 0.1700 0.0641 0.2368 0.9955 0.1102 0.5000 0.0005 0.7374 0.0000
0.7456 0.6111 0.4513 0.1896 0.1422 0.8884 0.7043 0.6068 0.7530 0.7567
0.0110 0.9141 0.7067 0.1736 0.0007 0.1667 0.1667
1.0000 0.0000 1.0000 2.1383
0.0408 0.1700 0.0641 0.2370 0.9955 0.1081 0.5000 0.0005 0.7254 0.0000
0.7336 0.6080 0.4454 0.1626 0.1051 0.8858 0.6962 0.5967 0.7459 0.7494
0.0000 0.9241 0.7067 0.1736 0.0007 0.1667 0.1667
1.0000 0.0000 1.0000 2.3883
0.9713 0.5490 0.8286 0.2385 0.2648 0.0775 0.4090 0.8378 0.7642 0.8210
0.7725 0.0000 0.5174 0.6054 0.6686 0.8941 0.7664 0.7477 0.7998 0.8814
0.5840 0.8305 0.7065 0.1736 0.0007 0.1457 0.1457
0.0000 0.0000 0.0000 0.0558
0.9713 0.5490 0.8286 0.2385 0.2648 0.0775 0.4090 0.8378 0.7641 0.8210
0.7725 0.0000 0.5174 0.6054 0.6686 0.8941 0.7664 0.7477 0.7998 0.8814
0.5840 0.8305 0.7065 0.1736 0.0007 0.1457 0.1457
0.0000 0.0000 0.0000 0.0608
0.9713 0.5490 0.8286 0.2385 0.2648 0.0775 0.4090 0.8378 0.7642 0.8210
0.7725 0.0000 0.5174 0.6054 0.6686 0.8941 0.7664 0.7477 0.7998 0.8814
0.5840 0.8305 0.7065 0.1736 0.0007 0.1457 0.1457
0.0000 0.0000 0.0000 0.0708
0.9713 0.5490 0.8285 0.2385 0.2648 0.0775 0.4090 0.8378 0.7641 0.8210
0.7725 0.0000 0.5174 0.6054 0.6686 0.8941 0.7664 0.7477 0.7998 0.8814
0.5840 0.8305 0.7065 0.1736 0.0007 0.1457 0.1457
0.0000 0.0000 0.0000 0.0808
0.9540 0.5490 0.8282 0.2370 0.4225 0.0987 0.4090 0.8380 0.7660 0.8210
0.7743 0.0000 0.5171 0.4792 0.5468 0.9105 0.7671 0.7150 0.8002 0.8811
0.5849 0.8288 0.7065 0.1736 0.0007 0.3236 0.2507
1.0000 0.0000 0.0000 0.5058
0.9367 0.5490 0.8280 0.2349 0.6669 0.0984 0.4092 0.8377 0.7654 0.8221
0.7737 0.0000 0.5171 0.4178 0.4841 0.9047 0.7670 0.6981 0.8001 0.8805
0.5827 0.8276 0.7066 0.1736 0.0007 0.3516 0.3041
1.0000 0.0000 0.0000 0.6008
0.5011 0.5363 0.0586 0.2316 0.8174 0.0932 0.4145 0.5178 0.7760 0.7544
0.7854 0.0000 0.5129 0.3518 0.4084 0.8977 0.7682 0.6776 0.8013 0.8800
0.5839 0.8240 0.7042 0.0000 0.0000 0.3512 0.3038
1.0000 0.0000 0.0000 0.7208
0.0408 0.4145 0.0596 0.2307 0.8330 0.0929 0.4169 0.3726 0.7955 0.5550
0.8074 0.0000 0.4979 0.3343 0.3965 0.8978 0.7688 0.6743 0.8017 0.8781
0.5832 0.8254 0.7062 0.1736 0.0007 0.3512 0.3037
1.0000 0.0000 0.0000 0.7408
0.0408 0.1700 0.0606 0.2284 0.8752 0.0934 0.4961 0.3865 0.8350 0.3053

0.8422 0.0000 0.4973 0.2278 0.3562 0.8941 0.7767 0.6636 0.8096 0.8407
0.5112 0.8160 0.7067 0.1736 0.0007 0.3510 0.3036
1.0000 0.0000 0.0000 0.8008
0.0408 0.1700 0.0612 0.2224 0.9312 0.0960 0.5002 0.2112 0.8171 0.4013
0.8248 0.0000 0.5008 0.1036 0.2014 0.8761 0.7695 0.6224 0.8008 0.8154
0.3913 0.8331 0.7067 0.1736 0.0007 0.3508 0.3034
1.0000 0.0000 0.0000 0.8758
0.0408 0.1700 0.0641 0.1955 0.9955 0.1012 0.5001 0.0297 0.8336 0.0000
0.8419 0.2293 0.5168-0.0317 0.0000 0.7889 0.7630 0.5344 0.7966 0.7999
0.2865 0.8228 0.7029 0.1736 0.0007 0.3500 0.3026
1.0000 0.0000 0.0000 1.2008
0.0408 0.1700 0.0641 0.1960 0.9955 0.0951 0.5000 0.0136 0.8318 0.0000
0.8400 0.1506 0.5130-0.0457 0.0000 0.6061 0.7619 0.3918 0.7954 0.7978
0.2762 0.7672 0.7067 0.1736 0.0007 0.3482 0.3010
1.0000 0.0000 0.0000 1.8708
0.0408 0.1700 0.0641 0.1962 0.9955 0.0954 0.5000 0.0107 0.8346 0.0000
0.8429 0.1483 0.5131-0.0449 0.0000 0.6052 0.7623 0.3724 0.7953 0.7975
0.2751 0.7545 0.7067 0.1736 0.0007 0.3475 0.3003
1.0000 0.0000 0.0000 2.1208
0.0408 0.1700 0.0641 0.1965 0.9955 0.0960 0.5000 0.0095 0.8363 0.0000
0.8445 0.1461 0.5132-0.0355 0.0000 0.6963 0.7625 0.3726 0.7954 0.7973
0.2746 0.7411 0.7067 0.1736 0.0007 0.3466 0.2995
1.0000 0.0000 0.0000 2.4808
0.0408 0.1700 0.0616 0.2034 0.9955 0.2700 0.4992 0.0003 0.8352 0.0000
0.8434 0.0594 0.5200 0.0000 0.0000 0.5704 0.7471 0.3399 0.7765 0.7801
0.2169 0.0129 0.7067 0.1736 0.0007 0.3229 0.1806
0.0000 1.0000 1.0000 0.3458
0.0408 0.1700 0.0616 0.2034 0.9955 0.2635 0.4993 0.0004 0.8324 0.0000
0.8405 0.0825 0.5124 0.0000 0.0000 0.5087 0.7228 0.2995 0.7504 0.7577
0.0591 0.0088 0.7067 0.1736 0.0007 0.3227 0.1806
0.0000 1.0000 1.0000 0.3958
0.0408 0.1700 0.0616 0.2034 0.9955 0.2613 0.4992 0.0004 0.8318 0.0000
0.8400 0.0869 0.5166 0.0000 0.0000 0.4966 0.7174 0.2912 0.7447 0.7530
0.0236 0.0083 0.7067 0.1736 0.0007 0.3227 0.1806
0.0000 1.0000 1.0000 0.4058
0.0408 0.1700 0.0616 0.2034 0.9955 0.2462 0.4991 0.0004 0.8278 0.0000
0.8360 0.0723 0.5152 0.0000 0.0000 0.4244 0.6856 0.2464 0.7101 0.7249
0.0000 0.0048 0.7067 0.1736 0.0007 0.3226 0.1806
0.0000 1.0000 1.0000 0.4608
0.0408 0.1700 0.0641 0.2035 0.9955 0.1900 0.4949 0.0004 0.8129 0.0000
0.8210 0.1143 0.5213 0.0000 0.0000 0.0172 0.4312 0.1003 0.2473 0.5891
0.0000 0.0001 0.7067 0.1736 0.0007 0.3221 0.1805
0.0000 1.0000 1.0000 0.6308
0.0408 0.1700 0.0641 0.2035 0.9955 0.1580 0.5007 0.0004 0.8055 0.0000
0.8137 0.1179 0.5214 0.0000 0.0000-0.1166 0.2540 0.0479 0.2043 0.3171
0.0000 0.0000 0.7067 0.1736 0.0007 0.3219 0.1804
0.0000 1.0000 1.0000 0.7258
0.0408 0.1700 0.0641 0.2036 0.9955 0.1228 0.5000 0.0004 0.7880 0.0000
0.7963 0.1137 0.5231 0.0000 0.0000 0.1473 0.2991 0.0354 0.1952 0.3210
0.0000 0.0000 0.7067 0.1736 0.0007 0.3209 0.1802

0.0000 1.0000 1.0000 1.1008
0.0408 0.1700 0.0641 0.2037 0.9955 0.1254 0.5000 0.0004 0.7786 0.0000
0.7869 0.1132 0.5242 0.0000 0.0000 0.1513 0.2844 0.0278 0.1866 0.3052
0.0000 0.0000 0.7067 0.1736 0.0007 0.3202 0.1801
0.0000 1.0000 1.0000 1.3808
0.0408 0.1700 0.0641 0.2037 0.9955 0.1232 0.5000 0.0004 0.7671 0.0000
0.7755 0.1113 0.5259 0.0000 0.0000 0.1678 0.1007 0.0144 0.2001 0.2765
0.0000 0.0000 0.7067 0.1736 0.0007 0.3190 0.1799
0.0000 1.0000 1.0000 1.8708
0.0408 0.1700 0.0641 0.2038 0.9955 0.1227 0.5000 0.0004 0.7654 0.0000
0.7738 0.1106 0.5264 0.0000 0.0000 0.1402 0.0771 0.0126 0.1940 0.2515
0.0000 0.0000 0.7067 0.1736 0.0007 0.3187 0.1798
0.0000 1.0000 1.0000 1.9708
0.0408 0.1700 0.0641 0.2038 0.9955 0.1218 0.5000 0.0004 0.7629 0.0000
0.7713 0.1083 0.5266 0.0000 0.0000 0.1627 0.0378 0.0105 0.1877 0.3302
0.0000 0.0003 0.7067 0.1736 0.0007 0.3183 0.1797
0.0000 1.0000 1.0000 2.1208
0.0408 0.1700 0.0641 0.2038 0.9955 0.1245 0.5000 0.0004 0.7577 0.0000
0.7660 0.1045 0.5280 0.0000 0.0000 0.2673 0.0238 0.0121 0.1618 0.3733
0.0000 0.0001 0.7067 0.1736 0.0007 0.3175 0.1796
0.0000 1.0000 1.0000 2.4408
0.5290 0.5490 0.0583 0.2371 0.9955 0.1226 0.3874 0.5429 0.7692 0.7618
0.7800 0.0000 0.5232 0.0000 0.2189 0.8465 0.7656 0.6278 0.7975 0.8747
0.5802 0.9042 0.7067 0.0000 0.0000 0.3080 0.1638
0.0000 1.0000 0.0000 0.1708
0.0408 0.1700 0.0616 0.2023 0.9955 0.2987 0.4968 0.0003 0.7928 0.0000
0.8012 0.0572 0.5136 0.0000 0.0000 0.5075 0.7270 0.3080 0.7541 0.7615
0.0845 0.0118 0.7067 0.1736 0.0007 0.3307 0.1833
0.0000 1.0000 0.0000 0.3408
0.0408 0.1700 0.0616 0.2023 0.9955 0.2968 0.4971 0.0004 0.7928 0.0000
0.8011 0.0625 0.5109 0.0000 0.0000 0.4903 0.7213 0.2988 0.7481 0.7564
0.0483 0.0105 0.7067 0.1736 0.0007 0.3307 0.1833
0.0000 1.0000 0.0000 0.3508
0.0408 0.1700 0.0616 0.2023 0.9955 0.2835 0.4971 0.0004 0.7918 0.0000
0.8002 0.0886 0.5227 0.0000 0.0000 0.4130 0.6895 0.2528 0.7156 0.7285
0.0000 0.0068 0.7067 0.1736 0.0007 0.3306 0.1833
0.0000 1.0000 0.0000 0.4008
0.0408 0.1700 0.0641 0.2024 0.9955 0.2483 0.4906 0.0004 0.7862 0.0000
0.7943 0.1025 0.5229 0.0000 0.0000 0.1646 0.6076 0.1609 0.6075 0.6566
0.0000 0.0009 0.7067 0.1736 0.0007 0.3303 0.1832
0.0000 1.0000 0.0000 0.5058
0.0408 0.1700 0.0641 0.2024 0.9955 0.2197 0.4919 0.0004 0.7784 0.0000
0.7866 0.1271 0.5209 0.0000 0.0000-0.1178 0.4593 0.0773 0.2159 0.5373
0.0000 0.0001 0.7067 0.1736 0.0007 0.3301 0.1831
0.0000 1.0000 0.0000 0.5858
0.0408 0.1700 0.0641 0.2024 0.9955 0.2018 0.5000 0.0004 0.7746 0.0000
0.7828 0.1201 0.5185 0.0000 0.0000-0.1901 0.3703 0.0432 0.2041 0.4612
0.0000 0.0000 0.7067 0.1736 0.0007 0.3300 0.1831
0.0000 1.0000 0.0000 0.6408
0.0408 0.1700 0.0641 0.2024 0.9955 0.1930 0.5012 0.0004 0.7728 0.0000

0.7811 0.1372 0.5213 0.0000 0.0000-0.0916 0.3684 0.0371 0.2060 0.4001
0.0000 0.0000 0.7067 0.1736 0.0007 0.3298 0.1831
0.0000 1.0000 0.0000 0.6808
0.0408 0.1700 0.0641 0.2024 0.9955 0.1893 0.5013 0.0004 0.7718 0.0000
0.7801 0.1295 0.5230 0.0000 0.0000 0.0759 0.3347 0.0375 0.2116 0.4019
0.0000 0.0001 0.7067 0.1736 0.0007 0.3298 0.1831
0.0000 1.0000 0.0000 0.7058
0.0408 0.1700 0.0641 0.2024 0.9955 0.1729 0.5013 0.0004 0.7649 0.0000
0.7731 0.1316 0.5209 0.0000 0.0000 0.2320 0.4201 0.0485 0.2362 0.4068
0.0000 0.0001 0.7067 0.1736 0.0007 0.3294 0.1830
0.0000 1.0000 0.0000 0.8508
0.0408 0.1700 0.0641 0.2025 0.9955 0.1717 0.5000 0.0004 0.7567 0.0000
0.7650 0.1237 0.5238 0.0000 0.0000 0.2684 0.4407 0.0469 0.2379 0.5117
0.0000 0.0001 0.7067 0.1736 0.0007 0.3290 0.1829
0.0000 1.0000 0.0000 1.0008
0.0408 0.1700 0.0641 0.2026 0.9955 0.1398 0.5000 0.0004 0.7409 0.0000
0.7494 0.1256 0.5267 0.0000 0.0000 0.3053 0.3776 0.0297 0.2152 0.4220
0.0000 0.0000 0.7067 0.1736 0.0007 0.3277 0.1826
0.0000 1.0000 0.0000 1.5008
0.0408 0.1700 0.0641 0.2026 0.9955 0.1404 0.5000 0.0004 0.7359 0.0000
0.7443 0.1223 0.5275 0.0000 0.0000 0.3192 0.3919 0.0261 0.1848 0.4345
0.0000 0.0000 0.7067 0.1736 0.0007 0.3273 0.1825
0.0000 1.0000 0.0000 1.6758
0.0408 0.1700 0.0641 0.2027 0.9955 0.1350 0.5000 0.0004 0.7318 0.0000
0.7402 0.1183 0.5285 0.0000 0.0000 0.2928 0.2862 0.0244 0.2044 0.4103
0.0000 0.0000 0.7067 0.1736 0.0007 0.3268 0.1824
0.0000 1.0000 0.0000 1.8708
0.0408 0.1700 0.0641 0.2027 0.9955 0.1329 0.5000 0.0004 0.7284 0.0000
0.7368 0.1146 0.5288 0.0000 0.0000 0.3029 0.2934 0.0257 0.1868 0.4272
0.0000 0.0000 0.7067 0.1736 0.0007 0.3264 0.1823
0.0000 1.0000 0.0000 2.0008
0.0408 0.1700 0.0641 0.2027 0.9955 0.1318 0.5000 0.0004 0.7254 0.0000
0.7339 0.1129 0.5293 0.0000 0.0000 0.3116 0.2990 0.0221 0.1788 0.4224
0.0000 0.0000 0.7067 0.1736 0.0007 0.3261 0.1823
0.0000 1.0000 0.0000 2.1208
0.0408 0.1700 0.0641 0.2027 0.9955 0.1304 0.5000 0.0004 0.7220 0.0000
0.7305 0.1091 0.5297 0.0000 0.0000 0.3129 0.2108 0.0190 0.2036 0.4230
0.0000 0.0000 0.7067 0.1736 0.0007 0.3257 0.1822
0.0000 1.0000 0.0000 2.2758
0.0408 0.4002 0.0641 0.2449 0.2648 0.0777 0.4278 0.4426 0.8646 0.0000
0.8733 0.0000 0.5060 0.6698 0.7969 0.8723 0.7790 0.7814 0.8124 0.8881
0.6223 0.4969 0.6645 0.0000 0.0000 0.1457 0.1457
1.0000 1.0000 1.0000 0.3008
0.0408 0.1700 0.0641 0.2496 0.2648 0.0780 0.4949 0.2139 0.8858 0.0000
0.8951 0.0000 0.4868 0.6390 0.6541 0.9141 0.7823 0.7455 0.8135 0.8706
0.6202 0.2750 0.7036 0.1736 0.0007 0.1457 0.1457
1.0000 1.0000 1.0000 0.3558
0.0408 0.1700 0.0641 0.2462 0.2648 0.0776 0.5000 0.0613 0.8682 0.0000
0.8761 0.0320 0.4893 0.4933 0.4262 0.8999 0.7702 0.6827 0.8027 0.8252
0.3223 0.0462 0.7067 0.1736 0.0007 0.1457 0.1457

1.0000 1.0000 1.0000 0.6558
0.0408 0.1700 0.0641 0.2456 0.2648 0.0774 0.5000 0.0595 0.8664 0.0000
0.8742 0.1625 0.4858 0.4874 0.4163 0.8990 0.7700 0.6800 0.8026 0.8233
0.3141 0.0328 0.7067 0.1736 0.0007 0.1457 0.1457
1.0000 1.0000 1.0000 0.7458
0.0408 0.1700 0.0641 0.2447 0.2648 0.0770 0.5000 0.0441 0.8629 0.0000
0.8707 0.2327 0.4851 0.4821 0.4081 0.8983 0.7694 0.6778 0.8022 0.8228
0.3874 0.0202 0.6978 0.1736 0.0007 0.1457 0.1457
1.0000 1.0000 1.0000 0.9008
0.0408 0.1700 0.0641 0.2444 0.2648 0.0764 0.5000 0.0309 0.8604 0.0000
0.8682 0.3151 0.4842 0.4788 0.4029 0.8979 0.7682 0.6764 0.8011 0.8253
0.3917 0.0100 0.7053 0.1736 0.0007 0.1457 0.1457
1.0000 1.0000 1.0000 1.2008
0.0408 0.1700 0.0641 0.2458 0.2648 0.0759 0.5000 0.0257 0.8593 0.0000
0.8672 0.3126 0.4840 0.4776 0.4060 0.8976 0.7677 0.6772 0.8007 0.8278
0.3990 0.0060 0.7050 0.1736 0.0007 0.1457 0.1457
1.0000 1.0000 1.0000 1.5008
0.0408 0.1700 0.0641 0.2482 0.2648 0.0755 0.5000 0.0226 0.8581 0.0000
0.8659 0.3498 0.4840 0.4763 0.4125 0.8965 0.7673 0.6789 0.8004 0.8308
0.4084 0.0038 0.7051 0.1736 0.0007 0.1457 0.1457
1.0000 1.0000 1.0000 1.8708
0.0408 0.1700 0.0641 0.2499 0.2648 0.0753 0.5000 0.0213 0.8576 0.0000
0.8654 0.2957 0.4841 0.4751 0.4166 0.8964 0.7474 0.6800 0.8001 0.8325
0.4136 0.0030 0.7053 0.1736 0.0007 0.1457 0.1457
1.0000 1.0000 1.0000 2.1208
0.0408 0.1700 0.0641 0.2520 0.2648 0.0750 0.5000 0.0195 0.8571 0.0000
0.8649 0.3251 0.4843 0.4728 0.4221 0.8964 0.6978 0.6815 0.7998 0.8345
0.4196 0.0023 0.7057 0.1736 0.0007 0.1457 0.1457
1.0000 1.0000 1.0000 2.4808
0.9713 0.5490 0.8279 0.2321 0.2648 0.0775 0.4090 0.8371 0.7641 0.8061
0.7724 0.0000 0.5191 0.4993 0.5768 0.9128 0.7665 0.7229 0.7998 0.8806
0.5812 0.8281 0.7067 0.1772 0.0007 0.1457 0.1457
0.0000 0.0000 1.0000 1.2008
0.9713 0.5490 0.8281 0.2249 0.2648 0.0775 0.4090 0.8368 0.7628 0.8027
0.7712 0.0000 0.5191 0.4507 0.5400 0.9095 0.7662 0.7129 0.7995 0.8801
0.5785 0.8277 0.7067 0.1993 0.0007 0.1457 0.1457
0.0000 0.0000 1.0000 1.6008
0.9714 0.5199 0.7465 0.1449 0.2648 0.0775 0.3974 0.7418 0.7771 0.7316
0.7855 0.0000 0.5168 0.2022 0.3468 0.8908 0.7678 0.6604 0.8010 0.8756
0.5672 0.8218 0.7036 0.3033 0.0007 0.1457 0.1457
0.0000 0.0000 1.0000 4.0008
0.0408 0.4007 0.0597 0.1399 0.2648 0.0775 0.4071 0.3104 0.7939 0.5035
0.8054 0.0000 0.5017 0.1833 0.3403 0.8919 0.7684 0.6586 0.8012 0.8727
0.5622 0.8238 0.7067 0.3067 0.0007 0.1457 0.1457
0.0000 0.0000 1.0000 4.1108
0.0408 0.1700 0.0610 0.1332 0.2648 0.0775 0.4975 0.3395 0.8353 0.3620
0.8427 0.0000 0.5084 0.1046 0.3295 0.8898 0.7763 0.6560 0.8090 0.8340
0.4824 0.8162 0.7067 0.3089 0.0007 0.1457 0.1457
0.0000 0.0000 1.0000 4.1808
0.0408 0.1700 0.0613 0.1261 0.2648 0.0775 0.5001 0.2081 0.8192 0.2452

0.8270 0.0000 0.5085 0.0380 0.2421 0.8776 0.7700 0.6327 0.8013 0.8161
0.3941 0.8315 0.7067 0.3094 0.0007 0.1457 0.1457
0.0000 0.0000 1.0000 4.2408
0.0408 0.1700 0.0613 0.1249 0.2648 0.0775 0.5002 0.1847 0.8175 0.2631
0.8253 0.0000 0.5085 0.0295 0.2272 0.8727 0.7688 0.6286 0.8003 0.8138
0.3799 0.8330 0.7067 0.3095 0.0007 0.1457 0.1457
0.0000 0.0000 1.0000 4.2508
0.0408 0.1700 0.0617 0.1162 0.2648 0.0775 0.5003 0.0827 0.8130-0.0011
0.8212 0.0008 0.5147 0.0038 0.1694 0.8482 0.7641 0.6129 0.7964 0.8060
0.3264 0.8384 0.7067 0.3096 0.0007 0.1457 0.1457
0.0000 0.0000 1.0000 4.3008
0.0408 0.1700 0.0641 0.0921 0.2648 0.0775 0.5003 0.0123 0.8230 0.0000
0.8318 0.1435 0.5243-0.0088 0.1211 0.8270 0.7612 0.5997 0.7949 0.7998
0.2837 0.8377 0.7067 0.3096 0.0007 0.1458 0.1458
0.0000 0.0000 1.0000 4.4008
0.0408 0.1700 0.0641 0.0924 0.2648 0.0776 0.5000 0.0347 0.8350 0.0000
0.8433 0.0672 0.5231-0.0106 0.1087 0.8185 0.7637 0.5962 0.7969 0.8003
0.2904 0.8363 0.7059 0.3093 0.0007 0.1461 0.1461
0.0000 0.0000 1.0000 4.7008
0.0408 0.1700 0.0641 0.0926 0.2648 0.0776 0.5000 0.0284 0.8343 0.0000
0.8427 0.0571 0.5223-0.0145 0.0945 0.8154 0.7634 0.5925 0.7967 0.7996
0.2870 0.8361 0.7067 0.3088 0.0007 0.1463 0.1463
0.0000 0.0000 1.0000 4.9008

## C.4 File WB7.INX

This file shows the reduced variables used in the training set of the power plant diagnostic network described in Section 5.

```
FILE WB7.INX - A FILE FOR INPUT TO WBS###.FOR
1     0     1     1     1     1     1     0     1     1
1     1     1     1     0     1     1     0     1     0
1     1     0     0     1     1     1     1     1     1
1     1     0     0     0     1     1     0     0     0
```

## C.5 File WB7.NNI

This file is the parameter input file used to train the power plant diagnostics network described in Section 5.

```
!  WB7.NNI [WB7.DDI FROM TSG,N.EXE,SMA,BIG.TIM, ##1,A.DDI, WB3OG]
!   5   91 9991   13    6    6    9    4   17  340   20    1
!  27    1    1    1    3
!    1.015      0.50       0.1   1.00006      2.00      0.35     0.010   10.0
!     1.00      1.00      20.0     0.020      1.00      1.00       0.5  .0003
!          .0000001
```

# APPENDIX D.

## TABULATED PLANT DIAGNOSTIC RESULTS

### D.1 Scenario ED1 No-Noise

Below are the no-noise results for the ED1 scenario. These results are file ED1.PRX.

| Time (sec) | Node 1 | | | Node 2 | | | Node 3 | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Desired Output | Actual Output | | Desired Output | Actual Output | | Desired Output | Actual Output | |
| 0.08 | 1 | 0.0000 | 0.0474 | 1 | 0.0000 | 0.0108 | 2 | 0.0000 | 0.0361 | 3 |
| 0.58 | 2 | 0.0000 | 0.0474 | 1 | 0.0000 | 0.0108 | 2 | 0.0000 | 0.0361 | 3 |
| 1.08 | 3 | 0.0000 | 0.0474 | 1 | 0.0000 | 0.0108 | 2 | 0.0000 | 0.0361 | 3 |
| 1.58 | 4 | 0.0000 | 0.0474 | 1 | 0.0000 | 0.0108 | 2 | 0.0000 | 0.0361 | 3 |
| 2.08 | 5 | 0.0000 | 0.0474 | 1 | 0.0000 | 0.0108 | 2 | 0.0000 | 0.0361 | 3 |
| 2.58 | 6 | 0.0000 | 0.0474 | 1 | 0.0000 | 0.0108 | 2 | 0.0000 | 0.0361 | 3 |
| 3.08 | 7 | 0.0000 | 0.0474 | 1 | 0.0000 | 0.0108 | 2 | 0.0000 | 0.0361 | 3 |
| 3.58 | 8 | 0.0000 | 0.0474 | 1 | 0.0000 | 0.0108 | 2 | 0.0000 | 0.0361 | 3 |
| 4.08 | 9 | 0.0000 | 0.0474 | 1 | 0.0000 | 0.0108 | 2 | 0.0000 | 0.0361 | 3 |
| 4.58 | 10 | 0.0000 | 0.0473 | 1 | 0.0000 | 0.0108 | 2 | 0.0000 | 0.0361 | 3 |
| 5.08 | 11 | 0.0000 | 0.0474 | 1 | 0.0000 | 0.0108 | 2 | 0.0000 | 0.0361 | 3 |
| 5.58 | 12 | 0.0000 | 0.0473 | 1 | 0.0000 | 0.0108 | 2 | 0.0000 | 0.0361 | 3 |
| 6.08 | 13 | 0.0000 | 0.0473 | 1 | 0.0000 | 0.0108 | 2 | 0.0000 | 0.0361 | 3 |
| 6.58 | 14 | 0.0000 | 0.0473 | 1 | 0.0000 | 0.0108 | 2 | 0.0000 | 0.0361 | 3 |
| 7.08 | 15 | 0.0000 | 0.0472 | 1 | 0.0000 | 0.0108 | 2 | 0.0000 | 0.0361 | 3 |
| 7.58 | 16 | 0.0000 | 0.0473 | 1 | 0.0000 | 0.0108 | 2 | 0.0000 | 0.0361 | 3 |
| 8.08 | 17 | 0.0000 | 0.0473 | 1 | 0.0000 | 0.0108 | 2 | 0.0000 | 0.0361 | 3 |
| 8.58 | 18 | 0.0000 | 0.0473 | 1 | 0.0000 | 0.0108 | 2 | 0.0000 | 0.0361 | 3 |
| 9.08 | 19 | 0.0000 | 0.0472 | 1 | 0.0000 | 0.0108 | 2 | 0.0000 | 0.0361 | 3 |
| 9.58 | 20 | 0.0000 | 0.0473 | 1 | 0.0000 | 0.0108 | 2 | 0.0000 | 0.0361 | 3 |
| 10.08 | 21 | 0.0000 | 0.0473 | 1 | 0.0000 | 0.0108 | 2 | 0.0000 | 0.0361 | 3 |
| 10.58 | 22 | 0.0000 | 0.0472 | 1 | 0.0000 | 0.0108 | 2 | 0.0000 | 0.0361 | 3 |
| 11.08 | 23 | 0.0000 | 0.0473 | 1 | 0.0000 | 0.0108 | 2 | 0.0000 | 0.0361 | 3 |
| 11.58 | 24 | 0.0000 | 0.0472 | 1 | 0.0000 | 0.0108 | 2 | 0.0000 | 0.0361 | 3 |
| 12.08 | 25 | 0.0000 | 0.0472 | 1 | 0.0000 | 0.0108 | 2 | 0.0000 | 0.0361 | 3 |
| 12.58 | 26 | 0.0000 | 0.0473 | 1 | 0.0000 | 0.0108 | 2 | 0.0000 | 0.0361 | 3 |
| 13.08 | 27 | 0.0000 | 0.0472 | 1 | 0.0000 | 0.0108 | 2 | 0.0000 | 0.0361 | 3 |
| 13.58 | 28 | 0.0000 | 0.0472 | 1 | 0.0000 | 0.0108 | 2 | 0.0000 | 0.0361 | 3 |
| 14.08 | 29 | 0.0000 | 0.0471 | 1 | 0.0000 | 0.0108 | 2 | 0.0000 | 0.0361 | 3 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14.58 | 30 | 0.0000 | 0.0472 | 1 | 30 | 0.0000 | 0.0108 | 2 | 30 | 0.0000 | 0.0361 | 3 |
| 15.08 | 31 | 0.0000 | 0.0472 | 1 | 31 | 0.0000 | 0.0108 | 2 | 31 | 0.0000 | 0.0361 | 3 |
| 15.58 | 32 | 0.0000 | 0.0472 | 1 | 32 | 0.0000 | 0.0108 | 2 | 32 | 0.0000 | 0.0361 | 3 |
| 16.08 | 33 | 0.0000 | 0.0472 | 1 | 33 | 0.0000 | 0.0108 | 2 | 33 | 0.0000 | 0.0361 | 3 |
| 16.58 | 34 | 0.0000 | 0.0471 | 1 | 34 | 0.0000 | 0.0108 | 2 | 34 | 0.0000 | 0.0362 | 3 |
| 17.08 | 35 | 0.0000 | 0.0471 | 1 | 35 | 0.0000 | 0.0108 | 2 | 35 | 0.0000 | 0.0362 | 3 |
| 17.58 | 36 | 0.0000 | 0.0471 | 1 | 36 | 0.0000 | 0.0108 | 2 | 36 | 0.0000 | 0.0362 | 3 |
| 18.08 | 37 | 0.0000 | 0.0471 | 1 | 37 | 0.0000 | 0.0108 | 2 | 37 | 0.0000 | 0.0362 | 3 |
| 18.58 | 38 | 0.0000 | 0.0471 | 1 | 38 | 0.0000 | 0.0108 | 2 | 38 | 0.0000 | 0.0361 | 3 |
| 19.08 | 39 | 0.0000 | 0.0471 | 1 | 39 | 0.0000 | 0.0108 | 2 | 39 | 0.0000 | 0.0362 | 3 |
| 19.58 | 40 | 0.0000 | 0.0471 | 1 | 40 | 0.0000 | 0.0108 | 2 | 40 | 0.0000 | 0.0361 | 3 |
| 20.08 | 41 | 0.0000 | 0.0471 | 1 | 41 | 0.0000 | 0.0108 | 2 | 41 | 0.0000 | 0.0361 | 3 |
| 20.58 | 42 | 1.0000 | 0.8503 | 1 | 42 | 1.0000 | 0.0246 | 2 | 42 | 1.0000 | 0.0264 | 3 |
| 21.08 | 43 | 1.0000 | 0.8864 | 1 | 43 | 1.0000 | 0.0290 | 2 | 43 | 1.0000 | 0.0266 | 3 |
| 21.58 | 44 | 1.0000 | 0.0129 | 1 | 44 | 1.0000 | 0.0354 | 2 | 44 | 1.0000 | 0.2576 | 3 |
| 22.08 | 45 | 1.0000 | 0.0349 | 1 | 45 | 1.0000 | 0.9737 | 2 | 45 | 1.0000 | 0.9336 | 3 |
| 22.58 | 46 | 1.0000 | 0.2028 | 1 | 46 | 1.0000 | 0.9935 | 2 | 46 | 1.0000 | 0.9923 | 3 |
| 23.08 | 47 | 1.0000 | 0.8807 | 1 | 47 | 1.0000 | 0.9889 | 2 | 47 | 1.0000 | 0.9965 | 3 |
| 23.58 | 48 | 1.0000 | 0.9764 | 1 | 48 | 1.0000 | 0.9801 | 2 | 48 | 1.0000 | 0.9981 | 3 |
| 24.08 | 49 | 1.0000 | 0.9924 | 1 | 49 | 1.0000 | 0.9736 | 2 | 49 | 1.0000 | 0.9988 | 3 |
| 24.58 | 50 | 1.0000 | 0.9985 | 1 | 50 | 1.0000 | 0.9689 | 2 | 50 | 1.0000 | 0.9992 | 3 |
| 25.08 | 51 | 1.0000 | 1.0017 | 1 | 51 | 1.0000 | 0.9655 | 2 | 51 | 1.0000 | 0.9994 | 3 |
| 25.58 | 52 | 1.0000 | 0.0244 | 1 | 52 | 1.0000 | 1.0081 | 2 | 52 | 1.0000 | 0.9886 | 3 |
| 26.08 | 53 | 1.0000 | 0.0587 | 1 | 53 | 1.0000 | 1.0028 | 2 | 53 | 1.0000 | 0.9932 | 3 |
| 26.58 | 54 | 1.0000 | 0.9720 | 1 | 54 | 1.0000 | 0.9827 | 2 | 54 | 1.0000 | 0.9978 | 3 |
| 27.08 | 55 | 1.0000 | 1.0035 | 1 | 55 | 1.0000 | 0.9635 | 2 | 55 | 1.0000 | 0.9993 | 3 |
| 27.58 | 56 | 1.0000 | 1.0083 | 1 | 56 | 1.0000 | 0.9517 | 2 | 56 | 1.0000 | 1.0001 | 3 |
| 28.08 | 57 | 1.0000 | 1.0075 | 1 | 57 | 1.0000 | 0.9532 | 2 | 57 | 1.0000 | 1.0004 | 3 |
| 28.58 | 58 | 1.0000 | 1.0064 | 1 | 58 | 1.0000 | 0.9537 | 2 | 58 | 1.0000 | 1.0005 | 3 |
| 29.08 | 59 | 1.0000 | 0.9999 | 1 | 59 | 1.0000 | 0.9635 | 2 | 59 | 1.0000 | 1.0002 | 3 |
| 29.58 | 60 | 1.0000 | 0.9621 | 1 | 60 | 1.0000 | 0.9805 | 2 | 60 | 1.0000 | 0.9993 | 3 |
| 30.08 | 61 | 1.0000 | 0.9836 | 1 | 61 | 1.0000 | 0.9741 | 2 | 61 | 1.0000 | 0.9997 | 3 |
| 30.58 | 62 | 1.0000 | 0.9910 | 1 | 62 | 1.0000 | 0.9701 | 2 | 62 | 1.0000 | 0.9999 | 3 |
| 31.08 | 63 | 1.0000 | 0.9957 | 1 | 63 | 1.0000 | 0.9666 | 2 | 63 | 1.0000 | 1.0001 | 3 |
| 31.58 | 64 | 1.0000 | 0.9978 | 1 | 64 | 1.0000 | 0.9650 | 2 | 64 | 1.0000 | 1.0001 | 3 |
| 32.08 | 65 | 1.0000 | 0.9991 | 1 | 65 | 1.0000 | 0.9641 | 2 | 65 | 1.0000 | 1.0002 | 3 |
| 32.58 | 66 | 1.0000 | 0.9994 | 1 | 66 | 1.0000 | 0.9642 | 2 | 66 | 1.0000 | 1.0002 | 3 |
| 33.08 | 67 | 1.0000 | 1.0020 | 1 | 67 | 1.0000 | 0.9581 | 2 | 67 | 1.0000 | 1.0006 | 3 |
| 33.58 | 68 | 1.0000 | 1.0038 | 1 | 68 | 1.0000 | 0.9539 | 2 | 68 | 1.0000 | 1.0007 | 3 |
| 34.08 | 69 | 1.0000 | 1.0029 | 1 | 69 | 1.0000 | 0.9553 | 2 | 69 | 1.0000 | 1.0007 | 3 |
| 34.58 | 70 | 1.0000 | 1.0014 | 1 | 70 | 1.0000 | 0.9574 | 2 | 70 | 1.0000 | 1.0006 | 3 |
| 35.08 | 71 | 1.0000 | 0.9996 | 1 | 71 | 1.0000 | 0.9597 | 2 | 71 | 1.0000 | 1.0006 | 3 |
| 35.58 | 72 | 1.0000 | 0.9980 | 1 | 72 | 1.0000 | 0.9614 | 2 | 72 | 1.0000 | 1.0006 | 3 |
| 36.08 | 73 | 1.0000 | 0.9970 | 1 | 73 | 1.0000 | 0.9623 | 2 | 73 | 1.0000 | 1.0005 | 3 |
| 36.58 | 74 | 1.0000 | 0.9965 | 1 | 74 | 1.0000 | 0.9628 | 2 | 74 | 1.0000 | 1.0005 | 3 |
| 37.08 | 75 | 1.0000 | 0.9963 | 1 | 75 | 1.0000 | 0.9629 | 2 | 75 | 1.0000 | 1.0005 | 3 |
| 37.58 | 76 | 1.0000 | 0.9962 | 1 | 76 | 1.0000 | 0.9628 | 2 | 76 | 1.0000 | 1.0005 | 3 |
| 38.08 | 77 | 1.0000 | 0.9963 | 1 | 77 | 1.0000 | 0.9624 | 2 | 77 | 1.0000 | 1.0005 | 3 |
| 38.58 | 78 | 1.0000 | 0.9965 | 1 | 78 | 1.0000 | 0.9619 | 2 | 78 | 1.0000 | 1.0005 | 3 |
| 39.08 | 79 | 1.0000 | 0.9968 | 1 | 79 | 1.0000 | 0.9613 | 2 | 79 | 1.0000 | 1.0006 | 3 |
| 39.58 | 80 | 1.0000 | 0.9970 | 1 | 80 | 1.0000 | 0.9606 | 2 | 80 | 1.0000 | 1.0006 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 40.08 | 81 | 1.0000 | 0.9974 | 1 | 81 | 1.0000 | 0.9600 | 2 | 81 | 1.0000 | 1.0006 | 3 |
| 40.58 | 82 | 1.0000 | 0.9977 | 1 | 82 | 1.0000 | 0.9595 | 2 | 82 | 1.0000 | 1.0006 | 3 |
| 41.08 | 83 | 1.0000 | 0.9980 | 1 | 83 | 1.0000 | 0.9590 | 2 | 83 | 1.0000 | 1.0006 | 3 |
| 41.58 | 84 | 1.0000 | 0.9981 | 1 | 84 | 1.0000 | 0.9588 | 2 | 84 | 1.0000 | 1.0006 | 3 |
| 42.08 | 85 | 1.0000 | 0.9980 | 1 | 85 | 1.0000 | 0.9587 | 2 | 85 | 1.0000 | 1.0006 | 3 |
| 42.58 | 86 | 1.0000 | 0.9979 | 1 | 86 | 1.0000 | 0.9586 | 2 | 86 | 1.0000 | 1.0006 | 3 |
| 43.08 | 87 | 1.0000 | 0.9975 | 1 | 87 | 1.0000 | 0.9587 | 2 | 87 | 1.0000 | 1.0006 | 3 |
| 43.58 | 88 | 1.0000 | 0.9971 | 1 | 88 | 1.0000 | 0.9588 | 2 | 88 | 1.0000 | 1.0006 | 3 |
| 44.08 | 89 | 1.0000 | 0.9978 | 1 | 89 | 1.0000 | 0.9583 | 2 | 89 | 1.0000 | 1.0006 | 3 |
| 44.58 | 90 | 1.0000 | 0.9990 | 1 | 90 | 1.0000 | 0.9575 | 2 | 90 | 1.0000 | 1.0007 | 3 |
| 45.08 | 91 | 1.0000 | 1.0002 | 1 | 91 | 1.0000 | 0.9567 | 2 | 91 | 1.0000 | 1.0007 | 3 |
| 45.58 | 92 | 1.0000 | 1.0014 | 1 | 92 | 1.0000 | 0.9560 | 2 | 92 | 1.0000 | 1.0007 | 3 |
| 46.08 | 93 | 1.0000 | 1.0023 | 1 | 93 | 1.0000 | 0.9554 | 2 | 93 | 1.0000 | 1.0007 | 3 |
| 46.58 | 94 | 1.0000 | 1.0030 | 1 | 94 | 1.0000 | 0.9550 | 2 | 94 | 1.0000 | 1.0008 | 3 |
| 47.08 | 95 | 1.0000 | 1.0036 | 1 | 95 | 1.0000 | 0.9548 | 2 | 95 | 1.0000 | 1.0008 | 3 |
| 47.58 | 96 | 1.0000 | 1.0039 | 1 | 96 | 1.0000 | 0.9546 | 2 | 96 | 1.0000 | 1.0008 | 3 |
| 48.08 | 97 | 1.0000 | 1.0042 | 1 | 97 | 1.0000 | 0.9545 | 2 | 97 | 1.0000 | 1.0008 | 3 |
| 48.58 | 98 | 1.0000 | 1.0044 | 1 | 98 | 1.0000 | 0.9544 | 2 | 98 | 1.0000 | 1.0008 | 3 |
| 49.08 | 99 | 1.0000 | 1.0046 | 1 | 99 | 1.0000 | 0.9543 | 2 | 99 | 1.0000 | 1.0008 | 3 |
| 49.58 | 100 | 1.0000 | 1.0048 | 1 | 100 | 1.0000 | 0.9543 | 2 | 100 | 1.0000 | 1.0008 | 3 |
| 50.08 | 101 | 1.0000 | 1.0049 | 1 | 101 | 1.0000 | 0.9545 | 2 | 101 | 1.0000 | 1.0008 | 3 |
| 50.58 | 102 | 1.0000 | 1.0050 | 1 | 102 | 1.0000 | 0.9547 | 2 | 102 | 1.0000 | 1.0008 | 3 |
| 51.08 | 103 | 1.0000 | 1.0050 | 1 | 103 | 1.0000 | 0.9550 | 2 | 103 | 1.0000 | 1.0008 | 3 |
| 51.58 | 104 | 1.0000 | 1.0051 | 1 | 104 | 1.0000 | 0.9553 | 2 | 104 | 1.0000 | 1.0008 | 3 |
| 52.08 | 105 | 1.0000 | 1.0051 | 1 | 105 | 1.0000 | 0.9556 | 2 | 105 | 1.0000 | 1.0008 | 3 |
| 52.58 | 106 | 1.0000 | 1.0052 | 1 | 106 | 1.0000 | 0.9559 | 2 | 106 | 1.0000 | 1.0008 | 3 |
| 53.08 | 107 | 1.0000 | 1.0052 | 1 | 107 | 1.0000 | 0.9562 | 2 | 107 | 1.0000 | 1.0008 | 3 |
| 53.58 | 108 | 1.0000 | 1.0052 | 1 | 108 | 1.0000 | 0.9566 | 2 | 108 | 1.0000 | 1.0008 | 3 |
| 54.08 | 109 | 1.0000 | 1.0052 | 1 | 109 | 1.0000 | 0.9569 | 2 | 109 | 1.0000 | 1.0008 | 3 |
| 54.58 | 110 | 1.0000 | 1.0052 | 1 | 110 | 1.0000 | 0.9573 | 2 | 110 | 1.0000 | 1.0007 | 3 |
| 55.08 | 111 | 1.0000 | 1.0052 | 1 | 111 | 1.0000 | 0.9576 | 2 | 111 | 1.0000 | 1.0007 | 3 |
| 55.58 | 112 | 1.0000 | 1.0052 | 1 | 112 | 1.0000 | 0.9579 | 2 | 112 | 1.0000 | 1.0007 | 3 |
| 56.08 | 113 | 1.0000 | 1.0052 | 1 | 113 | 1.0000 | 0.9583 | 2 | 113 | 1.0000 | 1.0007 | 3 |
| 56.58 | 114 | 1.0000 | 1.0052 | 1 | 114 | 1.0000 | 0.9586 | 2 | 114 | 1.0000 | 1.0007 | 3 |
| 57.08 | 115 | 1.0000 | 1.0051 | 1 | 115 | 1.0000 | 0.9588 | 2 | 115 | 1.0000 | 1.0007 | 3 |
| 57.58 | 116 | 1.0000 | 1.0051 | 1 | 116 | 1.0000 | 0.9590 | 2 | 116 | 1.0000 | 1.0007 | 3 |
| 58.08 | 117 | 1.0000 | 1.0051 | 1 | 117 | 1.0000 | 0.9592 | 2 | 117 | 1.0000 | 1.0007 | 3 |
| 58.58 | 118 | 1.0000 | 1.0052 | 1 | 118 | 1.0000 | 0.9592 | 2 | 118 | 1.0000 | 1.0007 | 3 |
| 59.08 | 119 | 1.0000 | 1.0052 | 1 | 119 | 1.0000 | 0.9592 | 2 | 119 | 1.0000 | 1.0007 | 3 |
| 59.58 | 120 | 1.0000 | 1.0052 | 1 | 120 | 1.0000 | 0.9592 | 2 | 120 | 1.0000 | 1.0007 | 3 |
| 60.08 | 121 | 1.0000 | 1.0052 | 1 | 121 | 1.0000 | 0.9592 | 2 | 121 | 1.0000 | 1.0007 | 3 |
| 60.58 | 122 | 1.0000 | 1.0053 | 1 | 122 | 1.0000 | 0.9591 | 2 | 122 | 1.0000 | 1.0007 | 3 |
| 61.08 | 123 | 1.0000 | 1.0053 | 1 | 123 | 1.0000 | 0.9590 | 2 | 123 | 1.0000 | 1.0007 | 3 |
| 61.58 | 124 | 1.0000 | 1.0054 | 1 | 124 | 1.0000 | 0.9590 | 2 | 124 | 1.0000 | 1.0007 | 3 |
| 62.08 | 125 | 1.0000 | 1.0054 | 1 | 125 | 1.0000 | 0.9589 | 2 | 125 | 1.0000 | 1.0007 | 3 |
| 62.58 | 126 | 1.0000 | 1.0054 | 1 | 126 | 1.0000 | 0.9588 | 2 | 126 | 1.0000 | 1.0007 | 3 |
| 63.08 | 127 | 1.0000 | 1.0055 | 1 | 127 | 1.0000 | 0.9587 | 2 | 127 | 1.0000 | 1.0007 | 3 |
| 63.58 | 128 | 1.0000 | 1.0055 | 1 | 128 | 1.0000 | 0.9586 | 2 | 128 | 1.0000 | 1.0007 | 3 |
| 64.08 | 129 | 1.0000 | 1.0055 | 1 | 129 | 1.0000 | 0.9585 | 2 | 129 | 1.0000 | 1.0007 | 3 |
| 64.58 | 130 | 1.0000 | 1.0056 | 1 | 130 | 1.0000 | 0.9584 | 2 | 130 | 1.0000 | 1.0007 | 3 |
| 65.08 | 131 | 1.0000 | 1.0056 | 1 | 131 | 1.0000 | 0.9584 | 2 | 131 | 1.0000 | 1.0007 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 65.58 | 132 | 1.0000 | 1.0056 | 1 | 132 | 1.0000 | 0.9583 | 2 | 132 | 1.0000 | 1.0007 | 3 |
| 66.08 | 133 | 1.0000 | 1.0056 | 1 | 133 | 1.0000 | 0.9582 | 2 | 133 | 1.0000 | 1.0007 | 3 |
| 66.58 | 134 | 1.0000 | 1.0057 | 1 | 134 | 1.0000 | 0.9581 | 2 | 134 | 1.0000 | 1.0007 | 3 |
| 67.08 | 135 | 1.0000 | 1.0058 | 1 | 135 | 1.0000 | 0.9579 | 2 | 135 | 1.0000 | 1.0007 | 3 |
| 67.58 | 136 | 1.0000 | 1.0059 | 1 | 136 | 1.0000 | 0.9576 | 2 | 136 | 1.0000 | 1.0007 | 3 |
| 68.08 | 137 | 1.0000 | 1.0061 | 1 | 137 | 1.0000 | 0.9573 | 2 | 137 | 1.0000 | 1.0008 | 3 |
| 68.58 | 138 | 1.0000 | 1.0062 | 1 | 138 | 1.0000 | 0.9570 | 2 | 138 | 1.0000 | 1.0008 | 3 |
| 69.08 | 139 | 1.0000 | 1.0064 | 1 | 139 | 1.0000 | 0.9568 | 2 | 139 | 1.0000 | 1.0008 | 3 |
| 69.58 | 140 | 1.0000 | 1.0064 | 1 | 140 | 1.0000 | 0.9566 | 2 | 140 | 1.0000 | 1.0008 | 3 |
| 70.08 | 141 | 1.0000 | 1.0065 | 1 | 141 | 1.0000 | 0.9564 | 2 | 141 | 1.0000 | 1.0008 | 3 |
| 70.58 | 142 | 1.0000 | 1.0066 | 1 | 142 | 1.0000 | 0.9562 | 2 | 142 | 1.0000 | 1.0008 | 3 |
| 71.08 | 143 | 1.0000 | 1.0067 | 1 | 143 | 1.0000 | 0.9561 | 2 | 143 | 1.0000 | 1.0008 | 3 |
| 71.58 | 144 | 1.0000 | 1.0067 | 1 | 144 | 1.0000 | 0.9560 | 2 | 144 | 1.0000 | 1.0008 | 3 |
| 72.08 | 145 | 1.0000 | 1.0067 | 1 | 145 | 1.0000 | 0.9559 | 2 | 145 | 1.0000 | 1.0008 | 3 |
| 72.58 | 146 | 1.0000 | 1.0068 | 1 | 146 | 1.0000 | 0.9559 | 2 | 146 | 1.0000 | 1.0008 | 3 |
| 73.08 | 147 | 1.0000 | 1.0068 | 1 | 147 | 1.0000 | 0.9558 | 2 | 147 | 1.0000 | 1.0008 | 3 |
| 73.58 | 148 | 1.0000 | 1.0068 | 1 | 148 | 1.0000 | 0.9557 | 2 | 148 | 1.0000 | 1.0008 | 3 |
| 74.08 | 149 | 1.0000 | 1.0069 | 1 | 149 | 1.0000 | 0.9557 | 2 | 149 | 1.0000 | 1.0008 | 3 |
| 74.58 | 150 | 1.0000 | 1.0069 | 1 | 150 | 1.0000 | 0.9557 | 2 | 150 | 1.0000 | 1.0008 | 3 |
| 75.08 | 151 | 1.0000 | 1.0069 | 1 | 151 | 1.0000 | 0.9555 | 2 | 151 | 1.0000 | 1.0008 | 3 |
| 75.58 | 152 | 1.0000 | 1.0069 | 1 | 152 | 1.0000 | 0.9554 | 2 | 152 | 1.0000 | 1.0008 | 3 |
| 76.08 | 153 | 1.0000 | 1.0068 | 1 | 153 | 1.0000 | 0.9553 | 2 | 153 | 1.0000 | 1.0008 | 3 |
| 76.58 | 154 | 1.0000 | 1.0068 | 1 | 154 | 1.0000 | 0.9552 | 2 | 154 | 1.0000 | 1.0008 | 3 |
| 77.08 | 155 | 1.0000 | 1.0067 | 1 | 155 | 1.0000 | 0.9551 | 2 | 155 | 1.0000 | 1.0008 | 3 |
| 77.58 | 156 | 1.0000 | 1.0067 | 1 | 156 | 1.0000 | 0.9551 | 2 | 156 | 1.0000 | 1.0008 | 3 |
| 78.08 | 157 | 1.0000 | 1.0066 | 1 | 157 | 1.0000 | 0.9551 | 2 | 157 | 1.0000 | 1.0008 | 3 |
| 78.58 | 158 | 1.0000 | 1.0065 | 1 | 158 | 1.0000 | 0.9551 | 2 | 158 | 1.0000 | 1.0008 | 3 |
| 79.08 | 159 | 1.0000 | 1.0065 | 1 | 159 | 1.0000 | 0.9551 | 2 | 159 | 1.0000 | 1.0008 | 3 |
| 79.58 | 160 | 1.0000 | 1.0064 | 1 | 160 | 1.0000 | 0.9551 | 2 | 160 | 1.0000 | 1.0008 | 3 |
| 80.08 | 161 | 1.0000 | 1.0064 | 1 | 161 | 1.0000 | 0.9551 | 2 | 161 | 1.0000 | 1.0008 | 3 |
| 80.58 | 162 | 1.0000 | 1.0063 | 1 | 162 | 1.0000 | 0.9552 | 2 | 162 | 1.0000 | 1.0008 | 3 |
| 81.08 | 163 | 1.0000 | 1.0063 | 1 | 163 | 1.0000 | 0.9552 | 2 | 163 | 1.0000 | 1.0008 | 3 |
| 81.58 | 164 | 1.0000 | 1.0063 | 1 | 164 | 1.0000 | 0.9552 | 2 | 164 | 1.0000 | 1.0008 | 3 |
| 82.08 | 165 | 1.0000 | 1.0062 | 1 | 165 | 1.0000 | 0.9553 | 2 | 165 | 1.0000 | 1.0008 | 3 |
| 82.58 | 166 | 1.0000 | 1.0062 | 1 | 166 | 1.0000 | 0.9553 | 2 | 166 | 1.0000 | 1.0008 | 3 |
| 83.08 | 167 | 1.0000 | 1.0062 | 1 | 167 | 1.0000 | 0.9553 | 2 | 167 | 1.0000 | 1.0008 | 3 |
| 83.58 | 168 | 1.0000 | 1.0061 | 1 | 168 | 1.0000 | 0.9554 | 2 | 168 | 1.0000 | 1.0008 | 3 |
| 84.08 | 169 | 1.0000 | 1.0061 | 1 | 169 | 1.0000 | 0.9554 | 2 | 169 | 1.0000 | 1.0008 | 3 |
| 84.58 | 170 | 1.0000 | 1.0061 | 1 | 170 | 1.0000 | 0.9554 | 2 | 170 | 1.0000 | 1.0008 | 3 |
| 85.08 | 171 | 1.0000 | 1.0061 | 1 | 171 | 1.0000 | 0.9555 | 2 | 171 | 1.0000 | 1.0008 | 3 |
| 85.58 | 172 | 1.0000 | 1.0061 | 1 | 172 | 1.0000 | 0.9555 | 2 | 172 | 1.0000 | 1.0008 | 3 |
| 86.08 | 173 | 1.0000 | 1.0061 | 1 | 173 | 1.0000 | 0.9555 | 2 | 173 | 1.0000 | 1.0008 | 3 |
| 86.58 | 174 | 1.0000 | 1.0060 | 1 | 174 | 1.0000 | 0.9555 | 2 | 174 | 1.0000 | 1.0008 | 3 |
| 87.08 | 175 | 1.0000 | 1.0060 | 1 | 175 | 1.0000 | 0.9556 | 2 | 175 | 1.0000 | 1.0008 | 3 |
| 87.58 | 176 | 1.0000 | 1.0060 | 1 | 176 | 1.0000 | 0.9556 | 2 | 176 | 1.0000 | 1.0008 | 3 |
| 88.08 | 177 | 1.0000 | 1.0060 | 1 | 177 | 1.0000 | 0.9556 | 2 | 177 | 1.0000 | 1.0008 | 3 |
| 88.58 | 178 | 1.0000 | 1.0060 | 1 | 178 | 1.0000 | 0.9556 | 2 | 178 | 1.0000 | 1.0008 | 3 |
| 89.08 | 179 | 1.0000 | 1.0060 | 1 | 179 | 1.0000 | 0.9556 | 2 | 179 | 1.0000 | 1.0008 | 3 |
| 89.58 | 180 | 1.0000 | 1.0060 | 1 | 180 | 1.0000 | 0.9557 | 2 | 180 | 1.0000 | 1.0008 | 3 |
| 90.08 | 181 | 1.0000 | 1.0060 | 1 | 181 | 1.0000 | 0.9557 | 2 | 181 | 1.0000 | 1.0008 | 3 |
| 90.58 | 182 | 1.0000 | 1.0060 | 1 | 182 | 1.0000 | 0.9557 | 2 | 182 | 1.0000 | 1.0008 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 91.08 | 183 | 1.0000 | 1.0060 | 1 | 183 | 1.0000 | 0.9557 | 2 | 183 | 1.0000 | 1.0008 | 3 |
| 91.58 | 184 | 1.0000 | 1.0060 | 1 | 184 | 1.0000 | 0.9558 | 2 | 184 | 1.0000 | 1.0008 | 3 |
| 92.08 | 185 | 1.0000 | 1.0060 | 1 | 185 | 1.0000 | 0.9558 | 2 | 185 | 1.0000 | 1.0008 | 3 |
| 92.58 | 186 | 1.0000 | 1.0060 | 1 | 186 | 1.0000 | 0.9558 | 2 | 186 | 1.0000 | 1.0008 | 3 |
| 93.08 | 187 | 1.0000 | 1.0059 | 1 | 187 | 1.0000 | 0.9558 | 2 | 187 | 1.0000 | 1.0008 | 3 |
| 93.58 | 188 | 1.0000 | 1.0059 | 1 | 188 | 1.0000 | 0.9559 | 2 | 188 | 1.0000 | 1.0008 | 3 |
| 94.08 | 189 | 1.0000 | 1.0059 | 1 | 189 | 1.0000 | 0.9559 | 2 | 189 | 1.0000 | 1.0008 | 3 |
| 94.58 | 190 | 1.0000 | 1.0059 | 1 | 190 | 1.0000 | 0.9559 | 2 | 190 | 1.0000 | 1.0008 | 3 |
| 95.08 | 191 | 1.0000 | 1.0059 | 1 | 191 | 1.0000 | 0.9560 | 2 | 191 | 1.0000 | 1.0008 | 3 |
| 95.58 | 192 | 1.0000 | 1.0059 | 1 | 192 | 1.0000 | 0.9560 | 2 | 192 | 1.0000 | 1.0008 | 3 |
| 96.08 | 193 | 1.0000 | 1.0059 | 1 | 193 | 1.0000 | 0.9560 | 2 | 193 | 1.0000 | 1.0008 | 3 |
| 96.58 | 194 | 1.0000 | 1.0059 | 1 | 194 | 1.0000 | 0.9561 | 2 | 194 | 1.0000 | 1.0008 | 3 |
| 97.08 | 195 | 1.0000 | 1.0059 | 1 | 195 | 1.0000 | 0.9561 | 2 | 195 | 1.0000 | 1.0008 | 3 |
| 97.58 | 196 | 1.0000 | 1.0058 | 1 | 196 | 1.0000 | 0.9561 | 2 | 196 | 1.0000 | 1.0008 | 3 |
| 98.08 | 197 | 1.0000 | 1.0058 | 1 | 197 | 1.0000 | 0.9562 | 2 | 197 | 1.0000 | 1.0008 | 3 |
| 98.58 | 198 | 1.0000 | 1.0058 | 1 | 198 | 1.0000 | 0.9562 | 2 | 198 | 1.0000 | 1.0008 | 3 |
| 99.08 | 199 | 1.0000 | 1.0058 | 1 | 199 | 1.0000 | 0.9563 | 2 | 199 | 1.0000 | 1.0008 | 3 |
| 99.58 | 200 | 1.0000 | 1.0058 | 1 | 200 | 1.0000 | 0.9563 | 2 | 200 | 1.0000 | 1.0008 | 3 |
| 100.08 | 201 | 1.0000 | 1.0058 | 1 | 201 | 1.0000 | 0.9564 | 2 | 201 | 1.0000 | 1.0008 | 3 |
| 100.58 | 202 | 1.0000 | 1.0057 | 1 | 202 | 1.0000 | 0.9564 | 2 | 202 | 1.0000 | 1.0008 | 3 |
| 101.08 | 203 | 1.0000 | 1.0057 | 1 | 203 | 1.0000 | 0.9565 | 2 | 203 | 1.0000 | 1.0008 | 3 |
| 101.58 | 204 | 1.0000 | 1.0057 | 1 | 204 | 1.0000 | 0.9565 | 2 | 204 | 1.0000 | 1.0008 | 3 |
| 102.08 | 205 | 1.0000 | 1.0057 | 1 | 205 | 1.0000 | 0.9565 | 2 | 205 | 1.0000 | 1.0008 | 3 |
| 102.58 | 206 | 1.0000 | 1.0057 | 1 | 206 | 1.0000 | 0.9566 | 2 | 206 | 1.0000 | 1.0008 | 3 |
| 103.08 | 207 | 1.0000 | 1.0056 | 1 | 207 | 1.0000 | 0.9566 | 2 | 207 | 1.0000 | 1.0008 | 3 |
| 103.58 | 208 | 1.0000 | 1.0056 | 1 | 208 | 1.0000 | 0.9567 | 2 | 208 | 1.0000 | 1.0008 | 3 |
| 104.08 | 209 | 1.0000 | 1.0056 | 1 | 209 | 1.0000 | 0.9568 | 2 | 209 | 1.0000 | 1.0008 | 3 |
| 104.58 | 210 | 1.0000 | 1.0056 | 1 | 210 | 1.0000 | 0.9568 | 2 | 210 | 1.0000 | 1.0008 | 3 |
| 105.08 | 211 | 1.0000 | 1.0056 | 1 | 211 | 1.0000 | 0.9569 | 2 | 211 | 1.0000 | 1.0008 | 3 |
| 105.58 | 212 | 1.0000 | 1.0055 | 1 | 212 | 1.0000 | 0.9569 | 2 | 212 | 1.0000 | 1.0008 | 3 |
| 106.08 | 213 | 1.0000 | 1.0055 | 1 | 213 | 1.0000 | 0.9570 | 2 | 213 | 1.0000 | 1.0008 | 3 |
| 106.58 | 214 | 1.0000 | 1.0055 | 1 | 214 | 1.0000 | 0.9571 | 2 | 214 | 1.0000 | 1.0007 | 3 |
| 107.08 | 215 | 1.0000 | 1.0055 | 1 | 215 | 1.0000 | 0.9571 | 2 | 215 | 1.0000 | 1.0007 | 3 |
| 107.58 | 216 | 1.0000 | 1.0054 | 1 | 216 | 1.0000 | 0.9572 | 2 | 216 | 1.0000 | 1.0007 | 3 |
| 108.08 | 217 | 1.0000 | 1.0054 | 1 | 217 | 1.0000 | 0.9572 | 2 | 217 | 1.0000 | 1.0007 | 3 |
| 108.58 | 218 | 1.0000 | 1.0054 | 1 | 218 | 1.0000 | 0.9573 | 2 | 218 | 1.0000 | 1.0007 | 3 |
| 109.08 | 219 | 1.0000 | 1.0054 | 1 | 219 | 1.0000 | 0.9573 | 2 | 219 | 1.0000 | 1.0007 | 3 |
| 109.58 | 220 | 1.0000 | 1.0053 | 1 | 220 | 1.0000 | 0.9573 | 2 | 220 | 1.0000 | 1.0007 | 3 |
| 110.08 | 221 | 1.0000 | 1.0053 | 1 | 221 | 1.0000 | 0.9574 | 2 | 221 | 1.0000 | 1.0007 | 3 |
| 110.58 | 222 | 1.0000 | 1.0053 | 1 | 222 | 1.0000 | 0.9574 | 2 | 222 | 1.0000 | 1.0007 | 3 |
| 111.08 | 223 | 1.0000 | 1.0053 | 1 | 223 | 1.0000 | 0.9574 | 2 | 223 | 1.0000 | 1.0007 | 3 |
| 111.58 | 224 | 1.0000 | 1.0053 | 1 | 224 | 1.0000 | 0.9574 | 2 | 224 | 1.0000 | 1.0007 | 3 |
| 112.08 | 225 | 1.0000 | 1.0053 | 1 | 225 | 1.0000 | 0.9574 | 2 | 225 | 1.0000 | 1.0007 | 3 |
| 112.58 | 226 | 1.0000 | 1.0053 | 1 | 226 | 1.0000 | 0.9574 | 2 | 226 | 1.0000 | 1.0007 | 3 |
| 113.08 | 227 | 1.0000 | 1.0053 | 1 | 227 | 1.0000 | 0.9574 | 2 | 227 | 1.0000 | 1.0007 | 3 |
| 113.58 | 228 | 1.0000 | 1.0053 | 1 | 228 | 1.0000 | 0.9574 | 2 | 228 | 1.0000 | 1.0007 | 3 |
| 114.08 | 229 | 1.0000 | 1.0053 | 1 | 229 | 1.0000 | 0.9573 | 2 | 229 | 1.0000 | 1.0007 | 3 |
| 114.58 | 230 | 1.0000 | 1.0053 | 1 | 230 | 1.0000 | 0.9573 | 2 | 230 | 1.0000 | 1.0007 | 3 |
| 115.08 | 231 | 1.0000 | 1.0054 | 1 | 231 | 1.0000 | 0.9573 | 2 | 231 | 1.0000 | 1.0007 | 3 |
| 115.58 | 232 | 1.0000 | 1.0054 | 1 | 232 | 1.0000 | 0.9572 | 2 | 232 | 1.0000 | 1.0007 | 3 |
| 116.08 | 233 | 1.0000 | 1.0054 | 1 | 233 | 1.0000 | 0.9572 | 2 | 233 | 1.0000 | 1.0007 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 116.58 | 234 | 1.0000 | 1.0054 | 1 | 234 | 1.0000 | 0.9572 | 2 | 234 | 1.0000 | 1.0007 | 3 |
| 117.08 | 235 | 1.0000 | 1.0054 | 1 | 235 | 1.0000 | 0.9571 | 2 | 235 | 1.0000 | 1.0007 | 3 |
| 117.58 | 236 | 1.0000 | 1.0054 | 1 | 236 | 1.0000 | 0.9571 | 2 | 236 | 1.0000 | 1.0007 | 3 |
| 118.08 | 237 | 1.0000 | 1.0054 | 1 | 237 | 1.0000 | 0.9571 | 2 | 237 | 1.0000 | 1.0008 | 3 |
| 118.58 | 238 | 1.0000 | 1.0054 | 1 | 238 | 1.0000 | 0.9570 | 2 | 238 | 1.0000 | 1.0008 | 3 |
| 119.08 | 239 | 1.0000 | 1.0054 | 1 | 239 | 1.0000 | 0.9570 | 2 | 239 | 1.0000 | 1.0008 | 3 |
| 119.58 | 240 | 1.0000 | 1.0054 | 1 | 240 | 1.0000 | 0.9570 | 2 | 240 | 1.0000 | 1.0008 | 3 |
| 120.08 | 241 | 1.0000 | 1.0054 | 1 | 241 | 1.0000 | 0.9570 | 2 | 241 | 1.0000 | 1.0008 | 3 |
| 120.58 | 242 | 1.0000 | 1.0054 | 1 | 242 | 1.0000 | 0.9570 | 2 | 242 | 1.0000 | 1.0008 | 3 |
| 121.08 | 243 | 1.0000 | 1.0054 | 1 | 243 | 1.0000 | 0.9571 | 2 | 243 | 1.0000 | 1.0007 | 3 |
| 121.58 | 244 | 1.0000 | 1.0054 | 1 | 244 | 1.0000 | 0.9571 | 2 | 244 | 1.0000 | 1.0007 | 3 |
| 122.08 | 245 | 1.0000 | 1.0054 | 1 | 245 | 1.0000 | 0.9572 | 2 | 245 | 1.0000 | 1.0007 | 3 |
| 122.58 | 246 | 1.0000 | 1.0054 | 1 | 246 | 1.0000 | 0.9572 | 2 | 246 | 1.0000 | 1.0007 | 3 |
| 123.08 | 247 | 1.0000 | 1.0053 | 1 | 247 | 1.0000 | 0.9573 | 2 | 247 | 1.0000 | 1.0007 | 3 |
| 123.58 | 248 | 1.0000 | 1.0053 | 1 | 248 | 1.0000 | 0.9573 | 2 | 248 | 1.0000 | 1.0007 | 3 |
| 124.08 | 249 | 1.0000 | 1.0053 | 1 | 249 | 1.0000 | 0.9574 | 2 | 249 | 1.0000 | 1.0007 | 3 |
| 124.58 | 250 | 1.0000 | 1.0053 | 1 | 250 | 1.0000 | 0.9574 | 2 | 250 | 1.0000 | 1.0007 | 3 |
| 125.08 | 251 | 1.0000 | 1.0052 | 1 | 251 | 1.0000 | 0.9575 | 2 | 251 | 1.0000 | 1.0007 | 3 |
| 125.58 | 252 | 1.0000 | 1.0052 | 1 | 252 | 1.0000 | 0.9575 | 2 | 252 | 1.0000 | 1.0007 | 3 |
| 126.08 | 253 | 1.0000 | 1.0052 | 1 | 253 | 1.0000 | 0.9576 | 2 | 253 | 1.0000 | 1.0007 | 3 |
| 126.58 | 254 | 1.0000 | 1.0052 | 1 | 254 | 1.0000 | 0.9576 | 2 | 254 | 1.0000 | 1.0007 | 3 |
| 127.08 | 255 | 1.0000 | 1.0052 | 1 | 255 | 1.0000 | 0.9576 | 2 | 255 | 1.0000 | 1.0007 | 3 |
| 127.58 | 256 | 1.0000 | 1.0052 | 1 | 256 | 1.0000 | 0.9577 | 2 | 256 | 1.0000 | 1.0007 | 3 |
| 128.08 | 257 | 1.0000 | 1.0051 | 1 | 257 | 1.0000 | 0.9577 | 2 | 257 | 1.0000 | 1.0007 | 3 |
| 128.58 | 258 | 1.0000 | 1.0052 | 1 | 258 | 1.0000 | 0.9576 | 2 | 258 | 1.0000 | 1.0007 | 3 |
| 129.08 | 259 | 1.0000 | 1.0052 | 1 | 259 | 1.0000 | 0.9576 | 2 | 259 | 1.0000 | 1.0007 | 3 |
| 129.58 | 260 | 1.0000 | 1.0052 | 1 | 260 | 1.0000 | 0.9576 | 2 | 260 | 1.0000 | 1.0007 | 3 |
| 130.08 | 261 | 1.0000 | 1.0052 | 1 | 261 | 1.0000 | 0.9576 | 2 | 261 | 1.0000 | 1.0007 | 3 |
| 130.58 | 262 | 1.0000 | 1.0052 | 1 | 262 | 1.0000 | 0.9575 | 2 | 262 | 1.0000 | 1.0007 | 3 |
| 131.08 | 263 | 1.0000 | 1.0052 | 1 | 263 | 1.0000 | 0.9574 | 2 | 263 | 1.0000 | 1.0007 | 3 |
| 131.58 | 264 | 1.0000 | 1.0053 | 1 | 264 | 1.0000 | 0.9574 | 2 | 264 | 1.0000 | 1.0007 | 3 |
| 132.08 | 265 | 1.0000 | 1.0053 | 1 | 265 | 1.0000 | 0.9573 | 2 | 265 | 1.0000 | 1.0007 | 3 |
| 132.58 | 266 | 1.0000 | 1.0053 | 1 | 266 | 1.0000 | 0.9573 | 2 | 266 | 1.0000 | 1.0007 | 3 |
| 133.08 | 267 | 1.0000 | 1.0053 | 1 | 267 | 1.0000 | 0.9572 | 2 | 267 | 1.0000 | 1.0007 | 3 |
| 133.58 | 268 | 1.0000 | 1.0054 | 1 | 268 | 1.0000 | 0.9572 | 2 | 268 | 1.0000 | 1.0007 | 3 |
| 134.08 | 269 | 1.0000 | 1.0054 | 1 | 269 | 1.0000 | 0.9571 | 2 | 269 | 1.0000 | 1.0007 | 3 |
| 134.58 | 270 | 1.0000 | 1.0054 | 1 | 270 | 1.0000 | 0.9571 | 2 | 270 | 1.0000 | 1.0007 | 3 |
| 135.08 | 271 | 1.0000 | 1.0054 | 1 | 271 | 1.0000 | 0.9571 | 2 | 271 | 1.0000 | 1.0007 | 3 |
| 135.58 | 272 | 1.0000 | 1.0054 | 1 | 272 | 1.0000 | 0.9571 | 2 | 272 | 1.0000 | 1.0007 | 3 |
| 136.08 | 273 | 1.0000 | 1.0054 | 1 | 273 | 1.0000 | 0.9571 | 2 | 273 | 1.0000 | 1.0007 | 3 |
| 136.58 | 274 | 1.0000 | 1.0054 | 1 | 274 | 1.0000 | 0.9571 | 2 | 274 | 1.0000 | 1.0007 | 3 |
| 137.08 | 275 | 1.0000 | 1.0053 | 1 | 275 | 1.0000 | 0.9572 | 2 | 275 | 1.0000 | 1.0007 | 3 |
| 137.58 | 276 | 1.0000 | 1.0053 | 1 | 276 | 1.0000 | 0.9572 | 2 | 276 | 1.0000 | 1.0007 | 3 |
| 138.08 | 277 | 1.0000 | 1.0053 | 1 | 277 | 1.0000 | 0.9573 | 2 | 277 | 1.0000 | 1.0007 | 3 |
| 138.58 | 278 | 1.0000 | 1.0053 | 1 | 278 | 1.0000 | 0.9574 | 2 | 278 | 1.0000 | 1.0007 | 3 |
| 139.08 | 279 | 1.0000 | 1.0052 | 1 | 279 | 1.0000 | 0.9574 | 2 | 279 | 1.0000 | 1.0007 | 3 |
| 139.58 | 280 | 1.0000 | 1.0052 | 1 | 280 | 1.0000 | 0.9575 | 2 | 280 | 1.0000 | 1.0007 | 3 |
| 140.08 | 281 | 1.0000 | 1.0051 | 1 | 281 | 1.0000 | 0.9576 | 2 | 281 | 1.0000 | 1.0007 | 3 |
| 140.58 | 282 | 1.0000 | 1.0051 | 1 | 282 | 1.0000 | 0.9577 | 2 | 282 | 1.0000 | 1.0007 | 3 |
| 141.08 | 283 | 1.0000 | 1.0051 | 1 | 283 | 1.0000 | 0.9577 | 2 | 283 | 1.0000 | 1.0007 | 3 |
| 141.58 | 284 | 1.0000 | 1.0051 | 1 | 284 | 1.0000 | 0.9578 | 2 | 284 | 1.0000 | 1.0007 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 142.08 | 285 | 1.0000 | 1.0050 | 1 | 285 | 1.0000 | 0.9578 | 2 | 285 | 1.0000 | 1.0007 | 3 |
| 142.58 | 286 | 1.0000 | 1.0050 | 1 | 286 | 1.0000 | 0.9578 | 2 | 286 | 1.0000 | 1.0007 | 3 |
| 143.08 | 287 | 1.0000 | 1.0050 | 1 | 287 | 1.0000 | 0.9578 | 2 | 287 | 1.0000 | 1.0007 | 3 |
| 143.58 | 288 | 1.0000 | 1.0050 | 1 | 288 | 1.0000 | 0.9578 | 2 | 288 | 1.0000 | 1.0007 | 3 |
| 144.08 | 289 | 1.0000 | 1.0051 | 1 | 289 | 1.0000 | 0.9578 | 2 | 289 | 1.0000 | 1.0007 | 3 |
| 144.58 | 290 | 1.0000 | 1.0051 | 1 | 290 | 1.0000 | 0.9577 | 2 | 290 | 1.0000 | 1.0007 | 3 |
| 145.08 | 291 | 1.0000 | 1.0051 | 1 | 291 | 1.0000 | 0.9577 | 2 | 291 | 1.0000 | 1.0007 | 3 |
| 145.58 | 292 | 1.0000 | 1.0051 | 1 | 292 | 1.0000 | 0.9576 | 2 | 292 | 1.0000 | 1.0007 | 3 |
| 146.08 | 293 | 1.0000 | 1.0052 | 1 | 293 | 1.0000 | 0.9575 | 2 | 293 | 1.0000 | 1.0007 | 3 |
| 146.58 | 294 | 1.0000 | 1.0052 | 1 | 294 | 1.0000 | 0.9574 | 2 | 294 | 1.0000 | 1.0007 | 3 |
| 147.08 | 295 | 1.0000 | 1.0052 | 1 | 295 | 1.0000 | 0.9573 | 2 | 295 | 1.0000 | 1.0007 | 3 |
| 147.58 | 296 | 1.0000 | 1.0053 | 1 | 296 | 1.0000 | 0.9572 | 2 | 296 | 1.0000 | 1.0007 | 3 |
| 148.08 | 297 | 1.0000 | 1.0053 | 1 | 297 | 1.0000 | 0.9572 | 2 | 297 | 1.0000 | 1.0007 | 3 |
| 148.58 | 298 | 1.0000 | 1.0053 | 1 | 298 | 1.0000 | 0.9571 | 2 | 298 | 1.0000 | 1.0007 | 3 |
| 149.08 | 299 | 1.0000 | 1.0054 | 1 | 299 | 1.0000 | 0.9570 | 2 | 299 | 1.0000 | 1.0008 | 3 |
| 149.58 | 300 | 1.0000 | 1.0054 | 1 | 300 | 1.0000 | 0.9570 | 2 | 300 | 1.0000 | 1.0008 | 3 |
| 150.08 | 301 | 1.0000 | 1.0054 | 1 | 301 | 1.0000 | 0.9570 | 2 | 301 | 1.0000 | 1.0008 | 3 |
| 150.58 | 302 | 1.0000 | 1.0054 | 1 | 302 | 1.0000 | 0.9570 | 2 | 302 | 1.0000 | 1.0008 | 3 |
| 151.08 | 303 | 1.0000 | 1.0054 | 1 | 303 | 1.0000 | 0.9570 | 2 | 303 | 1.0000 | 1.0008 | 3 |
| 151.58 | 304 | 1.0000 | 1.0053 | 1 | 304 | 1.0000 | 0.9570 | 2 | 304 | 1.0000 | 1.0008 | 3 |
| 152.08 | 305 | 1.0000 | 1.0053 | 1 | 305 | 1.0000 | 0.9571 | 2 | 305 | 1.0000 | 1.0007 | 3 |
| 152.58 | 306 | 1.0000 | 1.0053 | 1 | 306 | 1.0000 | 0.9571 | 2 | 306 | 1.0000 | 1.0007 | 3 |
| 153.08 | 307 | 1.0000 | 1.0053 | 1 | 307 | 1.0000 | 0.9572 | 2 | 307 | 1.0000 | 1.0007 | 3 |
| 153.58 | 308 | 1.0000 | 1.0052 | 1 | 308 | 1.0000 | 0.9573 | 2 | 308 | 1.0000 | 1.0007 | 3 |
| 154.08 | 309 | 1.0000 | 1.0052 | 1 | 309 | 1.0000 | 0.9574 | 2 | 309 | 1.0000 | 1.0007 | 3 |
| 154.58 | 310 | 1.0000 | 1.0051 | 1 | 310 | 1.0000 | 0.9575 | 2 | 310 | 1.0000 | 1.0007 | 3 |
| 155.08 | 311 | 1.0000 | 1.0051 | 1 | 311 | 1.0000 | 0.9576 | 2 | 311 | 1.0000 | 1.0007 | 3 |
| 155.58 | 312 | 1.0000 | 1.0051 | 1 | 312 | 1.0000 | 0.9576 | 2 | 312 | 1.0000 | 1.0007 | 3 |
| 156.08 | 313 | 1.0000 | 1.0050 | 1 | 313 | 1.0000 | 0.9577 | 2 | 313 | 1.0000 | 1.0007 | 3 |
| 156.58 | 314 | 1.0000 | 1.0050 | 1 | 314 | 1.0000 | 0.9578 | 2 | 314 | 1.0000 | 1.0007 | 3 |
| 157.08 | 315 | 1.0000 | 1.0050 | 1 | 315 | 1.0000 | 0.9578 | 2 | 315 | 1.0000 | 1.0007 | 3 |
| 157.58 | 316 | 1.0000 | 1.0050 | 1 | 316 | 1.0000 | 0.9578 | 2 | 316 | 1.0000 | 1.0007 | 3 |
| 158.08 | 317 | 1.0000 | 1.0050 | 1 | 317 | 1.0000 | 0.9578 | 2 | 317 | 1.0000 | 1.0007 | 3 |
| 158.58 | 318 | 1.0000 | 1.0050 | 1 | 318 | 1.0000 | 0.9578 | 2 | 318 | 1.0000 | 1.0007 | 3 |
| 159.08 | 319 | 1.0000 | 1.0050 | 1 | 319 | 1.0000 | 0.9578 | 2 | 319 | 1.0000 | 1.0007 | 3 |
| 159.58 | 320 | 1.0000 | 1.0050 | 1 | 320 | 1.0000 | 0.9577 | 2 | 320 | 1.0000 | 1.0007 | 3 |
| 160.08 | 321 | 1.0000 | 1.0051 | 1 | 321 | 1.0000 | 0.9576 | 2 | 321 | 1.0000 | 1.0007 | 3 |
| 160.58 | 322 | 1.0000 | 1.0051 | 1 | 322 | 1.0000 | 0.9576 | 2 | 322 | 1.0000 | 1.0007 | 3 |
| 161.08 | 323 | 1.0000 | 1.0051 | 1 | 323 | 1.0000 | 0.9575 | 2 | 323 | 1.0000 | 1.0007 | 3 |
| 161.58 | 324 | 1.0000 | 1.0052 | 1 | 324 | 1.0000 | 0.9574 | 2 | 324 | 1.0000 | 1.0007 | 3 |
| 162.08 | 325 | 1.0000 | 1.0052 | 1 | 325 | 1.0000 | 0.9572 | 2 | 325 | 1.0000 | 1.0007 | 3 |
| 162.58 | 326 | 1.0000 | 1.0053 | 1 | 326 | 1.0000 | 0.9571 | 2 | 326 | 1.0000 | 1.0007 | 3 |
| 163.08 | 327 | 1.0000 | 1.0053 | 1 | 327 | 1.0000 | 0.9571 | 2 | 327 | 1.0000 | 1.0007 | 3 |
| 163.58 | 328 | 1.0000 | 1.0053 | 1 | 328 | 1.0000 | 0.9570 | 2 | 328 | 1.0000 | 1.0008 | 3 |
| 164.08 | 329 | 1.0000 | 1.0054 | 1 | 329 | 1.0000 | 0.9569 | 2 | 329 | 1.0000 | 1.0008 | 3 |
| 164.58 | 330 | 1.0000 | 1.0054 | 1 | 330 | 1.0000 | 0.9569 | 2 | 330 | 1.0000 | 1.0008 | 3 |
| 165.08 | 331 | 1.0000 | 1.0054 | 1 | 331 | 1.0000 | 0.9569 | 2 | 331 | 1.0000 | 1.0008 | 3 |
| 165.58 | 332 | 1.0000 | 1.0054 | 1 | 332 | 1.0000 | 0.9569 | 2 | 332 | 1.0000 | 1.0008 | 3 |
| 166.08 | 333 | 1.0000 | 1.0054 | 1 | 333 | 1.0000 | 0.9569 | 2 | 333 | 1.0000 | 1.0008 | 3 |
| 166.58 | 334 | 1.0000 | 1.0053 | 1 | 334 | 1.0000 | 0.9569 | 2 | 334 | 1.0000 | 1.0008 | 3 |
| 167.08 | 335 | 1.0000 | 1.0053 | 1 | 335 | 1.0000 | 0.9570 | 2 | 335 | 1.0000 | 1.0008 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 167.58 | 336 | 1.0000 | 1.0053 | 1 | 336 | 1.0000 | 0.9571 | 2 | 336 | 1.0000 | 1.0007 | 3 |
| 168.08 | 337 | 1.0000 | 1.0052 | 1 | 337 | 1.0000 | 0.9571 | 2 | 337 | 1.0000 | 1.0007 | 3 |
| 168.58 | 338 | 1.0000 | 1.0052 | 1 | 338 | 1.0000 | 0.9572 | 2 | 338 | 1.0000 | 1.0007 | 3 |
| 169.08 | 339 | 1.0000 | 1.0052 | 1 | 339 | 1.0000 | 0.9573 | 2 | 339 | 1.0000 | 1.0007 | 3 |
| 169.58 | 340 | 1.0000 | 1.0051 | 1 | 340 | 1.0000 | 0.9574 | 2 | 340 | 1.0000 | 1.0007 | 3 |
| 170.08 | 341 | 1.0000 | 1.0051 | 1 | 341 | 1.0000 | 0.9576 | 2 | 341 | 1.0000 | 1.0007 | 3 |
| 170.58 | 342 | 1.0000 | 1.0050 | 1 | 342 | 1.0000 | 0.9577 | 2 | 342 | 1.0000 | 1.0007 | 3 |
| 171.08 | 343 | 1.0000 | 1.0050 | 1 | 343 | 1.0000 | 0.9577 | 2 | 343 | 1.0000 | 1.0007 | 3 |
| 171.58 | 344 | 1.0000 | 1.0049 | 1 | 344 | 1.0000 | 0.9578 | 2 | 344 | 1.0000 | 1.0007 | 3 |
| 172.08 | 345 | 1.0000 | 1.0049 | 1 | 345 | 1.0000 | 0.9579 | 2 | 345 | 1.0000 | 1.0007 | 3 |
| 172.58 | 346 | 1.0000 | 1.0049 | 1 | 346 | 1.0000 | 0.9579 | 2 | 346 | 1.0000 | 1.0007 | 3 |
| 173.08 | 347 | 1.0000 | 1.0049 | 1 | 347 | 1.0000 | 0.9579 | 2 | 347 | 1.0000 | 1.0007 | 3 |
| 173.58 | 348 | 1.0000 | 1.0049 | 1 | 348 | 1.0000 | 0.9579 | 2 | 348 | 1.0000 | 1.0007 | 3 |
| 174.08 | 349 | 1.0000 | 1.0049 | 1 | 349 | 1.0000 | 0.9579 | 2 | 349 | 1.0000 | 1.0007 | 3 |
| 174.58 | 350 | 1.0000 | 1.0049 | 1 | 350 | 1.0000 | 0.9578 | 2 | 350 | 1.0000 | 1.0007 | 3 |
| 175.08 | 351 | 1.0000 | 1.0050 | 1 | 351 | 1.0000 | 0.9577 | 2 | 351 | 1.0000 | 1.0007 | 3 |
| 175.58 | 352 | 1.0000 | 1.0050 | 1 | 352 | 1.0000 | 0.9576 | 2 | 352 | 1.0000 | 1.0007 | 3 |
| 176.08 | 353 | 1.0000 | 1.0051 | 1 | 353 | 1.0000 | 0.9575 | 2 | 353 | 1.0000 | 1.0007 | 3 |
| 176.58 | 354 | 1.0000 | 1.0051 | 1 | 354 | 1.0000 | 0.9574 | 2 | 354 | 1.0000 | 1.0007 | 3 |
| 177.08 | 355 | 1.0000 | 1.0052 | 1 | 355 | 1.0000 | 0.9573 | 2 | 355 | 1.0000 | 1.0007 | 3 |
| 177.58 | 356 | 1.0000 | 1.0052 | 1 | 356 | 1.0000 | 0.9571 | 2 | 356 | 1.0000 | 1.0007 | 3 |
| 178.08 | 357 | 1.0000 | 1.0053 | 1 | 357 | 1.0000 | 0.9570 | 2 | 357 | 1.0000 | 1.0007 | 3 |
| 178.58 | 358 | 1.0000 | 1.0053 | 1 | 358 | 1.0000 | 0.9569 | 2 | 358 | 1.0000 | 1.0008 | 3 |
| 179.08 | 359 | 1.0000 | 1.0053 | 1 | 359 | 1.0000 | 0.9569 | 2 | 359 | 1.0000 | 1.0008 | 3 |
| 179.58 | 360 | 1.0000 | 1.0053 | 1 | 360 | 1.0000 | 0.9568 | 2 | 360 | 1.0000 | 1.0008 | 3 |
| 180.08 | 361 | 1.0000 | 1.0054 | 1 | 361 | 1.0000 | 0.9568 | 2 | 361 | 1.0000 | 1.0008 | 3 |
| 180.58 | 362 | 1.0000 | 1.0054 | 1 | 362 | 1.0000 | 0.9568 | 2 | 362 | 1.0000 | 1.0008 | 3 |
| 181.08 | 363 | 1.0000 | 1.0054 | 1 | 363 | 1.0000 | 0.9568 | 2 | 363 | 1.0000 | 1.0008 | 3 |
| 181.58 | 364 | 1.0000 | 1.0053 | 1 | 364 | 1.0000 | 0.9568 | 2 | 364 | 1.0000 | 1.0008 | 3 |
| 182.08 | 365 | 1.0000 | 1.0053 | 1 | 365 | 1.0000 | 0.9568 | 2 | 365 | 1.0000 | 1.0008 | 3 |
| 182.58 | 366 | 1.0000 | 1.0053 | 1 | 366 | 1.0000 | 0.9569 | 2 | 366 | 1.0000 | 1.0008 | 3 |
| 183.08 | 367 | 1.0000 | 1.0053 | 1 | 367 | 1.0000 | 0.9570 | 2 | 367 | 1.0000 | 1.0007 | 3 |
| 183.58 | 368 | 1.0000 | 1.0052 | 1 | 368 | 1.0000 | 0.9571 | 2 | 368 | 1.0000 | 1.0007 | 3 |
| 184.08 | 369 | 1.0000 | 1.0052 | 1 | 369 | 1.0000 | 0.9572 | 2 | 369 | 1.0000 | 1.0007 | 3 |
| 184.58 | 370 | 1.0000 | 1.0051 | 1 | 370 | 1.0000 | 0.9573 | 2 | 370 | 1.0000 | 1.0007 | 3 |
| 185.08 | 371 | 1.0000 | 1.0051 | 1 | 371 | 1.0000 | 0.9574 | 2 | 371 | 1.0000 | 1.0007 | 3 |
| 185.58 | 372 | 1.0000 | 1.0050 | 1 | 372 | 1.0000 | 0.9576 | 2 | 372 | 1.0000 | 1.0007 | 3 |
| 186.08 | 373 | 1.0000 | 1.0050 | 1 | 373 | 1.0000 | 0.9577 | 2 | 373 | 1.0000 | 1.0007 | 3 |
| 186.58 | 374 | 1.0000 | 1.0049 | 1 | 374 | 1.0000 | 0.9578 | 2 | 374 | 1.0000 | 1.0007 | 3 |
| 187.08 | 375 | 1.0000 | 1.0049 | 1 | 375 | 1.0000 | 0.9579 | 2 | 375 | 1.0000 | 1.0007 | 3 |
| 187.58 | 376 | 1.0000 | 1.0048 | 1 | 376 | 1.0000 | 0.9579 | 2 | 376 | 1.0000 | 1.0007 | 3 |
| 188.08 | 377 | 1.0000 | 1.0048 | 1 | 377 | 1.0000 | 0.9580 | 2 | 377 | 1.0000 | 1.0007 | 3 |
| 188.58 | 378 | 1.0000 | 1.0048 | 1 | 378 | 1.0000 | 0.9580 | 2 | 378 | 1.0000 | 1.0007 | 3 |
| 189.08 | 379 | 1.0000 | 1.0048 | 1 | 379 | 1.0000 | 0.9580 | 2 | 379 | 1.0000 | 1.0007 | 3 |
| 189.58 | 380 | 1.0000 | 1.0048 | 1 | 380 | 1.0000 | 0.9580 | 2 | 380 | 1.0000 | 1.0007 | 3 |
| 190.08 | 381 | 1.0000 | 1.0048 | 1 | 381 | 1.0000 | 0.9579 | 2 | 381 | 1.0000 | 1.0007 | 3 |
| 190.58 | 382 | 1.0000 | 1.0049 | 1 | 382 | 1.0000 | 0.9578 | 2 | 382 | 1.0000 | 1.0007 | 3 |
| 191.08 | 383 | 1.0000 | 1.0049 | 1 | 383 | 1.0000 | 0.9577 | 2 | 383 | 1.0000 | 1.0007 | 3 |
| 191.58 | 384 | 1.0000 | 1.0050 | 1 | 384 | 1.0000 | 0.9575 | 2 | 384 | 1.0000 | 1.0007 | 3 |
| 192.08 | 385 | 1.0000 | 1.0050 | 1 | 385 | 1.0000 | 0.9574 | 2 | 385 | 1.0000 | 1.0007 | 3 |
| 192.58 | 386 | 1.0000 | 1.0051 | 1 | 386 | 1.0000 | 0.9573 | 2 | 386 | 1.0000 | 1.0007 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 193.08 | 387 | 1.0000 | 1.0052 | 1 | 387 | 1.0000 | 0.9571 | 2 | 387 | 1.0000 | 1.0007 | 3 |
| 193.58 | 388 | 1.0000 | 1.0052 | 1 | 388 | 1.0000 | 0.9570 | 2 | 388 | 1.0000 | 1.0007 | 3 |
| 194.08 | 389 | 1.0000 | 1.0053 | 1 | 389 | 1.0000 | 0.9569 | 2 | 389 | 1.0000 | 1.0008 | 3 |
| 194.58 | 390 | 1.0000 | 1.0053 | 1 | 390 | 1.0000 | 0.9568 | 2 | 390 | 1.0000 | 1.0008 | 3 |
| 195.08 | 391 | 1.0000 | 1.0053 | 1 | 391 | 1.0000 | 0.9567 | 2 | 391 | 1.0000 | 1.0008 | 3 |
| 195.58 | 392 | 1.0000 | 1.0053 | 1 | 392 | 1.0000 | 0.9567 | 2 | 392 | 1.0000 | 1.0008 | 3 |
| 196.08 | 393 | 1.0000 | 1.0053 | 1 | 393 | 1.0000 | 0.9566 | 2 | 393 | 1.0000 | 1.0008 | 3 |
| 196.58 | 394 | 1.0000 | 1.0053 | 1 | 394 | 1.0000 | 0.9567 | 2 | 394 | 1.0000 | 1.0008 | 3 |
| 197.08 | 395 | 1.0000 | 1.0053 | 1 | 395 | 1.0000 | 0.9567 | 2 | 395 | 1.0000 | 1.0008 | 3 |
| 197.58 | 396 | 1.0000 | 1.0053 | 1 | 396 | 1.0000 | 0.9567 | 2 | 396 | 1.0000 | 1.0008 | 3 |
| 198.08 | 397 | 1.0000 | 1.0053 | 1 | 397 | 1.0000 | 0.9568 | 2 | 397 | 1.0000 | 1.0008 | 3 |
| 198.58 | 398 | 1.0000 | 1.0052 | 1 | 398 | 1.0000 | 0.9569 | 2 | 398 | 1.0000 | 1.0008 | 3 |
| 199.08 | 399 | 1.0000 | 1.0052 | 1 | 399 | 1.0000 | 0.9570 | 2 | 399 | 1.0000 | 1.0007 | 3 |
| 199.58 | 400 | 1.0000 | 1.0052 | 1 | 400 | 1.0000 | 0.9571 | 2 | 400 | 1.0000 | 1.0007 | 3 |
| 200.08 | 401 | 1.0000 | 1.0051 | 1 | 401 | 1.0000 | 0.9572 | 2 | 401 | 1.0000 | 1.0007 | 3 |
| 200.58 | 402 | 1.0000 | 1.0051 | 1 | 402 | 1.0000 | 0.9573 | 2 | 402 | 1.0000 | 1.0007 | 3 |
| 201.08 | 403 | 1.0000 | 1.0050 | 1 | 403 | 1.0000 | 0.9574 | 2 | 403 | 1.0000 | 1.0007 | 3 |
| 201.58 | 404 | 1.0000 | 1.0049 | 1 | 404 | 1.0000 | 0.9575 | 2 | 404 | 1.0000 | 1.0007 | 3 |
| 202.08 | 405 | 1.0000 | 1.0049 | 1 | 405 | 1.0000 | 0.9576 | 2 | 405 | 1.0000 | 1.0007 | 3 |
| 202.58 | 406 | 1.0000 | 1.0048 | 1 | 406 | 1.0000 | 0.9577 | 2 | 406 | 1.0000 | 1.0007 | 3 |
| 203.08 | 407 | 1.0000 | 1.0048 | 1 | 407 | 1.0000 | 0.9578 | 2 | 407 | 1.0000 | 1.0007 | 3 |
| 203.58 | 408 | 1.0000 | 1.0048 | 1 | 408 | 1.0000 | 0.9579 | 2 | 408 | 1.0000 | 1.0007 | 3 |
| 204.08 | 409 | 1.0000 | 1.0048 | 1 | 409 | 1.0000 | 0.9579 | 2 | 409 | 1.0000 | 1.0007 | 3 |
| 204.58 | 410 | 1.0000 | 1.0048 | 1 | 410 | 1.0000 | 0.9579 | 2 | 410 | 1.0000 | 1.0007 | 3 |
| 205.08 | 411 | 1.0000 | 1.0048 | 1 | 411 | 1.0000 | 0.9578 | 2 | 411 | 1.0000 | 1.0007 | 3 |
| 205.58 | 412 | 1.0000 | 1.0048 | 1 | 412 | 1.0000 | 0.9577 | 2 | 412 | 1.0000 | 1.0007 | 3 |
| 206.08 | 413 | 1.0000 | 1.0049 | 1 | 413 | 1.0000 | 0.9576 | 2 | 413 | 1.0000 | 1.0007 | 3 |
| 206.58 | 414 | 1.0000 | 1.0049 | 1 | 414 | 1.0000 | 0.9575 | 2 | 414 | 1.0000 | 1.0007 | 3 |
| 207.08 | 415 | 1.0000 | 1.0050 | 1 | 415 | 1.0000 | 0.9573 | 2 | 415 | 1.0000 | 1.0007 | 3 |
| 207.58 | 416 | 1.0000 | 1.0051 | 1 | 416 | 1.0000 | 0.9572 | 2 | 416 | 1.0000 | 1.0007 | 3 |
| 208.08 | 417 | 1.0000 | 1.0051 | 1 | 417 | 1.0000 | 0.9570 | 2 | 417 | 1.0000 | 1.0008 | 3 |
| 208.58 | 418 | 1.0000 | 1.0052 | 1 | 418 | 1.0000 | 0.9568 | 2 | 418 | 1.0000 | 1.0008 | 3 |
| 209.08 | 419 | 1.0000 | 1.0053 | 1 | 419 | 1.0000 | 0.9567 | 2 | 419 | 1.0000 | 1.0008 | 3 |
| 209.58 | 420 | 1.0000 | 1.0053 | 1 | 420 | 1.0000 | 0.9565 | 2 | 420 | 1.0000 | 1.0008 | 3 |
| 210.08 | 421 | 1.0000 | 1.0053 | 1 | 421 | 1.0000 | 0.9564 | 2 | 421 | 1.0000 | 1.0008 | 3 |
| 210.58 | 422 | 1.0000 | 1.0054 | 1 | 422 | 1.0000 | 0.9563 | 2 | 422 | 1.0000 | 1.0008 | 3 |
| 211.08 | 423 | 1.0000 | 1.0054 | 1 | 423 | 1.0000 | 0.9562 | 2 | 423 | 1.0000 | 1.0008 | 3 |
| 211.58 | 424 | 1.0000 | 1.0054 | 1 | 424 | 1.0000 | 0.9562 | 2 | 424 | 1.0000 | 1.0008 | 3 |
| 212.08 | 425 | 1.0000 | 1.0054 | 1 | 425 | 1.0000 | 0.9562 | 2 | 425 | 1.0000 | 1.0008 | 3 |
| 212.58 | 426 | 1.0000 | 1.0054 | 1 | 426 | 1.0000 | 0.9562 | 2 | 426 | 1.0000 | 1.0008 | 3 |
| 213.08 | 427 | 1.0000 | 1.0054 | 1 | 427 | 1.0000 | 0.9562 | 2 | 427 | 1.0000 | 1.0008 | 3 |
| 213.58 | 428 | 1.0000 | 1.0054 | 1 | 428 | 1.0000 | 0.9562 | 2 | 428 | 1.0000 | 1.0008 | 3 |
| 214.08 | 429 | 1.0000 | 1.0054 | 1 | 429 | 1.0000 | 0.9563 | 2 | 429 | 1.0000 | 1.0008 | 3 |
| 214.58 | 430 | 1.0000 | 1.0053 | 1 | 430 | 1.0000 | 0.9564 | 2 | 430 | 1.0000 | 1.0008 | 3 |
| 215.08 | 431 | 1.0000 | 1.0053 | 1 | 431 | 1.0000 | 0.9565 | 2 | 431 | 1.0000 | 1.0008 | 3 |
| 215.58 | 432 | 1.0000 | 1.0052 | 1 | 432 | 1.0000 | 0.9566 | 2 | 432 | 1.0000 | 1.0008 | 3 |
| 216.08 | 433 | 1.0000 | 1.0052 | 1 | 433 | 1.0000 | 0.9567 | 2 | 433 | 1.0000 | 1.0008 | 3 |
| 216.58 | 434 | 1.0000 | 1.0051 | 1 | 434 | 1.0000 | 0.9568 | 2 | 434 | 1.0000 | 1.0008 | 3 |
| 217.08 | 435 | 1.0000 | 1.0051 | 1 | 435 | 1.0000 | 0.9569 | 2 | 435 | 1.0000 | 1.0008 | 3 |
| 217.58 | 436 | 1.0000 | 1.0050 | 1 | 436 | 1.0000 | 0.9570 | 2 | 436 | 1.0000 | 1.0008 | 3 |
| 218.08 | 437 | 1.0000 | 1.0050 | 1 | 437 | 1.0000 | 0.9571 | 2 | 437 | 1.0000 | 1.0007 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 218.58 | 438 | 1.0000 | 1.0050 | 1 | 438 | 1.0000 | 0.9572 | 2 | 438 | 1.0000 | 1.0007 | 3 |
| 219.08 | 439 | 1.0000 | 1.0049 | 1 | 439 | 1.0000 | 0.9573 | 2 | 439 | 1.0000 | 1.0007 | 3 |
| 219.58 | 440 | 1.0000 | 1.0049 | 1 | 440 | 1.0000 | 0.9574 | 2 | 440 | 1.0000 | 1.0007 | 3 |
| 220.08 | 441 | 1.0000 | 1.0049 | 1 | 441 | 1.0000 | 0.9574 | 2 | 441 | 1.0000 | 1.0007 | 3 |
| 220.58 | 442 | 1.0000 | 1.0049 | 1 | 442 | 1.0000 | 0.9573 | 2 | 442 | 1.0000 | 1.0007 | 3 |
| 221.08 | 443 | 1.0000 | 1.0049 | 1 | 443 | 1.0000 | 0.9573 | 2 | 443 | 1.0000 | 1.0007 | 3 |
| 221.58 | 444 | 1.0000 | 1.0049 | 1 | 444 | 1.0000 | 0.9572 | 2 | 444 | 1.0000 | 1.0007 | 3 |
| 222.08 | 445 | 1.0000 | 1.0050 | 1 | 445 | 1.0000 | 0.9571 | 2 | 445 | 1.0000 | 1.0008 | 3 |
| 222.58 | 446 | 1.0000 | 1.0050 | 1 | 446 | 1.0000 | 0.9570 | 2 | 446 | 1.0000 | 1.0008 | 3 |
| 223.08 | 447 | 1.0000 | 1.0051 | 1 | 447 | 1.0000 | 0.9568 | 2 | 447 | 1.0000 | 1.0008 | 3 |
| 223.58 | 448 | 1.0000 | 1.0052 | 1 | 448 | 1.0000 | 0.9566 | 2 | 448 | 1.0000 | 1.0008 | 3 |
| 224.08 | 449 | 1.0000 | 1.0052 | 1 | 449 | 1.0000 | 0.9565 | 2 | 449 | 1.0000 | 1.0008 | 3 |
| 224.58 | 450 | 1.0000 | 1.0053 | 1 | 450 | 1.0000 | 0.9563 | 2 | 450 | 1.0000 | 1.0008 | 3 |
| 225.08 | 451 | 1.0000 | 1.0053 | 1 | 451 | 1.0000 | 0.9561 | 2 | 451 | 1.0000 | 1.0008 | 3 |
| 225.58 | 452 | 1.0000 | 1.0054 | 1 | 452 | 1.0000 | 0.9560 | 2 | 452 | 1.0000 | 1.0008 | 3 |
| 226.08 | 453 | 1.0000 | 1.0054 | 1 | 453 | 1.0000 | 0.9559 | 2 | 453 | 1.0000 | 1.0008 | 3 |
| 226.58 | 454 | 1.0000 | 1.0054 | 1 | 454 | 1.0000 | 0.9558 | 2 | 454 | 1.0000 | 1.0008 | 3 |
| 227.08 | 455 | 1.0000 | 1.0055 | 1 | 455 | 1.0000 | 0.9557 | 2 | 455 | 1.0000 | 1.0008 | 3 |
| 227.58 | 456 | 1.0000 | 1.0055 | 1 | 456 | 1.0000 | 0.9557 | 2 | 456 | 1.0000 | 1.0008 | 3 |
| 228.08 | 457 | 1.0000 | 1.0055 | 1 | 457 | 1.0000 | 0.9557 | 2 | 457 | 1.0000 | 1.0008 | 3 |
| 228.58 | 458 | 1.0000 | 1.0055 | 1 | 458 | 1.0000 | 0.9557 | 2 | 458 | 1.0000 | 1.0008 | 3 |
| 229.08 | 459 | 1.0000 | 1.0055 | 1 | 459 | 1.0000 | 0.9557 | 2 | 459 | 1.0000 | 1.0008 | 3 |
| 229.58 | 460 | 1.0000 | 1.0054 | 1 | 460 | 1.0000 | 0.9558 | 2 | 460 | 1.0000 | 1.0008 | 3 |
| 230.08 | 461 | 1.0000 | 1.0054 | 1 | 461 | 1.0000 | 0.9558 | 2 | 461 | 1.0000 | 1.0008 | 3 |
| 230.58 | 462 | 1.0000 | 1.0054 | 1 | 462 | 1.0000 | 0.9559 | 2 | 462 | 1.0000 | 1.0008 | 3 |
| 231.08 | 463 | 1.0000 | 1.0053 | 1 | 463 | 1.0000 | 0.9560 | 2 | 463 | 1.0000 | 1.0008 | 3 |
| 231.58 | 464 | 1.0000 | 1.0053 | 1 | 464 | 1.0000 | 0.9561 | 2 | 464 | 1.0000 | 1.0008 | 3 |
| 232.08 | 465 | 1.0000 | 1.0053 | 1 | 465 | 1.0000 | 0.9562 | 2 | 465 | 1.0000 | 1.0008 | 3 |
| 232.58 | 466 | 1.0000 | 1.0052 | 1 | 466 | 1.0000 | 0.9563 | 2 | 466 | 1.0000 | 1.0008 | 3 |
| 233.08 | 467 | 1.0000 | 1.0052 | 1 | 467 | 1.0000 | 0.9564 | 2 | 467 | 1.0000 | 1.0008 | 3 |
| 233.58 | 468 | 1.0000 | 1.0051 | 1 | 468 | 1.0000 | 0.9566 | 2 | 468 | 1.0000 | 1.0008 | 3 |
| 234.08 | 469 | 1.0000 | 1.0051 | 1 | 469 | 1.0000 | 0.9567 | 2 | 469 | 1.0000 | 1.0008 | 3 |
| 234.58 | 470 | 1.0000 | 1.0050 | 1 | 470 | 1.0000 | 0.9568 | 2 | 470 | 1.0000 | 1.0008 | 3 |
| 235.08 | 471 | 1.0000 | 1.0050 | 1 | 471 | 1.0000 | 0.9568 | 2 | 471 | 1.0000 | 1.0008 | 3 |
| 235.58 | 472 | 1.0000 | 1.0050 | 1 | 472 | 1.0000 | 0.9569 | 2 | 472 | 1.0000 | 1.0008 | 3 |
| 236.08 | 473 | 1.0000 | 1.0050 | 1 | 473 | 1.0000 | 0.9569 | 2 | 473 | 1.0000 | 1.0008 | 3 |
| 236.58 | 474 | 1.0000 | 1.0050 | 1 | 474 | 1.0000 | 0.9569 | 2 | 474 | 1.0000 | 1.0008 | 3 |
| 237.08 | 475 | 1.0000 | 1.0050 | 1 | 475 | 1.0000 | 0.9568 | 2 | 475 | 1.0000 | 1.0008 | 3 |
| 237.58 | 476 | 1.0000 | 1.0050 | 1 | 476 | 1.0000 | 0.9568 | 2 | 476 | 1.0000 | 1.0008 | 3 |
| 238.08 | 477 | 1.0000 | 1.0051 | 1 | 477 | 1.0000 | 0.9566 | 2 | 477 | 1.0000 | 1.0008 | 3 |
| 238.58 | 478 | 1.0000 | 1.0051 | 1 | 478 | 1.0000 | 0.9565 | 2 | 478 | 1.0000 | 1.0008 | 3 |
| 239.08 | 479 | 1.0000 | 1.0052 | 1 | 479 | 1.0000 | 0.9563 | 2 | 479 | 1.0000 | 1.0008 | 3 |
| 239.58 | 480 | 1.0000 | 1.0052 | 1 | 480 | 1.0000 | 0.9562 | 2 | 480 | 1.0000 | 1.0008 | 3 |
| 240.08 | 481 | 1.0000 | 1.0053 | 1 | 481 | 1.0000 | 0.9560 | 2 | 481 | 1.0000 | 1.0008 | 3 |
| 240.58 | 482 | 1.0000 | 1.0053 | 1 | 482 | 1.0000 | 0.9558 | 2 | 482 | 1.0000 | 1.0008 | 3 |
| 241.08 | 483 | 1.0000 | 1.0054 | 1 | 483 | 1.0000 | 0.9557 | 2 | 483 | 1.0000 | 1.0008 | 3 |
| 241.58 | 484 | 1.0000 | 1.0054 | 1 | 484 | 1.0000 | 0.9555 | 2 | 484 | 1.0000 | 1.0008 | 3 |
| 242.08 | 485 | 1.0000 | 1.0055 | 1 | 485 | 1.0000 | 0.9554 | 2 | 485 | 1.0000 | 1.0008 | 3 |
| 242.58 | 486 | 1.0000 | 1.0055 | 1 | 486 | 1.0000 | 0.9553 | 2 | 486 | 1.0000 | 1.0008 | 3 |
| 243.08 | 487 | 1.0000 | 1.0055 | 1 | 487 | 1.0000 | 0.9553 | 2 | 487 | 1.0000 | 1.0008 | 3 |
| 243.58 | 488 | 1.0000 | 1.0055 | 1 | 488 | 1.0000 | 0.9552 | 2 | 488 | 1.0000 | 1.0008 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 244.08 | 489 | 1.0000 | 1.0055 | 1 | 489 | 1.0000 | 0.9552 | 2 | 489 | 1.0000 | 1.0008 | 3 |
| 244.58 | 490 | 1.0000 | 1.0055 | 1 | 490 | 1.0000 | 0.9552 | 2 | 490 | 1.0000 | 1.0008 | 3 |
| 245.08 | 491 | 1.0000 | 1.0055 | 1 | 491 | 1.0000 | 0.9553 | 2 | 491 | 1.0000 | 1.0008 | 3 |
| 245.58 | 492 | 1.0000 | 1.0055 | 1 | 492 | 1.0000 | 0.9553 | 2 | 492 | 1.0000 | 1.0008 | 3 |
| 246.08 | 493 | 1.0000 | 1.0055 | 1 | 493 | 1.0000 | 0.9554 | 2 | 493 | 1.0000 | 1.0008 | 3 |
| 246.58 | 494 | 1.0000 | 1.0054 | 1 | 494 | 1.0000 | 0.9554 | 2 | 494 | 1.0000 | 1.0008 | 3 |
| 247.08 | 495 | 1.0000 | 1.0054 | 1 | 495 | 1.0000 | 0.9555 | 2 | 495 | 1.0000 | 1.0008 | 3 |
| 247.58 | 496 | 1.0000 | 1.0054 | 1 | 496 | 1.0000 | 0.9556 | 2 | 496 | 1.0000 | 1.0008 | 3 |
| 248.08 | 497 | 1.0000 | 1.0053 | 1 | 497 | 1.0000 | 0.9557 | 2 | 497 | 1.0000 | 1.0008 | 3 |
| 248.58 | 498 | 1.0000 | 1.0053 | 1 | 498 | 1.0000 | 0.9559 | 2 | 498 | 1.0000 | 1.0008 | 3 |

| | | | | |
|---|---|---|---|---|
| TIME | IDER | XD | X | ERROR ID |
| RECALL SET SIZE | | | | 498 |
| RECALL SET ERROR RMS | | | | 0.084590 |
| MAX BIAS OR WEIGHT | | | | 20.0000 |
| MAX GAIN OR CONSTANT | | | | 2.0000 |

## D.2 Scenario F23 No-Noise

Below are the no-noise results for the F23 scenario. These results are file F23.PRX.

| Time (sec) | Node 1 | | | | Node 2 | | | | Node 3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Desired Output | Actual Output | | | Desired Output | Actual Output | | | Desired Output | Actual Output | |
| 21.92 | 1 | 0.0000 | 0.0401 | 1 | 1 | 0.0000 | 0.0108 | 2 | 1 | 0.0000 | 0.0366 | 3 |
| 22.42 | 2 | 0.0000 | 0.0401 | 1 | 2 | 0.0000 | 0.0108 | 2 | 2 | 0.0000 | 0.0366 | 3 |
| 22.92 | 3 | 0.0000 | 0.0401 | 1 | 3 | 0.0000 | 0.0108 | 2 | 3 | 0.0000 | 0.0366 | 3 |
| 23.42 | 4 | 0.0000 | 0.0401 | 1 | 4 | 0.0000 | 0.0108 | 2 | 4 | 0.0000 | 0.0366 | 3 |
| 23.92 | 5 | 0.0000 | 0.0401 | 1 | 5 | 0.0000 | 0.0108 | 2 | 5 | 0.0000 | 0.0366 | 3 |
| 24.42 | 6 | 0.0000 | 0.0400 | 1 | 6 | 0.0000 | 0.0108 | 2 | 6 | 0.0000 | 0.0366 | 3 |
| 24.92 | 7 | 0.0000 | 0.0400 | 1 | 7 | 0.0000 | 0.0108 | 2 | 7 | 0.0000 | 0.0366 | 3 |
| 25.42 | 8 | 0.0000 | 0.0399 | 1 | 8 | 0.0000 | 0.0108 | 2 | 8 | 0.0000 | 0.0367 | 3 |
| 25.92 | 9 | 0.0000 | 0.0399 | 1 | 9 | 0.0000 | 0.0108 | 2 | 9 | 0.0000 | 0.0367 | 3 |
| 26.42 | 10 | 0.0000 | 0.0400 | 1 | 10 | 0.0000 | 0.0108 | 2 | 10 | 0.0000 | 0.0366 | 3 |
| 26.92 | 11 | 0.0000 | 0.0400 | 1 | 11 | 0.0000 | 0.0108 | 2 | 11 | 0.0000 | 0.0367 | 3 |
| 27.42 | 12 | 0.0000 | 0.0399 | 1 | 12 | 0.0000 | 0.0108 | 2 | 12 | 0.0000 | 0.0367 | 3 |
| 27.92 | 13 | 0.0000 | 0.0402 | 1 | 13 | 0.0000 | 0.0108 | 2 | 13 | 0.0000 | 0.0366 | 3 |
| 28.42 | 14 | 0.0000 | 0.0402 | 1 | 14 | 0.0000 | 0.0108 | 2 | 14 | 0.0000 | 0.0366 | 3 |
| 28.92 | 15 | 0.0000 | 0.0402 | 1 | 15 | 0.0000 | 0.0108 | 2 | 15 | 0.0000 | 0.0366 | 3 |
| 29.42 | 16 | 0.0000 | 0.0402 | 1 | 16 | 0.0000 | 0.0108 | 2 | 16 | 0.0000 | 0.0366 | 3 |
| 29.92 | 17 | 0.0000 | 0.0401 | 1 | 17 | 0.0000 | 0.0108 | 2 | 17 | 0.0000 | 0.0366 | 3 |
| 30.42 | 18 | 0.0000 | 0.0401 | 1 | 18 | 0.0000 | 0.0108 | 2 | 18 | 0.0000 | 0.0366 | 3 |
| 30.92 | 19 | 0.0000 | 0.0401 | 1 | 19 | 0.0000 | 0.0108 | 2 | 19 | 0.0000 | 0.0366 | 3 |
| 31.42 | 20 | 0.0000 | 0.0402 | 1 | 20 | 0.0000 | 0.0108 | 2 | 20 | 0.0000 | 0.0366 | 3 |
| 31.92 | 21 | 0.0000 | 0.0402 | 1 | 21 | 0.0000 | 0.0108 | 2 | 21 | 0.0000 | 0.0366 | 3 |
| 32.42 | 22 | 0.0000 | 0.0401 | 1 | 22 | 0.0000 | 0.0108 | 2 | 22 | 0.0000 | 0.0366 | 3 |
| 32.92 | 23 | 1.0000 | 0.0398 | 1 | 23 | 1.0000 | 0.0108 | 2 | 23 | 0.0000 | 0.0367 | 3 |
| 33.42 | 24 | 1.0000 | 0.0417 | 1 | 24 | 1.0000 | 0.0107 | 2 | 24 | 0.0000 | 0.0362 | 3 |
| 33.92 | 25 | 1.0000 | 0.0440 | 1 | 25 | 1.0000 | 0.0107 | 2 | 25 | 0.0000 | 0.0357 | 3 |
| 34.42 | 26 | 1.0000 | 0.0461 | 1 | 26 | 1.0000 | 0.0106 | 2 | 26 | 0.0000 | 0.0353 | 3 |
| 34.92 | 27 | 1.0000 | 0.0478 | 1 | 27 | 1.0000 | 0.0106 | 2 | 27 | 0.0000 | 0.0350 | 3 |
| 35.42 | 28 | 1.0000 | 0.0495 | 1 | 28 | 1.0000 | 0.0106 | 2 | 28 | 0.0000 | 0.0347 | 3 |
| 35.92 | 29 | 1.0000 | 0.0509 | 1 | 29 | 1.0000 | 0.0106 | 2 | 29 | 0.0000 | 0.0345 | 3 |
| 36.42 | 30 | 1.0000 | 0.0525 | 1 | 30 | 1.0000 | 0.0105 | 2 | 30 | 0.0000 | 0.0343 | 3 |
| 36.92 | 31 | 1.0000 | 0.0542 | 1 | 31 | 1.0000 | 0.0105 | 2 | 31 | 0.0000 | 0.0340 | 3 |
| 37.42 | 32 | 1.0000 | 0.0563 | 1 | 32 | 1.0000 | 0.0105 | 2 | 32 | 0.0000 | 0.0338 | 3 |
| 37.92 | 33 | 1.0000 | 0.0589 | 1 | 33 | 1.0000 | 0.0105 | 2 | 33 | 0.0000 | 0.0335 | 3 |
| 38.42 | 34 | 1.0000 | 0.0623 | 1 | 34 | 1.0000 | 0.0104 | 2 | 34 | 0.0000 | 0.0332 | 3 |
| 38.92 | 35 | 1.0000 | 0.0669 | 1 | 35 | 1.0000 | 0.0104 | 2 | 35 | 0.0000 | 0.0329 | 3 |
| 39.42 | 36 | 1.0000 | 0.0730 | 1 | 36 | 1.0000 | 0.0103 | 2 | 36 | 0.0000 | 0.0325 | 3 |
| 39.92 | 37 | 1.0000 | 0.0814 | 1 | 37 | 1.0000 | 0.0103 | 2 | 37 | 0.0000 | 0.0320 | 3 |
| 40.42 | 38 | 1.0000 | 0.0937 | 1 | 38 | 1.0000 | 0.0103 | 2 | 38 | 0.0000 | 0.0316 | 3 |
| 40.92 | 39 | 1.0000 | 0.1120 | 1 | 39 | 1.0000 | 0.0102 | 2 | 39 | 0.0000 | 0.0311 | 3 |
| 41.42 | 40 | 1.0000 | 0.1419 | 1 | 40 | 1.0000 | 0.0102 | 2 | 40 | 0.0000 | 0.0306 | 3 |
| 41.92 | 41 | 1.0000 | 0.1918 | 1 | 41 | 1.0000 | 0.0102 | 2 | 41 | 0.0000 | 0.0301 | 3 |
| 42.42 | 42 | 1.0000 | 0.2912 | 1 | 42 | 1.0000 | 0.0101 | 2 | 42 | 0.0000 | 0.0297 | 3 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 42.92 | 43 | 1.0000 | 0.4758 | 1 | 43 | 1.0000 | 0.0101 | 2 | 43 | 0.0000 | 0.0292 | 3 |
| 43.42 | 44 | 1.0000 | 0.6798 | 1 | 44 | 1.0000 | 0.0102 | 2 | 44 | 0.0000 | 0.0288 | 3 |
| 43.92 | 45 | 1.0000 | 0.8020 | 1 | 45 | 1.0000 | 0.0103 | 2 | 45 | 0.0000 | 0.0284 | 3 |
| 44.42 | 46 | 1.0000 | 0.8614 | 1 | 46 | 1.0000 | 0.0104 | 2 | 46 | 0.0000 | 0.0281 | 3 |
| 44.92 | 47 | 1.0000 | 0.9051 | 1 | 47 | 1.0000 | 0.0106 | 2 | 47 | 0.0000 | 0.0278 | 3 |
| 45.42 | 48 | 1.0000 | 0.4279 | 1 | 48 | 1.0000 | 0.0134 | 2 | 48 | 0.0000 | 0.0285 | 3 |
| 45.92 | 49 | 1.0000 | 0.8414 | 1 | 49 | 1.0000 | 0.0148 | 2 | 49 | 0.0000 | 0.0271 | 3 |
| 46.42 | 50 | 1.0000 | 0.8602 | 1 | 50 | 1.0000 | 0.0173 | 2 | 50 | 0.0000 | 0.0267 | 3 |
| 46.92 | 51 | 1.0000 | 0.8812 | 1 | 51 | 1.0000 | 0.0193 | 2 | 51 | 0.0000 | 0.0266 | 3 |
| 47.42 | 52 | 1.0000 | 0.8229 | 1 | 52 | 1.0000 | 0.0183 | 2 | 52 | 0.0000 | 0.0269 | 3 |
| 47.92 | 53 | 1.0000 | 0.4098 | 1 | 53 | 1.0000 | 0.0159 | 2 | 53 | 0.0000 | 0.0281 | 3 |
| 48.42 | 54 | 1.0000 | 0.3234 | 1 | 54 | 1.0000 | 0.0186 | 2 | 54 | 0.0000 | 0.0301 | 3 |
| 48.92 | 55 | 1.0000 | 0.1431 | 1 | 55 | 1.0000 | 0.0396 | 2 | 55 | 0.0000 | 0.0367 | 3 |
| 49.42 | 56 | 1.0000 | 0.0253 | 1 | 56 | 1.0000 | 0.9928 | 2 | 56 | 0.0000 | 0.1228 | 3 |
| 49.92 | 57 | 1.0000 | 0.0161 | 1 | 57 | 1.0000 | 1.0073 | 2 | 57 | 0.0000 | 0.8902 | 3 |
| 50.42 | 58 | 1.0000 | 0.0220 | 1 | 58 | 1.0000 | 1.0062 | 2 | 58 | 0.0000 | 0.6852 | 3 |
| 50.92 | 59 | 1.0000 | 0.0780 | 1 | 59 | 1.0000 | 1.0014 | 2 | 59 | 0.0000 | 0.0901 | 3 |
| 51.42 | 60 | 1.0000 | 0.9784 | 1 | 60 | 1.0000 | 0.9945 | 2 | 60 | 0.0000 | 0.0459 | 3 |
| 51.92 | 61 | 1.0000 | 1.0097 | 1 | 61 | 1.0000 | 0.9909 | 2 | 61 | 0.0000 | 0.0376 | 3 |
| 52.42 | 62 | 1.0000 | 1.0157 | 1 | 62 | 1.0000 | 0.9898 | 2 | 62 | 0.0000 | 0.0341 | 3 |
| 52.92 | 63 | 1.0000 | 1.0165 | 1 | 63 | 1.0000 | 0.9907 | 2 | 63 | 0.0000 | 0.0326 | 3 |
| 53.42 | 64 | 1.0000 | 1.0164 | 1 | 64 | 1.0000 | 0.9914 | 2 | 64 | 0.0000 | 0.0316 | 3 |
| 53.92 | 65 | 1.0000 | 1.0160 | 1 | 65 | 1.0000 | 0.9919 | 2 | 65 | 0.0000 | 0.0309 | 3 |
| 54.42 | 66 | 1.0000 | 1.0155 | 1 | 66 | 1.0000 | 0.9920 | 2 | 66 | 0.0000 | 0.0303 | 3 |
| 54.92 | 67 | 1.0000 | 1.0148 | 1 | 67 | 1.0000 | 0.9927 | 2 | 67 | 0.0000 | 0.0299 | 3 |
| 55.42 | 68 | 1.0000 | 1.0141 | 1 | 68 | 1.0000 | 0.9938 | 2 | 68 | 0.0000 | 0.0295 | 3 |
| 55.92 | 69 | 1.0000 | 1.0135 | 1 | 69 | 1.0000 | 0.9945 | 2 | 69 | 0.0000 | 0.0292 | 3 |
| 56.42 | 70 | 1.0000 | 1.0131 | 1 | 70 | 1.0000 | 0.9949 | 2 | 70 | 0.0000 | 0.0290 | 3 |
| 56.92 | 71 | 1.0000 | 1.0128 | 1 | 71 | 1.0000 | 0.9949 | 2 | 71 | 0.0000 | 0.0289 | 3 |
| 57.42 | 72 | 1.0000 | 1.0127 | 1 | 72 | 1.0000 | 0.9949 | 2 | 72 | 0.0000 | 0.0288 | 3 |
| 57.92 | 73 | 1.0000 | 1.0128 | 1 | 73 | 1.0000 | 0.9948 | 2 | 73 | 0.0000 | 0.0287 | 3 |
| 58.42 | 74 | 1.0000 | 1.0131 | 1 | 74 | 1.0000 | 0.9947 | 2 | 74 | 0.0000 | 0.0287 | 3 |
| 58.92 | 75 | 1.0000 | 1.0137 | 1 | 75 | 1.0000 | 0.9944 | 2 | 75 | 0.0000 | 0.0288 | 3 |
| 59.42 | 76 | 1.0000 | 1.0145 | 1 | 76 | 1.0000 | 0.9943 | 2 | 76 | 0.0000 | 0.0289 | 3 |
| 59.92 | 77 | 1.0000 | 1.0161 | 1 | 77 | 1.0000 | 0.9939 | 2 | 77 | 0.0000 | 0.0292 | 3 |
| 60.42 | 78 | 1.0000 | 1.0177 | 1 | 78 | 1.0000 | 0.9935 | 2 | 78 | 0.0000 | 0.0296 | 3 |
| 60.92 | 79 | 1.0000 | 1.0193 | 1 | 79 | 1.0000 | 0.9931 | 2 | 79 | 0.0000 | 0.0301 | 3 |
| 61.42 | 80 | 1.0000 | 1.0208 | 1 | 80 | 1.0000 | 0.9926 | 2 | 80 | 0.0000 | 0.0305 | 3 |
| 61.92 | 81 | 1.0000 | 1.0224 | 1 | 81 | 1.0000 | 0.9918 | 2 | 81 | 0.0000 | 0.0311 | 3 |
| 62.42 | 82 | 1.0000 | 1.0239 | 1 | 82 | 1.0000 | 0.9909 | 2 | 82 | 0.0000 | 0.0316 | 3 |
| 62.92 | 83 | 1.0000 | 1.0253 | 1 | 83 | 1.0000 | 0.9896 | 2 | 83 | 0.0000 | 0.0323 | 3 |
| 63.42 | 84 | 1.0000 | 1.0267 | 1 | 84 | 1.0000 | 0.9878 | 2 | 84 | 0.0000 | 0.0331 | 3 |
| 63.92 | 85 | 1.0000 | 1.0279 | 1 | 85 | 1.0000 | 0.9856 | 2 | 85 | 0.0000 | 0.0338 | 3 |
| 64.42 | 86 | 1.0000 | 1.0287 | 1 | 86 | 1.0000 | 0.9835 | 2 | 86 | 0.0000 | 0.0345 | 3 |
| 64.92 | 87 | 1.0000 | 1.0295 | 1 | 87 | 1.0000 | 0.9809 | 2 | 87 | 0.0000 | 0.0352 | 3 |
| 65.42 | 88 | 1.0000 | 1.0301 | 1 | 88 | 1.0000 | 0.9781 | 2 | 88 | 0.0000 | 0.0359 | 3 |
| 65.92 | 89 | 1.0000 | 1.0309 | 1 | 89 | 1.0000 | 0.9738 | 2 | 89 | 0.0000 | 0.0368 | 3 |
| 66.42 | 90 | 1.0000 | 1.0314 | 1 | 90 | 1.0000 | 0.9695 | 2 | 90 | 0.0000 | 0.0377 | 3 |
| 66.92 | 91 | 1.0000 | 1.0319 | 1 | 91 | 1.0000 | 0.9646 | 2 | 91 | 0.0000 | 0.0387 | 3 |
| 67.42 | 92 | 1.0000 | 1.0324 | 1 | 92 | 1.0000 | 0.9588 | 2 | 92 | 0.0000 | 0.0398 | 3 |
| 67.92 | 93 | 1.0000 | 1.0327 | 1 | 93 | 1.0000 | 0.9538 | 2 | 93 | 0.0000 | 0.0411 | 3 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 68.42 | 94 | 1.0000 | 1.0329 | 1 | 94 | 1.0000 | 0.9479 | 2 | 94 | 0.0000 | 0.0428 | 3 |
| 68.92 | 95 | 1.0000 | 1.0333 | 1 | 95 | 1.0000 | 0.9366 | 2 | 95 | 0.0000 | 0.0452 | 3 |
| 69.42 | 96 | 1.0000 | 1.0334 | 1 | 96 | 1.0000 | 0.9292 | 2 | 96 | 0.0000 | 0.0477 | 3 |
| 69.92 | 97 | 1.0000 | 1.0333 | 1 | 97 | 1.0000 | 0.9264 | 2 | 97 | 0.0000 | 0.0504 | 3 |
| 70.42 | 98 | 1.0000 | 1.0330 | 1 | 98 | 1.0000 | 0.9267 | 2 | 98 | 0.0000 | 0.0534 | 3 |
| 70.92 | 99 | 1.0000 | 1.0328 | 1 | 99 | 1.0000 | 0.9209 | 2 | 99 | 0.0000 | 0.0582 | 3 |
| 71.42 | 100 | 1.0000 | 1.0322 | 1 | 100 | 1.0000 | 0.9279 | 2 | 100 | 0.0000 | 0.0622 | 3 |
| 71.92 | 101 | 1.0000 | 1.0316 | 1 | 101 | 1.0000 | 0.9336 | 2 | 101 | 0.0000 | 0.0665 | 3 |
| 72.42 | 102 | 1.0000 | 1.0309 | 1 | 102 | 1.0000 | 0.9396 | 2 | 102 | 0.0000 | 0.0721 | 3 |
| 72.92 | 103 | 1.0000 | 1.0300 | 1 | 103 | 1.0000 | 0.9474 | 2 | 103 | 0.0000 | 0.0764 | 3 |
| 73.42 | 104 | 1.0000 | 1.0290 | 1 | 104 | 1.0000 | 0.9545 | 2 | 104 | 0.0000 | 0.0804 | 3 |
| 73.92 | 105 | 1.0000 | 1.0280 | 1 | 105 | 1.0000 | 0.9611 | 2 | 105 | 0.0000 | 0.0834 | 3 |
| 74.42 | 106 | 1.0000 | 1.0270 | 1 | 106 | 1.0000 | 0.9664 | 2 | 106 | 0.0000 | 0.0849 | 3 |
| 74.92 | 107 | 1.0000 | 1.0259 | 1 | 107 | 1.0000 | 0.9717 | 2 | 107 | 0.0000 | 0.0846 | 3 |
| 75.42 | 108 | 1.0000 | 1.0305 | 1 | 108 | 1.0000 | 0.9481 | 2 | 108 | 0.0000 | 0.0658 | 3 |
| 75.92 | 109 | 1.0000 | 1.0245 | 1 | 109 | 1.0000 | 0.9773 | 2 | 109 | 0.0000 | 0.0807 | 3 |
| 76.42 | 110 | 1.0000 | 1.0234 | 1 | 110 | 1.0000 | 0.9807 | 2 | 110 | 0.0000 | 0.0780 | 3 |
| 76.92 | 111 | 1.0000 | 1.0222 | 1 | 111 | 1.0000 | 0.9832 | 2 | 111 | 0.0000 | 0.0772 | 3 |
| 77.42 | 112 | 1.0000 | 1.0211 | 1 | 112 | 1.0000 | 0.9853 | 2 | 112 | 0.0000 | 0.0758 | 3 |
| 77.92 | 113 | 1.0000 | 1.0197 | 1 | 113 | 1.0000 | 0.9873 | 2 | 113 | 0.0000 | 0.0745 | 3 |
| 78.42 | 114 | 1.0000 | 1.0183 | 1 | 114 | 1.0000 | 0.9894 | 2 | 114 | 0.0000 | 0.0719 | 3 |
| 78.92 | 115 | 1.0000 | 1.0169 | 1 | 115 | 1.0000 | 0.9908 | 2 | 115 | 0.0000 | 0.0705 | 3 |
| 79.42 | 116 | 1.0000 | 1.0154 | 1 | 116 | 1.0000 | 0.9921 | 2 | 116 | 0.0000 | 0.0695 | 3 |
| 79.92 | 117 | 1.0000 | 1.0137 | 1 | 117 | 1.0000 | 0.9933 | 2 | 117 | 0.0000 | 0.0684 | 3 |
| 80.42 | 118 | 1.0000 | 1.0120 | 1 | 118 | 1.0000 | 0.9944 | 2 | 118 | 0.0000 | 0.0665 | 3 |
| 80.92 | 119 | 1.0000 | 1.0104 | 1 | 119 | 1.0000 | 0.9953 | 2 | 119 | 0.0000 | 0.0655 | 3 |
| 81.42 | 120 | 1.0000 | 1.0089 | 1 | 120 | 1.0000 | 0.9961 | 2 | 120 | 0.0000 | 0.0640 | 3 |
| 81.92 | 121 | 1.0000 | 1.0075 | 1 | 121 | 1.0000 | 0.9968 | 2 | 121 | 0.0000 | 0.0620 | 3 |
| 82.42 | 122 | 1.0000 | 1.0061 | 1 | 122 | 1.0000 | 0.9975 | 2 | 122 | 0.0000 | 0.0602 | 3 |
| 82.92 | 123 | 1.0000 | 1.0050 | 1 | 123 | 1.0000 | 0.9980 | 2 | 123 | 0.0000 | 0.0586 | 3 |
| 83.42 | 124 | 1.0000 | 1.0041 | 1 | 124 | 1.0000 | 0.9985 | 2 | 124 | 0.0000 | 0.0567 | 3 |
| 83.92 | 125 | 1.0000 | 1.0028 | 1 | 125 | 1.0000 | 0.9990 | 2 | 125 | 0.0000 | 0.0557 | 3 |
| 84.42 | 126 | 1.0000 | 1.0023 | 1 | 126 | 1.0000 | 0.9994 | 2 | 126 | 0.0000 | 0.0537 | 3 |
| 84.92 | 127 | 1.0000 | 1.0017 | 1 | 127 | 1.0000 | 0.9997 | 2 | 127 | 0.0000 | 0.0525 | 3 |
| 85.42 | 128 | 1.0000 | 1.0012 | 1 | 128 | 1.0000 | 1.0001 | 2 | 128 | 0.0000 | 0.0507 | 3 |
| 85.92 | 129 | 1.0000 | 1.0011 | 1 | 129 | 1.0000 | 1.0003 | 2 | 129 | 0.0000 | 0.0493 | 3 |
| 86.42 | 130 | 1.0000 | 1.0011 | 1 | 130 | 1.0000 | 1.0006 | 2 | 130 | 0.0000 | 0.0479 | 3 |
| 86.92 | 131 | 1.0000 | 1.0013 | 1 | 131 | 1.0000 | 1.0009 | 2 | 131 | 0.0000 | 0.0462 | 3 |
| 87.42 | 132 | 1.0000 | 1.0017 | 1 | 132 | 1.0000 | 1.0011 | 2 | 132 | 0.0000 | 0.0447 | 3 |
| 87.92 | 133 | 1.0000 | 1.0020 | 1 | 133 | 1.0000 | 1.0013 | 2 | 133 | 0.0000 | 0.0433 | 3 |
| 88.42 | 134 | 1.0000 | 1.0026 | 1 | 134 | 1.0000 | 1.0015 | 2 | 134 | 0.0000 | 0.0419 | 3 |
| 88.92 | 135 | 1.0000 | 1.0030 | 1 | 135 | 1.0000 | 1.0017 | 2 | 135 | 0.0000 | 0.0408 | 3 |
| 89.42 | 136 | 1.0000 | 1.0035 | 1 | 136 | 1.0000 | 1.0018 | 2 | 136 | 0.0000 | 0.0397 | 3 |
| 89.92 | 137 | 1.0000 | 1.0037 | 1 | 137 | 1.0000 | 1.0020 | 2 | 137 | 0.0000 | 0.0389 | 3 |
| 90.42 | 138 | 1.0000 | 1.0039 | 1 | 138 | 1.0000 | 1.0021 | 2 | 138 | 0.0000 | 0.0383 | 3 |
| 90.92 | 139 | 1.0000 | 1.0041 | 1 | 139 | 1.0000 | 1.0022 | 2 | 139 | 0.0000 | 0.0377 | 3 |
| 91.42 | 140 | 1.0000 | 1.0042 | 1 | 140 | 1.0000 | 1.0023 | 2 | 140 | 0.0000 | 0.0372 | 3 |
| 91.92 | 141 | 1.0000 | 1.0042 | 1 | 141 | 1.0000 | 1.0024 | 2 | 141 | 0.0000 | 0.0367 | 3 |
| 92.42 | 142 | 1.0000 | 1.0044 | 1 | 142 | 1.0000 | 1.0024 | 2 | 142 | 0.0000 | 0.0363 | 3 |
| 92.92 | 143 | 1.0000 | 1.0045 | 1 | 143 | 1.0000 | 1.0025 | 2 | 143 | 0.0000 | 0.0359 | 3 |
| 93.42 | 144 | 1.0000 | 1.0046 | 1 | 144 | 1.0000 | 1.0026 | 2 | 144 | 0.0000 | 0.0355 | 3 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 93.92 | 145 | 1.0000 | 1.0048 | 1 | 145 | 1.0000 | 1.0026 | 2 | 145 | 0.0000 | 0.0352 | 3 |
| 94.42 | 146 | 1.0000 | 1.0050 | 1 | 146 | 1.0000 | 1.0027 | 2 | 146 | 0.0000 | 0.0348 | 3 |
| 94.92 | 147 | 1.0000 | 1.0051 | 1 | 147 | 1.0000 | 1.0027 | 2 | 147 | 0.0000 | 0.0345 | 3 |
| 95.42 | 148 | 1.0000 | 1.0053 | 1 | 148 | 1.0000 | 1.0027 | 2 | 148 | 0.0000 | 0.0341 | 3 |
| 95.92 | 149 | 1.0000 | 1.0054 | 1 | 149 | 1.0000 | 1.0028 | 2 | 149 | 0.0000 | 0.0338 | 3 |
| 96.42 | 150 | 1.0000 | 1.0056 | 1 | 150 | 1.0000 | 1.0028 | 2 | 150 | 0.0000 | 0.0336 | 3 |
| 96.92 | 151 | 1.0000 | 1.0057 | 1 | 151 | 1.0000 | 1.0028 | 2 | 151 | 0.0000 | 0.0333 | 3 |
| 97.42 | 152 | 1.0000 | 1.0059 | 1 | 152 | 1.0000 | 1.0028 | 2 | 152 | 0.0000 | 0.0331 | 3 |
| 97.92 | 153 | 1.0000 | 1.0059 | 1 | 153 | 1.0000 | 1.0028 | 2 | 153 | 0.0000 | 0.0329 | 3 |
| 98.42 | 154 | 1.0000 | 1.0060 | 1 | 154 | 1.0000 | 1.0029 | 2 | 154 | 0.0000 | 0.0326 | 3 |
| 98.92 | 155 | 1.0000 | 1.0061 | 1 | 155 | 1.0000 | 1.0029 | 2 | 155 | 0.0000 | 0.0324 | 3 |
| 99.42 | 156 | 1.0000 | 1.0062 | 1 | 156 | 1.0000 | 1.0029 | 2 | 156 | 0.0000 | 0.0322 | 3 |
| 99.92 | 157 | 1.0000 | 1.0063 | 1 | 157 | 1.0000 | 1.0029 | 2 | 157 | 0.0000 | 0.0320 | 3 |
| 100.42 | 158 | 1.0000 | 1.0063 | 1 | 158 | 1.0000 | 1.0029 | 2 | 158 | 0.0000 | 0.0318 | 3 |
| 100.92 | 159 | 1.0000 | 1.0064 | 1 | 159 | 1.0000 | 1.0029 | 2 | 159 | 0.0000 | 0.0317 | 3 |
| 101.42 | 160 | 1.0000 | 1.0064 | 1 | 160 | 1.0000 | 1.0029 | 2 | 160 | 0.0000 | 0.0315 | 3 |
| 101.92 | 161 | 1.0000 | 1.0065 | 1 | 161 | 1.0000 | 1.0030 | 2 | 161 | 0.0000 | 0.0314 | 3 |
| 102.42 | 162 | 1.0000 | 1.0065 | 1 | 162 | 1.0000 | 1.0030 | 2 | 162 | 0.0000 | 0.0313 | 3 |
| 102.92 | 163 | 1.0000 | 1.0065 | 1 | 163 | 1.0000 | 1.0030 | 2 | 163 | 0.0000 | 0.0312 | 3 |
| 103.42 | 164 | 1.0000 | 1.0065 | 1 | 164 | 1.0000 | 1.0029 | 2 | 164 | 0.0000 | 0.0311 | 3 |
| 103.92 | 165 | 1.0000 | 1.0065 | 1 | 165 | 1.0000 | 1.0029 | 2 | 165 | 0.0000 | 0.0310 | 3 |
| 104.42 | 166 | 1.0000 | 1.0065 | 1 | 166 | 1.0000 | 1.0029 | 2 | 166 | 0.0000 | 0.0309 | 3 |
| 104.92 | 167 | 1.0000 | 1.0066 | 1 | 167 | 1.0000 | 1.0029 | 2 | 167 | 0.0000 | 0.0309 | 3 |
| 105.42 | 168 | 1.0000 | 1.0066 | 1 | 168 | 1.0000 | 1.0029 | 2 | 168 | 0.0000 | 0.0308 | 3 |
| 105.92 | 169 | 1.0000 | 1.0066 | 1 | 169 | 1.0000 | 1.0029 | 2 | 169 | 0.0000 | 0.0307 | 3 |
| 106.42 | 170 | 1.0000 | 1.0066 | 1 | 170 | 1.0000 | 1.0029 | 2 | 170 | 0.0000 | 0.0306 | 3 |
| 106.92 | 171 | 1.0000 | 1.0066 | 1 | 171 | 1.0000 | 1.0028 | 2 | 171 | 0.0000 | 0.0306 | 3 |
| 107.42 | 172 | 1.0000 | 1.0066 | 1 | 172 | 1.0000 | 1.0028 | 2 | 172 | 0.0000 | 0.0305 | 3 |
| 107.92 | 173 | 1.0000 | 1.0066 | 1 | 173 | 1.0000 | 1.0028 | 2 | 173 | 0.0000 | 0.0304 | 3 |
| 108.42 | 174 | 1.0000 | 1.0067 | 1 | 174 | 1.0000 | 1.0028 | 2 | 174 | 0.0000 | 0.0303 | 3 |
| 108.92 | 175 | 1.0000 | 1.0067 | 1 | 175 | 1.0000 | 1.0028 | 2 | 175 | 0.0000 | 0.0303 | 3 |
| 109.42 | 176 | 1.0000 | 1.0066 | 1 | 176 | 1.0000 | 1.0028 | 2 | 176 | 0.0000 | 0.0302 | 3 |
| 109.92 | 177 | 1.0000 | 1.0067 | 1 | 177 | 1.0000 | 1.0027 | 2 | 177 | 0.0000 | 0.0302 | 3 |
| 110.42 | 178 | 1.0000 | 1.0066 | 1 | 178 | 1.0000 | 1.0027 | 2 | 178 | 0.0000 | 0.0301 | 3 |
| 110.92 | 179 | 1.0000 | 1.0066 | 1 | 179 | 1.0000 | 1.0027 | 2 | 179 | 0.0000 | 0.0300 | 3 |
| 111.42 | 180 | 1.0000 | 1.0066 | 1 | 180 | 1.0000 | 1.0027 | 2 | 180 | 0.0000 | 0.0299 | 3 |
| 111.92 | 181 | 1.0000 | 1.0066 | 1 | 181 | 1.0000 | 1.0027 | 2 | 181 | 0.0000 | 0.0299 | 3 |
| 112.42 | 182 | 1.0000 | 1.0066 | 1 | 182 | 1.0000 | 1.0027 | 2 | 182 | 0.0000 | 0.0298 | 3 |
| 112.92 | 183 | 1.0000 | 1.0066 | 1 | 183 | 1.0000 | 1.0026 | 2 | 183 | 0.0000 | 0.0298 | 3 |
| 113.42 | 184 | 1.0000 | 1.0066 | 1 | 184 | 1.0000 | 1.0026 | 2 | 184 | 0.0000 | 0.0298 | 3 |
| 113.92 | 185 | 1.0000 | 1.0066 | 1 | 185 | 1.0000 | 1.0026 | 2 | 185 | 0.0000 | 0.0297 | 3 |
| 114.42 | 186 | 1.0000 | 1.0066 | 1 | 186 | 1.0000 | 1.0026 | 2 | 186 | 0.0000 | 0.0297 | 3 |
| 114.92 | 187 | 1.0000 | 1.0065 | 1 | 187 | 1.0000 | 1.0025 | 2 | 187 | 0.0000 | 0.0296 | 3 |
| 115.42 | 188 | 1.0000 | 1.0065 | 1 | 188 | 1.0000 | 1.0025 | 2 | 188 | 0.0000 | 0.0296 | 3 |
| 115.92 | 189 | 1.0000 | 1.0065 | 1 | 189 | 1.0000 | 1.0025 | 2 | 189 | 0.0000 | 0.0295 | 3 |
| 116.42 | 190 | 1.0000 | 1.0065 | 1 | 190 | 1.0000 | 1.0025 | 2 | 190 | 0.0000 | 0.0295 | 3 |
| 116.92 | 191 | 1.0000 | 1.0065 | 1 | 191 | 1.0000 | 1.0025 | 2 | 191 | 0.0000 | 0.0295 | 3 |
| 117.42 | 192 | 1.0000 | 1.0064 | 1 | 192 | 1.0000 | 1.0024 | 2 | 192 | 0.0000 | 0.0294 | 3 |
| 117.92 | 193 | 1.0000 | 1.0064 | 1 | 193 | 1.0000 | 1.0024 | 2 | 193 | 0.0000 | 0.0294 | 3 |
| 118.42 | 194 | 1.0000 | 1.0064 | 1 | 194 | 1.0000 | 1.0024 | 2 | 194 | 0.0000 | 0.0293 | 3 |
| 118.92 | 195 | 1.0000 | 1.0064 | 1 | 195 | 1.0000 | 1.0024 | 2 | 195 | 0.0000 | 0.0293 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 119.42 | 196 | 1.0000 | 1.0064 | 1 | 196 | 1.0000 | 1.0024 | 2 | 196 | 0.0000 | 0.0293 | 3 |
| 119.92 | 197 | 1.0000 | 1.0063 | 1 | 197 | 1.0000 | 1.0024 | 2 | 197 | 0.0000 | 0.0292 | 3 |
| 120.42 | 198 | 1.0000 | 1.0063 | 1 | 198 | 1.0000 | 1.0024 | 2 | 198 | 0.0000 | 0.0292 | 3 |
| 120.92 | 199 | 1.0000 | 1.0063 | 1 | 199 | 1.0000 | 1.0023 | 2 | 199 | 0.0000 | 0.0291 | 3 |
| 121.42 | 200 | 1.0000 | 1.0062 | 1 | 200 | 1.0000 | 1.0023 | 2 | 200 | 0.0000 | 0.0291 | 3 |
| 121.92 | 201 | 1.0000 | 1.0062 | 1 | 201 | 1.0000 | 1.0023 | 2 | 201 | 0.0000 | 0.0290 | 3 |
| 122.42 | 202 | 1.0000 | 1.0062 | 1 | 202 | 1.0000 | 1.0023 | 2 | 202 | 0.0000 | 0.0290 | 3 |
| 122.92 | 203 | 1.0000 | 1.0062 | 1 | 203 | 1.0000 | 1.0023 | 2 | 203 | 0.0000 | 0.0290 | 3 |
| 123.42 | 204 | 1.0000 | 1.0061 | 1 | 204 | 1.0000 | 1.0023 | 2 | 204 | 0.0000 | 0.0290 | 3 |
| 123.92 | 205 | 1.0000 | 1.0061 | 1 | 205 | 1.0000 | 1.0023 | 2 | 205 | 0.0000 | 0.0289 | 3 |
| 124.42 | 206 | 1.0000 | 1.0061 | 1 | 206 | 1.0000 | 1.0023 | 2 | 206 | 0.0000 | 0.0289 | 3 |
| 124.92 | 207 | 1.0000 | 1.0061 | 1 | 207 | 1.0000 | 1.0023 | 2 | 207 | 0.0000 | 0.0289 | 3 |
| 125.42 | 208 | 1.0000 | 1.0060 | 1 | 208 | 1.0000 | 1.0023 | 2 | 208 | 0.0000 | 0.0289 | 3 |
| 125.92 | 209 | 1.0000 | 1.0060 | 1 | 209 | 1.0000 | 1.0023 | 2 | 209 | 0.0000 | 0.0289 | 3 |
| 126.42 | 210 | 1.0000 | 1.0060 | 1 | 210 | 1.0000 | 1.0023 | 2 | 210 | 0.0000 | 0.0288 | 3 |
| 126.92 | 211 | 1.0000 | 1.0059 | 1 | 211 | 1.0000 | 1.0023 | 2 | 211 | 0.0000 | 0.0289 | 3 |
| 127.42 | 212 | 1.0000 | 1.0059 | 1 | 212 | 1.0000 | 1.0024 | 2 | 212 | 0.0000 | 0.0289 | 3 |
| 127.92 | 213 | 1.0000 | 1.0059 | 1 | 213 | 1.0000 | 1.0024 | 2 | 213 | 0.0000 | 0.0289 | 3 |
| 128.42 | 214 | 1.0000 | 1.0059 | 1 | 214 | 1.0000 | 1.0024 | 2 | 214 | 0.0000 | 0.0289 | 3 |
| 128.92 | 215 | 1.0000 | 1.0058 | 1 | 215 | 1.0000 | 1.0025 | 2 | 215 | 0.0000 | 0.0289 | 3 |
| 129.42 | 216 | 1.0000 | 1.0058 | 1 | 216 | 1.0000 | 1.0025 | 2 | 216 | 0.0000 | 0.0289 | 3 |
| 129.92 | 217 | 1.0000 | 1.0058 | 1 | 217 | 1.0000 | 1.0026 | 2 | 217 | 0.0000 | 0.0289 | 3 |
| 130.42 | 218 | 1.0000 | 1.0058 | 1 | 218 | 1.0000 | 1.0026 | 2 | 218 | 0.0000 | 0.0289 | 3 |
| 130.92 | 219 | 1.0000 | 1.0057 | 1 | 219 | 1.0000 | 1.0027 | 2 | 219 | 0.0000 | 0.0290 | 3 |
| 131.42 | 220 | 1.0000 | 1.0057 | 1 | 220 | 1.0000 | 1.0027 | 2 | 220 | 0.0000 | 0.0290 | 3 |
| 131.92 | 221 | 1.0000 | 1.0057 | 1 | 221 | 1.0000 | 1.0028 | 2 | 221 | 0.0000 | 0.0290 | 3 |
| 132.42 | 222 | 1.0000 | 1.0056 | 1 | 222 | 1.0000 | 1.0028 | 2 | 222 | 0.0000 | 0.0290 | 3 |
| 132.92 | 223 | 1.0000 | 1.0056 | 1 | 223 | 1.0000 | 1.0029 | 2 | 223 | 0.0000 | 0.0290 | 3 |
| 133.42 | 224 | 1.0000 | 1.0055 | 1 | 224 | 1.0000 | 1.0029 | 2 | 224 | 0.0000 | 0.0290 | 3 |
| 133.92 | 225 | 1.0000 | 1.0055 | 1 | 225 | 1.0000 | 1.0030 | 2 | 225 | 0.0000 | 0.0291 | 3 |
| 134.42 | 226 | 1.0000 | 1.0055 | 1 | 226 | 1.0000 | 1.0030 | 2 | 226 | 0.0000 | 0.0291 | 3 |
| 134.92 | 227 | 1.0000 | 1.0054 | 1 | 227 | 1.0000 | 1.0030 | 2 | 227 | 0.0000 | 0.0291 | 3 |
| 135.42 | 228 | 1.0000 | 1.0054 | 1 | 228 | 1.0000 | 1.0031 | 2 | 228 | 0.0000 | 0.0291 | 3 |
| 135.92 | 229 | 1.0000 | 1.0054 | 1 | 229 | 1.0000 | 1.0031 | 2 | 229 | 0.0000 | 0.0290 | 3 |
| 136.42 | 230 | 1.0000 | 1.0053 | 1 | 230 | 1.0000 | 1.0031 | 2 | 230 | 0.0000 | 0.0290 | 3 |
| 136.92 | 231 | 1.0000 | 1.0053 | 1 | 231 | 1.0000 | 1.0031 | 2 | 231 | 0.0000 | 0.0290 | 3 |
| 137.42 | 232 | 1.0000 | 1.0053 | 1 | 232 | 1.0000 | 1.0031 | 2 | 232 | 0.0000 | 0.0290 | 3 |
| 137.92 | 233 | 1.0000 | 1.0053 | 1 | 233 | 1.0000 | 1.0031 | 2 | 233 | 0.0000 | 0.0290 | 3 |
| 138.42 | 234 | 1.0000 | 1.0053 | 1 | 234 | 1.0000 | 1.0031 | 2 | 234 | 0.0000 | 0.0289 | 3 |
| 138.92 | 235 | 1.0000 | 1.0052 | 1 | 235 | 1.0000 | 1.0031 | 2 | 235 | 0.0000 | 0.0289 | 3 |
| 139.42 | 236 | 1.0000 | 1.0052 | 1 | 236 | 1.0000 | 1.0031 | 2 | 236 | 0.0000 | 0.0288 | 3 |
| 139.92 | 237 | 1.0000 | 1.0052 | 1 | 237 | 1.0000 | 1.0031 | 2 | 237 | 0.0000 | 0.0288 | 3 |
| 140.42 | 238 | 1.0000 | 1.0052 | 1 | 238 | 1.0000 | 1.0031 | 2 | 238 | 0.0000 | 0.0288 | 3 |
| 140.92 | 239 | 1.0000 | 1.0052 | 1 | 239 | 1.0000 | 1.0032 | 2 | 239 | 0.0000 | 0.0288 | 3 |
| 141.42 | 240 | 1.0000 | 1.0052 | 1 | 240 | 1.0000 | 1.0032 | 2 | 240 | 0.0000 | 0.0287 | 3 |
| 141.92 | 241 | 1.0000 | 1.0052 | 1 | 241 | 1.0000 | 1.0032 | 2 | 241 | 0.0000 | 0.0287 | 3 |
| 142.42 | 242 | 1.0000 | 1.0051 | 1 | 242 | 1.0000 | 1.0032 | 2 | 242 | 0.0000 | 0.0287 | 3 |
| 142.92 | 243 | 1.0000 | 1.0051 | 1 | 243 | 1.0000 | 1.0032 | 2 | 243 | 0.0000 | 0.0287 | 3 |
| 143.42 | 244 | 1.0000 | 1.0051 | 1 | 244 | 1.0000 | 1.0033 | 2 | 244 | 0.0000 | 0.0287 | 3 |
| 143.92 | 245 | 1.0000 | 1.0051 | 1 | 245 | 1.0000 | 1.0033 | 2 | 245 | 0.0000 | 0.0287 | 3 |
| 144.42 | 246 | 1.0000 | 1.0050 | 1 | 246 | 1.0000 | 1.0034 | 2 | 246 | 0.0000 | 0.0287 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 144.92 | 247 | 1.0000 | 1.0050 | 1 | 247 | 1.0000 | 1.0034 | 2 | 247 | 0.0000 | 0.0287 | 3 |
| 145.42 | 248 | 1.0000 | 1.0049 | 1 | 248 | 1.0000 | 1.0035 | 2 | 248 | 0.0000 | 0.0287 | 3 |
| 145.92 | 249 | 1.0000 | 1.0049 | 1 | 249 | 1.0000 | 1.0035 | 2 | 249 | 0.0000 | 0.0287 | 3 |
| 146.42 | 250 | 1.0000 | 1.0048 | 1 | 250 | 1.0000 | 1.0036 | 2 | 250 | 0.0000 | 0.0288 | 3 |
| 146.92 | 251 | 1.0000 | 1.0047 | 1 | 251 | 1.0000 | 1.0036 | 2 | 251 | 0.0000 | 0.0288 | 3 |
| 147.42 | 252 | 1.0000 | 1.0047 | 1 | 252 | 1.0000 | 1.0037 | 2 | 252 | 0.0000 | 0.0288 | 3 |
| 147.92 | 253 | 1.0000 | 1.0046 | 1 | 253 | 1.0000 | 1.0038 | 2 | 253 | 0.0000 | 0.0288 | 3 |
| 148.42 | 254 | 1.0000 | 1.0045 | 1 | 254 | 1.0000 | 1.0038 | 2 | 254 | 0.0000 | 0.0289 | 3 |
| 148.92 | 255 | 1.0000 | 1.0045 | 1 | 255 | 1.0000 | 1.0038 | 2 | 255 | 0.0000 | 0.0289 | 3 |
| 149.42 | 256 | 1.0000 | 1.0045 | 1 | 256 | 1.0000 | 1.0039 | 2 | 256 | 0.0000 | 0.0289 | 3 |
| 149.92 | 257 | 1.0000 | 1.0044 | 1 | 257 | 1.0000 | 1.0039 | 2 | 257 | 0.0000 | 0.0289 | 3 |
| 150.42 | 258 | 1.0000 | 1.0044 | 1 | 258 | 1.0000 | 1.0039 | 2 | 258 | 0.0000 | 0.0288 | 3 |
| 150.92 | 259 | 1.0000 | 1.0044 | 1 | 259 | 1.0000 | 1.0040 | 2 | 259 | 0.0000 | 0.0288 | 3 |
| 151.42 | 260 | 1.0000 | 1.0044 | 1 | 260 | 1.0000 | 1.0040 | 2 | 260 | 0.0000 | 0.0288 | 3 |
| 151.92 | 261 | 1.0000 | 1.0044 | 1 | 261 | 1.0000 | 1.0040 | 2 | 261 | 0.0000 | 0.0288 | 3 |
| 152.42 | 262 | 1.0000 | 1.0044 | 1 | 262 | 1.0000 | 1.0040 | 2 | 262 | 0.0000 | 0.0288 | 3 |
| 152.92 | 263 | 1.0000 | 1.0044 | 1 | 263 | 1.0000 | 1.0040 | 2 | 263 | 0.0000 | 0.0287 | 3 |
| 153.42 | 264 | 1.0000 | 1.0044 | 1 | 264 | 1.0000 | 1.0040 | 2 | 264 | 0.0000 | 0.0287 | 3 |
| 153.92 | 265 | 1.0000 | 1.0044 | 1 | 265 | 1.0000 | 1.0040 | 2 | 265 | 0.0000 | 0.0286 | 3 |
| 154.42 | 266 | 1.0000 | 1.0044 | 1 | 266 | 1.0000 | 1.0040 | 2 | 266 | 0.0000 | 0.0286 | 3 |
| 154.92 | 267 | 1.0000 | 1.0044 | 1 | 267 | 1.0000 | 1.0040 | 2 | 267 | 0.0000 | 0.0286 | 3 |
| 155.42 | 268 | 1.0000 | 1.0044 | 1 | 268 | 1.0000 | 1.0040 | 2 | 268 | 0.0000 | 0.0286 | 3 |
| 155.92 | 269 | 1.0000 | 1.0044 | 1 | 269 | 1.0000 | 1.0040 | 2 | 269 | 0.0000 | 0.0285 | 3 |
| 156.42 | 270 | 1.0000 | 1.0044 | 1 | 270 | 1.0000 | 1.0040 | 2 | 270 | 0.0000 | 0.0285 | 3 |
| 156.92 | 271 | 1.0000 | 1.0044 | 1 | 271 | 1.0000 | 1.0040 | 2 | 271 | 0.0000 | 0.0285 | 3 |
| 157.42 | 272 | 1.0000 | 1.0044 | 1 | 272 | 1.0000 | 1.0040 | 2 | 272 | 0.0000 | 0.0285 | 3 |
| 157.92 | 273 | 1.0000 | 1.0043 | 1 | 273 | 1.0000 | 1.0041 | 2 | 273 | 0.0000 | 0.0285 | 3 |
| 158.42 | 274 | 1.0000 | 1.0043 | 1 | 274 | 1.0000 | 1.0041 | 2 | 274 | 0.0000 | 0.0285 | 3 |
| 158.92 | 275 | 1.0000 | 1.0043 | 1 | 275 | 1.0000 | 1.0041 | 2 | 275 | 0.0000 | 0.0285 | 3 |
| 159.42 | 276 | 1.0000 | 1.0042 | 1 | 276 | 1.0000 | 1.0042 | 2 | 276 | 0.0000 | 0.0285 | 3 |
| 159.92 | 277 | 1.0000 | 1.0041 | 1 | 277 | 1.0000 | 1.0042 | 2 | 277 | 0.0000 | 0.0286 | 3 |
| 160.42 | 278 | 1.0000 | 1.0041 | 1 | 278 | 1.0000 | 1.0043 | 2 | 278 | 0.0000 | 0.0286 | 3 |
| 160.92 | 279 | 1.0000 | 1.0040 | 1 | 279 | 1.0000 | 1.0043 | 2 | 279 | 0.0000 | 0.0286 | 3 |
| 161.42 | 280 | 1.0000 | 1.0039 | 1 | 280 | 1.0000 | 1.0044 | 2 | 280 | 0.0000 | 0.0286 | 3 |
| 161.92 | 281 | 1.0000 | 1.0038 | 1 | 281 | 1.0000 | 1.0044 | 2 | 281 | 0.0000 | 0.0287 | 3 |
| 162.42 | 282 | 1.0000 | 1.0037 | 1 | 282 | 1.0000 | 1.0045 | 2 | 282 | 0.0000 | 0.0287 | 3 |
| 162.92 | 283 | 1.0000 | 1.0037 | 1 | 283 | 1.0000 | 1.0045 | 2 | 283 | 0.0000 | 0.0287 | 3 |
| 163.42 | 284 | 1.0000 | 1.0036 | 1 | 284 | 1.0000 | 1.0046 | 2 | 284 | 0.0000 | 0.0287 | 3 |
| 163.92 | 285 | 1.0000 | 1.0036 | 1 | 285 | 1.0000 | 1.0046 | 2 | 285 | 0.0000 | 0.0287 | 3 |
| 164.42 | 286 | 1.0000 | 1.0035 | 1 | 286 | 1.0000 | 1.0046 | 2 | 286 | 0.0000 | 0.0287 | 3 |
| 164.92 | 287 | 1.0000 | 1.0035 | 1 | 287 | 1.0000 | 1.0046 | 2 | 287 | 0.0000 | 0.0287 | 3 |
| 165.42 | 288 | 1.0000 | 1.0035 | 1 | 288 | 1.0000 | 1.0046 | 2 | 288 | 0.0000 | 0.0287 | 3 |
| 165.92 | 289 | 1.0000 | 1.0035 | 1 | 289 | 1.0000 | 1.0047 | 2 | 289 | 0.0000 | 0.0287 | 3 |
| 166.42 | 290 | 1.0000 | 1.0035 | 1 | 290 | 1.0000 | 1.0047 | 2 | 290 | 0.0000 | 0.0286 | 3 |
| 166.92 | 291 | 1.0000 | 1.0035 | 1 | 291 | 1.0000 | 1.0047 | 2 | 291 | 0.0000 | 0.0286 | 3 |
| 167.42 | 292 | 1.0000 | 1.0036 | 1 | 292 | 1.0000 | 1.0046 | 2 | 292 | 0.0000 | 0.0286 | 3 |
| 167.92 | 293 | 1.0000 | 1.0036 | 1 | 293 | 1.0000 | 1.0046 | 2 | 293 | 0.0000 | 0.0285 | 3 |
| 168.42 | 294 | 1.0000 | 1.0036 | 1 | 294 | 1.0000 | 1.0046 | 2 | 294 | 0.0000 | 0.0285 | 3 |
| 168.92 | 295 | 1.0000 | 1.0037 | 1 | 295 | 1.0000 | 1.0046 | 2 | 295 | 0.0000 | 0.0285 | 3 |
| 169.42 | 296 | 1.0000 | 1.0037 | 1 | 296 | 1.0000 | 1.0046 | 2 | 296 | 0.0000 | 0.0285 | 3 |
| 169.92 | 297 | 1.0000 | 1.0037 | 1 | 297 | 1.0000 | 1.0046 | 2 | 297 | 0.0000 | 0.0284 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 170.42 | 298 | 1.0000 | 1.0037 | 1 | 298 | 1.0000 | 1.0046 | 2 | 298 | 0.0000 | 0.0284 | 3 |
| 170.92 | 299 | 1.0000 | 1.0037 | 1 | 299 | 1.0000 | 1.0046 | 2 | 299 | 0.0000 | 0.0284 | 3 |
| 171.42 | 300 | 1.0000 | 1.0036 | 1 | 300 | 1.0000 | 1.0046 | 2 | 300 | 0.0000 | 0.0284 | 3 |
| 171.92 | 301 | 1.0000 | 1.0036 | 1 | 301 | 1.0000 | 1.0047 | 2 | 301 | 0.0000 | 0.0284 | 3 |
| 172.42 | 302 | 1.0000 | 1.0036 | 1 | 302 | 1.0000 | 1.0047 | 2 | 302 | 0.0000 | 0.0284 | 3 |
| 172.92 | 303 | 1.0000 | 1.0035 | 1 | 303 | 1.0000 | 1.0047 | 2 | 303 | 0.0000 | 0.0284 | 3 |
| 173.42 | 304 | 1.0000 | 1.0035 | 1 | 304 | 1.0000 | 1.0048 | 2 | 304 | 0.0000 | 0.0285 | 3 |
| 173.92 | 305 | 1.0000 | 1.0034 | 1 | 305 | 1.0000 | 1.0048 | 2 | 305 | 0.0000 | 0.0285 | 3 |
| 174.42 | 306 | 1.0000 | 1.0033 | 1 | 306 | 1.0000 | 1.0048 | 2 | 306 | 0.0000 | 0.0285 | 3 |
| 174.92 | 307 | 1.0000 | 1.0032 | 1 | 307 | 1.0000 | 1.0049 | 2 | 307 | 0.0000 | 0.0285 | 3 |
| 175.42 | 308 | 1.0000 | 1.0031 | 1 | 308 | 1.0000 | 1.0049 | 2 | 308 | 0.0000 | 0.0286 | 3 |
| 175.92 | 309 | 1.0000 | 1.0030 | 1 | 309 | 1.0000 | 1.0050 | 2 | 309 | 0.0000 | 0.0286 | 3 |
| 176.42 | 310 | 1.0000 | 1.0029 | 1 | 310 | 1.0000 | 1.0050 | 2 | 310 | 0.0000 | 0.0286 | 3 |
| 176.92 | 311 | 1.0000 | 1.0027 | 1 | 311 | 1.0000 | 1.0051 | 2 | 311 | 0.0000 | 0.0286 | 3 |
| 177.42 | 312 | 1.0000 | 1.0027 | 1 | 312 | 1.0000 | 1.0051 | 2 | 312 | 0.0000 | 0.0287 | 3 |
| 177.92 | 313 | 1.0000 | 1.0026 | 1 | 313 | 1.0000 | 1.0051 | 2 | 313 | 0.0000 | 0.0287 | 3 |
| 178.42 | 314 | 1.0000 | 1.0026 | 1 | 314 | 1.0000 | 1.0052 | 2 | 314 | 0.0000 | 0.0287 | 3 |
| 178.92 | 315 | 1.0000 | 1.0025 | 1 | 315 | 1.0000 | 1.0052 | 2 | 315 | 0.0000 | 0.0287 | 3 |
| 179.42 | 316 | 1.0000 | 1.0025 | 1 | 316 | 1.0000 | 1.0052 | 2 | 316 | 0.0000 | 0.0286 | 3 |
| 179.92 | 317 | 1.0000 | 1.0025 | 1 | 317 | 1.0000 | 1.0052 | 2 | 317 | 0.0000 | 0.0286 | 3 |
| 180.42 | 318 | 1.0000 | 1.0026 | 1 | 318 | 1.0000 | 1.0052 | 2 | 318 | 0.0000 | 0.0286 | 3 |
| 180.92 | 319 | 1.0000 | 1.0026 | 1 | 319 | 1.0000 | 1.0052 | 2 | 319 | 0.0000 | 0.0286 | 3 |
| 181.42 | 320 | 1.0000 | 1.0026 | 1 | 320 | 1.0000 | 1.0052 | 2 | 320 | 0.0000 | 0.0285 | 3 |
| 181.92 | 321 | 1.0000 | 1.0027 | 1 | 321 | 1.0000 | 1.0052 | 2 | 321 | 0.0000 | 0.0285 | 3 |
| 182.42 | 322 | 1.0000 | 1.0028 | 1 | 322 | 1.0000 | 1.0052 | 2 | 322 | 0.0000 | 0.0285 | 3 |
| 182.92 | 323 | 1.0000 | 1.0028 | 1 | 323 | 1.0000 | 1.0052 | 2 | 323 | 0.0000 | 0.0284 | 3 |
| 183.42 | 324 | 1.0000 | 1.0028 | 1 | 324 | 1.0000 | 1.0052 | 2 | 324 | 0.0000 | 0.0284 | 3 |
| 183.92 | 325 | 1.0000 | 1.0029 | 1 | 325 | 1.0000 | 1.0052 | 2 | 325 | 0.0000 | 0.0284 | 3 |
| 184.42 | 326 | 1.0000 | 1.0029 | 1 | 326 | 1.0000 | 1.0052 | 2 | 326 | 0.0000 | 0.0284 | 3 |
| 184.92 | 327 | 1.0000 | 1.0029 | 1 | 327 | 1.0000 | 1.0052 | 2 | 327 | 0.0000 | 0.0284 | 3 |
| 185.42 | 328 | 1.0000 | 1.0029 | 1 | 328 | 1.0000 | 1.0052 | 2 | 328 | 0.0000 | 0.0284 | 3 |
| 185.92 | 329 | 1.0000 | 1.0028 | 1 | 329 | 1.0000 | 1.0052 | 2 | 329 | 0.0000 | 0.0284 | 3 |
| 186.42 | 330 | 1.0000 | 1.0028 | 1 | 330 | 1.0000 | 1.0053 | 2 | 330 | 0.0000 | 0.0284 | 3 |
| 186.92 | 331 | 1.0000 | 1.0027 | 1 | 331 | 1.0000 | 1.0053 | 2 | 331 | 0.0000 | 0.0284 | 3 |
| 187.42 | 332 | 1.0000 | 1.0026 | 1 | 332 | 1.0000 | 1.0053 | 2 | 332 | 0.0000 | 0.0284 | 3 |
| 187.92 | 333 | 1.0000 | 1.0025 | 1 | 333 | 1.0000 | 1.0054 | 2 | 333 | 0.0000 | 0.0284 | 3 |
| 188.42 | 334 | 1.0000 | 1.0024 | 1 | 334 | 1.0000 | 1.0054 | 2 | 334 | 0.0000 | 0.0284 | 3 |
| 188.92 | 335 | 1.0000 | 1.0023 | 1 | 335 | 1.0000 | 1.0055 | 2 | 335 | 0.0000 | 0.0285 | 3 |
| 189.42 | 336 | 1.0000 | 1.0022 | 1 | 336 | 1.0000 | 1.0055 | 2 | 336 | 0.0000 | 0.0285 | 3 |
| 189.92 | 337 | 1.0000 | 1.0020 | 1 | 337 | 1.0000 | 1.0055 | 2 | 337 | 0.0000 | 0.0285 | 3 |
| 190.42 | 338 | 1.0000 | 1.0019 | 1 | 338 | 1.0000 | 1.0056 | 2 | 338 | 0.0000 | 0.0285 | 3 |
| 190.92 | 339 | 1.0000 | 1.0017 | 1 | 339 | 1.0000 | 1.0056 | 2 | 339 | 0.0000 | 0.0286 | 3 |
| 191.42 | 340 | 1.0000 | 1.0016 | 1 | 340 | 1.0000 | 1.0057 | 2 | 340 | 0.0000 | 0.0286 | 3 |
| 191.92 | 341 | 1.0000 | 1.0015 | 1 | 341 | 1.0000 | 1.0057 | 2 | 341 | 0.0000 | 0.0286 | 3 |
| 192.42 | 342 | 1.0000 | 1.0015 | 1 | 342 | 1.0000 | 1.0057 | 2 | 342 | 0.0000 | 0.0286 | 3 |
| 192.92 | 343 | 1.0000 | 1.0015 | 1 | 343 | 1.0000 | 1.0057 | 2 | 343 | 0.0000 | 0.0286 | 3 |
| 193.42 | 344 | 1.0000 | 1.0015 | 1 | 344 | 1.0000 | 1.0057 | 2 | 344 | 0.0000 | 0.0286 | 3 |
| 193.92 | 345 | 1.0000 | 1.0015 | 1 | 345 | 1.0000 | 1.0057 | 2 | 345 | 0.0000 | 0.0286 | 3 |
| 194.42 | 346 | 1.0000 | 1.0015 | 1 | 346 | 1.0000 | 1.0057 | 2 | 346 | 0.0000 | 0.0285 | 3 |
| 194.92 | 347 | 1.0000 | 1.0016 | 1 | 347 | 1.0000 | 1.0057 | 2 | 347 | 0.0000 | 0.0285 | 3 |
| 195.42 | 348 | 1.0000 | 1.0017 | 1 | 348 | 1.0000 | 1.0057 | 2 | 348 | 0.0000 | 0.0285 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 195.92 | 349 | 1.0000 | 1.0018 | 1 | 349 | 1.0000 | 1.0057 | 2 | 349 | 0.0000 | 0.0284 | 3 |
| 196.42 | 350 | 1.0000 | 1.0019 | 1 | 350 | 1.0000 | 1.0057 | 2 | 350 | 0.0000 | 0.0284 | 3 |
| 196.92 | 351 | 1.0000 | 1.0019 | 1 | 351 | 1.0000 | 1.0057 | 2 | 351 | 0.0000 | 0.0284 | 3 |
| 197.42 | 352 | 1.0000 | 1.0020 | 1 | 352 | 1.0000 | 1.0057 | 2 | 352 | 0.0000 | 0.0284 | 3 |
| 197.92 | 353 | 1.0000 | 1.0020 | 1 | 353 | 1.0000 | 1.0057 | 2 | 353 | 0.0000 | 0.0283 | 3 |
| 198.42 | 354 | 1.0000 | 1.0021 | 1 | 354 | 1.0000 | 1.0057 | 2 | 354 | 0.0000 | 0.0283 | 3 |
| 198.92 | 355 | 1.0000 | 1.0021 | 1 | 355 | 1.0000 | 1.0057 | 2 | 355 | 0.0000 | 0.0283 | 3 |
| 199.42 | 356 | 1.0000 | 1.0021 | 1 | 356 | 1.0000 | 1.0057 | 2 | 356 | 0.0000 | 0.0283 | 3 |
| 199.92 | 357 | 1.0000 | 1.0020 | 1 | 357 | 1.0000 | 1.0057 | 2 | 357 | 0.0000 | 0.0283 | 3 |
| 200.42 | 358 | 1.0000 | 1.0020 | 1 | 358 | 1.0000 | 1.0057 | 2 | 358 | 0.0000 | 0.0283 | 3 |
| 200.92 | 359 | 1.0000 | 1.0019 | 1 | 359 | 1.0000 | 1.0057 | 2 | 359 | 0.0000 | 0.0283 | 3 |
| 201.42 | 360 | 1.0000 | 1.0018 | 1 | 360 | 1.0000 | 1.0058 | 2 | 360 | 0.0000 | 0.0283 | 3 |
| 201.92 | 361 | 1.0000 | 1.0017 | 1 | 361 | 1.0000 | 1.0058 | 2 | 361 | 0.0000 | 0.0283 | 3 |
| 202.42 | 362 | 1.0000 | 1.0016 | 1 | 362 | 1.0000 | 1.0058 | 2 | 362 | 0.0000 | 0.0284 | 3 |
| 202.92 | 363 | 1.0000 | 1.0015 | 1 | 363 | 1.0000 | 1.0059 | 2 | 363 | 0.0000 | 0.0284 | 3 |
| 203.42 | 364 | 1.0000 | 1.0013 | 1 | 364 | 1.0000 | 1.0059 | 2 | 364 | 0.0000 | 0.0284 | 3 |
| 203.92 | 365 | 1.0000 | 1.0011 | 1 | 365 | 1.0000 | 1.0060 | 2 | 365 | 0.0000 | 0.0284 | 3 |
| 204.42 | 366 | 1.0000 | 1.0010 | 1 | 366 | 1.0000 | 1.0060 | 2 | 366 | 0.0000 | 0.0285 | 3 |
| 204.92 | 367 | 1.0000 | 1.0008 | 1 | 367 | 1.0000 | 1.0061 | 2 | 367 | 0.0000 | 0.0285 | 3 |
| 205.42 | 368 | 1.0000 | 1.0006 | 1 | 368 | 1.0000 | 1.0061 | 2 | 368 | 0.0000 | 0.0285 | 3 |
| 205.92 | 369 | 1.0000 | 1.0005 | 1 | 369 | 1.0000 | 1.0061 | 2 | 369 | 0.0000 | 0.0285 | 3 |
| 206.42 | 370 | 1.0000 | 1.0005 | 1 | 370 | 1.0000 | 1.0062 | 2 | 370 | 0.0000 | 0.0285 | 3 |
| 206.92 | 371 | 1.0000 | 1.0004 | 1 | 371 | 1.0000 | 1.0062 | 2 | 371 | 0.0000 | 0.0285 | 3 |
| 207.42 | 372 | 1.0000 | 1.0004 | 1 | 372 | 1.0000 | 1.0062 | 2 | 372 | 0.0000 | 0.0285 | 3 |
| 207.92 | 373 | 1.0000 | 1.0004 | 1 | 373 | 1.0000 | 1.0062 | 2 | 373 | 0.0000 | 0.0285 | 3 |
| 208.42 | 374 | 1.0000 | 1.0005 | 1 | 374 | 1.0000 | 1.0062 | 2 | 374 | 0.0000 | 0.0285 | 3 |
| 208.92 | 375 | 1.0000 | 1.0005 | 1 | 375 | 1.0000 | 1.0062 | 2 | 375 | 0.0000 | 0.0285 | 3 |
| 209.42 | 376 | 1.0000 | 1.0006 | 1 | 376 | 1.0000 | 1.0062 | 2 | 376 | 0.0000 | 0.0284 | 3 |
| 209.92 | 377 | 1.0000 | 1.0007 | 1 | 377 | 1.0000 | 1.0062 | 2 | 377 | 0.0000 | 0.0284 | 3 |
| 210.42 | 378 | 1.0000 | 1.0008 | 1 | 378 | 1.0000 | 1.0061 | 2 | 378 | 0.0000 | 0.0284 | 3 |
| 210.92 | 379 | 1.0000 | 1.0009 | 1 | 379 | 1.0000 | 1.0061 | 2 | 379 | 0.0000 | 0.0283 | 3 |
| 211.42 | 380 | 1.0000 | 1.0010 | 1 | 380 | 1.0000 | 1.0061 | 2 | 380 | 0.0000 | 0.0283 | 3 |
| 211.92 | 381 | 1.0000 | 1.0011 | 1 | 381 | 1.0000 | 1.0061 | 2 | 381 | 0.0000 | 0.0283 | 3 |
| 212.42 | 382 | 1.0000 | 1.0011 | 1 | 382 | 1.0000 | 1.0061 | 2 | 382 | 0.0000 | 0.0283 | 3 |
| 212.92 | 383 | 1.0000 | 1.0012 | 1 | 383 | 1.0000 | 1.0061 | 2 | 383 | 0.0000 | 0.0283 | 3 |
| 213.42 | 384 | 1.0000 | 1.0012 | 1 | 384 | 1.0000 | 1.0061 | 2 | 384 | 0.0000 | 0.0282 | 3 |
| 213.92 | 385 | 1.0000 | 1.0012 | 1 | 385 | 1.0000 | 1.0061 | 2 | 385 | 0.0000 | 0.0282 | 3 |
| 214.42 | 386 | 1.0000 | 1.0011 | 1 | 386 | 1.0000 | 1.0061 | 2 | 386 | 0.0000 | 0.0282 | 3 |
| 214.92 | 387 | 1.0000 | 1.0011 | 1 | 387 | 1.0000 | 1.0062 | 2 | 387 | 0.0000 | 0.0282 | 3 |
| 215.42 | 388 | 1.0000 | 1.0010 | 1 | 388 | 1.0000 | 1.0062 | 2 | 388 | 0.0000 | 0.0282 | 3 |
| 215.92 | 389 | 1.0000 | 1.0009 | 1 | 389 | 1.0000 | 1.0062 | 2 | 389 | 0.0000 | 0.0283 | 3 |
| 216.42 | 390 | 1.0000 | 1.0007 | 1 | 390 | 1.0000 | 1.0062 | 2 | 390 | 0.0000 | 0.0283 | 3 |
| 216.92 | 391 | 1.0000 | 1.0006 | 1 | 391 | 1.0000 | 1.0063 | 2 | 391 | 0.0000 | 0.0283 | 3 |
| 217.42 | 392 | 1.0000 | 1.0004 | 1 | 392 | 1.0000 | 1.0063 | 2 | 392 | 0.0000 | 0.0283 | 3 |
| 217.92 | 393 | 1.0000 | 1.0002 | 1 | 393 | 1.0000 | 1.0064 | 2 | 393 | 0.0000 | 0.0284 | 3 |
| 218.42 | 394 | 1.0000 | 1.0000 | 1 | 394 | 1.0000 | 1.0064 | 2 | 394 | 0.0000 | 0.0284 | 3 |
| 218.92 | 395 | 1.0000 | 0.9998 | 1 | 395 | 1.0000 | 1.0064 | 2 | 395 | 0.0000 | 0.0284 | 3 |
| 219.42 | 396 | 1.0000 | 0.9996 | 1 | 396 | 1.0000 | 1.0065 | 2 | 396 | 0.0000 | 0.0284 | 3 |
| 219.92 | 397 | 1.0000 | 0.9995 | 1 | 397 | 1.0000 | 1.0065 | 2 | 397 | 0.0000 | 0.0285 | 3 |
| 220.42 | 398 | 1.0000 | 0.9994 | 1 | 398 | 1.0000 | 1.0065 | 2 | 398 | 0.0000 | 0.0285 | 3 |
| 220.92 | 399 | 1.0000 | 0.9993 | 1 | 399 | 1.0000 | 1.0066 | 2 | 399 | 0.0000 | 0.0285 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 221.42 | 400 | 1.0000 | 0.9993 | 1 | 400 | 1.0000 | 1.0066 | 2 | 400 | 0.0000 | 0.0285 | 3 |
| 221.92 | 401 | 1.0000 | 0.9993 | 1 | 401 | 1.0000 | 1.0066 | 2 | 401 | 0.0000 | 0.0285 | 3 |
| 222.42 | 402 | 1.0000 | 0.9993 | 1 | 402 | 1.0000 | 1.0066 | 2 | 402 | 0.0000 | 0.0285 | 3 |
| 222.92 | 403 | 1.0000 | 0.9994 | 1 | 403 | 1.0000 | 1.0066 | 2 | 403 | 0.0000 | 0.0284 | 3 |
| 223.42 | 404 | 1.0000 | 0.9995 | 1 | 404 | 1.0000 | 1.0066 | 2 | 404 | 0.0000 | 0.0284 | 3 |
| 223.92 | 405 | 1.0000 | 0.9996 | 1 | 405 | 1.0000 | 1.0066 | 2 | 405 | 0.0000 | 0.0284 | 3 |
| 224.42 | 406 | 1.0000 | 0.9997 | 1 | 406 | 1.0000 | 1.0065 | 2 | 406 | 0.0000 | 0.0283 | 3 |
| 224.92 | 407 | 1.0000 | 0.9999 | 1 | 407 | 1.0000 | 1.0065 | 2 | 407 | 0.0000 | 0.0283 | 3 |
| 225.42 | 408 | 1.0000 | 1.0000 | 1 | 408 | 1.0000 | 1.0065 | 2 | 408 | 0.0000 | 0.0283 | 3 |
| 225.92 | 409 | 1.0000 | 1.0001 | 1 | 409 | 1.0000 | 1.0065 | 2 | 409 | 0.0000 | 0.0283 | 3 |
| 226.42 | 410 | 1.0000 | 1.0001 | 1 | 410 | 1.0000 | 1.0065 | 2 | 410 | 0.0000 | 0.0282 | 3 |
| 226.92 | 411 | 1.0000 | 1.0002 | 1 | 411 | 1.0000 | 1.0065 | 2 | 411 | 0.0000 | 0.0282 | 3 |
| 227.42 | 412 | 1.0000 | 1.0002 | 1 | 412 | 1.0000 | 1.0065 | 2 | 412 | 0.0000 | 0.0282 | 3 |
| 227.92 | 413 | 1.0000 | 1.0002 | 1 | 413 | 1.0000 | 1.0065 | 2 | 413 | 0.0000 | 0.0282 | 3 |
| 228.42 | 414 | 1.0000 | 1.0002 | 1 | 414 | 1.0000 | 1.0065 | 2 | 414 | 0.0000 | 0.0282 | 3 |
| 228.92 | 415 | 1.0000 | 1.0002 | 1 | 415 | 1.0000 | 1.0065 | 2 | 415 | 0.0000 | 0.0282 | 3 |
| 229.42 | 416 | 1.0000 | 1.0001 | 1 | 416 | 1.0000 | 1.0066 | 2 | 416 | 0.0000 | 0.0282 | 3 |
| 229.92 | 417 | 1.0000 | 1.0000 | 1 | 417 | 1.0000 | 1.0066 | 2 | 417 | 0.0000 | 0.0282 | 3 |
| 230.42 | 418 | 1.0000 | 0.9999 | 1 | 418 | 1.0000 | 1.0066 | 2 | 418 | 0.0000 | 0.0282 | 3 |
| 230.92 | 419 | 1.0000 | 0.9997 | 1 | 419 | 1.0000 | 1.0066 | 2 | 419 | 0.0000 | 0.0282 | 3 |
| 231.42 | 420 | 1.0000 | 0.9996 | 1 | 420 | 1.0000 | 1.0067 | 2 | 420 | 0.0000 | 0.0283 | 3 |
| 231.92 | 421 | 1.0000 | 0.9994 | 1 | 421 | 1.0000 | 1.0067 | 2 | 421 | 0.0000 | 0.0283 | 3 |
| 232.42 | 422 | 1.0000 | 0.9992 | 1 | 422 | 1.0000 | 1.0067 | 2 | 422 | 0.0000 | 0.0283 | 3 |
| 232.92 | 423 | 1.0000 | 0.9990 | 1 | 423 | 1.0000 | 1.0068 | 2 | 423 | 0.0000 | 0.0284 | 3 |
| 233.42 | 424 | 1.0000 | 0.9988 | 1 | 424 | 1.0000 | 1.0068 | 2 | 424 | 0.0000 | 0.0284 | 3 |
| 233.92 | 425 | 1.0000 | 0.9986 | 1 | 425 | 1.0000 | 1.0068 | 2 | 425 | 0.0000 | 0.0284 | 3 |
| 234.42 | 426 | 1.0000 | 0.9984 | 1 | 426 | 1.0000 | 1.0068 | 2 | 426 | 0.0000 | 0.0284 | 3 |
| 234.92 | 427 | 1.0000 | 0.9983 | 1 | 427 | 1.0000 | 1.0069 | 2 | 427 | 0.0000 | 0.0284 | 3 |
| 235.42 | 428 | 1.0000 | 0.9983 | 1 | 428 | 1.0000 | 1.0069 | 2 | 428 | 0.0000 | 0.0284 | 3 |
| 235.92 | 429 | 1.0000 | 0.9982 | 1 | 429 | 1.0000 | 1.0069 | 2 | 429 | 0.0000 | 0.0284 | 3 |
| 236.42 | 430 | 1.0000 | 0.9982 | 1 | 430 | 1.0000 | 1.0069 | 2 | 430 | 0.0000 | 0.0284 | 3 |
| 236.92 | 431 | 1.0000 | 0.9983 | 1 | 431 | 1.0000 | 1.0069 | 2 | 431 | 0.0000 | 0.0284 | 3 |
| 237.42 | 432 | 1.0000 | 0.9984 | 1 | 432 | 1.0000 | 1.0069 | 2 | 432 | 0.0000 | 0.0284 | 3 |
| 237.92 | 433 | 1.0000 | 0.9984 | 1 | 433 | 1.0000 | 1.0069 | 2 | 433 | 0.0000 | 0.0284 | 3 |
| 238.42 | 434 | 1.0000 | 0.9986 | 1 | 434 | 1.0000 | 1.0069 | 2 | 434 | 0.0000 | 0.0283 | 3 |
| 238.92 | 435 | 1.0000 | 0.9987 | 1 | 435 | 1.0000 | 1.0069 | 2 | 435 | 0.0000 | 0.0283 | 3 |
| 239.42 | 436 | 1.0000 | 0.9988 | 1 | 436 | 1.0000 | 1.0069 | 2 | 436 | 0.0000 | 0.0283 | 3 |
| 239.92 | 437 | 1.0000 | 0.9989 | 1 | 437 | 1.0000 | 1.0069 | 2 | 437 | 0.0000 | 0.0282 | 3 |
| 240.42 | 438 | 1.0000 | 0.9990 | 1 | 438 | 1.0000 | 1.0069 | 2 | 438 | 0.0000 | 0.0282 | 3 |
| 240.92 | 439 | 1.0000 | 0.9991 | 1 | 439 | 1.0000 | 1.0068 | 2 | 439 | 0.0000 | 0.0282 | 3 |
| 241.42 | 440 | 1.0000 | 0.9992 | 1 | 440 | 1.0000 | 1.0069 | 2 | 440 | 0.0000 | 0.0282 | 3 |
| 241.92 | 441 | 1.0000 | 0.9992 | 1 | 441 | 1.0000 | 1.0069 | 2 | 441 | 0.0000 | 0.0282 | 3 |
| 242.42 | 442 | 1.0000 | 0.9992 | 1 | 442 | 1.0000 | 1.0069 | 2 | 442 | 0.0000 | 0.0282 | 3 |
| 242.92 | 443 | 1.0000 | 0.9992 | 1 | 443 | 1.0000 | 1.0069 | 2 | 443 | 0.0000 | 0.0282 | 3 |
| 243.42 | 444 | 1.0000 | 0.9991 | 1 | 444 | 1.0000 | 1.0069 | 2 | 444 | 0.0000 | 0.0282 | 3 |
| 243.92 | 445 | 1.0000 | 0.9990 | 1 | 445 | 1.0000 | 1.0069 | 2 | 445 | 0.0000 | 0.0282 | 3 |
| 244.42 | 446 | 1.0000 | 0.9989 | 1 | 446 | 1.0000 | 1.0069 | 2 | 446 | 0.0000 | 0.0282 | 3 |
| 244.92 | 447 | 1.0000 | 0.9988 | 1 | 447 | 1.0000 | 1.0069 | 2 | 447 | 0.0000 | 0.0282 | 3 |
| 245.42 | 448 | 1.0000 | 0.9986 | 1 | 448 | 1.0000 | 1.0070 | 2 | 448 | 0.0000 | 0.0282 | 3 |
| 245.92 | 449 | 1.0000 | 0.9984 | 1 | 449 | 1.0000 | 1.0070 | 2 | 449 | 0.0000 | 0.0282 | 3 |
| 246.42 | 450 | 1.0000 | 0.9983 | 1 | 450 | 1.0000 | 1.0070 | 2 | 450 | 0.0000 | 0.0283 | 3 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 246.92 | 451 | 1.0000 | 0.9980 | 1 | 451 | 1.0000 | 1.0071 | 2 | 451 | 0.0000 | 0.0283 | 3 |
| 247.42 | 452 | 1.0000 | 0.9978 | 1 | 452 | 1.0000 | 1.0071 | 2 | 452 | 0.0000 | 0.0283 | 3 |
| 247.92 | 453 | 1.0000 | 0.9976 | 1 | 453 | 1.0000 | 1.0071 | 2 | 453 | 0.0000 | 0.0283 | 3 |
| 248.42 | 454 | 1.0000 | 0.9975 | 1 | 454 | 1.0000 | 1.0071 | 2 | 454 | 0.0000 | 0.0284 | 3 |
| 248.92 | 455 | 1.0000 | 0.9973 | 1 | 455 | 1.0000 | 1.0072 | 2 | 455 | 0.0000 | 0.0284 | 3 |
| 249.42 | 456 | 1.0000 | 0.9972 | 1 | 456 | 1.0000 | 1.0072 | 2 | 456 | 0.0000 | 0.0284 | 3 |
| 249.92 | 457 | 1.0000 | 0.9971 | 1 | 457 | 1.0000 | 1.0072 | 2 | 457 | 0.0000 | 0.0284 | 3 |
| 250.42 | 458 | 1.0000 | 0.9971 | 1 | 458 | 1.0000 | 1.0072 | 2 | 458 | 0.0000 | 0.0284 | 3 |
| 250.92 | 459 | 1.0000 | 0.9971 | 1 | 459 | 1.0000 | 1.0072 | 2 | 459 | 0.0000 | 0.0284 | 3 |
| 251.42 | 460 | 1.0000 | 0.9972 | 1 | 460 | 1.0000 | 1.0072 | 2 | 460 | 0.0000 | 0.0283 | 3 |
| 251.92 | 461 | 1.0000 | 0.9973 | 1 | 461 | 1.0000 | 1.0072 | 2 | 461 | 0.0000 | 0.0283 | 3 |
| 252.42 | 462 | 1.0000 | 0.9975 | 1 | 462 | 1.0000 | 1.0072 | 2 | 462 | 0.0000 | 0.0283 | 3 |
| 252.92 | 463 | 1.0000 | 0.9976 | 1 | 463 | 1.0000 | 1.0072 | 2 | 463 | 0.0000 | 0.0283 | 3 |
| 253.42 | 464 | 1.0000 | 0.9978 | 1 | 464 | 1.0000 | 1.0072 | 2 | 464 | 0.0000 | 0.0282 | 3 |
| 253.92 | 465 | 1.0000 | 0.9979 | 1 | 465 | 1.0000 | 1.0072 | 2 | 465 | 0.0000 | 0.0282 | 3 |
| 254.42 | 466 | 1.0000 | 0.9981 | 1 | 466 | 1.0000 | 1.0071 | 2 | 466 | 0.0000 | 0.0282 | 3 |
| 254.92 | 467 | 1.0000 | 0.9982 | 1 | 467 | 1.0000 | 1.0071 | 2 | 467 | 0.0000 | 0.0282 | 3 |
| 255.42 | 468 | 1.0000 | 0.9982 | 1 | 468 | 1.0000 | 1.0071 | 2 | 468 | 0.0000 | 0.0281 | 3 |
| 255.92 | 469 | 1.0000 | 0.9983 | 1 | 469 | 1.0000 | 1.0071 | 2 | 469 | 0.0000 | 0.0281 | 3 |
| 256.42 | 470 | 1.0000 | 0.9984 | 1 | 470 | 1.0000 | 1.0071 | 2 | 470 | 0.0000 | 0.0281 | 3 |
| 256.92 | 471 | 1.0000 | 0.9984 | 1 | 471 | 1.0000 | 1.0071 | 2 | 471 | 0.0000 | 0.0281 | 3 |
| 257.42 | 472 | 1.0000 | 0.9983 | 1 | 472 | 1.0000 | 1.0071 | 2 | 472 | 0.0000 | 0.0281 | 3 |
| 257.92 | 473 | 1.0000 | 0.9983 | 1 | 473 | 1.0000 | 1.0072 | 2 | 473 | 0.0000 | 0.0281 | 3 |
| 258.42 | 474 | 1.0000 | 0.9982 | 1 | 474 | 1.0000 | 1.0072 | 2 | 474 | 0.0000 | 0.0281 | 3 |
| 258.92 | 475 | 1.0000 | 0.9981 | 1 | 475 | 1.0000 | 1.0072 | 2 | 475 | 0.0000 | 0.0281 | 3 |
| 259.42 | 476 | 1.0000 | 0.9979 | 1 | 476 | 1.0000 | 1.0072 | 2 | 476 | 0.0000 | 0.0281 | 3 |
| 259.92 | 477 | 1.0000 | 0.9978 | 1 | 477 | 1.0000 | 1.0072 | 2 | 477 | 0.0000 | 0.0282 | 3 |
| 260.42 | 478 | 1.0000 | 0.9976 | 1 | 478 | 1.0000 | 1.0073 | 2 | 478 | 0.0000 | 0.0282 | 3 |
| 260.92 | 479 | 1.0000 | 0.9974 | 1 | 479 | 1.0000 | 1.0073 | 2 | 479 | 0.0000 | 0.0282 | 3 |
| 261.42 | 480 | 1.0000 | 0.9972 | 1 | 480 | 1.0000 | 1.0073 | 2 | 480 | 0.0000 | 0.0282 | 3 |
| 261.92 | 481 | 1.0000 | 0.9969 | 1 | 481 | 1.0000 | 1.0073 | 2 | 481 | 0.0000 | 0.0283 | 3 |
| 262.42 | 482 | 1.0000 | 0.9967 | 1 | 482 | 1.0000 | 1.0074 | 2 | 482 | 0.0000 | 0.0283 | 3 |
| 262.92 | 483 | 1.0000 | 0.9965 | 1 | 483 | 1.0000 | 1.0074 | 2 | 483 | 0.0000 | 0.0283 | 3 |
| 263.42 | 484 | 1.0000 | 0.9964 | 1 | 484 | 1.0000 | 1.0074 | 2 | 484 | 0.0000 | 0.0283 | 3 |
| 263.92 | 485 | 1.0000 | 0.9962 | 1 | 485 | 1.0000 | 1.0074 | 2 | 485 | 0.0000 | 0.0283 | 3 |
| 264.42 | 486 | 1.0000 | 0.9961 | 1 | 486 | 1.0000 | 1.0074 | 2 | 486 | 0.0000 | 0.0283 | 3 |
| 264.92 | 487 | 1.0000 | 0.9961 | 1 | 487 | 1.0000 | 1.0074 | 2 | 487 | 0.0000 | 0.0283 | 3 |
| 265.42 | 488 | 1.0000 | 0.9961 | 1 | 488 | 1.0000 | 1.0074 | 2 | 488 | 0.0000 | 0.0283 | 3 |
| 265.92 | 489 | 1.0000 | 0.9962 | 1 | 489 | 1.0000 | 1.0074 | 2 | 489 | 0.0000 | 0.0283 | 3 |
| 266.42 | 490 | 1.0000 | 0.9963 | 1 | 490 | 1.0000 | 1.0074 | 2 | 490 | 0.0000 | 0.0283 | 3 |
| 266.92 | 491 | 1.0000 | 0.9964 | 1 | 491 | 1.0000 | 1.0074 | 2 | 491 | 0.0000 | 0.0283 | 3 |
| 267.42 | 492 | 1.0000 | 0.9966 | 1 | 492 | 1.0000 | 1.0074 | 2 | 492 | 0.0000 | 0.0282 | 3 |
| 267.92 | 493 | 1.0000 | 0.9967 | 1 | 493 | 1.0000 | 1.0074 | 2 | 493 | 0.0000 | 0.0282 | 3 |
| 268.42 | 494 | 1.0000 | 0.9968 | 1 | 494 | 1.0000 | 1.0074 | 2 | 494 | 0.0000 | 0.0282 | 3 |
| 268.92 | 495 | 1.0000 | 0.9970 | 1 | 495 | 1.0000 | 1.0074 | 2 | 495 | 0.0000 | 0.0282 | 3 |
| 269.42 | 496 | 1.0000 | 0.9971 | 1 | 496 | 1.0000 | 1.0074 | 2 | 496 | 0.0000 | 0.0281 | 3 |
| 269.92 | 497 | 1.0000 | 0.9972 | 1 | 497 | 1.0000 | 1.0074 | 2 | 497 | 0.0000 | 0.0281 | 3 |
| 270.42 | 498 | 1.0000 | 0.9973 | 1 | 498 | 1.0000 | 1.0074 | 2 | 498 | 0.0000 | 0.0281 | 3 |

| | |
|---|---|
| RECALL SET SIZE | 498 |
| RECALL SET ERROR RMS | 0.195687 |
| MAX BIAS OR WEIGHT | 20.0000 |
| MAX GAIN OR CONSTANT | 2.0000 |

## D.3 Scenario MS1 No-Noise

Below are the no-noise results for the MS1 scenario. These results are file MS1.PRX.

| Time (sec) | Node 1 | Desired Output | Actual Output | | Node 2 | Desired Output | Actual Output | | Node 3 | Desired Output | Actual Output | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 26.83 | 1 | 0.0000 | 0.0400 | 1 | 1 | 0.0000 | 0.0108 | 2 | 1 | 0.0000 | 0.0366 | 3 |
| 27.33 | 2 | 0.0000 | 0.0400 | 1 | 2 | 0.0000 | 0.0108 | 2 | 2 | 0.0000 | 0.0366 | 3 |
| 27.83 | 3 | 0.0000 | 0.0400 | 1 | 3 | 0.0000 | 0.0108 | 2 | 3 | 0.0000 | 0.0366 | 3 |
| 28.33 | 4 | 0.0000 | 0.0400 | 1 | 4 | 0.0000 | 0.0108 | 2 | 4 | 0.0000 | 0.0366 | 3 |
| 28.83 | 5 | 0.0000 | 0.0400 | 1 | 5 | 0.0000 | 0.0108 | 2 | 5 | 0.0000 | 0.0367 | 3 |
| 29.33 | 6 | 0.0000 | 0.0400 | 1 | 6 | 0.0000 | 0.0108 | 2 | 6 | 0.0000 | 0.0366 | 3 |
| 29.83 | 7 | 0.0000 | 0.0400 | 1 | 7 | 0.0000 | 0.0108 | 2 | 7 | 0.0000 | 0.0366 | 3 |
| 30.33 | 8 | 0.0000 | 0.0400 | 1 | 8 | 0.0000 | 0.0108 | 2 | 8 | 0.0000 | 0.0366 | 3 |
| 30.83 | 9 | 0.0000 | 0.0400 | 1 | 9 | 0.0000 | 0.0108 | 2 | 9 | 0.0000 | 0.0366 | 3 |
| 31.33 | 10 | 0.0000 | 0.0400 | 1 | 10 | 0.0000 | 0.0108 | 2 | 10 | 0.0000 | 0.0367 | 3 |
| 31.83 | 11 | 0.0000 | 0.0400 | 1 | 11 | 0.0000 | 0.0108 | 2 | 11 | 0.0000 | 0.0366 | 3 |
| 32.33 | 12 | 0.0000 | 0.0400 | 1 | 12 | 0.0000 | 0.0108 | 2 | 12 | 0.0000 | 0.0366 | 3 |
| 32.83 | 13 | 0.0000 | 0.0400 | 1 | 13 | 0.0000 | 0.0108 | 2 | 13 | 0.0000 | 0.0367 | 3 |
| 33.33 | 14 | 0.0000 | 0.0400 | 1 | 14 | 0.0000 | 0.0108 | 2 | 14 | 0.0000 | 0.0367 | 3 |
| 33.83 | 15 | 0.0000 | 0.0400 | 1 | 15 | 0.0000 | 0.0108 | 2 | 15 | 0.0000 | 0.0367 | 3 |
| 34.33 | 16 | 0.0000 | 0.0400 | 1 | 16 | 0.0000 | 0.0108 | 2 | 16 | 0.0000 | 0.0366 | 3 |
| 34.83 | 17 | 0.0000 | 0.0400 | 1 | 17 | 0.0000 | 0.0108 | 2 | 17 | 0.0000 | 0.0366 | 3 |
| 35.33 | 18 | 0.0000 | 0.0397 | 1 | 18 | 0.0000 | 0.0108 | 2 | 18 | 0.0000 | 0.0367 | 3 |
| 35.83 | 19 | 0.0000 | 0.0397 | 1 | 19 | 0.0000 | 0.0108 | 2 | 19 | 0.0000 | 0.0367 | 3 |
| 36.33 | 20 | 0.0000 | 0.0397 | 1 | 20 | 0.0000 | 0.0108 | 2 | 20 | 0.0000 | 0.0367 | 3 |
| 36.83 | 21 | 0.0000 | 0.0398 | 1 | 21 | 0.0000 | 0.0108 | 2 | 21 | 0.0000 | 0.0367 | 3 |
| 37.33 | 22 | 0.0000 | 0.0398 | 1 | 22 | 0.0000 | 0.0108 | 2 | 22 | 0.0000 | 0.0367 | 3 |
| 37.83 | 23 | 0.0000 | 0.0399 | 1 | 23 | 0.0000 | 0.0108 | 2 | 23 | 0.0000 | 0.0367 | 3 |
| 38.33 | 24 | 0.0000 | 0.0399 | 1 | 24 | 0.0000 | 0.0108 | 2 | 24 | 0.0000 | 0.0367 | 3 |
| 38.83 | 25 | 0.0000 | 0.0400 | 1 | 25 | 0.0000 | 0.0108 | 2 | 25 | 0.0000 | 0.0367 | 3 |
| 39.33 | 26 | 0.0000 | 0.0400 | 1 | 26 | 0.0000 | 0.0108 | 2 | 26 | 0.0000 | 0.0367 | 3 |
| 39.83 | 27 | 0.0000 | 0.0399 | 1 | 27 | 0.0000 | 0.0108 | 2 | 27 | 0.0000 | 0.0367 | 3 |
| 40.33 | 28 | 0.0000 | 0.0399 | 1 | 28 | 0.0000 | 0.0108 | 2 | 28 | 0.0000 | 0.0367 | 3 |
| 40.83 | 29 | 0.0000 | 0.0400 | 1 | 29 | 0.0000 | 0.0108 | 2 | 29 | 0.0000 | 0.0367 | 3 |
| 41.33 | 30 | 0.0000 | 0.0400 | 1 | 30 | 0.0000 | 0.0108 | 2 | 30 | 0.0000 | 0.0366 | 3 |
| 41.83 | 31 | 0.0000 | 0.0400 | 1 | 31 | 0.0000 | 0.0108 | 2 | 31 | 0.0000 | 0.0367 | 3 |
| 42.33 | 32 | 0.0000 | 0.0400 | 1 | 32 | 0.0000 | 0.0108 | 2 | 32 | 0.0000 | 0.0367 | 3 |
| 42.83 | 33 | 0.0000 | 0.0399 | 1 | 33 | 0.0000 | 0.0108 | 2 | 33 | 0.0000 | 0.0367 | 3 |
| 43.33 | 34 | 0.0000 | 0.0400 | 1 | 34 | 0.0000 | 0.0108 | 2 | 34 | 0.0000 | 0.0367 | 3 |
| 43.83 | 35 | 0.0000 | 0.0400 | 1 | 35 | 0.0000 | 0.0108 | 2 | 35 | 0.0000 | 0.0366 | 3 |
| 44.33 | 36 | 0.0000 | 0.0400 | 1 | 36 | 0.0000 | 0.0108 | 2 | 36 | 0.0000 | 0.0366 | 3 |
| 44.83 | 37 | 0.0000 | 0.0400 | 1 | 37 | 0.0000 | 0.0108 | 2 | 37 | 0.0000 | 0.0366 | 3 |
| 45.33 | 38 | 0.0000 | 0.0400 | 1 | 38 | 0.0000 | 0.0108 | 2 | 38 | 0.0000 | 0.0366 | 3 |
| 45.83 | 39 | 0.0000 | 0.0400 | 1 | 39 | 0.0000 | 0.0108 | 2 | 39 | 0.0000 | 0.0367 | 3 |
| 46.33 | 40 | 0.0000 | 0.0400 | 1 | 40 | 0.0000 | 0.0108 | 2 | 40 | 0.0000 | 0.0367 | 3 |
| 46.83 | 41 | 1.0000 | 0.0337 | 1 | 41 | 0.0000 | 0.0110 | 2 | 41 | 1.0000 | 0.0386 | 3 |
| 47.33 | 42 | 1.0000 | 0.0246 | 1 | 42 | 0.0000 | 0.0116 | 2 | 42 | 1.0000 | 0.0444 | 3 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 47.83 | 43 | 1.0000 | 0.0216 | 1 | 43 | 0.0000 | 0.0119 | 2 | 43 | 1.0000 | 0.0482 | 3 |
| 48.33 | 44 | 1.0000 | 0.0202 | 1 | 44 | 0.0000 | 0.0121 | 2 | 44 | 1.0000 | 0.0507 | 3 |
| 48.83 | 45 | 1.0000 | 0.0182 | 1 | 45 | 0.0000 | 0.0125 | 2 | 45 | 1.0000 | 0.0562 | 3 |
| 49.33 | 46 | 1.0000 | 0.0172 | 1 | 46 | 0.0000 | 0.0128 | 2 | 46 | 1.0000 | 0.0601 | 3 |
| 49.83 | 47 | 1.0000 | 0.0176 | 1 | 47 | 0.0000 | 0.0126 | 2 | 47 | 1.0000 | 0.0583 | 3 |
| 50.33 | 48 | 1.0000 | 0.0187 | 1 | 48 | 0.0000 | 0.0124 | 2 | 48 | 1.0000 | 0.0544 | 3 |
| 50.83 | 49 | 1.0000 | 0.0203 | 1 | 49 | 0.0000 | 0.0121 | 2 | 49 | 1.0000 | 0.0503 | 3 |
| 51.33 | 50 | 1.0000 | 0.0238 | 1 | 50 | 0.0000 | 0.0116 | 2 | 50 | 1.0000 | 0.0445 | 3 |
| 51.83 | 51 | 1.0000 | 0.0296 | 1 | 51 | 0.0000 | 0.0111 | 2 | 51 | 1.0000 | 0.0394 | 3 |
| 52.33 | 52 | 1.0000 | 0.0384 | 1 | 52 | 0.0000 | 0.0107 | 2 | 52 | 1.0000 | 0.0357 | 3 |
| 52.83 | 53 | 1.0000 | 0.0515 | 1 | 53 | 0.0000 | 0.0104 | 2 | 53 | 1.0000 | 0.0332 | 3 |
| 53.33 | 54 | 1.0000 | 0.0758 | 1 | 54 | 0.0000 | 0.0102 | 2 | 54 | 1.0000 | 0.0313 | 3 |
| 53.83 | 55 | 1.0000 | 0.1269 | 1 | 55 | 0.0000 | 0.0101 | 2 | 55 | 1.0000 | 0.0300 | 3 |
| 54.33 | 56 | 1.0000 | 0.2533 | 1 | 56 | 0.0000 | 0.0100 | 2 | 56 | 1.0000 | 0.0292 | 3 |
| 54.83 | 57 | 1.0000 | 0.3156 | 1 | 57 | 0.0000 | 0.0102 | 2 | 57 | 1.0000 | 0.0281 | 3 |
| 55.33 | 58 | 1.0000 | 0.1010 | 1 | 58 | 0.0000 | 0.0119 | 2 | 58 | 1.0000 | 0.0287 | 3 |
| 55.83 | 59 | 1.0000 | 0.3375 | 1 | 59 | 0.0000 | 0.0129 | 2 | 59 | 1.0000 | 0.0273 | 3 |
| 56.33 | 60 | 1.0000 | 0.4685 | 1 | 60 | 0.0000 | 0.0132 | 2 | 60 | 1.0000 | 0.0269 | 3 |
| 56.83 | 61 | 1.0000 | 0.6245 | 1 | 61 | 0.0000 | 0.0142 | 2 | 61 | 1.0000 | 0.0267 | 3 |
| 57.33 | 62 | 1.0000 | 0.4966 | 1 | 62 | 0.0000 | 0.0139 | 2 | 62 | 1.0000 | 0.0271 | 3 |
| 57.83 | 63 | 1.0000 | 0.4253 | 1 | 63 | 0.0000 | 0.0138 | 2 | 63 | 1.0000 | 0.0275 | 3 |
| 58.33 | 64 | 1.0000 | 0.8994 | 1 | 64 | 0.0000 | 0.0182 | 2 | 64 | 1.0000 | 0.0274 | 3 |
| 58.83 | 65 | 1.0000 | 0.9614 | 1 | 65 | 0.0000 | 0.0263 | 2 | 65 | 1.0000 | 0.0273 | 3 |
| 59.33 | 66 | 1.0000 | 0.9770 | 1 | 66 | 0.0000 | 0.0294 | 2 | 66 | 1.0000 | 0.0280 | 3 |
| 59.83 | 67 | 1.0000 | 0.9919 | 1 | 67 | 0.0000 | 0.0355 | 2 | 67 | 1.0000 | 0.0288 | 3 |
| 60.33 | 68 | 1.0000 | 1.0015 | 1 | 68 | 0.0000 | 0.0466 | 2 | 68 | 1.0000 | 0.0291 | 3 |
| 60.83 | 69 | 1.0000 | 1.0082 | 1 | 69 | 0.0000 | 0.0753 | 2 | 69 | 1.0000 | 0.0292 | 3 |
| 61.33 | 70 | 1.0000 | 1.0111 | 1 | 70 | 0.0000 | 0.1061 | 2 | 70 | 1.0000 | 0.0291 | 3 |
| 61.83 | 71 | 1.0000 | 1.0146 | 1 | 71 | 0.0000 | 0.1880 | 2 | 71 | 1.0000 | 0.0293 | 3 |
| 62.33 | 72 | 1.0000 | 1.0204 | 1 | 72 | 0.0000 | 0.3777 | 2 | 72 | 1.0000 | 0.0301 | 3 |
| 62.83 | 73 | 1.0000 | 1.0313 | 1 | 73 | 0.0000 | 0.1053 | 2 | 73 | 1.0000 | 0.0339 | 3 |
| 63.33 | 74 | 1.0000 | 1.0383 | 1 | 74 | 0.0000 | 0.0310 | 2 | 74 | 1.0000 | 0.0439 | 3 |
| 63.83 | 75 | 1.0000 | 1.0387 | 1 | 75 | 0.0000 | 0.0253 | 2 | 75 | 1.0000 | 0.0757 | 3 |
| 64.33 | 76 | 1.0000 | 1.0350 | 1 | 76 | 0.0000 | 0.0319 | 2 | 76 | 1.0000 | 0.3680 | 3 |
| 64.83 | 77 | 1.0000 | 1.0292 | 1 | 77 | 0.0000 | 0.0448 | 2 | 77 | 1.0000 | 0.9014 | 3 |
| 65.33 | 78 | 1.0000 | 1.0240 | 1 | 78 | 0.0000 | 0.0623 | 2 | 78 | 1.0000 | 0.9526 | 3 |
| 65.83 | 79 | 1.0000 | 1.0196 | 1 | 79 | 0.0000 | 0.0877 | 2 | 79 | 1.0000 | 0.9686 | 3 |
| 66.33 | 80 | 1.0000 | 1.0158 | 1 | 80 | 0.0000 | 0.1205 | 2 | 80 | 1.0000 | 0.9772 | 3 |
| 66.83 | 81 | 1.0000 | 1.0129 | 1 | 81 | 0.0000 | 0.1681 | 2 | 81 | 1.0000 | 0.9821 | 3 |
| 67.33 | 82 | 1.0000 | 1.0107 | 1 | 82 | 0.0000 | 0.2240 | 2 | 82 | 1.0000 | 0.9853 | 3 |
| 67.83 | 83 | 1.0000 | 1.0091 | 1 | 83 | 0.0000 | 0.3022 | 2 | 83 | 1.0000 | 0.9873 | 3 |
| 68.33 | 84 | 1.0000 | 1.0080 | 1 | 84 | 0.0000 | 0.3757 | 2 | 84 | 1.0000 | 0.9886 | 3 |
| 68.83 | 85 | 1.0000 | 1.0074 | 1 | 85 | 0.0000 | 0.4265 | 2 | 85 | 1.0000 | 0.9894 | 3 |
| 69.33 | 86 | 1.0000 | 1.0072 | 1 | 86 | 0.0000 | 0.4310 | 2 | 86 | 1.0000 | 0.9896 | 3 |
| 69.83 | 87 | 1.0000 | 1.0073 | 1 | 87 | 0.0000 | 0.4145 | 2 | 87 | 1.0000 | 0.9896 | 3 |
| 70.33 | 88 | 1.0000 | 1.0081 | 1 | 88 | 0.0000 | 0.3433 | 2 | 88 | 1.0000 | 0.9889 | 3 |
| 70.83 | 89 | 1.0000 | 1.0087 | 1 | 89 | 0.0000 | 0.3073 | 2 | 89 | 1.0000 | 0.9883 | 3 |
| 71.33 | 90 | 1.0000 | 1.0095 | 1 | 90 | 0.0000 | 0.2796 | 2 | 90 | 1.0000 | 0.9876 | 3 |
| 71.83 | 91 | 1.0000 | 1.0113 | 1 | 91 | 0.0000 | 0.2282 | 2 | 91 | 1.0000 | 0.9860 | 3 |
| 72.33 | 92 | 1.0000 | 1.0124 | 1 | 92 | 0.0000 | 0.2285 | 2 | 92 | 1.0000 | 0.9851 | 3 |
| 72.83 | 93 | 1.0000 | 1.0135 | 1 | 93 | 0.0000 | 0.2395 | 2 | 93 | 1.0000 | 0.9842 | 3 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 73.33 | 94 | 1.0000 | 1.0145 | 1 | 94 | 0.0000 | 0.2639 | 2 | 94 | 1.0000 | 0.9831 | 3 |
| 73.83 | 95 | 1.0000 | 1.0154 | 1 | 95 | 0.0000 | 0.2837 | 2 | 95 | 1.0000 | 0.9816 | 3 |
| 74.33 | 96 | 1.0000 | 1.0164 | 1 | 96 | 0.0000 | 0.2867 | 2 | 96 | 1.0000 | 0.9799 | 3 |
| 74.83 | 97 | 1.0000 | 1.0175 | 1 | 97 | 0.0000 | 0.2788 | 2 | 97 | 1.0000 | 0.9777 | 3 |
| 75.33 | 98 | 1.0000 | 1.0186 | 1 | 98 | 0.0000 | 0.2602 | 2 | 98 | 1.0000 | 0.9750 | 3 |
| 75.83 | 99 | 1.0000 | 1.0197 | 1 | 99 | 0.0000 | 0.2406 | 2 | 99 | 1.0000 | 0.9720 | 3 |
| 76.33 | 100 | 1.0000 | 1.0207 | 1 | 100 | 0.0000 | 0.2218 | 2 | 100 | 1.0000 | 0.9690 | 3 |
| 76.83 | 101 | 1.0000 | 1.0216 | 1 | 101 | 0.0000 | 0.2001 | 2 | 101 | 1.0000 | 0.9662 | 3 |
| 77.33 | 102 | 1.0000 | 1.0223 | 1 | 102 | 0.0000 | 0.1848 | 2 | 102 | 1.0000 | 0.9632 | 3 |
| 77.83 | 103 | 1.0000 | 1.0229 | 1 | 103 | 0.0000 | 0.1707 | 2 | 103 | 1.0000 | 0.9613 | 3 |
| 78.33 | 104 | 1.0000 | 1.0232 | 1 | 104 | 0.0000 | 0.1618 | 2 | 104 | 1.0000 | 0.9600 | 3 |
| 78.83 | 105 | 1.0000 | 1.0234 | 1 | 105 | 0.0000 | 0.1551 | 2 | 105 | 1.0000 | 0.9593 | 3 |
| 79.33 | 106 | 1.0000 | 1.0235 | 1 | 106 | 0.0000 | 0.1483 | 2 | 106 | 1.0000 | 0.9594 | 3 |
| 79.83 | 107 | 1.0000 | 1.0235 | 1 | 107 | 0.0000 | 0.1452 | 2 | 107 | 1.0000 | 0.9594 | 3 |
| 80.33 | 108 | 1.0000 | 1.0235 | 1 | 108 | 0.0000 | 0.1410 | 2 | 108 | 1.0000 | 0.9599 | 3 |
| 80.83 | 109 | 1.0000 | 1.0235 | 1 | 109 | 0.0000 | 0.1376 | 2 | 109 | 1.0000 | 0.9600 | 3 |
| 81.33 | 110 | 1.0000 | 1.0236 | 1 | 110 | 0.0000 | 0.1342 | 2 | 110 | 1.0000 | 0.9599 | 3 |
| 81.83 | 111 | 1.0000 | 1.0237 | 1 | 111 | 0.0000 | 0.1313 | 2 | 111 | 1.0000 | 0.9595 | 3 |
| 82.33 | 112 | 1.0000 | 1.0238 | 1 | 112 | 0.0000 | 0.1282 | 2 | 112 | 1.0000 | 0.9588 | 3 |
| 82.83 | 113 | 1.0000 | 1.0240 | 1 | 113 | 0.0000 | 0.1247 | 2 | 113 | 1.0000 | 0.9581 | 3 |
| 83.33 | 114 | 1.0000 | 1.0244 | 1 | 114 | 0.0000 | 0.1211 | 2 | 114 | 1.0000 | 0.9563 | 3 |
| 83.83 | 115 | 1.0000 | 1.0247 | 1 | 115 | 0.0000 | 0.1155 | 2 | 115 | 1.0000 | 0.9550 | 3 |
| 84.33 | 116 | 1.0000 | 1.0251 | 1 | 116 | 0.0000 | 0.1112 | 2 | 116 | 1.0000 | 0.9528 | 3 |
| 84.83 | 117 | 1.0000 | 1.0255 | 1 | 117 | 0.0000 | 0.1063 | 2 | 117 | 1.0000 | 0.9506 | 3 |
| 85.33 | 118 | 1.0000 | 1.0289 | 1 | 118 | 0.0000 | 0.0651 | 2 | 118 | 1.0000 | 0.9286 | 3 |
| 85.83 | 119 | 1.0000 | 1.0268 | 1 | 119 | 0.0000 | 0.0922 | 2 | 119 | 1.0000 | 0.9427 | 3 |
| 86.33 | 120 | 1.0000 | 1.0271 | 1 | 120 | 0.0000 | 0.0884 | 2 | 120 | 1.0000 | 0.9405 | 3 |
| 86.83 | 121 | 1.0000 | 1.0274 | 1 | 121 | 0.0000 | 0.0857 | 2 | 121 | 1.0000 | 0.9378 | 3 |
| 87.33 | 122 | 1.0000 | 1.0276 | 1 | 122 | 0.0000 | 0.0833 | 2 | 122 | 1.0000 | 0.9360 | 3 |
| 87.83 | 123 | 1.0000 | 1.0277 | 1 | 123 | 0.0000 | 0.0808 | 2 | 123 | 1.0000 | 0.9365 | 3 |
| 88.33 | 124 | 1.0000 | 1.0278 | 1 | 124 | 0.0000 | 0.0794 | 2 | 124 | 1.0000 | 0.9359 | 3 |
| 88.83 | 125 | 1.0000 | 1.0277 | 1 | 125 | 0.0000 | 0.0778 | 2 | 125 | 1.0000 | 0.9376 | 3 |
| 89.33 | 126 | 1.0000 | 1.0277 | 1 | 126 | 0.0000 | 0.0763 | 2 | 126 | 1.0000 | 0.9386 | 3 |
| 89.83 | 127 | 1.0000 | 1.0276 | 1 | 127 | 0.0000 | 0.0751 | 2 | 127 | 1.0000 | 0.9397 | 3 |
| 90.33 | 128 | 1.0000 | 1.0275 | 1 | 128 | 0.0000 | 0.0735 | 2 | 128 | 1.0000 | 0.9420 | 3 |
| 90.83 | 129 | 1.0000 | 1.0273 | 1 | 129 | 0.0000 | 0.0726 | 2 | 129 | 1.0000 | 0.9433 | 3 |
| 91.33 | 130 | 1.0000 | 1.0272 | 1 | 130 | 0.0000 | 0.0712 | 2 | 130 | 1.0000 | 0.9453 | 3 |
| 91.83 | 131 | 1.0000 | 1.0272 | 1 | 131 | 0.0000 | 0.0695 | 2 | 131 | 1.0000 | 0.9464 | 3 |
| 92.33 | 132 | 1.0000 | 1.0271 | 1 | 132 | 0.0000 | 0.0681 | 2 | 132 | 1.0000 | 0.9473 | 3 |
| 92.83 | 133 | 1.0000 | 1.0269 | 1 | 133 | 0.0000 | 0.0661 | 2 | 133 | 1.0000 | 0.9497 | 3 |
| 93.33 | 134 | 1.0000 | 1.0269 | 1 | 134 | 0.0000 | 0.0643 | 2 | 134 | 1.0000 | 0.9503 | 3 |
| 93.83 | 135 | 1.0000 | 1.0270 | 1 | 135 | 0.0000 | 0.0624 | 2 | 135 | 1.0000 | 0.9510 | 3 |
| 94.33 | 136 | 1.0000 | 1.0270 | 1 | 136 | 0.0000 | 0.0607 | 2 | 136 | 1.0000 | 0.9515 | 3 |
| 94.83 | 137 | 1.0000 | 1.0270 | 1 | 137 | 0.0000 | 0.0590 | 2 | 137 | 1.0000 | 0.9516 | 3 |
| 95.33 | 138 | 1.0000 | 1.0270 | 1 | 138 | 0.0000 | 0.0573 | 2 | 138 | 1.0000 | 0.9526 | 3 |
| 95.83 | 139 | 1.0000 | 1.0271 | 1 | 139 | 0.0000 | 0.0559 | 2 | 139 | 1.0000 | 0.9527 | 3 |
| 96.33 | 140 | 1.0000 | 1.0269 | 1 | 140 | 0.0000 | 0.0545 | 2 | 140 | 1.0000 | 0.9544 | 3 |
| 96.83 | 141 | 1.0000 | 1.0269 | 1 | 141 | 0.0000 | 0.0530 | 2 | 141 | 1.0000 | 0.9550 | 3 |
| 97.33 | 142 | 1.0000 | 1.0268 | 1 | 142 | 0.0000 | 0.0519 | 2 | 142 | 1.0000 | 0.9562 | 3 |
| 97.83 | 143 | 1.0000 | 1.0265 | 1 | 143 | 0.0000 | 0.0508 | 2 | 143 | 1.0000 | 0.9583 | 3 |
| 98.33 | 144 | 1.0000 | 1.0262 | 1 | 144 | 0.0000 | 0.0500 | 2 | 144 | 1.0000 | 0.9606 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 98.83 | 145 | 1.0000 | 1.0259 | 1 | 145 | 0.0000 | 0.0491 | 2 | 145 | 1.0000 | 0.9623 | 3 |
| 99.33 | 146 | 1.0000 | 1.0256 | 1 | 146 | 0.0000 | 0.0480 | 2 | 146 | 1.0000 | 0.9643 | 3 |
| 99.83 | 147 | 1.0000 | 1.0252 | 1 | 147 | 0.0000 | 0.0473 | 2 | 147 | 1.0000 | 0.9663 | 3 |
| 100.33 | 148 | 1.0000 | 1.0249 | 1 | 148 | 0.0000 | 0.0465 | 2 | 148 | 1.0000 | 0.9679 | 3 |
| 100.83 | 149 | 1.0000 | 1.0246 | 1 | 149 | 0.0000 | 0.0458 | 2 | 149 | 1.0000 | 0.9691 | 3 |
| 101.33 | 150 | 1.0000 | 1.0242 | 1 | 150 | 0.0000 | 0.0450 | 2 | 150 | 1.0000 | 0.9708 | 3 |
| 101.83 | 151 | 1.0000 | 1.0239 | 1 | 151 | 0.0000 | 0.0443 | 2 | 151 | 1.0000 | 0.9719 | 3 |
| 102.33 | 152 | 1.0000 | 1.0236 | 1 | 152 | 0.0000 | 0.0434 | 2 | 152 | 1.0000 | 0.9730 | 3 |
| 102.83 | 153 | 1.0000 | 1.0234 | 1 | 153 | 0.0000 | 0.0427 | 2 | 153 | 1.0000 | 0.9740 | 3 |
| 103.33 | 154 | 1.0000 | 1.0231 | 1 | 154 | 0.0000 | 0.0418 | 2 | 154 | 1.0000 | 0.9748 | 3 |
| 103.83 | 155 | 1.0000 | 1.0229 | 1 | 155 | 0.0000 | 0.0411 | 2 | 155 | 1.0000 | 0.9755 | 3 |
| 104.33 | 156 | 1.0000 | 1.0228 | 1 | 156 | 0.0000 | 0.0403 | 2 | 156 | 1.0000 | 0.9759 | 3 |
| 104.83 | 157 | 1.0000 | 1.0226 | 1 | 157 | 0.0000 | 0.0396 | 2 | 157 | 1.0000 | 0.9765 | 3 |
| 105.33 | 158 | 1.0000 | 1.0226 | 1 | 158 | 0.0000 | 0.0389 | 2 | 158 | 1.0000 | 0.9767 | 3 |
| 105.83 | 159 | 1.0000 | 1.0224 | 1 | 159 | 0.0000 | 0.0381 | 2 | 159 | 1.0000 | 0.9773 | 3 |
| 106.33 | 160 | 1.0000 | 1.0223 | 1 | 160 | 0.0000 | 0.0376 | 2 | 160 | 1.0000 | 0.9776 | 3 |
| 106.83 | 161 | 1.0000 | 1.0221 | 1 | 161 | 0.0000 | 0.0369 | 2 | 161 | 1.0000 | 0.9780 | 3 |
| 107.33 | 162 | 1.0000 | 1.0220 | 1 | 162 | 0.0000 | 0.0363 | 2 | 162 | 1.0000 | 0.9785 | 3 |
| 107.83 | 163 | 1.0000 | 1.0218 | 1 | 163 | 0.0000 | 0.0358 | 2 | 163 | 1.0000 | 0.9789 | 3 |
| 108.33 | 164 | 1.0000 | 1.0216 | 1 | 164 | 0.0000 | 0.0353 | 2 | 164 | 1.0000 | 0.9793 | 3 |
| 108.83 | 165 | 1.0000 | 1.0215 | 1 | 165 | 0.0000 | 0.0348 | 2 | 165 | 1.0000 | 0.9796 | 3 |
| 109.33 | 166 | 1.0000 | 1.0213 | 1 | 166 | 0.0000 | 0.0343 | 2 | 166 | 1.0000 | 0.9801 | 3 |
| 109.83 | 167 | 1.0000 | 1.0211 | 1 | 167 | 0.0000 | 0.0339 | 2 | 167 | 1.0000 | 0.9805 | 3 |
| 110.33 | 168 | 1.0000 | 1.0209 | 1 | 168 | 0.0000 | 0.0335 | 2 | 168 | 1.0000 | 0.9810 | 3 |
| 110.83 | 169 | 1.0000 | 1.0207 | 1 | 169 | 0.0000 | 0.0332 | 2 | 169 | 1.0000 | 0.9812 | 3 |
| 111.33 | 170 | 1.0000 | 1.0206 | 1 | 170 | 0.0000 | 0.0328 | 2 | 170 | 1.0000 | 0.9815 | 3 |
| 111.83 | 171 | 1.0000 | 1.0204 | 1 | 171 | 0.0000 | 0.0324 | 2 | 171 | 1.0000 | 0.9818 | 3 |
| 112.33 | 172 | 1.0000 | 1.0202 | 1 | 172 | 0.0000 | 0.0320 | 2 | 172 | 1.0000 | 0.9822 | 3 |
| 112.83 | 173 | 1.0000 | 1.0200 | 1 | 173 | 0.0000 | 0.0316 | 2 | 173 | 1.0000 | 0.9824 | 3 |
| 113.33 | 174 | 1.0000 | 1.0199 | 1 | 174 | 0.0000 | 0.0314 | 2 | 174 | 1.0000 | 0.9826 | 3 |
| 113.83 | 175 | 1.0000 | 1.0198 | 1 | 175 | 0.0000 | 0.0309 | 2 | 175 | 1.0000 | 0.9828 | 3 |
| 114.33 | 176 | 1.0000 | 1.0197 | 1 | 176 | 0.0000 | 0.0306 | 2 | 176 | 1.0000 | 0.9829 | 3 |
| 114.83 | 177 | 1.0000 | 1.0196 | 1 | 177 | 0.0000 | 0.0302 | 2 | 177 | 1.0000 | 0.9832 | 3 |
| 115.33 | 178 | 1.0000 | 1.0195 | 1 | 178 | 0.0000 | 0.0299 | 2 | 178 | 1.0000 | 0.9833 | 3 |
| 115.83 | 179 | 1.0000 | 1.0194 | 1 | 179 | 0.0000 | 0.0296 | 2 | 179 | 1.0000 | 0.9834 | 3 |
| 116.33 | 180 | 1.0000 | 1.0193 | 1 | 180 | 0.0000 | 0.0292 | 2 | 180 | 1.0000 | 0.9835 | 3 |
| 116.83 | 181 | 1.0000 | 1.0192 | 1 | 181 | 0.0000 | 0.0290 | 2 | 181 | 1.0000 | 0.9837 | 3 |
| 117.33 | 182 | 1.0000 | 1.0190 | 1 | 182 | 0.0000 | 0.0287 | 2 | 182 | 1.0000 | 0.9838 | 3 |
| 117.83 | 183 | 1.0000 | 1.0189 | 1 | 183 | 0.0000 | 0.0284 | 2 | 183 | 1.0000 | 0.9840 | 3 |
| 118.33 | 184 | 1.0000 | 1.0188 | 1 | 184 | 0.0000 | 0.0281 | 2 | 184 | 1.0000 | 0.9842 | 3 |
| 118.83 | 185 | 1.0000 | 1.0186 | 1 | 185 | 0.0000 | 0.0279 | 2 | 185 | 1.0000 | 0.9844 | 3 |
| 119.33 | 186 | 1.0000 | 1.0185 | 1 | 186 | 0.0000 | 0.0277 | 2 | 186 | 1.0000 | 0.9846 | 3 |
| 119.83 | 187 | 1.0000 | 1.0183 | 1 | 187 | 0.0000 | 0.0274 | 2 | 187 | 1.0000 | 0.9848 | 3 |
| 120.33 | 188 | 1.0000 | 1.0181 | 1 | 188 | 0.0000 | 0.0272 | 2 | 188 | 1.0000 | 0.9851 | 3 |
| 120.83 | 189 | 1.0000 | 1.0179 | 1 | 189 | 0.0000 | 0.0270 | 2 | 189 | 1.0000 | 0.9853 | 3 |
| 121.33 | 190 | 1.0000 | 1.0177 | 1 | 190 | 0.0000 | 0.0268 | 2 | 190 | 1.0000 | 0.9856 | 3 |
| 121.83 | 191 | 1.0000 | 1.0175 | 1 | 191 | 0.0000 | 0.0266 | 2 | 191 | 1.0000 | 0.9858 | 3 |
| 122.33 | 192 | 1.0000 | 1.0173 | 1 | 192 | 0.0000 | 0.0264 | 2 | 192 | 1.0000 | 0.9860 | 3 |
| 122.83 | 193 | 1.0000 | 1.0171 | 1 | 193 | 0.0000 | 0.0263 | 2 | 193 | 1.0000 | 0.9862 | 3 |
| 123.33 | 194 | 1.0000 | 1.0169 | 1 | 194 | 0.0000 | 0.0261 | 2 | 194 | 1.0000 | 0.9865 | 3 |
| 123.83 | 195 | 1.0000 | 1.0167 | 1 | 195 | 0.0000 | 0.0259 | 2 | 195 | 1.0000 | 0.9867 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 124.33 | 196 | 1.0000 | 1.0166 | 1 | 196 | 0.0000 | 0.0257 | 2 | 196 | 1.0000 | 0.9869 | 3 |
| 124.83 | 197 | 1.0000 | 1.0164 | 1 | 197 | 0.0000 | 0.0256 | 2 | 197 | 1.0000 | 0.9871 | 3 |
| 125.33 | 198 | 1.0000 | 1.0162 | 1 | 198 | 0.0000 | 0.0254 | 2 | 198 | 1.0000 | 0.9873 | 3 |
| 125.83 | 199 | 1.0000 | 1.0161 | 1 | 199 | 0.0000 | 0.0252 | 2 | 199 | 1.0000 | 0.9874 | 3 |
| 126.33 | 200 | 1.0000 | 1.0159 | 1 | 200 | 0.0000 | 0.0251 | 2 | 200 | 1.0000 | 0.9875 | 3 |
| 126.83 | 201 | 1.0000 | 1.0157 | 1 | 201 | 0.0000 | 0.0249 | 2 | 201 | 1.0000 | 0.9877 | 3 |
| 127.33 | 202 | 1.0000 | 1.0156 | 1 | 202 | 0.0000 | 0.0248 | 2 | 202 | 1.0000 | 0.9879 | 3 |
| 127.83 | 203 | 1.0000 | 1.0154 | 1 | 203 | 0.0000 | 0.0246 | 2 | 203 | 1.0000 | 0.9880 | 3 |
| 128.33 | 204 | 1.0000 | 1.0152 | 1 | 204 | 0.0000 | 0.0245 | 2 | 204 | 1.0000 | 0.9882 | 3 |
| 128.83 | 205 | 1.0000 | 1.0151 | 1 | 205 | 0.0000 | 0.0244 | 2 | 205 | 1.0000 | 0.9884 | 3 |
| 129.33 | 206 | 1.0000 | 1.0149 | 1 | 206 | 0.0000 | 0.0243 | 2 | 206 | 1.0000 | 0.9886 | 3 |
| 129.83 | 207 | 1.0000 | 1.0147 | 1 | 207 | 0.0000 | 0.0242 | 2 | 207 | 1.0000 | 0.9887 | 3 |
| 130.33 | 208 | 1.0000 | 1.0145 | 1 | 208 | 0.0000 | 0.0241 | 2 | 208 | 1.0000 | 0.9890 | 3 |
| 130.83 | 209 | 1.0000 | 1.0143 | 1 | 209 | 0.0000 | 0.0240 | 2 | 209 | 1.0000 | 0.9891 | 3 |
| 131.33 | 210 | 1.0000 | 1.0141 | 1 | 210 | 0.0000 | 0.0239 | 2 | 210 | 1.0000 | 0.9893 | 3 |
| 131.83 | 211 | 1.0000 | 1.0140 | 1 | 211 | 0.0000 | 0.0238 | 2 | 211 | 1.0000 | 0.9895 | 3 |
| 132.33 | 212 | 1.0000 | 1.0138 | 1 | 212 | 0.0000 | 0.0238 | 2 | 212 | 1.0000 | 0.9897 | 3 |
| 132.83 | 213 | 1.0000 | 1.0137 | 1 | 213 | 0.0000 | 0.0237 | 2 | 213 | 1.0000 | 0.9898 | 3 |
| 133.33 | 214 | 1.0000 | 1.0135 | 1 | 214 | 0.0000 | 0.0236 | 2 | 214 | 1.0000 | 0.9900 | 3 |
| 133.83 | 215 | 1.0000 | 1.0134 | 1 | 215 | 0.0000 | 0.0236 | 2 | 215 | 1.0000 | 0.9902 | 3 |
| 134.33 | 216 | 1.0000 | 1.0132 | 1 | 216 | 0.0000 | 0.0235 | 2 | 216 | 1.0000 | 0.9903 | 3 |
| 134.83 | 217 | 1.0000 | 1.0131 | 1 | 217 | 0.0000 | 0.0234 | 2 | 217 | 1.0000 | 0.9905 | 3 |
| 135.33 | 218 | 1.0000 | 1.0130 | 1 | 218 | 0.0000 | 0.0233 | 2 | 218 | 1.0000 | 0.9906 | 3 |
| 135.83 | 219 | 1.0000 | 1.0129 | 1 | 219 | 0.0000 | 0.0233 | 2 | 219 | 1.0000 | 0.9908 | 3 |
| 136.33 | 220 | 1.0000 | 1.0128 | 1 | 220 | 0.0000 | 0.0232 | 2 | 220 | 1.0000 | 0.9909 | 3 |
| 136.83 | 221 | 1.0000 | 1.0127 | 1 | 221 | 0.0000 | 0.0231 | 2 | 221 | 1.0000 | 0.9910 | 3 |
| 137.33 | 222 | 1.0000 | 1.0126 | 1 | 222 | 0.0000 | 0.0230 | 2 | 222 | 1.0000 | 0.9912 | 3 |
| 137.83 | 223 | 1.0000 | 1.0126 | 1 | 223 | 0.0000 | 0.0229 | 2 | 223 | 1.0000 | 0.9913 | 3 |
| 138.33 | 224 | 1.0000 | 1.0125 | 1 | 224 | 0.0000 | 0.0228 | 2 | 224 | 1.0000 | 0.9914 | 3 |
| 138.83 | 225 | 1.0000 | 1.0124 | 1 | 225 | 0.0000 | 0.0228 | 2 | 225 | 1.0000 | 0.9916 | 3 |
| 139.33 | 226 | 1.0000 | 1.0124 | 1 | 226 | 0.0000 | 0.0227 | 2 | 226 | 1.0000 | 0.9917 | 3 |
| 139.83 | 227 | 1.0000 | 1.0123 | 1 | 227 | 0.0000 | 0.0226 | 2 | 227 | 1.0000 | 0.9918 | 3 |
| 140.33 | 228 | 1.0000 | 1.0122 | 1 | 228 | 0.0000 | 0.0226 | 2 | 228 | 1.0000 | 0.9919 | 3 |
| 140.83 | 229 | 1.0000 | 1.0121 | 1 | 229 | 0.0000 | 0.0225 | 2 | 229 | 1.0000 | 0.9920 | 3 |
| 141.33 | 230 | 1.0000 | 1.0121 | 1 | 230 | 0.0000 | 0.0224 | 2 | 230 | 1.0000 | 0.9921 | 3 |
| 141.83 | 231 | 1.0000 | 1.0120 | 1 | 231 | 0.0000 | 0.0224 | 2 | 231 | 1.0000 | 0.9922 | 3 |
| 142.33 | 232 | 1.0000 | 1.0119 | 1 | 232 | 0.0000 | 0.0223 | 2 | 232 | 1.0000 | 0.9923 | 3 |
| 142.83 | 233 | 1.0000 | 1.0119 | 1 | 233 | 0.0000 | 0.0223 | 2 | 233 | 1.0000 | 0.9924 | 3 |
| 143.33 | 234 | 1.0000 | 1.0118 | 1 | 234 | 0.0000 | 0.0223 | 2 | 234 | 1.0000 | 0.9925 | 3 |
| 143.83 | 235 | 1.0000 | 1.0117 | 1 | 235 | 0.0000 | 0.0222 | 2 | 235 | 1.0000 | 0.9926 | 3 |
| 144.33 | 236 | 1.0000 | 1.0116 | 1 | 236 | 0.0000 | 0.0222 | 2 | 236 | 1.0000 | 0.9927 | 3 |
| 144.83 | 237 | 1.0000 | 1.0116 | 1 | 237 | 0.0000 | 0.0221 | 2 | 237 | 1.0000 | 0.9928 | 3 |
| 145.33 | 238 | 1.0000 | 1.0115 | 1 | 238 | 0.0000 | 0.0221 | 2 | 238 | 1.0000 | 0.9928 | 3 |
| 145.83 | 239 | 1.0000 | 1.0114 | 1 | 239 | 0.0000 | 0.0220 | 2 | 239 | 1.0000 | 0.9929 | 3 |
| 146.33 | 240 | 1.0000 | 1.0113 | 1 | 240 | 0.0000 | 0.0220 | 2 | 240 | 1.0000 | 0.9930 | 3 |
| 146.83 | 241 | 1.0000 | 1.0113 | 1 | 241 | 0.0000 | 0.0220 | 2 | 241 | 1.0000 | 0.9931 | 3 |
| 147.33 | 242 | 1.0000 | 1.0112 | 1 | 242 | 0.0000 | 0.0219 | 2 | 242 | 1.0000 | 0.9931 | 3 |
| 147.83 | 243 | 1.0000 | 1.0111 | 1 | 243 | 0.0000 | 0.0219 | 2 | 243 | 1.0000 | 0.9932 | 3 |
| 148.33 | 244 | 1.0000 | 1.0111 | 1 | 244 | 0.0000 | 0.0219 | 2 | 244 | 1.0000 | 0.9933 | 3 |
| 148.83 | 245 | 1.0000 | 1.0110 | 1 | 245 | 0.0000 | 0.0219 | 2 | 245 | 1.0000 | 0.9934 | 3 |
| 149.33 | 246 | 1.0000 | 1.0109 | 1 | 246 | 0.0000 | 0.0219 | 2 | 246 | 1.0000 | 0.9934 | 3 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 149.83 | 247 | 1.0000 | 1.0109 | 1 | 247 | 0.0000 | 0.0219 | 2 | 247 | 1.0000 | 0.9935 | 3 |
| 150.33 | 248 | 1.0000 | 1.0108 | 1 | 248 | 0.0000 | 0.0218 | 2 | 248 | 1.0000 | 0.9936 | 3 |
| 150.83 | 249 | 1.0000 | 1.0108 | 1 | 249 | 0.0000 | 0.0218 | 2 | 249 | 1.0000 | 0.9936 | 3 |
| 151.33 | 250 | 1.0000 | 1.0107 | 1 | 250 | 0.0000 | 0.0218 | 2 | 250 | 1.0000 | 0.9937 | 3 |
| 151.83 | 251 | 1.0000 | 1.0107 | 1 | 251 | 0.0000 | 0.0218 | 2 | 251 | 1.0000 | 0.9938 | 3 |
| 152.33 | 252 | 1.0000 | 1.0106 | 1 | 252 | 0.0000 | 0.0218 | 2 | 252 | 1.0000 | 0.9938 | 3 |
| 152.83 | 253 | 1.0000 | 1.0106 | 1 | 253 | 0.0000 | 0.0218 | 2 | 253 | 1.0000 | 0.9939 | 3 |
| 153.33 | 254 | 1.0000 | 1.0105 | 1 | 254 | 0.0000 | 0.0217 | 2 | 254 | 1.0000 | 0.9940 | 3 |
| 153.83 | 255 | 1.0000 | 1.0105 | 1 | 255 | 0.0000 | 0.0217 | 2 | 255 | 1.0000 | 0.9940 | 3 |
| 154.33 | 256 | 1.0000 | 1.0104 | 1 | 256 | 0.0000 | 0.0217 | 2 | 256 | 1.0000 | 0.9941 | 3 |
| 154.83 | 257 | 1.0000 | 1.0104 | 1 | 257 | 0.0000 | 0.0217 | 2 | 257 | 1.0000 | 0.9941 | 3 |
| 155.33 | 258 | 1.0000 | 1.0103 | 1 | 258 | 0.0000 | 0.0217 | 2 | 258 | 1.0000 | 0.9942 | 3 |
| 155.83 | 259 | 1.0000 | 1.0103 | 1 | 259 | 0.0000 | 0.0217 | 2 | 259 | 1.0000 | 0.9942 | 3 |
| 156.33 | 260 | 1.0000 | 1.0103 | 1 | 260 | 0.0000 | 0.0216 | 2 | 260 | 1.0000 | 0.9943 | 3 |
| 156.83 | 261 | 1.0000 | 1.0102 | 1 | 261 | 0.0000 | 0.0216 | 2 | 261 | 1.0000 | 0.9943 | 3 |
| 157.33 | 262 | 1.0000 | 1.0102 | 1 | 262 | 0.0000 | 0.0216 | 2 | 262 | 1.0000 | 0.9944 | 3 |
| 157.83 | 263 | 1.0000 | 1.0101 | 1 | 263 | 0.0000 | 0.0216 | 2 | 263 | 1.0000 | 0.9944 | 3 |
| 158.33 | 264 | 1.0000 | 1.0101 | 1 | 264 | 0.0000 | 0.0215 | 2 | 264 | 1.0000 | 0.9945 | 3 |
| 158.83 | 265 | 1.0000 | 1.0101 | 1 | 265 | 0.0000 | 0.0215 | 2 | 265 | 1.0000 | 0.9945 | 3 |
| 159.33 | 266 | 1.0000 | 1.0100 | 1 | 266 | 0.0000 | 0.0215 | 2 | 266 | 1.0000 | 0.9945 | 3 |
| 159.83 | 267 | 1.0000 | 1.0100 | 1 | 267 | 0.0000 | 0.0215 | 2 | 267 | 1.0000 | 0.9946 | 3 |
| 160.33 | 268 | 1.0000 | 1.0100 | 1 | 268 | 0.0000 | 0.0215 | 2 | 268 | 1.0000 | 0.9946 | 3 |
| 160.83 | 269 | 1.0000 | 1.0099 | 1 | 269 | 0.0000 | 0.0215 | 2 | 269 | 1.0000 | 0.9947 | 3 |
| 161.33 | 270 | 1.0000 | 1.0099 | 1 | 270 | 0.0000 | 0.0215 | 2 | 270 | 1.0000 | 0.9947 | 3 |
| 161.83 | 271 | 1.0000 | 1.0098 | 1 | 271 | 0.0000 | 0.0215 | 2 | 271 | 1.0000 | 0.9948 | 3 |
| 162.33 | 272 | 1.0000 | 1.0098 | 1 | 272 | 0.0000 | 0.0215 | 2 | 272 | 1.0000 | 0.9948 | 3 |
| 162.83 | 273 | 1.0000 | 1.0098 | 1 | 273 | 0.0000 | 0.0215 | 2 | 273 | 1.0000 | 0.9949 | 3 |
| 163.33 | 274 | 1.0000 | 1.0098 | 1 | 274 | 0.0000 | 0.0215 | 2 | 274 | 1.0000 | 0.9949 | 3 |
| 163.83 | 275 | 1.0000 | 1.0097 | 1 | 275 | 0.0000 | 0.0216 | 2 | 275 | 1.0000 | 0.9950 | 3 |
| 164.33 | 276 | 1.0000 | 1.0097 | 1 | 276 | 0.0000 | 0.0216 | 2 | 276 | 1.0000 | 0.9950 | 3 |
| 164.83 | 277 | 1.0000 | 1.0097 | 1 | 277 | 0.0000 | 0.0216 | 2 | 277 | 1.0000 | 0.9951 | 3 |
| 165.33 | 278 | 1.0000 | 1.0097 | 1 | 278 | 0.0000 | 0.0217 | 2 | 278 | 1.0000 | 0.9951 | 3 |
| 165.83 | 279 | 1.0000 | 1.0096 | 1 | 279 | 0.0000 | 0.0217 | 2 | 279 | 1.0000 | 0.9952 | 3 |
| 166.33 | 280 | 1.0000 | 1.0096 | 1 | 280 | 0.0000 | 0.0217 | 2 | 280 | 1.0000 | 0.9952 | 3 |
| 166.83 | 281 | 1.0000 | 1.0096 | 1 | 281 | 0.0000 | 0.0218 | 2 | 281 | 1.0000 | 0.9953 | 3 |
| 167.33 | 282 | 1.0000 | 1.0096 | 1 | 282 | 0.0000 | 0.0218 | 2 | 282 | 1.0000 | 0.9953 | 3 |
| 167.83 | 283 | 1.0000 | 1.0096 | 1 | 283 | 0.0000 | 0.0219 | 2 | 283 | 1.0000 | 0.9954 | 3 |
| 168.33 | 284 | 1.0000 | 1.0096 | 1 | 284 | 0.0000 | 0.0219 | 2 | 284 | 1.0000 | 0.9954 | 3 |
| 168.83 | 285 | 1.0000 | 1.0095 | 1 | 285 | 0.0000 | 0.0219 | 2 | 285 | 1.0000 | 0.9955 | 3 |
| 169.33 | 286 | 1.0000 | 1.0095 | 1 | 286 | 0.0000 | 0.0220 | 2 | 286 | 1.0000 | 0.9955 | 3 |
| 169.83 | 287 | 1.0000 | 1.0095 | 1 | 287 | 0.0000 | 0.0219 | 2 | 287 | 1.0000 | 0.9955 | 3 |
| 170.33 | 288 | 1.0000 | 1.0095 | 1 | 288 | 0.0000 | 0.0219 | 2 | 288 | 1.0000 | 0.9956 | 3 |
| 170.83 | 289 | 1.0000 | 1.0094 | 1 | 289 | 0.0000 | 0.0219 | 2 | 289 | 1.0000 | 0.9956 | 3 |
| 171.33 | 290 | 1.0000 | 1.0094 | 1 | 290 | 0.0000 | 0.0219 | 2 | 290 | 1.0000 | 0.9956 | 3 |
| 171.83 | 291 | 1.0000 | 1.0094 | 1 | 291 | 0.0000 | 0.0218 | 2 | 291 | 1.0000 | 0.9956 | 3 |
| 172.33 | 292 | 1.0000 | 1.0094 | 1 | 292 | 0.0000 | 0.0218 | 2 | 292 | 1.0000 | 0.9957 | 3 |
| 172.83 | 293 | 1.0000 | 1.0093 | 1 | 293 | 0.0000 | 0.0218 | 2 | 293 | 1.0000 | 0.9957 | 3 |
| 173.33 | 294 | 1.0000 | 1.0093 | 1 | 294 | 0.0000 | 0.0218 | 2 | 294 | 1.0000 | 0.9957 | 3 |
| 173.83 | 295 | 1.0000 | 1.0093 | 1 | 295 | 0.0000 | 0.0218 | 2 | 295 | 1.0000 | 0.9957 | 3 |
| 174.33 | 296 | 1.0000 | 1.0093 | 1 | 296 | 0.0000 | 0.0218 | 2 | 296 | 1.0000 | 0.9958 | 3 |
| 174.83 | 297 | 1.0000 | 1.0092 | 1 | 297 | 0.0000 | 0.0218 | 2 | 297 | 1.0000 | 0.9958 | 3 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 175.33 | 298 | 1.0000 | 1.0092 | 1 | 298 | 0.0000 | 0.0217 | 2 | 298 | 1.0000 | 0.9958 | 3 |
| 175.83 | 299 | 1.0000 | 1.0092 | 1 | 299 | 0.0000 | 0.0218 | 2 | 299 | 1.0000 | 0.9959 | 3 |
| 176.33 | 300 | 1.0000 | 1.0092 | 1 | 300 | 0.0000 | 0.0218 | 2 | 300 | 1.0000 | 0.9959 | 3 |
| 176.83 | 301 | 1.0000 | 1.0091 | 1 | 301 | 0.0000 | 0.0218 | 2 | 301 | 1.0000 | 0.9959 | 3 |
| 177.33 | 302 | 1.0000 | 1.0091 | 1 | 302 | 0.0000 | 0.0218 | 2 | 302 | 1.0000 | 0.9960 | 3 |
| 177.83 | 303 | 1.0000 | 1.0091 | 1 | 303 | 0.0000 | 0.0218 | 2 | 303 | 1.0000 | 0.9960 | 3 |
| 178.33 | 304 | 1.0000 | 1.0091 | 1 | 304 | 0.0000 | 0.0218 | 2 | 304 | 1.0000 | 0.9960 | 3 |
| 178.83 | 305 | 1.0000 | 1.0091 | 1 | 305 | 0.0000 | 0.0218 | 2 | 305 | 1.0000 | 0.9961 | 3 |
| 179.33 | 306 | 1.0000 | 1.0091 | 1 | 306 | 0.0000 | 0.0218 | 2 | 306 | 1.0000 | 0.9961 | 3 |
| 179.83 | 307 | 1.0000 | 1.0090 | 1 | 307 | 0.0000 | 0.0218 | 2 | 307 | 1.0000 | 0.9961 | 3 |
| 180.33 | 308 | 1.0000 | 1.0090 | 1 | 308 | 0.0000 | 0.0218 | 2 | 308 | 1.0000 | 0.9961 | 3 |
| 180.83 | 309 | 1.0000 | 1.0090 | 1 | 309 | 0.0000 | 0.0218 | 2 | 309 | 1.0000 | 0.9962 | 3 |
| 181.33 | 310 | 1.0000 | 1.0090 | 1 | 310 | 0.0000 | 0.0218 | 2 | 310 | 1.0000 | 0.9962 | 3 |
| 181.83 | 311 | 1.0000 | 1.0090 | 1 | 311 | 0.0000 | 0.0219 | 2 | 311 | 1.0000 | 0.9962 | 3 |
| 182.33 | 312 | 1.0000 | 1.0090 | 1 | 312 | 0.0000 | 0.0219 | 2 | 312 | 1.0000 | 0.9962 | 3 |
| 182.83 | 313 | 1.0000 | 1.0090 | 1 | 313 | 0.0000 | 0.0219 | 2 | 313 | 1.0000 | 0.9963 | 3 |
| 183.33 | 314 | 1.0000 | 1.0090 | 1 | 314 | 0.0000 | 0.0220 | 2 | 314 | 1.0000 | 0.9963 | 3 |
| 183.83 | 315 | 1.0000 | 1.0090 | 1 | 315 | 0.0000 | 0.0220 | 2 | 315 | 1.0000 | 0.9963 | 3 |
| 184.33 | 316 | 1.0000 | 1.0090 | 1 | 316 | 0.0000 | 0.0221 | 2 | 316 | 1.0000 | 0.9964 | 3 |
| 184.83 | 317 | 1.0000 | 1.0090 | 1 | 317 | 0.0000 | 0.0221 | 2 | 317 | 1.0000 | 0.9964 | 3 |
| 185.33 | 318 | 1.0000 | 1.0090 | 1 | 318 | 0.0000 | 0.0222 | 2 | 318 | 1.0000 | 0.9964 | 3 |
| 185.83 | 319 | 1.0000 | 1.0090 | 1 | 319 | 0.0000 | 0.0223 | 2 | 319 | 1.0000 | 0.9965 | 3 |
| 186.33 | 320 | 1.0000 | 1.0090 | 1 | 320 | 0.0000 | 0.0223 | 2 | 320 | 1.0000 | 0.9965 | 3 |
| 186.83 | 321 | 1.0000 | 1.0090 | 1 | 321 | 0.0000 | 0.0224 | 2 | 321 | 1.0000 | 0.9965 | 3 |
| 187.33 | 322 | 1.0000 | 1.0090 | 1 | 322 | 0.0000 | 0.0225 | 2 | 322 | 1.0000 | 0.9966 | 3 |
| 187.83 | 323 | 1.0000 | 1.0090 | 1 | 323 | 0.0000 | 0.0226 | 2 | 323 | 1.0000 | 0.9966 | 3 |
| 188.33 | 324 | 1.0000 | 1.0090 | 1 | 324 | 0.0000 | 0.0226 | 2 | 324 | 1.0000 | 0.9966 | 3 |
| 188.83 | 325 | 1.0000 | 1.0090 | 1 | 325 | 0.0000 | 0.0227 | 2 | 325 | 1.0000 | 0.9966 | 3 |
| 189.33 | 326 | 1.0000 | 1.0090 | 1 | 326 | 0.0000 | 0.0227 | 2 | 326 | 1.0000 | 0.9967 | 3 |
| 189.83 | 327 | 1.0000 | 1.0090 | 1 | 327 | 0.0000 | 0.0228 | 2 | 327 | 1.0000 | 0.9967 | 3 |
| 190.33 | 328 | 1.0000 | 1.0090 | 1 | 328 | 0.0000 | 0.0228 | 2 | 328 | 1.0000 | 0.9967 | 3 |
| 190.83 | 329 | 1.0000 | 1.0090 | 1 | 329 | 0.0000 | 0.0229 | 2 | 329 | 1.0000 | 0.9967 | 3 |
| 191.33 | 330 | 1.0000 | 1.0090 | 1 | 330 | 0.0000 | 0.0229 | 2 | 330 | 1.0000 | 0.9968 | 3 |
| 191.83 | 331 | 1.0000 | 1.0090 | 1 | 331 | 0.0000 | 0.0229 | 2 | 331 | 1.0000 | 0.9968 | 3 |
| 192.33 | 332 | 1.0000 | 1.0090 | 1 | 332 | 0.0000 | 0.0230 | 2 | 332 | 1.0000 | 0.9968 | 3 |
| 192.83 | 333 | 1.0000 | 1.0090 | 1 | 333 | 0.0000 | 0.0231 | 2 | 333 | 1.0000 | 0.9968 | 3 |
| 193.33 | 334 | 1.0000 | 1.0090 | 1 | 334 | 0.0000 | 0.0232 | 2 | 334 | 1.0000 | 0.9968 | 3 |
| 193.83 | 335 | 1.0000 | 1.0090 | 1 | 335 | 0.0000 | 0.0233 | 2 | 335 | 1.0000 | 0.9969 | 3 |
| 194.33 | 336 | 1.0000 | 1.0090 | 1 | 336 | 0.0000 | 0.0233 | 2 | 336 | 1.0000 | 0.9969 | 3 |
| 194.83 | 337 | 1.0000 | 1.0091 | 1 | 337 | 0.0000 | 0.0234 | 2 | 337 | 1.0000 | 0.9969 | 3 |
| 195.33 | 338 | 1.0000 | 1.0091 | 1 | 338 | 0.0000 | 0.0236 | 2 | 338 | 1.0000 | 0.9970 | 3 |
| 195.83 | 339 | 1.0000 | 1.0091 | 1 | 339 | 0.0000 | 0.0237 | 2 | 339 | 1.0000 | 0.9970 | 3 |
| 196.33 | 340 | 1.0000 | 1.0091 | 1 | 340 | 0.0000 | 0.0238 | 2 | 340 | 1.0000 | 0.9970 | 3 |
| 196.83 | 341 | 1.0000 | 1.0092 | 1 | 341 | 0.0000 | 0.0240 | 2 | 341 | 1.0000 | 0.9970 | 3 |
| 197.33 | 342 | 1.0000 | 1.0092 | 1 | 342 | 0.0000 | 0.0241 | 2 | 342 | 1.0000 | 0.9971 | 3 |
| 197.83 | 343 | 1.0000 | 1.0092 | 1 | 343 | 0.0000 | 0.0242 | 2 | 343 | 1.0000 | 0.9971 | 3 |
| 198.33 | 344 | 1.0000 | 1.0092 | 1 | 344 | 0.0000 | 0.0244 | 2 | 344 | 1.0000 | 0.9971 | 3 |
| 198.83 | 345 | 1.0000 | 1.0093 | 1 | 345 | 0.0000 | 0.0245 | 2 | 345 | 1.0000 | 0.9971 | 3 |
| 199.33 | 346 | 1.0000 | 1.0093 | 1 | 346 | 0.0000 | 0.0246 | 2 | 346 | 1.0000 | 0.9972 | 3 |
| 199.83 | 347 | 1.0000 | 1.0093 | 1 | 347 | 0.0000 | 0.0247 | 2 | 347 | 1.0000 | 0.9972 | 3 |
| 200.33 | 348 | 1.0000 | 1.0093 | 1 | 348 | 0.0000 | 0.0249 | 2 | 348 | 1.0000 | 0.9972 | 3 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 200.83 | 349 | 1.0000 | 1.0093 | 1 | 349 | 0.0000 | 0.0250 | 2 | 349 | 1.0000 | 0.9972 | 3 |
| 201.33 | 350 | 1.0000 | 1.0094 | 1 | 350 | 0.0000 | 0.0251 | 2 | 350 | 1.0000 | 0.9973 | 3 |
| 201.83 | 351 | 1.0000 | 1.0094 | 1 | 351 | 0.0000 | 0.0253 | 2 | 351 | 1.0000 | 0.9973 | 3 |
| 202.33 | 352 | 1.0000 | 1.0094 | 1 | 352 | 0.0000 | 0.0254 | 2 | 352 | 1.0000 | 0.9973 | 3 |
| 202.83 | 353 | 1.0000 | 1.0094 | 1 | 353 | 0.0000 | 0.0256 | 2 | 353 | 1.0000 | 0.9973 | 3 |
| 203.33 | 354 | 1.0000 | 1.0095 | 1 | 354 | 0.0000 | 0.0258 | 2 | 354 | 1.0000 | 0.9974 | 3 |
| 203.83 | 355 | 1.0000 | 1.0095 | 1 | 355 | 0.0000 | 0.0259 | 2 | 355 | 1.0000 | 0.9974 | 3 |
| 204.33 | 356 | 1.0000 | 1.0095 | 1 | 356 | 0.0000 | 0.0261 | 2 | 356 | 1.0000 | 0.9974 | 3 |
| 204.83 | 357 | 1.0000 | 1.0096 | 1 | 357 | 0.0000 | 0.0263 | 2 | 357 | 1.0000 | 0.9974 | 3 |
| 205.33 | 358 | 1.0000 | 1.0096 | 1 | 358 | 0.0000 | 0.0266 | 2 | 358 | 1.0000 | 0.9975 | 3 |
| 205.83 | 359 | 1.0000 | 1.0096 | 1 | 359 | 0.0000 | 0.0268 | 2 | 359 | 1.0000 | 0.9975 | 3 |
| 206.33 | 360 | 1.0000 | 1.0097 | 1 | 360 | 0.0000 | 0.0271 | 2 | 360 | 1.0000 | 0.9975 | 3 |
| 206.83 | 361 | 1.0000 | 1.0097 | 1 | 361 | 0.0000 | 0.0273 | 2 | 361 | 1.0000 | 0.9976 | 3 |
| 207.33 | 362 | 1.0000 | 1.0098 | 1 | 362 | 0.0000 | 0.0276 | 2 | 362 | 1.0000 | 0.9976 | 3 |
| 207.83 | 363 | 1.0000 | 1.0098 | 1 | 363 | 0.0000 | 0.0279 | 2 | 363 | 1.0000 | 0.9976 | 3 |
| 208.33 | 364 | 1.0000 | 1.0099 | 1 | 364 | 0.0000 | 0.0281 | 2 | 364 | 1.0000 | 0.9976 | 3 |
| 208.83 | 365 | 1.0000 | 1.0099 | 1 | 365 | 0.0000 | 0.0284 | 2 | 365 | 1.0000 | 0.9977 | 3 |
| 209.33 | 366 | 1.0000 | 1.0099 | 1 | 366 | 0.0000 | 0.0285 | 2 | 366 | 1.0000 | 0.9977 | 3 |
| 209.83 | 367 | 1.0000 | 1.0099 | 1 | 367 | 0.0000 | 0.0288 | 2 | 367 | 1.0000 | 0.9977 | 3 |
| 210.33 | 368 | 1.0000 | 1.0100 | 1 | 368 | 0.0000 | 0.0289 | 2 | 368 | 1.0000 | 0.9977 | 3 |
| 210.83 | 369 | 1.0000 | 1.0100 | 1 | 369 | 0.0000 | 0.0292 | 2 | 369 | 1.0000 | 0.9978 | 3 |
| 211.33 | 370 | 1.0000 | 1.0100 | 1 | 370 | 0.0000 | 0.0294 | 2 | 370 | 1.0000 | 0.9978 | 3 |
| 211.83 | 371 | 1.0000 | 1.0100 | 1 | 371 | 0.0000 | 0.0295 | 2 | 371 | 1.0000 | 0.9978 | 3 |
| 212.33 | 372 | 1.0000 | 1.0101 | 1 | 372 | 0.0000 | 0.0299 | 2 | 372 | 1.0000 | 0.9978 | 3 |
| 212.83 | 373 | 1.0000 | 1.0101 | 1 | 373 | 0.0000 | 0.0300 | 2 | 373 | 1.0000 | 0.9978 | 3 |
| 213.33 | 374 | 1.0000 | 1.0101 | 1 | 374 | 0.0000 | 0.0303 | 2 | 374 | 1.0000 | 0.9979 | 3 |
| 213.83 | 375 | 1.0000 | 1.0101 | 1 | 375 | 0.0000 | 0.0306 | 2 | 375 | 1.0000 | 0.9979 | 3 |
| 214.33 | 376 | 1.0000 | 1.0102 | 1 | 376 | 0.0000 | 0.0308 | 2 | 376 | 1.0000 | 0.9979 | 3 |
| 214.83 | 377 | 1.0000 | 1.0102 | 1 | 377 | 0.0000 | 0.0310 | 2 | 377 | 1.0000 | 0.9979 | 3 |
| 215.33 | 378 | 1.0000 | 1.0102 | 1 | 378 | 0.0000 | 0.0313 | 2 | 378 | 1.0000 | 0.9979 | 3 |
| 215.83 | 379 | 1.0000 | 1.0103 | 1 | 379 | 0.0000 | 0.0316 | 2 | 379 | 1.0000 | 0.9980 | 3 |
| 216.33 | 380 | 1.0000 | 1.0103 | 1 | 380 | 0.0000 | 0.0317 | 2 | 380 | 1.0000 | 0.9980 | 3 |
| 216.83 | 381 | 1.0000 | 1.0103 | 1 | 381 | 0.0000 | 0.0319 | 2 | 381 | 1.0000 | 0.9980 | 3 |
| 217.33 | 382 | 1.0000 | 1.0103 | 1 | 382 | 0.0000 | 0.0321 | 2 | 382 | 1.0000 | 0.9980 | 3 |
| 217.83 | 383 | 1.0000 | 1.0103 | 1 | 383 | 0.0000 | 0.0323 | 2 | 383 | 1.0000 | 0.9980 | 3 |
| 218.33 | 384 | 1.0000 | 1.0104 | 1 | 384 | 0.0000 | 0.0325 | 2 | 384 | 1.0000 | 0.9980 | 3 |
| 218.83 | 385 | 1.0000 | 1.0104 | 1 | 385 | 0.0000 | 0.0326 | 2 | 385 | 1.0000 | 0.9981 | 3 |
| 219.33 | 386 | 1.0000 | 1.0104 | 1 | 386 | 0.0000 | 0.0326 | 2 | 386 | 1.0000 | 0.9981 | 3 |
| 219.83 | 387 | 1.0000 | 1.0104 | 1 | 387 | 0.0000 | 0.0326 | 2 | 387 | 1.0000 | 0.9981 | 3 |
| 220.33 | 388 | 1.0000 | 1.0104 | 1 | 388 | 0.0000 | 0.0326 | 2 | 388 | 1.0000 | 0.9981 | 3 |
| 220.83 | 389 | 1.0000 | 1.0103 | 1 | 389 | 0.0000 | 0.0325 | 2 | 389 | 1.0000 | 0.9981 | 3 |
| 221.33 | 390 | 1.0000 | 1.0103 | 1 | 390 | 0.0000 | 0.0325 | 2 | 390 | 1.0000 | 0.9981 | 3 |
| 221.83 | 391 | 1.0000 | 1.0103 | 1 | 391 | 0.0000 | 0.0325 | 2 | 391 | 1.0000 | 0.9981 | 3 |
| 222.33 | 392 | 1.0000 | 1.0103 | 1 | 392 | 0.0000 | 0.0325 | 2 | 392 | 1.0000 | 0.9981 | 3 |
| 222.83 | 393 | 1.0000 | 1.0103 | 1 | 393 | 0.0000 | 0.0325 | 2 | 393 | 1.0000 | 0.9981 | 3 |
| 223.33 | 394 | 1.0000 | 1.0103 | 1 | 394 | 0.0000 | 0.0326 | 2 | 394 | 1.0000 | 0.9981 | 3 |
| 223.83 | 395 | 1.0000 | 1.0103 | 1 | 395 | 0.0000 | 0.0325 | 2 | 395 | 1.0000 | 0.9981 | 3 |
| 224.33 | 396 | 1.0000 | 1.0103 | 1 | 396 | 0.0000 | 0.0327 | 2 | 396 | 1.0000 | 0.9981 | 3 |
| 224.83 | 397 | 1.0000 | 1.0103 | 1 | 397 | 0.0000 | 0.0329 | 2 | 397 | 1.0000 | 0.9981 | 3 |
| 225.33 | 398 | 1.0000 | 1.0104 | 1 | 398 | 0.0000 | 0.0331 | 2 | 398 | 1.0000 | 0.9982 | 3 |
| 225.83 | 399 | 1.0000 | 1.0104 | 1 | 399 | 0.0000 | 0.0333 | 2 | 399 | 1.0000 | 0.9982 | 3 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 226.33 | 400 | 1.0000 | 1.0104 | 1 | 400 | 0.0000 | 0.0336 | 2 | 400 | 1.0000 | 0.9982 | 3 |
| 226.83 | 401 | 1.0000 | 1.0104 | 1 | 401 | 0.0000 | 0.0336 | 2 | 401 | 1.0000 | 0.9982 | 3 |
| 227.33 | 402 | 1.0000 | 1.0104 | 1 | 402 | 0.0000 | 0.0338 | 2 | 402 | 1.0000 | 0.9982 | 3 |
| 227.83 | 403 | 1.0000 | 1.0105 | 1 | 403 | 0.0000 | 0.0339 | 2 | 403 | 1.0000 | 0.9982 | 3 |
| 228.33 | 404 | 1.0000 | 1.0104 | 1 | 404 | 0.0000 | 0.0337 | 2 | 404 | 1.0000 | 0.9982 | 3 |
| 228.83 | 405 | 1.0000 | 1.0104 | 1 | 405 | 0.0000 | 0.0337 | 2 | 405 | 1.0000 | 0.9982 | 3 |
| 229.33 | 406 | 1.0000 | 1.0104 | 1 | 406 | 0.0000 | 0.0338 | 2 | 406 | 1.0000 | 0.9982 | 3 |
| 229.83 | 407 | 1.0000 | 1.0104 | 1 | 407 | 0.0000 | 0.0335 | 2 | 407 | 1.0000 | 0.9982 | 3 |
| 230.33 | 408 | 1.0000 | 1.0104 | 1 | 408 | 0.0000 | 0.0331 | 2 | 408 | 1.0000 | 0.9982 | 3 |
| 230.83 | 409 | 1.0000 | 1.0103 | 1 | 409 | 0.0000 | 0.0330 | 2 | 409 | 1.0000 | 0.9982 | 3 |
| 231.33 | 410 | 1.0000 | 1.0103 | 1 | 410 | 0.0000 | 0.0326 | 2 | 410 | 1.0000 | 0.9982 | 3 |
| 231.83 | 411 | 1.0000 | 1.0102 | 1 | 411 | 0.0000 | 0.0322 | 2 | 411 | 1.0000 | 0.9982 | 3 |
| 232.33 | 412 | 1.0000 | 1.0102 | 1 | 412 | 0.0000 | 0.0321 | 2 | 412 | 1.0000 | 0.9982 | 3 |
| 232.83 | 413 | 1.0000 | 1.0102 | 1 | 413 | 0.0000 | 0.0317 | 2 | 413 | 1.0000 | 0.9982 | 3 |
| 233.33 | 414 | 1.0000 | 1.0101 | 1 | 414 | 0.0000 | 0.0315 | 2 | 414 | 1.0000 | 0.9982 | 3 |
| 233.83 | 415 | 1.0000 | 1.0101 | 1 | 415 | 0.0000 | 0.0313 | 2 | 415 | 1.0000 | 0.9982 | 3 |
| 234.33 | 416 | 1.0000 | 1.0101 | 1 | 416 | 0.0000 | 0.0313 | 2 | 416 | 1.0000 | 0.9982 | 3 |
| 234.83 | 417 | 1.0000 | 1.0101 | 1 | 417 | 0.0000 | 0.0311 | 2 | 417 | 1.0000 | 0.9982 | 3 |
| 235.33 | 418 | 1.0000 | 1.0101 | 1 | 418 | 0.0000 | 0.0310 | 2 | 418 | 1.0000 | 0.9982 | 3 |
| 235.83 | 419 | 1.0000 | 1.0101 | 1 | 419 | 0.0000 | 0.0310 | 2 | 419 | 1.0000 | 0.9982 | 3 |
| 236.33 | 420 | 1.0000 | 1.0101 | 1 | 420 | 0.0000 | 0.0310 | 2 | 420 | 1.0000 | 0.9982 | 3 |
| 236.83 | 421 | 1.0000 | 1.0101 | 1 | 421 | 0.0000 | 0.0310 | 2 | 421 | 1.0000 | 0.9982 | 3 |
| 237.33 | 422 | 1.0000 | 1.0101 | 1 | 422 | 0.0000 | 0.0311 | 2 | 422 | 1.0000 | 0.9982 | 3 |
| 237.83 | 423 | 1.0000 | 1.0101 | 1 | 423 | 0.0000 | 0.0311 | 2 | 423 | 1.0000 | 0.9982 | 3 |
| 238.33 | 424 | 1.0000 | 1.0101 | 1 | 424 | 0.0000 | 0.0309 | 2 | 424 | 1.0000 | 0.9982 | 3 |
| 238.83 | 425 | 1.0000 | 1.0101 | 1 | 425 | 0.0000 | 0.0308 | 2 | 425 | 1.0000 | 0.9982 | 3 |

| TIME | IDER | XD | X | ERROR | ID |
|---|---|---|---|---|---|
| RECALL SET SIZE | | | | 425 | |
| RECALL SET ERROR RMS | | | | 0.204241 | |
| MAX BIAS OR WEIGHT | | | | 20.0000 | |
| MAX GAIN OR CONSTANT | | | | 2.0000 | |

## D.4 Scenario RD6 No-Noise

Below are the no-noise results for the RD6 scenario. These results are file RD6.PRX.

| Time (sec) | Node 1 | | | | Node 2 | | | | Node 3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Desired Output | Actual Output | | | Desired Output | Actual Output | | | Desired Output | Actual Output | |
| 0.08 | 1 | 0.0000 | 0.0474 | 1 | 1 | 0.0000 | 0.0108 | 2 | 1 | 0.0000 | 0.0361 | 3 |
| 0.58 | 2 | 0.0000 | 0.0474 | 1 | 2 | 0.0000 | 0.0108 | 2 | 2 | 0.0000 | 0.0361 | 3 |
| 1.08 | 3 | 0.0000 | 0.0474 | 1 | 3 | 0.0000 | 0.0108 | 2 | 3 | 0.0000 | 0.0361 | 3 |
| 1.58 | 4 | 0.0000 | 0.0474 | 1 | 4 | 0.0000 | 0.0108 | 2 | 4 | 0.0000 | 0.0361 | 3 |
| 2.08 | 5 | 0.0000 | 0.0474 | 1 | 5 | 0.0000 | 0.0108 | 2 | 5 | 0.0000 | 0.0361 | 3 |
| 2.58 | 6 | 0.0000 | 0.0474 | 1 | 6 | 0.0000 | 0.0108 | 2 | 6 | 0.0000 | 0.0361 | 3 |
| 3.08 | 7 | 0.0000 | 0.0474 | 1 | 7 | 0.0000 | 0.0108 | 2 | 7 | 0.0000 | 0.0361 | 3 |
| 3.58 | 8 | 0.0000 | 0.0474 | 1 | 8 | 0.0000 | 0.0108 | 2 | 8 | 0.0000 | 0.0361 | 3 |
| 4.08 | 9 | 0.0000 | 0.0474 | 1 | 9 | 0.0000 | 0.0108 | 2 | 9 | 0.0000 | 0.0361 | 3 |
| 4.58 | 10 | 0.0000 | 0.0473 | 1 | 10 | 0.0000 | 0.0108 | 2 | 10 | 0.0000 | 0.0361 | 3 |
| 5.08 | 11 | 0.0000 | 0.0474 | 1 | 11 | 0.0000 | 0.0108 | 2 | 11 | 0.0000 | 0.0361 | 3 |
| 5.58 | 12 | 0.0000 | 0.0473 | 1 | 12 | 0.0000 | 0.0108 | 2 | 12 | 0.0000 | 0.0361 | 3 |
| 6.08 | 13 | 0.0000 | 0.0473 | 1 | 13 | 0.0000 | 0.0108 | 2 | 13 | 0.0000 | 0.0361 | 3 |
| 6.58 | 14 | 0.0000 | 0.0473 | 1 | 14 | 0.0000 | 0.0108 | 2 | 14 | 0.0000 | 0.0361 | 3 |
| 7.08 | 15 | 0.0000 | 0.0473 | 1 | 15 | 0.0000 | 0.0108 | 2 | 15 | 0.0000 | 0.0361 | 3 |
| 7.58 | 16 | 0.0000 | 0.0473 | 1 | 16 | 0.0000 | 0.0108 | 2 | 16 | 0.0000 | 0.0361 | 3 |
| 8.08 | 17 | 0.0000 | 0.0473 | 1 | 17 | 0.0000 | 0.0108 | 2 | 17 | 0.0000 | 0.0361 | 3 |
| 8.58 | 18 | 0.0000 | 0.0473 | 1 | 18 | 0.0000 | 0.0108 | 2 | 18 | 0.0000 | 0.0361 | 3 |
| 9.08 | 19 | 0.0000 | 0.0472 | 1 | 19 | 0.0000 | 0.0108 | 2 | 19 | 0.0000 | 0.0361 | 3 |
| 9.58 | 20 | 0.0000 | 0.0473 | 1 | 20 | 0.0000 | 0.0108 | 2 | 20 | 0.0000 | 0.0361 | 3 |
| 10.08 | 21 | 0.0000 | 0.0473 | 1 | 21 | 0.0000 | 0.0108 | 2 | 21 | 0.0000 | 0.0361 | 3 |
| 10.58 | 22 | 0.0000 | 0.0472 | 1 | 22 | 0.0000 | 0.0108 | 2 | 22 | 0.0000 | 0.0361 | 3 |
| 11.08 | 23 | 0.0000 | 0.0472 | 1 | 23 | 0.0000 | 0.0108 | 2 | 23 | 0.0000 | 0.0361 | 3 |
| 11.58 | 24 | 0.0000 | 0.0472 | 1 | 24 | 0.0000 | 0.0108 | 2 | 24 | 0.0000 | 0.0361 | 3 |
| 12.08 | 25 | 0.0000 | 0.0472 | 1 | 25 | 0.0000 | 0.0108 | 2 | 25 | 0.0000 | 0.0361 | 3 |
| 12.58 | 26 | 0.0000 | 0.0472 | 1 | 26 | 0.0000 | 0.0108 | 2 | 26 | 0.0000 | 0.0361 | 3 |
| 13.08 | 27 | 0.0000 | 0.0472 | 1 | 27 | 0.0000 | 0.0108 | 2 | 27 | 0.0000 | 0.0361 | 3 |
| 13.58 | 28 | 0.0000 | 0.0472 | 1 | 28 | 0.0000 | 0.0108 | 2 | 28 | 0.0000 | 0.0361 | 3 |
| 14.08 | 29 | 0.0000 | 0.0472 | 1 | 29 | 0.0000 | 0.0108 | 2 | 29 | 0.0000 | 0.0361 | 3 |
| 14.58 | 30 | 0.0000 | 0.0472 | 1 | 30 | 0.0000 | 0.0108 | 2 | 30 | 0.0000 | 0.0361 | 3 |
| 15.08 | 31 | 0.0000 | 0.0472 | 1 | 31 | 0.0000 | 0.0108 | 2 | 31 | 0.0000 | 0.0361 | 3 |
| 15.58 | 32 | 0.0000 | 0.0471 | 1 | 32 | 0.0000 | 0.0108 | 2 | 32 | 0.0000 | 0.0361 | 3 |
| 16.08 | 33 | 0.0000 | 0.0473 | 1 | 33 | 0.0000 | 0.0108 | 2 | 33 | 0.0000 | 0.0361 | 3 |
| 16.58 | 34 | 0.0000 | 0.0472 | 1 | 34 | 0.0000 | 0.0108 | 2 | 34 | 0.0000 | 0.0361 | 3 |
| 17.08 | 35 | 0.0000 | 0.0471 | 1 | 35 | 0.0000 | 0.0108 | 2 | 35 | 0.0000 | 0.0361 | 3 |
| 17.58 | 36 | 0.0000 | 0.0471 | 1 | 36 | 0.0000 | 0.0108 | 2 | 36 | 0.0000 | 0.0361 | 3 |
| 18.08 | 37 | 0.0000 | 0.0472 | 1 | 37 | 0.0000 | 0.0108 | 2 | 37 | 0.0000 | 0.0361 | 3 |
| 18.58 | 38 | 0.0000 | 0.0471 | 1 | 38 | 0.0000 | 0.0108 | 2 | 38 | 0.0000 | 0.0362 | 3 |
| 19.08 | 39 | 0.0000 | 0.0471 | 1 | 39 | 0.0000 | 0.0108 | 2 | 39 | 0.0000 | 0.0362 | 3 |
| 19.58 | 40 | 0.0000 | 0.0471 | 1 | 40 | 0.0000 | 0.0108 | 2 | 40 | 0.0000 | 0.0361 | 3 |
| 20.08 | 41 | 0.0000 | 0.0471 | 1 | 41 | 0.0000 | 0.0108 | 2 | 41 | 0.0000 | 0.0362 | 3 |
| 20.58 | 42 | 0.0000 | 0.0471 | 1 | 42 | 0.0000 | 0.0108 | 2 | 42 | 0.0000 | 0.0362 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 21.08 | 43 | 0.0000 | 0.0471 | 1 | 43 | 0.0000 | 0.0108 | 2 | 43 | 0.0000 | 0.0361 | 3 |
| 21.58 | 44 | 0.0000 | 0.0471 | 1 | 44 | 0.0000 | 0.0108 | 2 | 44 | 0.0000 | 0.0362 | 3 |
| 22.08 | 45 | 0.0000 | 0.0471 | 1 | 45 | 0.0000 | 0.0108 | 2 | 45 | 0.0000 | 0.0362 | 3 |
| 22.58 | 46 | 0.0000 | 0.0470 | 1 | 46 | 0.0000 | 0.0108 | 2 | 46 | 0.0000 | 0.0362 | 3 |
| 23.08 | 47 | 0.0000 | 0.0470 | 1 | 47 | 0.0000 | 0.0108 | 2 | 47 | 0.0000 | 0.0362 | 3 |
| 23.58 | 48 | 0.0000 | 0.0470 | 1 | 48 | 0.0000 | 0.0108 | 2 | 48 | 0.0000 | 0.0362 | 3 |
| 24.08 | 49 | 0.0000 | 0.0471 | 1 | 49 | 0.0000 | 0.0108 | 2 | 49 | 0.0000 | 0.0362 | 3 |
| 24.58 | 50 | 0.0000 | 0.0470 | 1 | 50 | 0.0000 | 0.0108 | 2 | 50 | 0.0000 | 0.0362 | 3 |
| 25.08 | 51 | 0.0000 | 0.0470 | 1 | 51 | 0.0000 | 0.0108 | 2 | 51 | 0.0000 | 0.0362 | 3 |
| 25.58 | 52 | 0.0000 | 0.0471 | 1 | 52 | 0.0000 | 0.0108 | 2 | 52 | 0.0000 | 0.0362 | 3 |
| 26.08 | 53 | 0.0000 | 0.0469 | 1 | 53 | 0.0000 | 0.0108 | 2 | 53 | 0.0000 | 0.0362 | 3 |
| 26.58 | 54 | 0.0000 | 0.0468 | 1 | 54 | 0.0000 | 0.0108 | 2 | 54 | 0.0000 | 0.0362 | 3 |
| 27.08 | 55 | 0.0000 | 0.0470 | 1 | 55 | 0.0000 | 0.0108 | 2 | 55 | 0.0000 | 0.0362 | 3 |
| 27.58 | 56 | 0.0000 | 0.0469 | 1 | 56 | 0.0000 | 0.0108 | 2 | 56 | 0.0000 | 0.0362 | 3 |
| 28.08 | 57 | 0.0000 | 0.0469 | 1 | 57 | 0.0000 | 0.0108 | 2 | 57 | 0.0000 | 0.0362 | 3 |
| 28.58 | 58 | 0.0000 | 0.0470 | 1 | 58 | 0.0000 | 0.0108 | 2 | 58 | 0.0000 | 0.0362 | 3 |
| 29.08 | 59 | 0.0000 | 0.0469 | 1 | 59 | 0.0000 | 0.0108 | 2 | 59 | 0.0000 | 0.0362 | 3 |
| 29.58 | 60 | 0.0000 | 0.0470 | 1 | 60 | 0.0000 | 0.0108 | 2 | 60 | 0.0000 | 0.0362 | 3 |
| 30.08 | 61 | 1.0000 | 0.0471 | 1 | 61 | 0.0000 | 0.0108 | 2 | 61 | 0.0000 | 0.0362 | 3 |
| 30.58 | 62 | 1.0000 | 0.0465 | 1 | 62 | 0.0000 | 0.0108 | 2 | 62 | 0.0000 | 0.0363 | 3 |
| 31.08 | 63 | 1.0000 | 0.0453 | 1 | 63 | 0.0000 | 0.0108 | 2 | 63 | 0.0000 | 0.0365 | 3 |
| 31.58 | 64 | 1.0000 | 0.0433 | 1 | 64 | 0.0000 | 0.0109 | 2 | 64 | 0.0000 | 0.0369 | 3 |
| 32.08 | 65 | 1.0000 | 0.0406 | 1 | 65 | 0.0000 | 0.0110 | 2 | 65 | 0.0000 | 0.0376 | 3 |
| 32.58 | 66 | 1.0000 | 0.0377 | 1 | 66 | 0.0000 | 0.0111 | 2 | 66 | 0.0000 | 0.0385 | 3 |
| 33.08 | 67 | 1.0000 | 0.0346 | 1 | 67 | 0.0000 | 0.0112 | 2 | 67 | 0.0000 | 0.0397 | 3 |
| 33.58 | 68 | 1.0000 | 0.0317 | 1 | 68 | 0.0000 | 0.0113 | 2 | 68 | 0.0000 | 0.0411 | 3 |
| 34.08 | 69 | 1.0000 | 0.0290 | 1 | 69 | 0.0000 | 0.0115 | 2 | 69 | 0.0000 | 0.0428 | 3 |
| 34.58 | 70 | 1.0000 | 0.0264 | 1 | 70 | 0.0000 | 0.0117 | 2 | 70 | 0.0000 | 0.0451 | 3 |
| 35.08 | 71 | 1.0000 | 0.0243 | 1 | 71 | 0.0000 | 0.0119 | 2 | 71 | 0.0000 | 0.0476 | 3 |
| 35.58 | 72 | 1.0000 | 0.0221 | 1 | 72 | 0.0000 | 0.0122 | 2 | 72 | 0.0000 | 0.0510 | 3 |
| 36.08 | 73 | 1.0000 | 0.0204 | 1 | 73 | 0.0000 | 0.0125 | 2 | 73 | 0.0000 | 0.0547 | 3 |
| 36.58 | 74 | 1.0000 | 0.0192 | 1 | 74 | 0.0000 | 0.0127 | 2 | 74 | 0.0000 | 0.0585 | 3 |
| 37.08 | 75 | 1.0000 | 0.0181 | 1 | 75 | 0.0000 | 0.0130 | 2 | 75 | 0.0000 | 0.0625 | 3 |
| 37.58 | 76 | 1.0000 | 0.0172 | 1 | 76 | 0.0000 | 0.0132 | 2 | 76 | 0.0000 | 0.0668 | 3 |
| 38.08 | 77 | 1.0000 | 0.0165 | 1 | 77 | 0.0000 | 0.0135 | 2 | 77 | 0.0000 | 0.0711 | 3 |
| 38.58 | 78 | 1.0000 | 0.0161 | 1 | 78 | 0.0000 | 0.0136 | 2 | 78 | 0.0000 | 0.0737 | 3 |
| 39.08 | 79 | 1.0000 | 0.0160 | 1 | 79 | 0.0000 | 0.0136 | 2 | 79 | 0.0000 | 0.0746 | 3 |
| 39.58 | 80 | 1.0000 | 0.0159 | 1 | 80 | 0.0000 | 0.0137 | 2 | 80 | 0.0000 | 0.0750 | 3 |
| 40.08 | 81 | 1.0000 | 0.0162 | 1 | 81 | 0.0000 | 0.0136 | 2 | 81 | 0.0000 | 0.0724 | 3 |
| 40.58 | 82 | 1.0000 | 0.0168 | 1 | 82 | 0.0000 | 0.0134 | 2 | 82 | 0.0000 | 0.0685 | 3 |
| 41.08 | 83 | 1.0000 | 0.0177 | 1 | 83 | 0.0000 | 0.0131 | 2 | 83 | 0.0000 | 0.0634 | 3 |
| 41.58 | 84 | 1.0000 | 0.0191 | 1 | 84 | 0.0000 | 0.0128 | 2 | 84 | 0.0000 | 0.0578 | 3 |
| 42.08 | 85 | 1.0000 | 0.0211 | 1 | 85 | 0.0000 | 0.0124 | 2 | 85 | 0.0000 | 0.0523 | 3 |
| 42.58 | 86 | 1.0000 | 0.0238 | 1 | 86 | 0.0000 | 0.0120 | 2 | 86 | 0.0000 | 0.0475 | 3 |
| 43.08 | 87 | 1.0000 | 0.0273 | 1 | 87 | 0.0000 | 0.0117 | 2 | 87 | 0.0000 | 0.0435 | 3 |
| 43.58 | 88 | 1.0000 | 0.0321 | 1 | 88 | 0.0000 | 0.0114 | 2 | 88 | 0.0000 | 0.0401 | 3 |
| 44.08 | 89 | 1.0000 | 0.0382 | 1 | 89 | 0.0000 | 0.0111 | 2 | 89 | 0.0000 | 0.0375 | 3 |
| 44.58 | 90 | 1.0000 | 0.0463 | 1 | 90 | 0.0000 | 0.0109 | 2 | 90 | 0.0000 | 0.0355 | 3 |
| 45.08 | 91 | 1.0000 | 0.0571 | 1 | 91 | 0.0000 | 0.0107 | 2 | 91 | 0.0000 | 0.0339 | 3 |
| 45.58 | 92 | 1.0000 | 0.0716 | 1 | 92 | 0.0000 | 0.0106 | 2 | 92 | 0.0000 | 0.0326 | 3 |
| 46.08 | 93 | 1.0000 | 0.0920 | 1 | 93 | 0.0000 | 0.0105 | 2 | 93 | 0.0000 | 0.0317 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 46.58 | 94 | 1.0000 | 0.1215 | 1 | 94 | 0.0000 | 0.0104 | 2 | 94 | 0.0000 | 0.0309 | 3 |
| 47.08 | 95 | 1.0000 | 0.1661 | 1 | 95 | 0.0000 | 0.0104 | 2 | 95 | 0.0000 | 0.0303 | 3 |
| 47.58 | 96 | 1.0000 | 0.2392 | 1 | 96 | 0.0000 | 0.0104 | 2 | 96 | 0.0000 | 0.0298 | 3 |
| 48.08 | 97 | 1.0000 | 0.3595 | 1 | 97 | 0.0000 | 0.0104 | 2 | 97 | 0.0000 | 0.0294 | 3 |
| 48.58 | 98 | 1.0000 | 0.5161 | 1 | 98 | 0.0000 | 0.0104 | 2 | 98 | 0.0000 | 0.0290 | 3 |
| 49.08 | 99 | 1.0000 | 0.6572 | 1 | 99 | 0.0000 | 0.0105 | 2 | 99 | 0.0000 | 0.0287 | 3 |
| 49.58 | 100 | 1.0000 | 0.7487 | 1 | 100 | 0.0000 | 0.0105 | 2 | 100 | 0.0000 | 0.0285 | 3 |
| 50.08 | 101 | 1.0000 | 0.8041 | 1 | 101 | 0.0000 | 0.0106 | 2 | 101 | 0.0000 | 0.0283 | 3 |
| 50.58 | 102 | 1.0000 | 0.8378 | 1 | 102 | 0.0000 | 0.0107 | 2 | 102 | 0.0000 | 0.0281 | 3 |
| 51.08 | 103 | 1.0000 | 0.8598 | 1 | 103 | 0.0000 | 0.0108 | 2 | 103 | 0.0000 | 0.0279 | 3 |
| 51.58 | 104 | 1.0000 | 0.8747 | 1 | 104 | 0.0000 | 0.0109 | 2 | 104 | 0.0000 | 0.0277 | 3 |
| 52.08 | 105 | 1.0000 | 0.8846 | 1 | 105 | 0.0000 | 0.0110 | 2 | 105 | 0.0000 | 0.0276 | 3 |
| 52.58 | 106 | 1.0000 | 0.8915 | 1 | 106 | 0.0000 | 0.0111 | 2 | 106 | 0.0000 | 0.0275 | 3 |
| 53.08 | 107 | 1.0000 | 0.8960 | 1 | 107 | 0.0000 | 0.0112 | 2 | 107 | 0.0000 | 0.0273 | 3 |
| 53.58 | 108 | 1.0000 | 0.8989 | 1 | 108 | 0.0000 | 0.0113 | 2 | 108 | 0.0000 | 0.0272 | 3 |
| 54.08 | 109 | 1.0000 | 0.9005 | 1 | 109 | 0.0000 | 0.0114 | 2 | 109 | 0.0000 | 0.0271 | 3 |
| 54.58 | 110 | 1.0000 | 0.9008 | 1 | 110 | 0.0000 | 0.0116 | 2 | 110 | 0.0000 | 0.0270 | 3 |
| 55.08 | 111 | 1.0000 | 0.9005 | 1 | 111 | 0.0000 | 0.0117 | 2 | 111 | 0.0000 | 0.0269 | 3 |
| 55.58 | 112 | 1.0000 | 0.8994 | 1 | 112 | 0.0000 | 0.0118 | 2 | 112 | 0.0000 | 0.0269 | 3 |
| 56.08 | 113 | 1.0000 | 0.8976 | 1 | 113 | 0.0000 | 0.0120 | 2 | 113 | 0.0000 | 0.0268 | 3 |
| 56.58 | 114 | 1.0000 | 0.8953 | 1 | 114 | 0.0000 | 0.0121 | 2 | 114 | 0.0000 | 0.0267 | 3 |
| 57.08 | 115 | 1.0000 | 0.8925 | 1 | 115 | 0.0000 | 0.0122 | 2 | 115 | 0.0000 | 0.0267 | 3 |
| 57.58 | 116 | 1.0000 | 0.8904 | 1 | 116 | 0.0000 | 0.0123 | 2 | 116 | 0.0000 | 0.0266 | 3 |
| 58.08 | 117 | 1.0000 | 0.8883 | 1 | 117 | 0.0000 | 0.0124 | 2 | 117 | 0.0000 | 0.0266 | 3 |
| 58.58 | 118 | 1.0000 | 0.8859 | 1 | 118 | 0.0000 | 0.0125 | 2 | 118 | 0.0000 | 0.0266 | 3 |
| 59.08 | 119 | 1.0000 | 0.8838 | 1 | 119 | 0.0000 | 0.0125 | 2 | 119 | 0.0000 | 0.0265 | 3 |
| 59.58 | 120 | 1.0000 | 0.8818 | 1 | 120 | 0.0000 | 0.0126 | 2 | 120 | 0.0000 | 0.0265 | 3 |
| 60.08 | 121 | 1.0000 | 0.8796 | 1 | 121 | 0.0000 | 0.0127 | 2 | 121 | 0.0000 | 0.0265 | 3 |
| 60.58 | 122 | 1.0000 | 0.8777 | 1 | 122 | 0.0000 | 0.0127 | 2 | 122 | 0.0000 | 0.0265 | 3 |
| 61.08 | 123 | 1.0000 | 0.8647 | 1 | 123 | 0.0000 | 0.0130 | 2 | 123 | 0.0000 | 0.0267 | 3 |
| 61.58 | 124 | 1.0000 | 0.8687 | 1 | 124 | 0.0000 | 0.0129 | 2 | 124 | 0.0000 | 0.0269 | 3 |
| 62.08 | 125 | 1.0000 | 0.8813 | 1 | 125 | 0.0000 | 0.0128 | 2 | 125 | 0.0000 | 0.0270 | 3 |
| 62.58 | 126 | 1.0000 | 0.8851 | 1 | 126 | 0.0000 | 0.0128 | 2 | 126 | 0.0000 | 0.0271 | 3 |
| 63.08 | 127 | 1.0000 | 0.8838 | 1 | 127 | 0.0000 | 0.0128 | 2 | 127 | 0.0000 | 0.0271 | 3 |
| 63.58 | 128 | 1.0000 | 0.8843 | 1 | 128 | 0.0000 | 0.0128 | 2 | 128 | 0.0000 | 0.0271 | 3 |
| 64.08 | 129 | 1.0000 | 0.8826 | 1 | 129 | 0.0000 | 0.0128 | 2 | 129 | 0.0000 | 0.0271 | 3 |
| 64.58 | 130 | 1.0000 | 0.8787 | 1 | 130 | 0.0000 | 0.0128 | 2 | 130 | 0.0000 | 0.0270 | 3 |
| 65.08 | 131 | 1.0000 | 0.8761 | 1 | 131 | 0.0000 | 0.0128 | 2 | 131 | 0.0000 | 0.0270 | 3 |
| 65.58 | 132 | 1.0000 | 0.8740 | 1 | 132 | 0.0000 | 0.0129 | 2 | 132 | 0.0000 | 0.0270 | 3 |
| 66.08 | 133 | 1.0000 | 0.8733 | 1 | 133 | 0.0000 | 0.0129 | 2 | 133 | 0.0000 | 0.0270 | 3 |
| 66.58 | 134 | 1.0000 | 0.8735 | 1 | 134 | 0.0000 | 0.0129 | 2 | 134 | 0.0000 | 0.0270 | 3 |
| 67.08 | 135 | 1.0000 | 0.8741 | 1 | 135 | 0.0000 | 0.0128 | 2 | 135 | 0.0000 | 0.0270 | 3 |
| 67.58 | 136 | 1.0000 | 0.8743 | 1 | 136 | 0.0000 | 0.0128 | 2 | 136 | 0.0000 | 0.0270 | 3 |
| 68.08 | 137 | 1.0000 | 0.8747 | 1 | 137 | 0.0000 | 0.0128 | 2 | 137 | 0.0000 | 0.0270 | 3 |
| 68.58 | 138 | 1.0000 | 0.8744 | 1 | 138 | 0.0000 | 0.0128 | 2 | 138 | 0.0000 | 0.0270 | 3 |
| 69.08 | 139 | 1.0000 | 0.8744 | 1 | 139 | 0.0000 | 0.0128 | 2 | 139 | 0.0000 | 0.0270 | 3 |
| 69.58 | 140 | 1.0000 | 0.8742 | 1 | 140 | 0.0000 | 0.0128 | 2 | 140 | 0.0000 | 0.0270 | 3 |
| 70.08 | 141 | 1.0000 | 0.8743 | 1 | 141 | 0.0000 | 0.0128 | 2 | 141 | 0.0000 | 0.0270 | 3 |
| 70.58 | 142 | 1.0000 | 0.8747 | 1 | 142 | 0.0000 | 0.0128 | 2 | 142 | 0.0000 | 0.0270 | 3 |
| 71.08 | 143 | 1.0000 | 0.8378 | 1 | 143 | 0.0000 | 0.0177 | 2 | 143 | 0.0000 | 0.0262 | 3 |
| 71.58 | 144 | 1.0000 | 0.8947 | 1 | 144 | 0.0000 | 0.0235 | 2 | 144 | 0.0000 | 0.0259 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 72.08 | 145 | 1.0000 | 0.9546 | 1 | 145 | 0.0000 | 0.0635 | 2 | 145 | 0.0000 | 0.0258 | 3 |
| 72.58 | 146 | 1.0000 | 0.8810 | 1 | 146 | 0.0000 | 0.0191 | 2 | 146 | 0.0000 | 0.0257 | 3 |
| 73.08 | 147 | 1.0000 | 0.8421 | 1 | 147 | 0.0000 | 0.0178 | 2 | 147 | 0.0000 | 0.0257 | 3 |
| 73.58 | 148 | 1.0000 | 0.7038 | 1 | 148 | 0.0000 | 0.0156 | 2 | 148 | 0.0000 | 0.0257 | 3 |
| 74.08 | 149 | 1.0000 | 0.6495 | 1 | 149 | 0.0000 | 0.0148 | 2 | 149 | 0.0000 | 0.0257 | 3 |
| 74.58 | 150 | 1.0000 | 0.7067 | 1 | 150 | 0.0000 | 0.0147 | 2 | 150 | 0.0000 | 0.0257 | 3 |
| 75.08 | 151 | 1.0000 | 0.7422 | 1 | 151 | 0.0000 | 0.0147 | 2 | 151 | 0.0000 | 0.0257 | 3 |
| 75.58 | 152 | 1.0000 | 0.7739 | 1 | 152 | 0.0000 | 0.0149 | 2 | 152 | 0.0000 | 0.0257 | 3 |
| 76.08 | 153 | 1.0000 | 0.7971 | 1 | 153 | 0.0000 | 0.0149 | 2 | 153 | 0.0000 | 0.0257 | 3 |
| 76.58 | 154 | 1.0000 | 0.8196 | 1 | 154 | 0.0000 | 0.0149 | 2 | 154 | 0.0000 | 0.0257 | 3 |
| 77.08 | 155 | 1.0000 | 0.8398 | 1 | 155 | 0.0000 | 0.0149 | 2 | 155 | 0.0000 | 0.0257 | 3 |
| 77.58 | 156 | 1.0000 | 0.8571 | 1 | 156 | 0.0000 | 0.0148 | 2 | 156 | 0.0000 | 0.0258 | 3 |
| 78.08 | 157 | 1.0000 | 0.8685 | 1 | 157 | 0.0000 | 0.0147 | 2 | 157 | 0.0000 | 0.0258 | 3 |
| 78.58 | 158 | 1.0000 | 0.8771 | 1 | 158 | 0.0000 | 0.0146 | 2 | 158 | 0.0000 | 0.0258 | 3 |
| 79.08 | 159 | 1.0000 | 0.8821 | 1 | 159 | 0.0000 | 0.0144 | 2 | 159 | 0.0000 | 0.0259 | 3 |
| 79.58 | 160 | 1.0000 | 0.8861 | 1 | 160 | 0.0000 | 0.0142 | 2 | 160 | 0.0000 | 0.0259 | 3 |
| 80.08 | 161 | 1.0000 | 0.8892 | 1 | 161 | 0.0000 | 0.0140 | 2 | 161 | 0.0000 | 0.0260 | 3 |
| 80.58 | 162 | 1.0000 | 0.8914 | 1 | 162 | 0.0000 | 0.0138 | 2 | 162 | 0.0000 | 0.0260 | 3 |
| 81.08 | 163 | 1.0000 | 0.8921 | 1 | 163 | 0.0000 | 0.0137 | 2 | 163 | 0.0000 | 0.0260 | 3 |
| 81.58 | 164 | 1.0000 | 0.8916 | 1 | 164 | 0.0000 | 0.0135 | 2 | 164 | 0.0000 | 0.0260 | 3 |
| 82.08 | 165 | 1.0000 | 0.8895 | 1 | 165 | 0.0000 | 0.0134 | 2 | 165 | 0.0000 | 0.0260 | 3 |
| 82.58 | 166 | 1.0000 | 0.8855 | 1 | 166 | 0.0000 | 0.0133 | 2 | 166 | 0.0000 | 0.0260 | 3 |
| 83.08 | 167 | 1.0000 | 0.8810 | 1 | 167 | 0.0000 | 0.0132 | 2 | 167 | 0.0000 | 0.0259 | 3 |
| 83.58 | 168 | 1.0000 | 0.8802 | 1 | 168 | 0.0000 | 0.0131 | 2 | 168 | 0.0000 | 0.0260 | 3 |
| 84.08 | 169 | 1.0000 | 0.8816 | 1 | 169 | 0.0000 | 0.0129 | 2 | 169 | 0.0000 | 0.0260 | 3 |
| 84.58 | 170 | 1.0000 | 0.8775 | 1 | 170 | 0.0000 | 0.0128 | 2 | 170 | 0.0000 | 0.0260 | 3 |
| 85.08 | 171 | 1.0000 | 0.8725 | 1 | 171 | 0.0000 | 0.0128 | 2 | 171 | 0.0000 | 0.0260 | 3 |
| 85.58 | 172 | 1.0000 | 0.8680 | 1 | 172 | 0.0000 | 0.0127 | 2 | 172 | 0.0000 | 0.0260 | 3 |
| 86.08 | 173 | 1.0000 | 0.8638 | 1 | 173 | 0.0000 | 0.0126 | 2 | 173 | 0.0000 | 0.0260 | 3 |
| 86.58 | 174 | 1.0000 | 0.8596 | 1 | 174 | 0.0000 | 0.0125 | 2 | 174 | 0.0000 | 0.0260 | 3 |
| 87.08 | 175 | 1.0000 | 0.8555 | 1 | 175 | 0.0000 | 0.0124 | 2 | 175 | 0.0000 | 0.0260 | 3 |
| 87.58 | 176 | 1.0000 | 0.8527 | 1 | 176 | 0.0000 | 0.0123 | 2 | 176 | 0.0000 | 0.0261 | 3 |
| 88.08 | 177 | 1.0000 | 0.8659 | 1 | 177 | 0.0000 | 0.0121 | 2 | 177 | 0.0000 | 0.0261 | 3 |
| 88.58 | 178 | 1.0000 | 0.9247 | 1 | 178 | 0.0000 | 0.0116 | 2 | 178 | 0.0000 | 0.0264 | 3 |
| 89.08 | 179 | 1.0000 | 1.0173 | 1 | 179 | 0.0000 | 0.0092 | 2 | 179 | 0.0000 | 0.0281 | 3 |
| 89.58 | 180 | 1.0000 | 1.0420 | 1 | 180 | 0.0000 | 0.0054 | 2 | 180 | 0.0000 | 0.0344 | 3 |
| 90.08 | 181 | 1.0000 | 1.0433 | 1 | 181 | 0.0000 | 0.0050 | 2 | 181 | 0.0000 | 0.0371 | 3 |
| 90.58 | 182 | 1.0000 | 1.0434 | 1 | 182 | 0.0000 | 0.0049 | 2 | 182 | 0.0000 | 0.0392 | 3 |
| 91.08 | 183 | 1.0000 | 1.0434 | 1 | 183 | 0.0000 | 0.0049 | 2 | 183 | 0.0000 | 0.0412 | 3 |
| 91.58 | 184 | 1.0000 | 1.0433 | 1 | 184 | 0.0000 | 0.0049 | 2 | 184 | 0.0000 | 0.0430 | 3 |
| 92.08 | 185 | 1.0000 | 1.0432 | 1 | 185 | 0.0000 | 0.0049 | 2 | 185 | 0.0000 | 0.0440 | 3 |
| 92.58 | 186 | 1.0000 | 1.0431 | 1 | 186 | 0.0000 | 0.0049 | 2 | 186 | 0.0000 | 0.0447 | 3 |
| 93.08 | 187 | 1.0000 | 1.0431 | 1 | 187 | 0.0000 | 0.0049 | 2 | 187 | 0.0000 | 0.0453 | 3 |
| 93.58 | 188 | 1.0000 | 1.0431 | 1 | 188 | 0.0000 | 0.0049 | 2 | 188 | 0.0000 | 0.0458 | 3 |
| 94.08 | 189 | 1.0000 | 1.0430 | 1 | 189 | 0.0000 | 0.0049 | 2 | 189 | 0.0000 | 0.0462 | 3 |
| 94.58 | 190 | 1.0000 | 1.0430 | 1 | 190 | 0.0000 | 0.0049 | 2 | 190 | 0.0000 | 0.0465 | 3 |
| 95.08 | 191 | 1.0000 | 1.0430 | 1 | 191 | 0.0000 | 0.0049 | 2 | 191 | 0.0000 | 0.0470 | 3 |
| 95.58 | 192 | 1.0000 | 1.0429 | 1 | 192 | 0.0000 | 0.0049 | 2 | 192 | 0.0000 | 0.0477 | 3 |
| 96.08 | 193 | 1.0000 | 1.0429 | 1 | 193 | 0.0000 | 0.0049 | 2 | 193 | 0.0000 | 0.0485 | 3 |
| 96.58 | 194 | 1.0000 | 1.0428 | 1 | 194 | 0.0000 | 0.0049 | 2 | 194 | 0.0000 | 0.0492 | 3 |
| 97.08 | 195 | 1.0000 | 1.0427 | 1 | 195 | 0.0000 | 0.0049 | 2 | 195 | 0.0000 | 0.0501 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 97.58 | 196 | 1.0000 | 1.0427 | 1 | 196 | 0.0000 | 0.0049 | 2 | 196 | 0.0000 | 0.0509 | 3 |
| 98.08 | 197 | 1.0000 | 1.0426 | 1 | 197 | 0.0000 | 0.0049 | 2 | 197 | 0.0000 | 0.0518 | 3 |
| 98.58 | 198 | 1.0000 | 1.0425 | 1 | 198 | 0.0000 | 0.0049 | 2 | 198 | 0.0000 | 0.0527 | 3 |
| 99.08 | 199 | 1.0000 | 1.0424 | 1 | 199 | 0.0000 | 0.0049 | 2 | 199 | 0.0000 | 0.0537 | 3 |
| 99.58 | 200 | 1.0000 | 1.0423 | 1 | 200 | 0.0000 | 0.0049 | 2 | 200 | 0.0000 | 0.0548 | 3 |
| 100.08 | 201 | 1.0000 | 1.0423 | 1 | 201 | 0.0000 | 0.0050 | 2 | 201 | 0.0000 | 0.0560 | 3 |
| 100.58 | 202 | 1.0000 | 1.0422 | 1 | 202 | 0.0000 | 0.0050 | 2 | 202 | 0.0000 | 0.0571 | 3 |
| 101.08 | 203 | 1.0000 | 1.0422 | 1 | 203 | 0.0000 | 0.0049 | 2 | 203 | 0.0000 | 0.0562 | 3 |
| 101.58 | 204 | 1.0000 | 1.0420 | 1 | 204 | 0.0000 | 0.0050 | 2 | 204 | 0.0000 | 0.0588 | 3 |
| 102.08 | 205 | 1.0000 | 1.0421 | 1 | 205 | 0.0000 | 0.0050 | 2 | 205 | 0.0000 | 0.0585 | 3 |
| 102.58 | 206 | 1.0000 | 1.0421 | 1 | 206 | 0.0000 | 0.0050 | 2 | 206 | 0.0000 | 0.0583 | 3 |
| 103.08 | 207 | 1.0000 | 1.0421 | 1 | 207 | 0.0000 | 0.0050 | 2 | 207 | 0.0000 | 0.0580 | 3 |
| 103.58 | 208 | 1.0000 | 1.0421 | 1 | 208 | 0.0000 | 0.0050 | 2 | 208 | 0.0000 | 0.0578 | 3 |
| 104.08 | 209 | 1.0000 | 1.0421 | 1 | 209 | 0.0000 | 0.0050 | 2 | 209 | 0.0000 | 0.0575 | 3 |
| 104.58 | 210 | 1.0000 | 1.0422 | 1 | 210 | 0.0000 | 0.0050 | 2 | 210 | 0.0000 | 0.0570 | 3 |
| 105.08 | 211 | 1.0000 | 1.0422 | 1 | 211 | 0.0000 | 0.0050 | 2 | 211 | 0.0000 | 0.0567 | 3 |
| 105.58 | 212 | 1.0000 | 1.0422 | 1 | 212 | 0.0000 | 0.0050 | 2 | 212 | 0.0000 | 0.0565 | 3 |
| 106.08 | 213 | 1.0000 | 1.0422 | 1 | 213 | 0.0000 | 0.0050 | 2 | 213 | 0.0000 | 0.0562 | 3 |
| 106.58 | 214 | 1.0000 | 1.0422 | 1 | 214 | 0.0000 | 0.0050 | 2 | 214 | 0.0000 | 0.0560 | 3 |
| 107.08 | 215 | 1.0000 | 1.0422 | 1 | 215 | 0.0000 | 0.0049 | 2 | 215 | 0.0000 | 0.0557 | 3 |
| 107.58 | 216 | 1.0000 | 1.0423 | 1 | 216 | 0.0000 | 0.0049 | 2 | 216 | 0.0000 | 0.0555 | 3 |
| 108.08 | 217 | 1.0000 | 1.0423 | 1 | 217 | 0.0000 | 0.0049 | 2 | 217 | 0.0000 | 0.0552 | 3 |
| 108.58 | 218 | 1.0000 | 1.0423 | 1 | 218 | 0.0000 | 0.0049 | 2 | 218 | 0.0000 | 0.0550 | 3 |
| 109.08 | 219 | 1.0000 | 1.0423 | 1 | 219 | 0.0000 | 0.0049 | 2 | 219 | 0.0000 | 0.0547 | 3 |
| 109.58 | 220 | 1.0000 | 1.0423 | 1 | 220 | 0.0000 | 0.0049 | 2 | 220 | 0.0000 | 0.0545 | 3 |
| 110.08 | 221 | 1.0000 | 1.0423 | 1 | 221 | 0.0000 | 0.0049 | 2 | 221 | 0.0000 | 0.0542 | 3 |
| 110.58 | 222 | 1.0000 | 1.0424 | 1 | 222 | 0.0000 | 0.0049 | 2 | 222 | 0.0000 | 0.0538 | 3 |
| 111.08 | 223 | 1.0000 | 1.0424 | 1 | 223 | 0.0000 | 0.0049 | 2 | 223 | 0.0000 | 0.0535 | 3 |
| 111.58 | 224 | 1.0000 | 1.0424 | 1 | 224 | 0.0000 | 0.0049 | 2 | 224 | 0.0000 | 0.0531 | 3 |
| 112.08 | 225 | 1.0000 | 1.0424 | 1 | 225 | 0.0000 | 0.0049 | 2 | 225 | 0.0000 | 0.0527 | 3 |
| 112.58 | 226 | 1.0000 | 1.0425 | 1 | 226 | 0.0000 | 0.0049 | 2 | 226 | 0.0000 | 0.0523 | 3 |
| 113.08 | 227 | 1.0000 | 1.0425 | 1 | 227 | 0.0000 | 0.0049 | 2 | 227 | 0.0000 | 0.0518 | 3 |
| 113.58 | 228 | 1.0000 | 1.0425 | 1 | 228 | 0.0000 | 0.0049 | 2 | 228 | 0.0000 | 0.0514 | 3 |
| 114.08 | 229 | 1.0000 | 1.0426 | 1 | 229 | 0.0000 | 0.0049 | 2 | 229 | 0.0000 | 0.0510 | 3 |
| 114.58 | 230 | 1.0000 | 1.0426 | 1 | 230 | 0.0000 | 0.0049 | 2 | 230 | 0.0000 | 0.0505 | 3 |
| 115.08 | 231 | 1.0000 | 1.0426 | 1 | 231 | 0.0000 | 0.0049 | 2 | 231 | 0.0000 | 0.0502 | 3 |
| 115.58 | 232 | 1.0000 | 1.0426 | 1 | 232 | 0.0000 | 0.0049 | 2 | 232 | 0.0000 | 0.0498 | 3 |
| 116.08 | 233 | 1.0000 | 1.0427 | 1 | 233 | 0.0000 | 0.0049 | 2 | 233 | 0.0000 | 0.0494 | 3 |
| 116.58 | 234 | 1.0000 | 1.0427 | 1 | 234 | 0.0000 | 0.0049 | 2 | 234 | 0.0000 | 0.0491 | 3 |
| 117.08 | 235 | 1.0000 | 1.0427 | 1 | 235 | 0.0000 | 0.0049 | 2 | 235 | 0.0000 | 0.0488 | 3 |
| 117.58 | 236 | 1.0000 | 1.0427 | 1 | 236 | 0.0000 | 0.0049 | 2 | 236 | 0.0000 | 0.0486 | 3 |
| 118.08 | 237 | 1.0000 | 1.0427 | 1 | 237 | 0.0000 | 0.0049 | 2 | 237 | 0.0000 | 0.0484 | 3 |
| 118.58 | 238 | 1.0000 | 1.0427 | 1 | 238 | 0.0000 | 0.0049 | 2 | 238 | 0.0000 | 0.0482 | 3 |
| 119.08 | 239 | 1.0000 | 1.0428 | 1 | 239 | 0.0000 | 0.0049 | 2 | 239 | 0.0000 | 0.0481 | 3 |
| 119.58 | 240 | 1.0000 | 1.0428 | 1 | 240 | 0.0000 | 0.0049 | 2 | 240 | 0.0000 | 0.0478 | 3 |
| 120.08 | 241 | 1.0000 | 1.0428 | 1 | 241 | 0.0000 | 0.0049 | 2 | 241 | 0.0000 | 0.0476 | 3 |
| 120.58 | 242 | 1.0000 | 1.0428 | 1 | 242 | 0.0000 | 0.0049 | 2 | 242 | 0.0000 | 0.0474 | 3 |
| 121.08 | 243 | 1.0000 | 1.0428 | 1 | 243 | 0.0000 | 0.0049 | 2 | 243 | 0.0000 | 0.0472 | 3 |
| 121.58 | 244 | 1.0000 | 1.0428 | 1 | 244 | 0.0000 | 0.0049 | 2 | 244 | 0.0000 | 0.0471 | 3 |
| 122.08 | 245 | 1.0000 | 1.0428 | 1 | 245 | 0.0000 | 0.0049 | 2 | 245 | 0.0000 | 0.0469 | 3 |
| 122.58 | 246 | 1.0000 | 1.0428 | 1 | 246 | 0.0000 | 0.0048 | 2 | 246 | 0.0000 | 0.0467 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 123.08 | 247 | 1.0000 | 1.0429 | 1 | 247 | 0.0000 | 0.0048 | 2 | 247 | 0.0000 | 0.0466 | 3 |
| 123.58 | 248 | 1.0000 | 1.0429 | 1 | 248 | 0.0000 | 0.0048 | 2 | 248 | 0.0000 | 0.0464 | 3 |
| 124.08 | 249 | 1.0000 | 1.0429 | 1 | 249 | 0.0000 | 0.0048 | 2 | 249 | 0.0000 | 0.0463 | 3 |
| 124.58 | 250 | 1.0000 | 1.0429 | 1 | 250 | 0.0000 | 0.0048 | 2 | 250 | 0.0000 | 0.0462 | 3 |
| 125.08 | 251 | 1.0000 | 1.0429 | 1 | 251 | 0.0000 | 0.0048 | 2 | 251 | 0.0000 | 0.0461 | 3 |
| 125.58 | 252 | 1.0000 | 1.0429 | 1 | 252 | 0.0000 | 0.0048 | 2 | 252 | 0.0000 | 0.0461 | 3 |
| 126.08 | 253 | 1.0000 | 1.0429 | 1 | 253 | 0.0000 | 0.0048 | 2 | 253 | 0.0000 | 0.0460 | 3 |
| 126.58 | 254 | 1.0000 | 1.0429 | 1 | 254 | 0.0000 | 0.0048 | 2 | 254 | 0.0000 | 0.0459 | 3 |
| 127.08 | 255 | 1.0000 | 1.0429 | 1 | 255 | 0.0000 | 0.0048 | 2 | 255 | 0.0000 | 0.0459 | 3 |
| 127.58 | 256 | 1.0000 | 1.0429 | 1 | 256 | 0.0000 | 0.0048 | 2 | 256 | 0.0000 | 0.0458 | 3 |
| 128.08 | 257 | 1.0000 | 1.0429 | 1 | 257 | 0.0000 | 0.0048 | 2 | 257 | 0.0000 | 0.0458 | 3 |
| 128.58 | 258 | 1.0000 | 1.0429 | 1 | 258 | 0.0000 | 0.0048 | 2 | 258 | 0.0000 | 0.0457 | 3 |
| 129.08 | 259 | 1.0000 | 1.0429 | 1 | 259 | 0.0000 | 0.0048 | 2 | 259 | 0.0000 | 0.0457 | 3 |
| 129.58 | 260 | 1.0000 | 1.0429 | 1 | 260 | 0.0000 | 0.0048 | 2 | 260 | 0.0000 | 0.0456 | 3 |
| 130.08 | 261 | 1.0000 | 1.0429 | 1 | 261 | 0.0000 | 0.0048 | 2 | 261 | 0.0000 | 0.0456 | 3 |
| 130.58 | 262 | 1.0000 | 1.0429 | 1 | 262 | 0.0000 | 0.0048 | 2 | 262 | 0.0000 | 0.0455 | 3 |
| 131.08 | 263 | 1.0000 | 1.0429 | 1 | 263 | 0.0000 | 0.0048 | 2 | 263 | 0.0000 | 0.0455 | 3 |
| 131.58 | 264 | 1.0000 | 1.0429 | 1 | 264 | 0.0000 | 0.0048 | 2 | 264 | 0.0000 | 0.0454 | 3 |
| 132.08 | 265 | 1.0000 | 1.0429 | 1 | 265 | 0.0000 | 0.0048 | 2 | 265 | 0.0000 | 0.0453 | 3 |
| 132.58 | 266 | 1.0000 | 1.0429 | 1 | 266 | 0.0000 | 0.0048 | 2 | 266 | 0.0000 | 0.0452 | 3 |
| 133.08 | 267 | 1.0000 | 1.0429 | 1 | 267 | 0.0000 | 0.0048 | 2 | 267 | 0.0000 | 0.0451 | 3 |
| 133.58 | 268 | 1.0000 | 1.0429 | 1 | 268 | 0.0000 | 0.0048 | 2 | 268 | 0.0000 | 0.0450 | 3 |
| 134.08 | 269 | 1.0000 | 1.0430 | 1 | 269 | 0.0000 | 0.0048 | 2 | 269 | 0.0000 | 0.0450 | 3 |
| 134.58 | 270 | 1.0000 | 1.0430 | 1 | 270 | 0.0000 | 0.0048 | 2 | 270 | 0.0000 | 0.0449 | 3 |
| 135.08 | 271 | 1.0000 | 1.0430 | 1 | 271 | 0.0000 | 0.0048 | 2 | 271 | 0.0000 | 0.0448 | 3 |
| 135.58 | 272 | 1.0000 | 1.0430 | 1 | 272 | 0.0000 | 0.0048 | 2 | 272 | 0.0000 | 0.0447 | 3 |
| 136.08 | 273 | 1.0000 | 1.0430 | 1 | 273 | 0.0000 | 0.0048 | 2 | 273 | 0.0000 | 0.0447 | 3 |
| 136.58 | 274 | 1.0000 | 1.0430 | 1 | 274 | 0.0000 | 0.0048 | 2 | 274 | 0.0000 | 0.0446 | 3 |
| 137.08 | 275 | 1.0000 | 1.0430 | 1 | 275 | 0.0000 | 0.0048 | 2 | 275 | 0.0000 | 0.0446 | 3 |
| 137.58 | 276 | 1.0000 | 1.0430 | 1 | 276 | 0.0000 | 0.0048 | 2 | 276 | 0.0000 | 0.0445 | 3 |
| 138.08 | 277 | 1.0000 | 1.0430 | 1 | 277 | 0.0000 | 0.0048 | 2 | 277 | 0.0000 | 0.0445 | 3 |
| 138.58 | 278 | 1.0000 | 1.0430 | 1 | 278 | 0.0000 | 0.0048 | 2 | 278 | 0.0000 | 0.0445 | 3 |
| 139.08 | 279 | 1.0000 | 1.0430 | 1 | 279 | 0.0000 | 0.0048 | 2 | 279 | 0.0000 | 0.0444 | 3 |
| 139.58 | 280 | 1.0000 | 1.0430 | 1 | 280 | 0.0000 | 0.0048 | 2 | 280 | 0.0000 | 0.0444 | 3 |
| 140.08 | 281 | 1.0000 | 1.0430 | 1 | 281 | 0.0000 | 0.0048 | 2 | 281 | 0.0000 | 0.0444 | 3 |
| 140.58 | 282 | 1.0000 | 1.0430 | 1 | 282 | 0.0000 | 0.0048 | 2 | 282 | 0.0000 | 0.0443 | 3 |
| 141.08 | 283 | 1.0000 | 1.0430 | 1 | 283 | 0.0000 | 0.0048 | 2 | 283 | 0.0000 | 0.0443 | 3 |
| 141.58 | 284 | 1.0000 | 1.0430 | 1 | 284 | 0.0000 | 0.0048 | 2 | 284 | 0.0000 | 0.0442 | 3 |
| 142.08 | 285 | 1.0000 | 1.0430 | 1 | 285 | 0.0000 | 0.0048 | 2 | 285 | 0.0000 | 0.0442 | 3 |
| 142.58 | 286 | 1.0000 | 1.0430 | 1 | 286 | 0.0000 | 0.0048 | 2 | 286 | 0.0000 | 0.0442 | 3 |
| 143.08 | 287 | 1.0000 | 1.0430 | 1 | 287 | 0.0000 | 0.0048 | 2 | 287 | 0.0000 | 0.0441 | 3 |
| 143.58 | 288 | 1.0000 | 1.0430 | 1 | 288 | 0.0000 | 0.0048 | 2 | 288 | 0.0000 | 0.0441 | 3 |
| 144.08 | 289 | 1.0000 | 1.0430 | 1 | 289 | 0.0000 | 0.0048 | 2 | 289 | 0.0000 | 0.0440 | 3 |
| 144.58 | 290 | 1.0000 | 1.0430 | 1 | 290 | 0.0000 | 0.0048 | 2 | 290 | 0.0000 | 0.0440 | 3 |
| 145.08 | 291 | 1.0000 | 1.0430 | 1 | 291 | 0.0000 | 0.0048 | 2 | 291 | 0.0000 | 0.0439 | 3 |
| 145.58 | 292 | 1.0000 | 1.0430 | 1 | 292 | 0.0000 | 0.0048 | 2 | 292 | 0.0000 | 0.0438 | 3 |
| 146.08 | 293 | 1.0000 | 1.0430 | 1 | 293 | 0.0000 | 0.0048 | 2 | 293 | 0.0000 | 0.0438 | 3 |
| 146.58 | 294 | 1.0000 | 1.0430 | 1 | 294 | 0.0000 | 0.0048 | 2 | 294 | 0.0000 | 0.0438 | 3 |
| 147.08 | 295 | 1.0000 | 1.0430 | 1 | 295 | 0.0000 | 0.0048 | 2 | 295 | 0.0000 | 0.0437 | 3 |
| 147.58 | 296 | 1.0000 | 1.0430 | 1 | 296 | 0.0000 | 0.0048 | 2 | 296 | 0.0000 | 0.0437 | 3 |
| 148.08 | 297 | 1.0000 | 1.0430 | 1 | 297 | 0.0000 | 0.0048 | 2 | 297 | 0.0000 | 0.0437 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 148.58 | 298 | 1.0000 | 1.0430 | 1 | 298 | 0.0000 | 0.0048 | 2 | 298 | 0.0000 | 0.0436 | 3 |
| 149.08 | 299 | 1.0000 | 1.0430 | 1 | 299 | 0.0000 | 0.0048 | 2 | 299 | 0.0000 | 0.0436 | 3 |
| 149.58 | 300 | 1.0000 | 1.0430 | 1 | 300 | 0.0000 | 0.0048 | 2 | 300 | 0.0000 | 0.0435 | 3 |
| 150.08 | 301 | 1.0000 | 1.0430 | 1 | 301 | 0.0000 | 0.0048 | 2 | 301 | 0.0000 | 0.0435 | 3 |
| 150.58 | 302 | 1.0000 | 1.0430 | 1 | 302 | 0.0000 | 0.0048 | 2 | 302 | 0.0000 | 0.0435 | 3 |
| 151.08 | 303 | 1.0000 | 1.0430 | 1 | 303 | 0.0000 | 0.0048 | 2 | 303 | 0.0000 | 0.0434 | 3 |
| 151.58 | 304 | 1.0000 | 1.0430 | 1 | 304 | 0.0000 | 0.0049 | 2 | 304 | 0.0000 | 0.0434 | 3 |
| 152.08 | 305 | 1.0000 | 1.0430 | 1 | 305 | 0.0000 | 0.0049 | 2 | 305 | 0.0000 | 0.0433 | 3 |
| 152.58 | 306 | 1.0000 | 1.0430 | 1 | 306 | 0.0000 | 0.0049 | 2 | 306 | 0.0000 | 0.0433 | 3 |
| 153.08 | 307 | 1.0000 | 1.0430 | 1 | 307 | 0.0000 | 0.0049 | 2 | 307 | 0.0000 | 0.0433 | 3 |
| 153.58 | 308 | 1.0000 | 1.0430 | 1 | 308 | 0.0000 | 0.0049 | 2 | 308 | 0.0000 | 0.0432 | 3 |
| 154.08 | 309 | 1.0000 | 1.0430 | 1 | 309 | 0.0000 | 0.0049 | 2 | 309 | 0.0000 | 0.0432 | 3 |
| 154.58 | 310 | 1.0000 | 1.0430 | 1 | 310 | 0.0000 | 0.0049 | 2 | 310 | 0.0000 | 0.0432 | 3 |
| 155.08 | 311 | 1.0000 | 1.0430 | 1 | 311 | 0.0000 | 0.0049 | 2 | 311 | 0.0000 | 0.0431 | 3 |
| 155.58 | 312 | 1.0000 | 1.0430 | 1 | 312 | 0.0000 | 0.0049 | 2 | 312 | 0.0000 | 0.0431 | 3 |
| 156.08 | 313 | 1.0000 | 1.0431 | 1 | 313 | 0.0000 | 0.0049 | 2 | 313 | 0.0000 | 0.0430 | 3 |
| 156.58 | 314 | 1.0000 | 1.0431 | 1 | 314 | 0.0000 | 0.0049 | 2 | 314 | 0.0000 | 0.0430 | 3 |
| 157.08 | 315 | 1.0000 | 1.0431 | 1 | 315 | 0.0000 | 0.0049 | 2 | 315 | 0.0000 | 0.0430 | 3 |
| 157.58 | 316 | 1.0000 | 1.0431 | 1 | 316 | 0.0000 | 0.0049 | 2 | 316 | 0.0000 | 0.0429 | 3 |
| 158.08 | 317 | 1.0000 | 1.0431 | 1 | 317 | 0.0000 | 0.0049 | 2 | 317 | 0.0000 | 0.0429 | 3 |
| 158.58 | 318 | 1.0000 | 1.0431 | 1 | 318 | 0.0000 | 0.0049 | 2 | 318 | 0.0000 | 0.0429 | 3 |
| 159.08 | 319 | 1.0000 | 1.0431 | 1 | 319 | 0.0000 | 0.0049 | 2 | 319 | 0.0000 | 0.0428 | 3 |
| 159.58 | 320 | 1.0000 | 1.0431 | 1 | 320 | 0.0000 | 0.0049 | 2 | 320 | 0.0000 | 0.0429 | 3 |
| 160.08 | 321 | 1.0000 | 1.0431 | 1 | 321 | 0.0000 | 0.0049 | 2 | 321 | 0.0000 | 0.0428 | 3 |
| 160.58 | 322 | 1.0000 | 1.0431 | 1 | 322 | 0.0000 | 0.0049 | 2 | 322 | 0.0000 | 0.0428 | 3 |
| 161.08 | 323 | 1.0000 | 1.0431 | 1 | 323 | 0.0000 | 0.0049 | 2 | 323 | 0.0000 | 0.0428 | 3 |
| 161.58 | 324 | 1.0000 | 1.0431 | 1 | 324 | 0.0000 | 0.0049 | 2 | 324 | 0.0000 | 0.0428 | 3 |
| 162.08 | 325 | 1.0000 | 1.0431 | 1 | 325 | 0.0000 | 0.0049 | 2 | 325 | 0.0000 | 0.0427 | 3 |
| 162.58 | 326 | 1.0000 | 1.0431 | 1 | 326 | 0.0000 | 0.0049 | 2 | 326 | 0.0000 | 0.0427 | 3 |
| 163.08 | 327 | 1.0000 | 1.0431 | 1 | 327 | 0.0000 | 0.0049 | 2 | 327 | 0.0000 | 0.0427 | 3 |
| 163.58 | 328 | 1.0000 | 1.0431 | 1 | 328 | 0.0000 | 0.0049 | 2 | 328 | 0.0000 | 0.0427 | 3 |
| 164.08 | 329 | 1.0000 | 1.0431 | 1 | 329 | 0.0000 | 0.0049 | 2 | 329 | 0.0000 | 0.0426 | 3 |
| 164.58 | 330 | 1.0000 | 1.0431 | 1 | 330 | 0.0000 | 0.0049 | 2 | 330 | 0.0000 | 0.0426 | 3 |
| 165.08 | 331 | 1.0000 | 1.0431 | 1 | 331 | 0.0000 | 0.0049 | 2 | 331 | 0.0000 | 0.0426 | 3 |
| 165.58 | 332 | 1.0000 | 1.0431 | 1 | 332 | 0.0000 | 0.0049 | 2 | 332 | 0.0000 | 0.0426 | 3 |
| 166.08 | 333 | 1.0000 | 1.0431 | 1 | 333 | 0.0000 | 0.0049 | 2 | 333 | 0.0000 | 0.0425 | 3 |
| 166.58 | 334 | 1.0000 | 1.0431 | 1 | 334 | 0.0000 | 0.0049 | 2 | 334 | 0.0000 | 0.0425 | 3 |
| 167.08 | 335 | 1.0000 | 1.0431 | 1 | 335 | 0.0000 | 0.0049 | 2 | 335 | 0.0000 | 0.0425 | 3 |
| 167.58 | 336 | 1.0000 | 1.0431 | 1 | 336 | 0.0000 | 0.0049 | 2 | 336 | 0.0000 | 0.0425 | 3 |
| 168.08 | 337 | 1.0000 | 1.0431 | 1 | 337 | 0.0000 | 0.0049 | 2 | 337 | 0.0000 | 0.0425 | 3 |
| 168.58 | 338 | 1.0000 | 1.0431 | 1 | 338 | 0.0000 | 0.0049 | 2 | 338 | 0.0000 | 0.0424 | 3 |
| 169.08 | 339 | 1.0000 | 1.0431 | 1 | 339 | 0.0000 | 0.0049 | 2 | 339 | 0.0000 | 0.0424 | 3 |
| 169.58 | 340 | 1.0000 | 1.0431 | 1 | 340 | 0.0000 | 0.0049 | 2 | 340 | 0.0000 | 0.0424 | 3 |
| 170.08 | 341 | 1.0000 | 1.0431 | 1 | 341 | 0.0000 | 0.0049 | 2 | 341 | 0.0000 | 0.0424 | 3 |
| 170.58 | 342 | 1.0000 | 1.0431 | 1 | 342 | 0.0000 | 0.0049 | 2 | 342 | 0.0000 | 0.0424 | 3 |
| 171.08 | 343 | 1.0000 | 1.0431 | 1 | 343 | 0.0000 | 0.0049 | 2 | 343 | 0.0000 | 0.0424 | 3 |
| 171.58 | 344 | 1.0000 | 1.0431 | 1 | 344 | 0.0000 | 0.0049 | 2 | 344 | 0.0000 | 0.0424 | 3 |
| 172.08 | 345 | 1.0000 | 1.0431 | 1 | 345 | 0.0000 | 0.0049 | 2 | 345 | 0.0000 | 0.0424 | 3 |
| 172.58 | 346 | 1.0000 | 1.0431 | 1 | 346 | 0.0000 | 0.0049 | 2 | 346 | 0.0000 | 0.0424 | 3 |
| 173.08 | 347 | 1.0000 | 1.0431 | 1 | 347 | 0.0000 | 0.0049 | 2 | 347 | 0.0000 | 0.0424 | 3 |
| 173.58 | 348 | 1.0000 | 1.0431 | 1 | 348 | 0.0000 | 0.0049 | 2 | 348 | 0.0000 | 0.0423 | 3 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 174.08 | 349 | 1.0000 | 1.0431 | 1 | 349 | 0.0000 | 0.0049 | 2 | 349 | 0.0000 | 0.0423 | 3 |
| 174.58 | 350 | 1.0000 | 1.0431 | 1 | 350 | 0.0000 | 0.0049 | 2 | 350 | 0.0000 | 0.0423 | 3 |
| 175.08 | 351 | 1.0000 | 1.0431 | 1 | 351 | 0.0000 | 0.0049 | 2 | 351 | 0.0000 | 0.0423 | 3 |
| 175.58 | 352 | 1.0000 | 1.0431 | 1 | 352 | 0.0000 | 0.0049 | 2 | 352 | 0.0000 | 0.0423 | 3 |
| 176.08 | 353 | 1.0000 | 1.0431 | 1 | 353 | 0.0000 | 0.0049 | 2 | 353 | 0.0000 | 0.0422 | 3 |
| 176.58 | 354 | 1.0000 | 1.0431 | 1 | 354 | 0.0000 | 0.0049 | 2 | 354 | 0.0000 | 0.0422 | 3 |
| 177.08 | 355 | 1.0000 | 1.0431 | 1 | 355 | 0.0000 | 0.0049 | 2 | 355 | 0.0000 | 0.0422 | 3 |
| 177.58 | 356 | 1.0000 | 1.0431 | 1 | 356 | 0.0000 | 0.0049 | 2 | 356 | 0.0000 | 0.0422 | 3 |
| 178.08 | 357 | 1.0000 | 1.0431 | 1 | 357 | 0.0000 | 0.0049 | 2 | 357 | 0.0000 | 0.0422 | 3 |
| 178.58 | 358 | 1.0000 | 1.0431 | 1 | 358 | 0.0000 | 0.0049 | 2 | 358 | 0.0000 | 0.0422 | 3 |
| 179.08 | 359 | 1.0000 | 1.0431 | 1 | 359 | 0.0000 | 0.0049 | 2 | 359 | 0.0000 | 0.0422 | 3 |
| 179.58 | 360 | 1.0000 | 1.0431 | 1 | 360 | 0.0000 | 0.0049 | 2 | 360 | 0.0000 | 0.0422 | 3 |
| 180.08 | 361 | 1.0000 | 1.0431 | 1 | 361 | 0.0000 | 0.0049 | 2 | 361 | 0.0000 | 0.0421 | 3 |
| 180.58 | 362 | 1.0000 | 1.0431 | 1 | 362 | 0.0000 | 0.0049 | 2 | 362 | 0.0000 | 0.0421 | 3 |
| 181.08 | 363 | 1.0000 | 1.0431 | 1 | 363 | 0.0000 | 0.0049 | 2 | 363 | 0.0000 | 0.0421 | 3 |
| 181.58 | 364 | 1.0000 | 1.0431 | 1 | 364 | 0.0000 | 0.0049 | 2 | 364 | 0.0000 | 0.0421 | 3 |
| 182.08 | 365 | 1.0000 | 1.0431 | 1 | 365 | 0.0000 | 0.0049 | 2 | 365 | 0.0000 | 0.0421 | 3 |
| 182.58 | 366 | 1.0000 | 1.0431 | 1 | 366 | 0.0000 | 0.0049 | 2 | 366 | 0.0000 | 0.0421 | 3 |
| 183.08 | 367 | 1.0000 | 1.0431 | 1 | 367 | 0.0000 | 0.0049 | 2 | 367 | 0.0000 | 0.0421 | 3 |
| 183.58 | 368 | 1.0000 | 1.0431 | 1 | 368 | 0.0000 | 0.0049 | 2 | 368 | 0.0000 | 0.0421 | 3 |
| 184.08 | 369 | 1.0000 | 1.0430 | 1 | 369 | 0.0000 | 0.0049 | 2 | 369 | 0.0000 | 0.0421 | 3 |
| 184.58 | 370 | 1.0000 | 1.0431 | 1 | 370 | 0.0000 | 0.0049 | 2 | 370 | 0.0000 | 0.0420 | 3 |
| 185.08 | 371 | 1.0000 | 1.0430 | 1 | 371 | 0.0000 | 0.0049 | 2 | 371 | 0.0000 | 0.0420 | 3 |
| 185.58 | 372 | 1.0000 | 1.0430 | 1 | 372 | 0.0000 | 0.0049 | 2 | 372 | 0.0000 | 0.0420 | 3 |
| 186.08 | 373 | 1.0000 | 1.0430 | 1 | 373 | 0.0000 | 0.0049 | 2 | 373 | 0.0000 | 0.0420 | 3 |
| 186.58 | 374 | 1.0000 | 1.0430 | 1 | 374 | 0.0000 | 0.0049 | 2 | 374 | 0.0000 | 0.0420 | 3 |
| 187.08 | 375 | 1.0000 | 1.0430 | 1 | 375 | 0.0000 | 0.0049 | 2 | 375 | 0.0000 | 0.0420 | 3 |
| 187.58 | 376 | 1.0000 | 1.0430 | 1 | 376 | 0.0000 | 0.0049 | 2 | 376 | 0.0000 | 0.0420 | 3 |
| 188.08 | 377 | 1.0000 | 1.0430 | 1 | 377 | 0.0000 | 0.0049 | 2 | 377 | 0.0000 | 0.0419 | 3 |
| 188.58 | 378 | 1.0000 | 1.0430 | 1 | 378 | 0.0000 | 0.0049 | 2 | 378 | 0.0000 | 0.0419 | 3 |
| 189.08 | 379 | 1.0000 | 1.0430 | 1 | 379 | 0.0000 | 0.0049 | 2 | 379 | 0.0000 | 0.0419 | 3 |
| 189.58 | 380 | 1.0000 | 1.0430 | 1 | 380 | 0.0000 | 0.0049 | 2 | 380 | 0.0000 | 0.0419 | 3 |
| 190.08 | 381 | 1.0000 | 1.0430 | 1 | 381 | 0.0000 | 0.0049 | 2 | 381 | 0.0000 | 0.0419 | 3 |
| 190.58 | 382 | 1.0000 | 1.0430 | 1 | 382 | 0.0000 | 0.0049 | 2 | 382 | 0.0000 | 0.0419 | 3 |
| 191.08 | 383 | 1.0000 | 1.0430 | 1 | 383 | 0.0000 | 0.0049 | 2 | 383 | 0.0000 | 0.0419 | 3 |
| 191.58 | 384 | 1.0000 | 1.0430 | 1 | 384 | 0.0000 | 0.0049 | 2 | 384 | 0.0000 | 0.0419 | 3 |
| 192.08 | 385 | 1.0000 | 1.0430 | 1 | 385 | 0.0000 | 0.0050 | 2 | 385 | 0.0000 | 0.0419 | 3 |
| 192.58 | 386 | 1.0000 | 1.0430 | 1 | 386 | 0.0000 | 0.0050 | 2 | 386 | 0.0000 | 0.0419 | 3 |
| 193.08 | 387 | 1.0000 | 1.0430 | 1 | 387 | 0.0000 | 0.0050 | 2 | 387 | 0.0000 | 0.0419 | 3 |
| 193.58 | 388 | 1.0000 | 1.0430 | 1 | 388 | 0.0000 | 0.0050 | 2 | 388 | 0.0000 | 0.0418 | 3 |
| 194.08 | 389 | 1.0000 | 1.0430 | 1 | 389 | 0.0000 | 0.0050 | 2 | 389 | 0.0000 | 0.0418 | 3 |
| 194.58 | 390 | 1.0000 | 1.0430 | 1 | 390 | 0.0000 | 0.0050 | 2 | 390 | 0.0000 | 0.0418 | 3 |
| 195.08 | 391 | 1.0000 | 1.0430 | 1 | 391 | 0.0000 | 0.0050 | 2 | 391 | 0.0000 | 0.0418 | 3 |
| 195.58 | 392 | 1.0000 | 1.0430 | 1 | 392 | 0.0000 | 0.0050 | 2 | 392 | 0.0000 | 0.0418 | 3 |
| 196.08 | 393 | 1.0000 | 1.0430 | 1 | 393 | 0.0000 | 0.0050 | 2 | 393 | 0.0000 | 0.0418 | 3 |
| 196.58 | 394 | 1.0000 | 1.0430 | 1 | 394 | 0.0000 | 0.0050 | 2 | 394 | 0.0000 | 0.0418 | 3 |
| 197.08 | 395 | 1.0000 | 1.0430 | 1 | 395 | 0.0000 | 0.0050 | 2 | 395 | 0.0000 | 0.0418 | 3 |
| 197.58 | 396 | 1.0000 | 1.0430 | 1 | 396 | 0.0000 | 0.0050 | 2 | 396 | 0.0000 | 0.0418 | 3 |
| 198.08 | 397 | 1.0000 | 1.0430 | 1 | 397 | 0.0000 | 0.0050 | 2 | 397 | 0.0000 | 0.0418 | 3 |
| 198.58 | 398 | 1.0000 | 1.0430 | 1 | 398 | 0.0000 | 0.0050 | 2 | 398 | 0.0000 | 0.0418 | 3 |
| 199.08 | 399 | 1.0000 | 1.0430 | 1 | 399 | 0.0000 | 0.0050 | 2 | 399 | 0.0000 | 0.0418 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 199.58 | 400 | 1.0000 | 1.0430 | 1 | 400 | 0.0000 | 0.0050 | 2 | 400 | 0.0000 | 0.0418 | 3 |
| 200.08 | 401 | 1.0000 | 1.0430 | 1 | 401 | 0.0000 | 0.0050 | 2 | 401 | 0.0000 | 0.0417 | 3 |
| 200.58 | 402 | 1.0000 | 1.0430 | 1 | 402 | 0.0000 | 0.0050 | 2 | 402 | 0.0000 | 0.0417 | 3 |
| 201.08 | 403 | 1.0000 | 1.0430 | 1 | 403 | 0.0000 | 0.0050 | 2 | 403 | 0.0000 | 0.0417 | 3 |
| 201.58 | 404 | 1.0000 | 1.0430 | 1 | 404 | 0.0000 | 0.0050 | 2 | 404 | 0.0000 | 0.0417 | 3 |
| 202.08 | 405 | 1.0000 | 1.0430 | 1 | 405 | 0.0000 | 0.0050 | 2 | 405 | 0.0000 | 0.0417 | 3 |
| 202.58 | 406 | 1.0000 | 1.0430 | 1 | 406 | 0.0000 | 0.0050 | 2 | 406 | 0.0000 | 0.0417 | 3 |
| 203.08 | 407 | 1.0000 | 1.0430 | 1 | 407 | 0.0000 | 0.0050 | 2 | 407 | 0.0000 | 0.0417 | 3 |
| 203.58 | 408 | 1.0000 | 1.0430 | 1 | 408 | 0.0000 | 0.0050 | 2 | 408 | 0.0000 | 0.0417 | 3 |
| 204.08 | 409 | 1.0000 | 1.0430 | 1 | 409 | 0.0000 | 0.0050 | 2 | 409 | 0.0000 | 0.0417 | 3 |
| 204.58 | 410 | 1.0000 | 1.0430 | 1 | 410 | 0.0000 | 0.0050 | 2 | 410 | 0.0000 | 0.0417 | 3 |
| 205.08 | 411 | 1.0000 | 1.0430 | 1 | 411 | 0.0000 | 0.0050 | 2 | 411 | 0.0000 | 0.0417 | 3 |
| 205.58 | 412 | 1.0000 | 1.0430 | 1 | 412 | 0.0000 | 0.0050 | 2 | 412 | 0.0000 | 0.0417 | 3 |
| 206.08 | 413 | 1.0000 | 1.0430 | 1 | 413 | 0.0000 | 0.0050 | 2 | 413 | 0.0000 | 0.0417 | 3 |
| 206.58 | 414 | 1.0000 | 1.0430 | 1 | 414 | 0.0000 | 0.0050 | 2 | 414 | 0.0000 | 0.0417 | 3 |
| 207.08 | 415 | 1.0000 | 1.0430 | 1 | 415 | 0.0000 | 0.0050 | 2 | 415 | 0.0000 | 0.0418 | 3 |
| 207.58 | 416 | 1.0000 | 1.0430 | 1 | 416 | 0.0000 | 0.0050 | 2 | 416 | 0.0000 | 0.0418 | 3 |
| 208.08 | 417 | 1.0000 | 1.0430 | 1 | 417 | 0.0000 | 0.0050 | 2 | 417 | 0.0000 | 0.0419 | 3 |
| 208.58 | 418 | 1.0000 | 1.0430 | 1 | 418 | 0.0000 | 0.0050 | 2 | 418 | 0.0000 | 0.0420 | 3 |
| 209.08 | 419 | 1.0000 | 1.0430 | 1 | 419 | 0.0000 | 0.0050 | 2 | 419 | 0.0000 | 0.0420 | 3 |
| 209.58 | 420 | 1.0000 | 1.0430 | 1 | 420 | 0.0000 | 0.0050 | 2 | 420 | 0.0000 | 0.0421 | 3 |
| 210.08 | 421 | 1.0000 | 1.0430 | 1 | 421 | 0.0000 | 0.0050 | 2 | 421 | 0.0000 | 0.0422 | 3 |
| 210.58 | 422 | 1.0000 | 1.0430 | 1 | 422 | 0.0000 | 0.0050 | 2 | 422 | 0.0000 | 0.0423 | 3 |
| 211.08 | 423 | 1.0000 | 1.0430 | 1 | 423 | 0.0000 | 0.0050 | 2 | 423 | 0.0000 | 0.0423 | 3 |
| 211.58 | 424 | 1.0000 | 1.0430 | 1 | 424 | 0.0000 | 0.0050 | 2 | 424 | 0.0000 | 0.0424 | 3 |
| 212.08 | 425 | 1.0000 | 1.0430 | 1 | 425 | 0.0000 | 0.0050 | 2 | 425 | 0.0000 | 0.0425 | 3 |
| 212.58 | 426 | 1.0000 | 1.0430 | 1 | 426 | 0.0000 | 0.0050 | 2 | 426 | 0.0000 | 0.0425 | 3 |
| 213.08 | 427 | 1.0000 | 1.0430 | 1 | 427 | 0.0000 | 0.0050 | 2 | 427 | 0.0000 | 0.0426 | 3 |
| 213.58 | 428 | 1.0000 | 1.0430 | 1 | 428 | 0.0000 | 0.0050 | 2 | 428 | 0.0000 | 0.0427 | 3 |
| 214.08 | 429 | 1.0000 | 1.0430 | 1 | 429 | 0.0000 | 0.0049 | 2 | 429 | 0.0000 | 0.0428 | 3 |
| 214.58 | 430 | 1.0000 | 1.0430 | 1 | 430 | 0.0000 | 0.0049 | 2 | 430 | 0.0000 | 0.0429 | 3 |
| 215.08 | 431 | 1.0000 | 1.0430 | 1 | 431 | 0.0000 | 0.0049 | 2 | 431 | 0.0000 | 0.0429 | 3 |
| 215.58 | 432 | 1.0000 | 1.0430 | 1 | 432 | 0.0000 | 0.0049 | 2 | 432 | 0.0000 | 0.0430 | 3 |
| 216.08 | 433 | 1.0000 | 1.0430 | 1 | 433 | 0.0000 | 0.0049 | 2 | 433 | 0.0000 | 0.0431 | 3 |
| 216.58 | 434 | 1.0000 | 1.0430 | 1 | 434 | 0.0000 | 0.0049 | 2 | 434 | 0.0000 | 0.0432 | 3 |
| 217.08 | 435 | 1.0000 | 1.0429 | 1 | 435 | 0.0000 | 0.0049 | 2 | 435 | 0.0000 | 0.0433 | 3 |
| 217.58 | 436 | 1.0000 | 1.0429 | 1 | 436 | 0.0000 | 0.0049 | 2 | 436 | 0.0000 | 0.0434 | 3 |
| 218.08 | 437 | 1.0000 | 1.0429 | 1 | 437 | 0.0000 | 0.0049 | 2 | 437 | 0.0000 | 0.0434 | 3 |
| 218.58 | 438 | 1.0000 | 1.0429 | 1 | 438 | 0.0000 | 0.0049 | 2 | 438 | 0.0000 | 0.0435 | 3 |
| 219.08 | 439 | 1.0000 | 1.0429 | 1 | 439 | 0.0000 | 0.0049 | 2 | 439 | 0.0000 | 0.0436 | 3 |
| 219.58 | 440 | 1.0000 | 1.0429 | 1 | 440 | 0.0000 | 0.0049 | 2 | 440 | 0.0000 | 0.0436 | 3 |
| 220.08 | 441 | 1.0000 | 1.0429 | 1 | 441 | 0.0000 | 0.0049 | 2 | 441 | 0.0000 | 0.0437 | 3 |
| 220.58 | 442 | 1.0000 | 1.0429 | 1 | 442 | 0.0000 | 0.0049 | 2 | 442 | 0.0000 | 0.0438 | 3 |
| 221.08 | 443 | 1.0000 | 1.0429 | 1 | 443 | 0.0000 | 0.0049 | 2 | 443 | 0.0000 | 0.0439 | 3 |
| 221.58 | 444 | 1.0000 | 1.0429 | 1 | 444 | 0.0000 | 0.0049 | 2 | 444 | 0.0000 | 0.0440 | 3 |
| 222.08 | 445 | 1.0000 | 1.0429 | 1 | 445 | 0.0000 | 0.0049 | 2 | 445 | 0.0000 | 0.0440 | 3 |
| 222.58 | 446 | 1.0000 | 1.0429 | 1 | 446 | 0.0000 | 0.0049 | 2 | 446 | 0.0000 | 0.0441 | 3 |
| 223.08 | 447 | 1.0000 | 1.0429 | 1 | 447 | 0.0000 | 0.0049 | 2 | 447 | 0.0000 | 0.0441 | 3 |
| 223.58 | 448 | 1.0000 | 1.0429 | 1 | 448 | 0.0000 | 0.0049 | 2 | 448 | 0.0000 | 0.0442 | 3 |
| 224.08 | 449 | 1.0000 | 1.0429 | 1 | 449 | 0.0000 | 0.0049 | 2 | 449 | 0.0000 | 0.0443 | 3 |
| 224.58 | 450 | 1.0000 | 1.0429 | 1 | 450 | 0.0000 | 0.0049 | 2 | 450 | 0.0000 | 0.0444 | 3 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 225.08 | 451 | 1.0000 | 1.0429 | 1 | 451 | 0.0000 | 0.0049 | 2 | 451 | 0.0000 | 0.0444 | 3 |
| 225.58 | 452 | 1.0000 | 1.0429 | 1 | 452 | 0.0000 | 0.0049 | 2 | 452 | 0.0000 | 0.0445 | 3 |
| 226.08 | 453 | 1.0000 | 1.0429 | 1 | 453 | 0.0000 | 0.0049 | 2 | 453 | 0.0000 | 0.0446 | 3 |
| 226.58 | 454 | 1.0000 | 1.0429 | 1 | 454 | 0.0000 | 0.0049 | 2 | 454 | 0.0000 | 0.0446 | 3 |
| 227.08 | 455 | 1.0000 | 1.0428 | 1 | 455 | 0.0000 | 0.0049 | 2 | 455 | 0.0000 | 0.0447 | 3 |
| 227.58 | 456 | 1.0000 | 1.0428 | 1 | 456 | 0.0000 | 0.0049 | 2 | 456 | 0.0000 | 0.0448 | 3 |
| 228.08 | 457 | 1.0000 | 1.0428 | 1 | 457 | 0.0000 | 0.0049 | 2 | 457 | 0.0000 | 0.0449 | 3 |
| 228.58 | 458 | 1.0000 | 1.0428 | 1 | 458 | 0.0000 | 0.0049 | 2 | 458 | 0.0000 | 0.0449 | 3 |
| 229.08 | 459 | 1.0000 | 1.0428 | 1 | 459 | 0.0000 | 0.0049 | 2 | 459 | 0.0000 | 0.0450 | 3 |
| 229.58 | 460 | 1.0000 | 1.0428 | 1 | 460 | 0.0000 | 0.0049 | 2 | 460 | 0.0000 | 0.0451 | 3 |
| 230.08 | 461 | 1.0000 | 1.0428 | 1 | 461 | 0.0000 | 0.0049 | 2 | 461 | 0.0000 | 0.0451 | 3 |
| 230.58 | 462 | 1.0000 | 1.0428 | 1 | 462 | 0.0000 | 0.0049 | 2 | 462 | 0.0000 | 0.0452 | 3 |
| 231.08 | 463 | 1.0000 | 1.0428 | 1 | 463 | 0.0000 | 0.0049 | 2 | 463 | 0.0000 | 0.0452 | 3 |
| 231.58 | 464 | 1.0000 | 1.0428 | 1 | 464 | 0.0000 | 0.0049 | 2 | 464 | 0.0000 | 0.0453 | 3 |
| 232.08 | 465 | 1.0000 | 1.0428 | 1 | 465 | 0.0000 | 0.0049 | 2 | 465 | 0.0000 | 0.0454 | 3 |
| 232.58 | 466 | 1.0000 | 1.0428 | 1 | 466 | 0.0000 | 0.0049 | 2 | 466 | 0.0000 | 0.0455 | 3 |
| 233.08 | 467 | 1.0000 | 1.0428 | 1 | 467 | 0.0000 | 0.0049 | 2 | 467 | 0.0000 | 0.0455 | 3 |
| 233.58 | 468 | 1.0000 | 1.0428 | 1 | 468 | 0.0000 | 0.0049 | 2 | 468 | 0.0000 | 0.0456 | 3 |
| 234.08 | 469 | 1.0000 | 1.0428 | 1 | 469 | 0.0000 | 0.0049 | 2 | 469 | 0.0000 | 0.0456 | 3 |
| 234.58 | 470 | 1.0000 | 1.0428 | 1 | 470 | 0.0000 | 0.0049 | 2 | 470 | 0.0000 | 0.0457 | 3 |
| 235.08 | 471 | 1.0000 | 1.0428 | 1 | 471 | 0.0000 | 0.0049 | 2 | 471 | 0.0000 | 0.0458 | 3 |
| 235.58 | 472 | 1.0000 | 1.0428 | 1 | 472 | 0.0000 | 0.0049 | 2 | 472 | 0.0000 | 0.0458 | 3 |
| 236.08 | 473 | 1.0000 | 1.0428 | 1 | 473 | 0.0000 | 0.0049 | 2 | 473 | 0.0000 | 0.0459 | 3 |
| 236.58 | 474 | 1.0000 | 1.0428 | 1 | 474 | 0.0000 | 0.0049 | 2 | 474 | 0.0000 | 0.0460 | 3 |
| 237.08 | 475 | 1.0000 | 1.0427 | 1 | 475 | 0.0000 | 0.0049 | 2 | 475 | 0.0000 | 0.0460 | 3 |
| 237.58 | 476 | 1.0000 | 1.0427 | 1 | 476 | 0.0000 | 0.0049 | 2 | 476 | 0.0000 | 0.0461 | 3 |
| 238.08 | 477 | 1.0000 | 1.0427 | 1 | 477 | 0.0000 | 0.0049 | 2 | 477 | 0.0000 | 0.0461 | 3 |
| 238.58 | 478 | 1.0000 | 1.0427 | 1 | 478 | 0.0000 | 0.0049 | 2 | 478 | 0.0000 | 0.0462 | 3 |
| 239.08 | 479 | 1.0000 | 1.0427 | 1 | 479 | 0.0000 | 0.0049 | 2 | 479 | 0.0000 | 0.0462 | 3 |
| 239.58 | 480 | 1.0000 | 1.0427 | 1 | 480 | 0.0000 | 0.0049 | 2 | 480 | 0.0000 | 0.0463 | 3 |
| 240.08 | 481 | 1.0000 | 1.0427 | 1 | 481 | 0.0000 | 0.0049 | 2 | 481 | 0.0000 | 0.0463 | 3 |
| 240.58 | 482 | 1.0000 | 1.0427 | 1 | 482 | 0.0000 | 0.0049 | 2 | 482 | 0.0000 | 0.0464 | 3 |
| 241.08 | 483 | 1.0000 | 1.0427 | 1 | 483 | 0.0000 | 0.0049 | 2 | 483 | 0.0000 | 0.0465 | 3 |
| 241.58 | 484 | 1.0000 | 1.0427 | 1 | 484 | 0.0000 | 0.0049 | 2 | 484 | 0.0000 | 0.0465 | 3 |
| 242.08 | 485 | 1.0000 | 1.0427 | 1 | 485 | 0.0000 | 0.0049 | 2 | 485 | 0.0000 | 0.0466 | 3 |
| 242.58 | 486 | 1.0000 | 1.0427 | 1 | 486 | 0.0000 | 0.0049 | 2 | 486 | 0.0000 | 0.0466 | 3 |
| 243.08 | 487 | 1.0000 | 1.0427 | 1 | 487 | 0.0000 | 0.0049 | 2 | 487 | 0.0000 | 0.0467 | 3 |
| 243.58 | 488 | 1.0000 | 1.0427 | 1 | 488 | 0.0000 | 0.0049 | 2 | 488 | 0.0000 | 0.0467 | 3 |
| 244.08 | 489 | 1.0000 | 1.0427 | 1 | 489 | 0.0000 | 0.0049 | 2 | 489 | 0.0000 | 0.0468 | 3 |
| 244.58 | 490 | 1.0000 | 1.0427 | 1 | 490 | 0.0000 | 0.0049 | 2 | 490 | 0.0000 | 0.0469 | 3 |
| 245.08 | 491 | 1.0000 | 1.0427 | 1 | 491 | 0.0000 | 0.0049 | 2 | 491 | 0.0000 | 0.0469 | 3 |
| 245.58 | 492 | 1.0000 | 1.0427 | 1 | 492 | 0.0000 | 0.0049 | 2 | 492 | 0.0000 | 0.0469 | 3 |
| 246.08 | 493 | 1.0000 | 1.0427 | 1 | 493 | 0.0000 | 0.0049 | 2 | 493 | 0.0000 | 0.0470 | 3 |
| 246.58 | 494 | 1.0000 | 1.0427 | 1 | 494 | 0.0000 | 0.0049 | 2 | 494 | 0.0000 | 0.0470 | 3 |
| 247.08 | 495 | 1.0000 | 1.0427 | 1 | 495 | 0.0000 | 0.0049 | 2 | 495 | 0.0000 | 0.0471 | 3 |
| 247.58 | 496 | 1.0000 | 1.0427 | 1 | 496 | 0.0000 | 0.0049 | 2 | 496 | 0.0000 | 0.0471 | 3 |
| 248.08 | 497 | 1.0000 | 1.0427 | 1 | 497 | 0.0000 | 0.0049 | 2 | 497 | 0.0000 | 0.0472 | 3 |
| 248.58 | 498 | 1.0000 | 1.0427 | 1 | 498 | 0.0000 | 0.0049 | 2 | 498 | 0.0000 | 0.0472 | 3 |

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|---|---|
| RECALL SET SIZE | 498 |
| RECALL SET ERROR RMS | 0.157419 |
| MAX BIAS OR WEIGHT | 20.0000 |
| MAX GAIN OR CONSTANT | 2.0000 |

## D.5 Scenario TH1 No-Noise

Below are the no-noise results for the TH1 scenario. These results are file TH1.PRX.

| Time (sec) | Node 1 | Desired Output | Actual Output | | Node 2 | Desired Output | Actual Output | | Node 3 | Desired Output | Actual Output | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.08 | 1 | 0.0000 | 0.0474 | 1 | 1 | 0.0000 | 0.0108 | 2 | 1 | 0.0000 | 0.0361 | 3 |
| 0.58 | 2 | 0.0000 | 0.0474 | 1 | 2 | 0.0000 | 0.0108 | 2 | 2 | 0.0000 | 0.0361 | 3 |
| 1.08 | 3 | 0.0000 | 0.0474 | 1 | 3 | 0.0000 | 0.0108 | 2 | 3 | 0.0000 | 0.0361 | 3 |
| 1.58 | 4 | 0.0000 | 0.0474 | 1 | 4 | 0.0000 | 0.0108 | 2 | 4 | 0.0000 | 0.0361 | 3 |
| 2.08 | 5 | 0.0000 | 0.0474 | 1 | 5 | 0.0000 | 0.0108 | 2 | 5 | 0.0000 | 0.0361 | 3 |
| 2.58 | 6 | 0.0000 | 0.0474 | 1 | 6 | 0.0000 | 0.0108 | 2 | 6 | 0.0000 | 0.0361 | 3 |
| 3.08 | 7 | 0.0000 | 0.0474 | 1 | 7 | 0.0000 | 0.0108 | 2 | 7 | 0.0000 | 0.0361 | 3 |
| 3.58 | 8 | 0.0000 | 0.0474 | 1 | 8 | 0.0000 | 0.0108 | 2 | 8 | 0.0000 | 0.0361 | 3 |
| 4.08 | 9 | 0.0000 | 0.0474 | 1 | 9 | 0.0000 | 0.0108 | 2 | 9 | 0.0000 | 0.0361 | 3 |
| 4.58 | 10 | 0.0000 | 0.0474 | 1 | 10 | 0.0000 | 0.0108 | 2 | 10 | 0.0000 | 0.0361 | 3 |
| 5.08 | 11 | 0.0000 | 0.0474 | 1 | 11 | 0.0000 | 0.0108 | 2 | 11 | 0.0000 | 0.0361 | 3 |
| 5.58 | 12 | 0.0000 | 0.0473 | 1 | 12 | 0.0000 | 0.0108 | 2 | 12 | 0.0000 | 0.0361 | 3 |
| 6.08 | 13 | 0.0000 | 0.0473 | 1 | 13 | 0.0000 | 0.0108 | 2 | 13 | 0.0000 | 0.0361 | 3 |
| 6.58 | 14 | 0.0000 | 0.0473 | 1 | 14 | 0.0000 | 0.0108 | 2 | 14 | 0.0000 | 0.0361 | 3 |
| 7.08 | 15 | 0.0000 | 0.0473 | 1 | 15 | 0.0000 | 0.0108 | 2 | 15 | 0.0000 | 0.0361 | 3 |
| 7.58 | 16 | 0.0000 | 0.0472 | 1 | 16 | 0.0000 | 0.0108 | 2 | 16 | 0.0000 | 0.0361 | 3 |
| 8.08 | 17 | 0.0000 | 0.0473 | 1 | 17 | 0.0000 | 0.0108 | 2 | 17 | 0.0000 | 0.0361 | 3 |
| 8.58 | 18 | 0.0000 | 0.0473 | 1 | 18 | 0.0000 | 0.0108 | 2 | 18 | 0.0000 | 0.0361 | 3 |
| 9.08 | 19 | 0.0000 | 0.0473 | 1 | 19 | 0.0000 | 0.0108 | 2 | 19 | 0.0000 | 0.0361 | 3 |
| 9.58 | 20 | 0.0000 | 0.0473 | 1 | 20 | 0.0000 | 0.0108 | 2 | 20 | 0.0000 | 0.0361 | 3 |
| 10.08 | 21 | 0.0000 | 0.0472 | 1 | 21 | 0.0000 | 0.0108 | 2 | 21 | 0.0000 | 0.0361 | 3 |
| 10.58 | 22 | 0.0000 | 0.0472 | 1 | 22 | 0.0000 | 0.0108 | 2 | 22 | 0.0000 | 0.0361 | 3 |
| 11.08 | 23 | 0.0000 | 0.0472 | 1 | 23 | 0.0000 | 0.0108 | 2 | 23 | 0.0000 | 0.0361 | 3 |
| 11.58 | 24 | 0.0000 | 0.0472 | 1 | 24 | 0.0000 | 0.0108 | 2 | 24 | 0.0000 | 0.0361 | 3 |
| 12.08 | 25 | 0.0000 | 0.0472 | 1 | 25 | 0.0000 | 0.0108 | 2 | 25 | 0.0000 | 0.0361 | 3 |
| 12.58 | 26 | 0.0000 | 0.0472 | 1 | 26 | 0.0000 | 0.0108 | 2 | 26 | 0.0000 | 0.0361 | 3 |
| 13.08 | 27 | 0.0000 | 0.0472 | 1 | 27 | 0.0000 | 0.0108 | 2 | 27 | 0.0000 | 0.0361 | 3 |
| 13.58 | 28 | 0.0000 | 0.0472 | 1 | 28 | 0.0000 | 0.0108 | 2 | 28 | 0.0000 | 0.0361 | 3 |
| 14.08 | 29 | 0.0000 | 0.0472 | 1 | 29 | 0.0000 | 0.0108 | 2 | 29 | 0.0000 | 0.0361 | 3 |
| 14.58 | 30 | 0.0000 | 0.0473 | 1 | 30 | 0.0000 | 0.0108 | 2 | 30 | 0.0000 | 0.0361 | 3 |
| 15.08 | 31 | 0.0000 | 0.0471 | 1 | 31 | 0.0000 | 0.0108 | 2 | 31 | 0.0000 | 0.0361 | 3 |
| 15.58 | 32 | 0.0000 | 0.0471 | 1 | 32 | 1.0000 | 0.0108 | 2 | 32 | 1.0000 | 0.0362 | 3 |
| 16.08 | 33 | 0.0000 | 0.0030 | 1 | 33 | 1.0000 | 0.0378 | 2 | 33 | 1.0000 | 0.9198 | 3 |
| 16.58 | 34 | 0.0000 | 0.0053 | 1 | 34 | 1.0000 | 0.0239 | 2 | 34 | 1.0000 | 0.8829 | 3 |
| 17.08 | 35 | 0.0000 | 0.0035 | 1 | 35 | 1.0000 | 0.0353 | 2 | 35 | 1.0000 | 0.9479 | 3 |
| 17.58 | 36 | 0.0000 | 0.0057 | 1 | 36 | 1.0000 | 0.0256 | 2 | 36 | 1.0000 | 0.9124 | 3 |
| 18.08 | 37 | 0.0000 | 0.0188 | 1 | 37 | 1.0000 | 0.0120 | 2 | 37 | 1.0000 | 0.0411 | 3 |
| 18.58 | 38 | 0.0000 | 0.0059 | 1 | 38 | 1.0000 | 0.0232 | 2 | 38 | 1.0000 | 0.8619 | 3 |
| 19.08 | 39 | 0.0000 | 0.0034 | 1 | 39 | 1.0000 | 0.0312 | 2 | 39 | 1.0000 | 0.9421 | 3 |
| 19.58 | 40 | 0.0000 | 0.0034 | 1 | 40 | 1.0000 | 0.0269 | 2 | 40 | 1.0000 | 0.9300 | 3 |
| 20.08 | 41 | 0.0000 | 0.0041 | 1 | 41 | 1.0000 | 0.0235 | 2 | 41 | 1.0000 | 0.9514 | 3 |
| 20.58 | 42 | 0.0000 | 0.0051 | 1 | 42 | 1.0000 | 0.0211 | 2 | 42 | 1.0000 | 0.9575 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 21.08 | 43 | 0.0000 | 0.0062 | 1 | 43 | 1.0000 | 0.0194 | 2 | 43 | 1.0000 | 0.9637 | 3 |
| 21.58 | 44 | 0.0000 | 0.0071 | 1 | 44 | 1.0000 | 0.0186 | 2 | 44 | 1.0000 | 0.9693 | 3 |
| 22.08 | 45 | 0.0000 | 0.0074 | 1 | 45 | 1.0000 | 0.0193 | 2 | 45 | 1.0000 | 0.9716 | 3 |
| 22.58 | 46 | 0.0000 | 0.0074 | 1 | 46 | 1.0000 | 0.0209 | 2 | 46 | 1.0000 | 0.9721 | 3 |
| 23.08 | 47 | 0.0000 | 0.0074 | 1 | 47 | 1.0000 | 0.0231 | 2 | 47 | 1.0000 | 0.9723 | 3 |
| 23.58 | 48 | 0.0000 | 0.0074 | 1 | 48 | 1.0000 | 0.0255 | 2 | 48 | 1.0000 | 0.9724 | 3 |
| 24.08 | 49 | 0.0000 | 0.0075 | 1 | 49 | 1.0000 | 0.0281 | 2 | 49 | 1.0000 | 0.9725 | 3 |
| 24.58 | 50 | 0.0000 | 0.0075 | 1 | 50 | 1.0000 | 0.0304 | 2 | 50 | 1.0000 | 0.9726 | 3 |
| 25.08 | 51 | 0.0000 | 0.0075 | 1 | 51 | 1.0000 | 0.0354 | 2 | 51 | 1.0000 | 0.9727 | 3 |
| 25.58 | 52 | 0.0000 | 0.0075 | 1 | 52 | 1.0000 | 0.0419 | 2 | 52 | 1.0000 | 0.9728 | 3 |
| 26.08 | 53 | 0.0000 | 0.0076 | 1 | 53 | 1.0000 | 0.0584 | 2 | 53 | 1.0000 | 0.9731 | 3 |
| 26.58 | 54 | 0.0000 | 0.0077 | 1 | 54 | 1.0000 | 0.0954 | 2 | 54 | 1.0000 | 0.9733 | 3 |
| 27.08 | 55 | 0.0000 | 0.0078 | 1 | 55 | 1.0000 | 0.5707 | 2 | 55 | 1.0000 | 0.9739 | 3 |
| 27.58 | 56 | 0.0000 | 0.0080 | 1 | 56 | 1.0000 | 0.9490 | 2 | 56 | 1.0000 | 0.9745 | 3 |
| 28.08 | 57 | 0.0000 | 0.0082 | 1 | 57 | 1.0000 | 0.9881 | 2 | 57 | 1.0000 | 0.9755 | 3 |
| 28.58 | 58 | 0.0000 | 0.0085 | 1 | 58 | 1.0000 | 0.9984 | 2 | 58 | 1.0000 | 0.9764 | 3 |
| 29.08 | 59 | 0.0000 | 0.0088 | 1 | 59 | 1.0000 | 1.0034 | 2 | 59 | 1.0000 | 0.9773 | 3 |
| 29.58 | 60 | 0.0000 | 0.0093 | 1 | 60 | 1.0000 | 1.0069 | 2 | 60 | 1.0000 | 0.9785 | 3 |
| 30.08 | 61 | 0.0000 | 0.0097 | 1 | 61 | 1.0000 | 1.0088 | 2 | 61 | 1.0000 | 0.9795 | 3 |
| 30.58 | 62 | 0.0000 | 0.0101 | 1 | 62 | 1.0000 | 1.0099 | 2 | 62 | 1.0000 | 0.9804 | 3 |
| 31.08 | 63 | 0.0000 | 0.0104 | 1 | 63 | 1.0000 | 1.0105 | 2 | 63 | 1.0000 | 0.9812 | 3 |
| 31.58 | 64 | 0.0000 | 0.0109 | 1 | 64 | 1.0000 | 1.0108 | 2 | 64 | 1.0000 | 0.9821 | 3 |
| 32.08 | 65 | 0.0000 | 0.0114 | 1 | 65 | 1.0000 | 1.0109 | 2 | 65 | 1.0000 | 0.9829 | 3 |
| 32.58 | 66 | 0.0000 | 0.0119 | 1 | 66 | 1.0000 | 1.0109 | 2 | 66 | 1.0000 | 0.9838 | 3 |
| 33.08 | 67 | 0.0000 | 0.0125 | 1 | 67 | 1.0000 | 1.0108 | 2 | 67 | 1.0000 | 0.9846 | 3 |
| 33.58 | 68 | 0.0000 | 0.0133 | 1 | 68 | 1.0000 | 1.0106 | 2 | 68 | 1.0000 | 0.9856 | 3 |
| 34.08 | 69 | 0.0000 | 0.0143 | 1 | 69 | 1.0000 | 1.0103 | 2 | 69 | 1.0000 | 0.9867 | 3 |
| 34.58 | 70 | 0.0000 | 0.0159 | 1 | 70 | 1.0000 | 1.0097 | 2 | 70 | 1.0000 | 0.9880 | 3 |
| 35.08 | 71 | 0.0000 | 0.0181 | 1 | 71 | 1.0000 | 1.0089 | 2 | 71 | 1.0000 | 0.9894 | 3 |
| 35.58 | 72 | 0.0000 | 0.0213 | 1 | 72 | 1.0000 | 1.0079 | 2 | 72 | 1.0000 | 0.9909 | 3 |
| 36.08 | 73 | 0.0000 | 0.0258 | 1 | 73 | 1.0000 | 1.0066 | 2 | 73 | 1.0000 | 0.9922 | 3 |
| 36.58 | 74 | 0.0000 | 0.0316 | 1 | 74 | 1.0000 | 1.0052 | 2 | 74 | 1.0000 | 0.9933 | 3 |
| 37.08 | 75 | 0.0000 | 0.0390 | 1 | 75 | 1.0000 | 1.0039 | 2 | 75 | 1.0000 | 0.9942 | 3 |
| 37.58 | 76 | 0.0000 | 0.0447 | 1 | 76 | 1.0000 | 1.0031 | 2 | 76 | 1.0000 | 0.9946 | 3 |
| 38.08 | 77 | 0.0000 | 0.0352 | 1 | 77 | 1.0000 | 1.0048 | 2 | 77 | 1.0000 | 0.9933 | 3 |
| 38.58 | 78 | 0.0000 | 0.0150 | 1 | 78 | 1.0000 | 1.0107 | 2 | 78 | 1.0000 | 0.9824 | 3 |
| 39.08 | 79 | 0.0000 | 0.0138 | 1 | 79 | 1.0000 | 1.0117 | 2 | 79 | 1.0000 | 0.9408 | 3 |
| 39.58 | 80 | 0.0000 | 0.0173 | 1 | 80 | 1.0000 | 1.0113 | 2 | 80 | 1.0000 | 0.7525 | 3 |
| 40.08 | 81 | 0.0000 | 0.0194 | 1 | 81 | 1.0000 | 1.0110 | 2 | 81 | 1.0000 | 0.4816 | 3 |
| 40.58 | 82 | 0.0000 | 0.0196 | 1 | 82 | 1.0000 | 1.0111 | 2 | 82 | 1.0000 | 0.4597 | 3 |
| 41.08 | 83 | 0.0000 | 0.0192 | 1 | 83 | 1.0000 | 1.0111 | 2 | 83 | 1.0000 | 0.5275 | 3 |
| 41.58 | 84 | 0.0000 | 0.0190 | 1 | 84 | 1.0000 | 1.0111 | 2 | 84 | 1.0000 | 0.5709 | 3 |
| 42.08 | 85 | 0.0000 | 0.0186 | 1 | 85 | 1.0000 | 1.0112 | 2 | 85 | 1.0000 | 0.6357 | 3 |
| 42.58 | 86 | 0.0000 | 0.0185 | 1 | 86 | 1.0000 | 1.0112 | 2 | 86 | 1.0000 | 0.6704 | 3 |
| 43.08 | 87 | 0.0000 | 0.0183 | 1 | 87 | 1.0000 | 1.0112 | 2 | 87 | 1.0000 | 0.6956 | 3 |
| 43.58 | 88 | 0.0000 | 0.0182 | 1 | 88 | 1.0000 | 1.0112 | 2 | 88 | 1.0000 | 0.7235 | 3 |
| 44.08 | 89 | 0.0000 | 0.0180 | 1 | 89 | 1.0000 | 1.0112 | 2 | 89 | 1.0000 | 0.7483 | 3 |
| 44.58 | 90 | 0.0000 | 0.0179 | 1 | 90 | 1.0000 | 1.0112 | 2 | 90 | 1.0000 | 0.7712 | 3 |
| 45.08 | 91 | 0.0000 | 0.0178 | 1 | 91 | 1.0000 | 1.0112 | 2 | 91 | 1.0000 | 0.7904 | 3 |
| 45.58 | 92 | 0.0000 | 0.0177 | 1 | 92 | 1.0000 | 1.0112 | 2 | 92 | 1.0000 | 0.8058 | 3 |
| 46.08 | 93 | 0.0000 | 0.0176 | 1 | 93 | 1.0000 | 1.0112 | 2 | 93 | 1.0000 | 0.8198 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 46.58 | 94 | 0.0000 | 0.0174 | 1 | 94 | 1.0000 | 1.0112 | 2 | 94 | 1.0000 | 0.8421 | 3 |
| 47.08 | 95 | 0.0000 | 0.0174 | 1 | 95 | 1.0000 | 1.0112 | 2 | 95 | 1.0000 | 0.8279 | 3 |
| 47.58 | 96 | 0.0000 | 0.0172 | 1 | 96 | 1.0000 | 1.0112 | 2 | 96 | 1.0000 | 0.8676 | 3 |
| 48.08 | 97 | 0.0000 | 0.0171 | 1 | 97 | 1.0000 | 1.0111 | 2 | 97 | 1.0000 | 0.8787 | 3 |
| 48.58 | 98 | 0.0000 | 0.0170 | 1 | 98 | 1.0000 | 1.0111 | 2 | 98 | 1.0000 | 0.8871 | 3 |
| 49.08 | 99 | 0.0000 | 0.0170 | 1 | 99 | 1.0000 | 1.0111 | 2 | 99 | 1.0000 | 0.8933 | 3 |
| 49.58 | 100 | 0.0000 | 0.0170 | 1 | 100 | 1.0000 | 1.0111 | 2 | 100 | 1.0000 | 0.8988 | 3 |
| 50.08 | 101 | 0.0000 | 0.0169 | 1 | 101 | 1.0000 | 1.0111 | 2 | 101 | 1.0000 | 0.9037 | 3 |
| 50.58 | 102 | 0.0000 | 0.0169 | 1 | 102 | 1.0000 | 1.0110 | 2 | 102 | 1.0000 | 0.9089 | 3 |
| 51.08 | 103 | 0.0000 | 0.0168 | 1 | 103 | 1.0000 | 1.0110 | 2 | 103 | 1.0000 | 0.9139 | 3 |
| 51.58 | 104 | 0.0000 | 0.0168 | 1 | 104 | 1.0000 | 1.0110 | 2 | 104 | 1.0000 | 0.9184 | 3 |
| 52.08 | 105 | 0.0000 | 0.0168 | 1 | 105 | 1.0000 | 1.0110 | 2 | 105 | 1.0000 | 0.9225 | 3 |
| 52.58 | 106 | 0.0000 | 0.0167 | 1 | 106 | 1.0000 | 1.0109 | 2 | 106 | 1.0000 | 0.9265 | 3 |
| 53.08 | 107 | 0.0000 | 0.0167 | 1 | 107 | 1.0000 | 1.0109 | 2 | 107 | 1.0000 | 0.9299 | 3 |
| 53.58 | 108 | 0.0000 | 0.0167 | 1 | 108 | 1.0000 | 1.0109 | 2 | 108 | 1.0000 | 0.9325 | 3 |
| 54.08 | 109 | 0.0000 | 0.0167 | 1 | 109 | 1.0000 | 1.0109 | 2 | 109 | 1.0000 | 0.9345 | 3 |
| 54.58 | 110 | 0.0000 | 0.0167 | 1 | 110 | 1.0000 | 1.0109 | 2 | 110 | 1.0000 | 0.9360 | 3 |
| 55.08 | 111 | 0.0000 | 0.0166 | 1 | 111 | 1.0000 | 1.0109 | 2 | 111 | 1.0000 | 0.9367 | 3 |
| 55.58 | 112 | 0.0000 | 0.0164 | 1 | 112 | 1.0000 | 1.0109 | 2 | 112 | 1.0000 | 0.9365 | 3 |
| 56.08 | 113 | 0.0000 | 0.0163 | 1 | 113 | 1.0000 | 1.0110 | 2 | 113 | 1.0000 | 0.9352 | 3 |
| 56.58 | 114 | 0.0000 | 0.0160 | 1 | 114 | 1.0000 | 1.0111 | 2 | 114 | 1.0000 | 0.9325 | 3 |
| 57.08 | 115 | 0.0000 | 0.0158 | 1 | 115 | 1.0000 | 1.0112 | 2 | 115 | 1.0000 | 0.9271 | 3 |
| 57.58 | 116 | 0.0000 | 0.0156 | 1 | 116 | 1.0000 | 1.0113 | 2 | 116 | 1.0000 | 0.9192 | 3 |
| 58.08 | 117 | 0.0000 | 0.0155 | 1 | 117 | 1.0000 | 1.0114 | 2 | 117 | 1.0000 | 0.9090 | 3 |
| 58.58 | 118 | 0.0000 | 0.0153 | 1 | 118 | 1.0000 | 1.0114 | 2 | 118 | 1.0000 | 0.8989 | 3 |
| 59.08 | 119 | 0.0000 | 0.0152 | 1 | 119 | 1.0000 | 1.0115 | 2 | 119 | 1.0000 | 0.8887 | 3 |
| 59.58 | 120 | 0.0000 | 0.0151 | 1 | 120 | 1.0000 | 1.0116 | 2 | 120 | 1.0000 | 0.8814 | 3 |
| 60.08 | 121 | 0.0000 | 0.0149 | 1 | 121 | 1.0000 | 1.0116 | 2 | 121 | 1.0000 | 0.8750 | 3 |
| 60.58 | 122 | 0.0000 | 0.0146 | 1 | 122 | 1.0000 | 1.0117 | 2 | 122 | 1.0000 | 0.8777 | 3 |
| 61.08 | 123 | 0.0000 | 0.0144 | 1 | 123 | 1.0000 | 1.0118 | 2 | 123 | 1.0000 | 0.8808 | 3 |
| 61.58 | 124 | 0.0000 | 0.0143 | 1 | 124 | 1.0000 | 1.0118 | 2 | 124 | 1.0000 | 0.8576 | 3 |
| 62.08 | 125 | 0.0000 | 0.0140 | 1 | 125 | 1.0000 | 1.0118 | 2 | 125 | 1.0000 | 0.8433 | 3 |
| 62.58 | 126 | 0.0000 | 0.0134 | 1 | 126 | 1.0000 | 1.0120 | 2 | 126 | 1.0000 | 0.8520 | 3 |
| 63.08 | 127 | 0.0000 | 0.0129 | 1 | 127 | 1.0000 | 1.0122 | 2 | 127 | 1.0000 | 0.8594 | 3 |
| 63.58 | 128 | 0.0000 | 0.0126 | 1 | 128 | 1.0000 | 1.0123 | 2 | 128 | 1.0000 | 0.8604 | 3 |
| 64.08 | 129 | 0.0000 | 0.0123 | 1 | 129 | 1.0000 | 1.0124 | 2 | 129 | 1.0000 | 0.8693 | 3 |
| 64.58 | 130 | 0.0000 | 0.0120 | 1 | 130 | 1.0000 | 1.0125 | 2 | 130 | 1.0000 | 0.8860 | 3 |
| 65.08 | 131 | 0.0000 | 0.0116 | 1 | 131 | 1.0000 | 1.0126 | 2 | 131 | 1.0000 | 0.9068 | 3 |
| 65.58 | 132 | 0.0000 | 0.0113 | 1 | 132 | 1.0000 | 1.0127 | 2 | 132 | 1.0000 | 0.9209 | 3 |
| 66.08 | 133 | 0.0000 | 0.0110 | 1 | 133 | 1.0000 | 1.0128 | 2 | 133 | 1.0000 | 0.9309 | 3 |
| 66.58 | 134 | 0.0000 | 0.0108 | 1 | 134 | 1.0000 | 1.0129 | 2 | 134 | 1.0000 | 0.9374 | 3 |
| 67.08 | 135 | 0.0000 | 0.0106 | 1 | 135 | 1.0000 | 1.0130 | 2 | 135 | 1.0000 | 0.9417 | 3 |
| 67.58 | 136 | 0.0000 | 0.0104 | 1 | 136 | 1.0000 | 1.0130 | 2 | 136 | 1.0000 | 0.9446 | 3 |
| 68.08 | 137 | 0.0000 | 0.0103 | 1 | 137 | 1.0000 | 1.0131 | 2 | 137 | 1.0000 | 0.9465 | 3 |
| 68.58 | 138 | 0.0000 | 0.0102 | 1 | 138 | 1.0000 | 1.0131 | 2 | 138 | 1.0000 | 0.9475 | 3 |
| 69.08 | 139 | 0.0000 | 0.0101 | 1 | 139 | 1.0000 | 1.0132 | 2 | 139 | 1.0000 | 0.9482 | 3 |
| 69.58 | 140 | 0.0000 | 0.0100 | 1 | 140 | 1.0000 | 1.0132 | 2 | 140 | 1.0000 | 0.9488 | 3 |
| 70.08 | 141 | 0.0000 | 0.0100 | 1 | 141 | 1.0000 | 1.0132 | 2 | 141 | 1.0000 | 0.9492 | 3 |
| 70.58 | 142 | 0.0000 | 0.0099 | 1 | 142 | 1.0000 | 1.0132 | 2 | 142 | 1.0000 | 0.9497 | 3 |
| 71.08 | 143 | 0.0000 | 0.0099 | 1 | 143 | 1.0000 | 1.0133 | 2 | 143 | 1.0000 | 0.9502 | 3 |
| 71.58 | 144 | 0.0000 | 0.0098 | 1 | 144 | 1.0000 | 1.0133 | 2 | 144 | 1.0000 | 0.9508 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 72.08 | 145 | 0.0000 | 0.0098 | 1 | 145 | 1.0000 | 1.0133 | 2 | 145 | 1.0000 | 0.9516 | 3 |
| 72.58 | 146 | 0.0000 | 0.0098 | 1 | 146 | 1.0000 | 1.0133 | 2 | 146 | 1.0000 | 0.9522 | 3 |
| 73.08 | 147 | 0.0000 | 0.0098 | 1 | 147 | 1.0000 | 1.0133 | 2 | 147 | 1.0000 | 0.9529 | 3 |
| 73.58 | 148 | 0.0000 | 0.0097 | 1 | 148 | 1.0000 | 1.0133 | 2 | 148 | 1.0000 | 0.9533 | 3 |
| 74.08 | 149 | 0.0000 | 0.0097 | 1 | 149 | 1.0000 | 1.0133 | 2 | 149 | 1.0000 | 0.9538 | 3 |
| 74.58 | 150 | 0.0000 | 0.0097 | 1 | 150 | 1.0000 | 1.0133 | 2 | 150 | 1.0000 | 0.9543 | 3 |
| 75.08 | 151 | 0.0000 | 0.0097 | 1 | 151 | 1.0000 | 1.0133 | 2 | 151 | 1.0000 | 0.9547 | 3 |
| 75.58 | 152 | 0.0000 | 0.0096 | 1 | 152 | 1.0000 | 1.0133 | 2 | 152 | 1.0000 | 0.9549 | 3 |
| 76.08 | 153 | 0.0000 | 0.0096 | 1 | 153 | 1.0000 | 1.0133 | 2 | 153 | 1.0000 | 0.9554 | 3 |
| 76.58 | 154 | 0.0000 | 0.0096 | 1 | 154 | 1.0000 | 1.0133 | 2 | 154 | 1.0000 | 0.9557 | 3 |
| 77.08 | 155 | 0.0000 | 0.0095 | 1 | 155 | 1.0000 | 1.0133 | 2 | 155 | 1.0000 | 0.9565 | 3 |
| 77.58 | 156 | 0.0000 | 0.0095 | 1 | 156 | 1.0000 | 1.0133 | 2 | 156 | 1.0000 | 0.9563 | 3 |
| 78.08 | 157 | 0.0000 | 0.0095 | 1 | 157 | 1.0000 | 1.0134 | 2 | 157 | 1.0000 | 0.9565 | 3 |
| 78.58 | 158 | 0.0000 | 0.0095 | 1 | 158 | 1.0000 | 1.0134 | 2 | 158 | 1.0000 | 0.9558 | 3 |
| 79.08 | 159 | 0.0000 | 0.0094 | 1 | 159 | 1.0000 | 1.0134 | 2 | 159 | 1.0000 | 0.9569 | 3 |
| 79.58 | 160 | 0.0000 | 0.0094 | 1 | 160 | 1.0000 | 1.0134 | 2 | 160 | 1.0000 | 0.9574 | 3 |
| 80.08 | 161 | 0.0000 | 0.0094 | 1 | 161 | 1.0000 | 1.0134 | 2 | 161 | 1.0000 | 0.9578 | 3 |
| 80.58 | 162 | 0.0000 | 0.0094 | 1 | 162 | 1.0000 | 1.0134 | 2 | 162 | 1.0000 | 0.9582 | 3 |
| 81.08 | 163 | 0.0000 | 0.0094 | 1 | 163 | 1.0000 | 1.0133 | 2 | 163 | 1.0000 | 0.9583 | 3 |
| 81.58 | 164 | 0.0000 | 0.0094 | 1 | 164 | 1.0000 | 1.0134 | 2 | 164 | 1.0000 | 0.9580 | 3 |
| 82.08 | 165 | 0.0000 | 0.0094 | 1 | 165 | 1.0000 | 1.0133 | 2 | 165 | 1.0000 | 0.9583 | 3 |
| 82.58 | 166 | 0.0000 | 0.0094 | 1 | 166 | 1.0000 | 1.0133 | 2 | 166 | 1.0000 | 0.9590 | 3 |
| 83.08 | 167 | 0.0000 | 0.0094 | 1 | 167 | 1.0000 | 1.0133 | 2 | 167 | 1.0000 | 0.9595 | 3 |
| 83.58 | 168 | 0.0000 | 0.0094 | 1 | 168 | 1.0000 | 1.0133 | 2 | 168 | 1.0000 | 0.9597 | 3 |
| 84.08 | 169 | 0.0000 | 0.0094 | 1 | 169 | 1.0000 | 1.0133 | 2 | 169 | 1.0000 | 0.9600 | 3 |
| 84.58 | 170 | 0.0000 | 0.0094 | 1 | 170 | 1.0000 | 1.0133 | 2 | 170 | 1.0000 | 0.9603 | 3 |
| 85.08 | 171 | 0.0000 | 0.0093 | 1 | 171 | 1.0000 | 1.0133 | 2 | 171 | 1.0000 | 0.9604 | 3 |
| 85.58 | 172 | 0.0000 | 0.0093 | 1 | 172 | 1.0000 | 1.0133 | 2 | 172 | 1.0000 | 0.9603 | 3 |
| 86.08 | 173 | 0.0000 | 0.0093 | 1 | 173 | 1.0000 | 1.0133 | 2 | 173 | 1.0000 | 0.9602 | 3 |
| 86.58 | 174 | 0.0000 | 0.0093 | 1 | 174 | 1.0000 | 1.0133 | 2 | 174 | 1.0000 | 0.9601 | 3 |
| 87.08 | 175 | 0.0000 | 0.0093 | 1 | 175 | 1.0000 | 1.0133 | 2 | 175 | 1.0000 | 0.9600 | 3 |
| 87.58 | 176 | 0.0000 | 0.0093 | 1 | 176 | 1.0000 | 1.0133 | 2 | 176 | 1.0000 | 0.9602 | 3 |
| 88.08 | 177 | 0.0000 | 0.0092 | 1 | 177 | 1.0000 | 1.0133 | 2 | 177 | 1.0000 | 0.9604 | 3 |
| 88.58 | 178 | 0.0000 | 0.0092 | 1 | 178 | 1.0000 | 1.0133 | 2 | 178 | 1.0000 | 0.9605 | 3 |
| 89.08 | 179 | 0.0000 | 0.0092 | 1 | 179 | 1.0000 | 1.0133 | 2 | 179 | 1.0000 | 0.9605 | 3 |
| 89.58 | 180 | 0.0000 | 0.0092 | 1 | 180 | 1.0000 | 1.0133 | 2 | 180 | 1.0000 | 0.9604 | 3 |
| 90.08 | 181 | 0.0000 | 0.0092 | 1 | 181 | 1.0000 | 1.0133 | 2 | 181 | 1.0000 | 0.9603 | 3 |
| 90.58 | 182 | 0.0000 | 0.0092 | 1 | 182 | 1.0000 | 1.0133 | 2 | 182 | 1.0000 | 0.9602 | 3 |
| 91.08 | 183 | 0.0000 | 0.0092 | 1 | 183 | 1.0000 | 1.0133 | 2 | 183 | 1.0000 | 0.9600 | 3 |
| 91.58 | 184 | 0.0000 | 0.0092 | 1 | 184 | 1.0000 | 1.0133 | 2 | 184 | 1.0000 | 0.9598 | 3 |
| 92.08 | 185 | 0.0000 | 0.0092 | 1 | 185 | 1.0000 | 1.0133 | 2 | 185 | 1.0000 | 0.9596 | 3 |
| 92.58 | 186 | 0.0000 | 0.0092 | 1 | 186 | 1.0000 | 1.0133 | 2 | 186 | 1.0000 | 0.9594 | 3 |
| 93.08 | 187 | 0.0000 | 0.0092 | 1 | 187 | 1.0000 | 1.0133 | 2 | 187 | 1.0000 | 0.9594 | 3 |
| 93.58 | 188 | 0.0000 | 0.0092 | 1 | 188 | 1.0000 | 1.0133 | 2 | 188 | 1.0000 | 0.9596 | 3 |
| 94.08 | 189 | 0.0000 | 0.0093 | 1 | 189 | 1.0000 | 1.0133 | 2 | 189 | 1.0000 | 0.9597 | 3 |
| 94.58 | 190 | 0.0000 | 0.0093 | 1 | 190 | 1.0000 | 1.0133 | 2 | 190 | 1.0000 | 0.9596 | 3 |
| 95.08 | 191 | 0.0000 | 0.0093 | 1 | 191 | 1.0000 | 1.0133 | 2 | 191 | 1.0000 | 0.9593 | 3 |
| 95.58 | 192 | 0.0000 | 0.0092 | 1 | 192 | 1.0000 | 1.0132 | 2 | 192 | 1.0000 | 0.9589 | 3 |
| 96.08 | 193 | 0.0000 | 0.0092 | 1 | 193 | 1.0000 | 1.0132 | 2 | 193 | 1.0000 | 0.9584 | 3 |
| 96.58 | 194 | 0.0000 | 0.0092 | 1 | 194 | 1.0000 | 1.0132 | 2 | 194 | 1.0000 | 0.9579 | 3 |
| 97.08 | 195 | 0.0000 | 0.0092 | 1 | 195 | 1.0000 | 1.0132 | 2 | 195 | 1.0000 | 0.9573 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 97.58 | 196 | 0.0000 | 0.0092 | 1 | 196 | 1.0000 | 1.0132 | 2 | 196 | 1.0000 | 0.9569 | 3 |
| 98.08 | 197 | 0.0000 | 0.0092 | 1 | 197 | 1.0000 | 1.0132 | 2 | 197 | 1.0000 | 0.9571 | 3 |
| 98.58 | 198 | 0.0000 | 0.0092 | 1 | 198 | 1.0000 | 1.0132 | 2 | 198 | 1.0000 | 0.9571 | 3 |
| 99.08 | 199 | 0.0000 | 0.0092 | 1 | 199 | 1.0000 | 1.0132 | 2 | 199 | 1.0000 | 0.9571 | 3 |
| 99.58 | 200 | 0.0000 | 0.0092 | 1 | 200 | 1.0000 | 1.0132 | 2 | 200 | 1.0000 | 0.9569 | 3 |
| 100.08 | 201 | 0.0000 | 0.0092 | 1 | 201 | 1.0000 | 1.0132 | 2 | 201 | 1.0000 | 0.9564 | 3 |
| 100.58 | 202 | 0.0000 | 0.0092 | 1 | 202 | 1.0000 | 1.0132 | 2 | 202 | 1.0000 | 0.9564 | 3 |
| 101.08 | 203 | 0.0000 | 0.0092 | 1 | 203 | 1.0000 | 1.0132 | 2 | 203 | 1.0000 | 0.9563 | 3 |
| 101.58 | 204 | 0.0000 | 0.0093 | 1 | 204 | 1.0000 | 1.0132 | 2 | 204 | 1.0000 | 0.9560 | 3 |
| 102.08 | 205 | 0.0000 | 0.0093 | 1 | 205 | 1.0000 | 1.0132 | 2 | 205 | 1.0000 | 0.9556 | 3 |
| 102.58 | 206 | 0.0000 | 0.0093 | 1 | 206 | 1.0000 | 1.0132 | 2 | 206 | 1.0000 | 0.9554 | 3 |
| 103.08 | 207 | 0.0000 | 0.0093 | 1 | 207 | 1.0000 | 1.0132 | 2 | 207 | 1.0000 | 0.9554 | 3 |
| 103.58 | 208 | 0.0000 | 0.0093 | 1 | 208 | 1.0000 | 1.0132 | 2 | 208 | 1.0000 | 0.9552 | 3 |
| 104.08 | 209 | 0.0000 | 0.0093 | 1 | 209 | 1.0000 | 1.0131 | 2 | 209 | 1.0000 | 0.9545 | 3 |
| 104.58 | 210 | 0.0000 | 0.0093 | 1 | 210 | 1.0000 | 1.0131 | 2 | 210 | 1.0000 | 0.9539 | 3 |
| 105.08 | 211 | 0.0000 | 0.0093 | 1 | 211 | 1.0000 | 1.0131 | 2 | 211 | 1.0000 | 0.9534 | 3 |
| 105.58 | 212 | 0.0000 | 0.0093 | 1 | 212 | 1.0000 | 1.0131 | 2 | 212 | 1.0000 | 0.9523 | 3 |
| 106.08 | 213 | 0.0000 | 0.0093 | 1 | 213 | 1.0000 | 1.0131 | 2 | 213 | 1.0000 | 0.9510 | 3 |
| 106.58 | 214 | 0.0000 | 0.0093 | 1 | 214 | 1.0000 | 1.0131 | 2 | 214 | 1.0000 | 0.9498 | 3 |
| 107.08 | 215 | 0.0000 | 0.0093 | 1 | 215 | 1.0000 | 1.0131 | 2 | 215 | 1.0000 | 0.9482 | 3 |
| 107.58 | 216 | 0.0000 | 0.0092 | 1 | 216 | 1.0000 | 1.0130 | 2 | 216 | 1.0000 | 0.9469 | 3 |
| 108.08 | 217 | 0.0000 | 0.0092 | 1 | 217 | 1.0000 | 1.0130 | 2 | 217 | 1.0000 | 0.9463 | 3 |
| 108.58 | 218 | 0.0000 | 0.0092 | 1 | 218 | 1.0000 | 1.0130 | 2 | 218 | 1.0000 | 0.9461 | 3 |
| 109.08 | 219 | 0.0000 | 0.0092 | 1 | 219 | 1.0000 | 1.0130 | 2 | 219 | 1.0000 | 0.9459 | 3 |
| 109.58 | 220 | 0.0000 | 0.0092 | 1 | 220 | 1.0000 | 1.0130 | 2 | 220 | 1.0000 | 0.9456 | 3 |
| 110.08 | 221 | 0.0000 | 0.0092 | 1 | 221 | 1.0000 | 1.0130 | 2 | 221 | 1.0000 | 0.9450 | 3 |
| 110.58 | 222 | 0.0000 | 0.0092 | 1 | 222 | 1.0000 | 1.0130 | 2 | 222 | 1.0000 | 0.9466 | 3 |
| 111.08 | 223 | 0.0000 | 0.0092 | 1 | 223 | 1.0000 | 1.0131 | 2 | 223 | 1.0000 | 0.9492 | 3 |
| 111.58 | 224 | 0.0000 | 0.0092 | 1 | 224 | 1.0000 | 1.0131 | 2 | 224 | 1.0000 | 0.9514 | 3 |
| 112.08 | 225 | 0.0000 | 0.0092 | 1 | 225 | 1.0000 | 1.0132 | 2 | 225 | 1.0000 | 0.9528 | 3 |
| 112.58 | 226 | 0.0000 | 0.0092 | 1 | 226 | 1.0000 | 1.0132 | 2 | 226 | 1.0000 | 0.9537 | 3 |
| 113.08 | 227 | 0.0000 | 0.0092 | 1 | 227 | 1.0000 | 1.0132 | 2 | 227 | 1.0000 | 0.9544 | 3 |
| 113.58 | 228 | 0.0000 | 0.0092 | 1 | 228 | 1.0000 | 1.0132 | 2 | 228 | 1.0000 | 0.9547 | 3 |
| 114.08 | 229 | 0.0000 | 0.0092 | 1 | 229 | 1.0000 | 1.0132 | 2 | 229 | 1.0000 | 0.9549 | 3 |
| 114.58 | 230 | 0.0000 | 0.0092 | 1 | 230 | 1.0000 | 1.0132 | 2 | 230 | 1.0000 | 0.9548 | 3 |
| 115.08 | 231 | 0.0000 | 0.0092 | 1 | 231 | 1.0000 | 1.0132 | 2 | 231 | 1.0000 | 0.9548 | 3 |
| 115.58 | 232 | 0.0000 | 0.0092 | 1 | 232 | 1.0000 | 1.0132 | 2 | 232 | 1.0000 | 0.9548 | 3 |
| 116.08 | 233 | 0.0000 | 0.0092 | 1 | 233 | 1.0000 | 1.0132 | 2 | 233 | 1.0000 | 0.9548 | 3 |
| 116.58 | 234 | 0.0000 | 0.0092 | 1 | 234 | 1.0000 | 1.0132 | 2 | 234 | 1.0000 | 0.9546 | 3 |
| 117.08 | 235 | 0.0000 | 0.0092 | 1 | 235 | 1.0000 | 1.0132 | 2 | 235 | 1.0000 | 0.9545 | 3 |
| 117.58 | 236 | 0.0000 | 0.0092 | 1 | 236 | 1.0000 | 1.0132 | 2 | 236 | 1.0000 | 0.9546 | 3 |
| 118.08 | 237 | 0.0000 | 0.0092 | 1 | 237 | 1.0000 | 1.0132 | 2 | 237 | 1.0000 | 0.9546 | 3 |
| 118.58 | 238 | 0.0000 | 0.0092 | 1 | 238 | 1.0000 | 1.0132 | 2 | 238 | 1.0000 | 0.9546 | 3 |
| 119.08 | 239 | 0.0000 | 0.0093 | 1 | 239 | 1.0000 | 1.0132 | 2 | 239 | 1.0000 | 0.9545 | 3 |
| 119.58 | 240 | 0.0000 | 0.0093 | 1 | 240 | 1.0000 | 1.0132 | 2 | 240 | 1.0000 | 0.9546 | 3 |
| 120.08 | 241 | 0.0000 | 0.0093 | 1 | 241 | 1.0000 | 1.0132 | 2 | 241 | 1.0000 | 0.9549 | 3 |
| 120.58 | 242 | 0.0000 | 0.0093 | 1 | 242 | 1.0000 | 1.0132 | 2 | 242 | 1.0000 | 0.9550 | 3 |
| 121.08 | 243 | 0.0000 | 0.0093 | 1 | 243 | 1.0000 | 1.0132 | 2 | 243 | 1.0000 | 0.9550 | 3 |
| 121.58 | 244 | 0.0000 | 0.0093 | 1 | 244 | 1.0000 | 1.0132 | 2 | 244 | 1.0000 | 0.9549 | 3 |
| 122.08 | 245 | 0.0000 | 0.0093 | 1 | 245 | 1.0000 | 1.0132 | 2 | 245 | 1.0000 | 0.9544 | 3 |
| 122.58 | 246 | 0.0000 | 0.0093 | 1 | 246 | 1.0000 | 1.0132 | 2 | 246 | 1.0000 | 0.9542 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 123.08 | 247 | 0.0000 | 0.0093 | 1 | 247 | 1.0000 | 1.0132 | 2 | 247 | 1.0000 | 0.9541 | 3 |
| 123.58 | 248 | 0.0000 | 0.0093 | 1 | 248 | 1.0000 | 1.0132 | 2 | 248 | 1.0000 | 0.9542 | 3 |
| 124.08 | 249 | 0.0000 | 0.0093 | 1 | 249 | 1.0000 | 1.0132 | 2 | 249 | 1.0000 | 0.9542 | 3 |
| 124.58 | 250 | 0.0000 | 0.0093 | 1 | 250 | 1.0000 | 1.0132 | 2 | 250 | 1.0000 | 0.9540 | 3 |
| 125.08 | 251 | 0.0000 | 0.0093 | 1 | 251 | 1.0000 | 1.0132 | 2 | 251 | 1.0000 | 0.9537 | 3 |
| 125.58 | 252 | 0.0000 | 0.0093 | 1 | 252 | 1.0000 | 1.0131 | 2 | 252 | 1.0000 | 0.9533 | 3 |
| 126.08 | 253 | 0.0000 | 0.0093 | 1 | 253 | 1.0000 | 1.0132 | 2 | 253 | 1.0000 | 0.9536 | 3 |
| 126.58 | 254 | 0.0000 | 0.0093 | 1 | 254 | 1.0000 | 1.0132 | 2 | 254 | 1.0000 | 0.9540 | 3 |
| 127.08 | 255 | 0.0000 | 0.0093 | 1 | 255 | 1.0000 | 1.0131 | 2 | 255 | 1.0000 | 0.9541 | 3 |
| 127.58 | 256 | 0.0000 | 0.0093 | 1 | 256 | 1.0000 | 1.0131 | 2 | 256 | 1.0000 | 0.9542 | 3 |
| 128.08 | 257 | 0.0000 | 0.0093 | 1 | 257 | 1.0000 | 1.0131 | 2 | 257 | 1.0000 | 0.9543 | 3 |
| 128.58 | 258 | 0.0000 | 0.0093 | 1 | 258 | 1.0000 | 1.0131 | 2 | 258 | 1.0000 | 0.9541 | 3 |
| 129.08 | 259 | 0.0000 | 0.0093 | 1 | 259 | 1.0000 | 1.0131 | 2 | 259 | 1.0000 | 0.9535 | 3 |
| 129.58 | 260 | 0.0000 | 0.0093 | 1 | 260 | 1.0000 | 1.0131 | 2 | 260 | 1.0000 | 0.9527 | 3 |
| 130.08 | 261 | 0.0000 | 0.0093 | 1 | 261 | 1.0000 | 1.0131 | 2 | 261 | 1.0000 | 0.9515 | 3 |
| 130.58 | 262 | 0.0000 | 0.0093 | 1 | 262 | 1.0000 | 1.0131 | 2 | 262 | 1.0000 | 0.9502 | 3 |
| 131.08 | 263 | 0.0000 | 0.0093 | 1 | 263 | 1.0000 | 1.0131 | 2 | 263 | 1.0000 | 0.9487 | 3 |
| 131.58 | 264 | 0.0000 | 0.0093 | 1 | 264 | 1.0000 | 1.0131 | 2 | 264 | 1.0000 | 0.9478 | 3 |
| 132.08 | 265 | 0.0000 | 0.0093 | 1 | 265 | 1.0000 | 1.0130 | 2 | 265 | 1.0000 | 0.9473 | 3 |
| 132.58 | 266 | 0.0000 | 0.0093 | 1 | 266 | 1.0000 | 1.0130 | 2 | 266 | 1.0000 | 0.9465 | 3 |
| 133.08 | 267 | 0.0000 | 0.0093 | 1 | 267 | 1.0000 | 1.0130 | 2 | 267 | 1.0000 | 0.9455 | 3 |
| 133.58 | 268 | 0.0000 | 0.0093 | 1 | 268 | 1.0000 | 1.0130 | 2 | 268 | 1.0000 | 0.9439 | 3 |
| 134.08 | 269 | 0.0000 | 0.0093 | 1 | 269 | 1.0000 | 1.0130 | 2 | 269 | 1.0000 | 0.9423 | 3 |
| 134.58 | 270 | 0.0000 | 0.0093 | 1 | 270 | 1.0000 | 1.0130 | 2 | 270 | 1.0000 | 0.9405 | 3 |
| 135.08 | 271 | 0.0000 | 0.0093 | 1 | 271 | 1.0000 | 1.0130 | 2 | 271 | 1.0000 | 0.9402 | 3 |
| 135.58 | 272 | 0.0000 | 0.0093 | 1 | 272 | 1.0000 | 1.0130 | 2 | 272 | 1.0000 | 0.9405 | 3 |
| 136.08 | 273 | 0.0000 | 0.0093 | 1 | 273 | 1.0000 | 1.0130 | 2 | 273 | 1.0000 | 0.9406 | 3 |
| 136.58 | 274 | 0.0000 | 0.0093 | 1 | 274 | 1.0000 | 1.0130 | 2 | 274 | 1.0000 | 0.9400 | 3 |
| 137.08 | 275 | 0.0000 | 0.0093 | 1 | 275 | 1.0000 | 1.0129 | 2 | 275 | 1.0000 | 0.9390 | 3 |
| 137.58 | 276 | 0.0000 | 0.0093 | 1 | 276 | 1.0000 | 1.0129 | 2 | 276 | 1.0000 | 0.9380 | 3 |
| 138.08 | 277 | 0.0000 | 0.0093 | 1 | 277 | 1.0000 | 1.0129 | 2 | 277 | 1.0000 | 0.9369 | 3 |
| 138.58 | 278 | 0.0000 | 0.0093 | 1 | 278 | 1.0000 | 1.0129 | 2 | 278 | 1.0000 | 0.9361 | 3 |
| 139.08 | 279 | 0.0000 | 0.0093 | 1 | 279 | 1.0000 | 1.0129 | 2 | 279 | 1.0000 | 0.9371 | 3 |
| 139.58 | 280 | 0.0000 | 0.0093 | 1 | 280 | 1.0000 | 1.0129 | 2 | 280 | 1.0000 | 0.9382 | 3 |
| 140.08 | 281 | 0.0000 | 0.0093 | 1 | 281 | 1.0000 | 1.0129 | 2 | 281 | 1.0000 | 0.9379 | 3 |
| 140.58 | 282 | 0.0000 | 0.0093 | 1 | 282 | 1.0000 | 1.0129 | 2 | 282 | 1.0000 | 0.9367 | 3 |
| 141.08 | 283 | 0.0000 | 0.0093 | 1 | 283 | 1.0000 | 1.0129 | 2 | 283 | 1.0000 | 0.9357 | 3 |
| 141.58 | 284 | 0.0000 | 0.0093 | 1 | 284 | 1.0000 | 1.0129 | 2 | 284 | 1.0000 | 0.9374 | 3 |
| 142.08 | 285 | 0.0000 | 0.0092 | 1 | 285 | 1.0000 | 1.0130 | 2 | 285 | 1.0000 | 0.9396 | 3 |
| 142.58 | 286 | 0.0000 | 0.0092 | 1 | 286 | 1.0000 | 1.0130 | 2 | 286 | 1.0000 | 0.9421 | 3 |
| 143.08 | 287 | 0.0000 | 0.0092 | 1 | 287 | 1.0000 | 1.0130 | 2 | 287 | 1.0000 | 0.9443 | 3 |
| 143.58 | 288 | 0.0000 | 0.0092 | 1 | 288 | 1.0000 | 1.0131 | 2 | 288 | 1.0000 | 0.9465 | 3 |
| 144.08 | 289 | 0.0000 | 0.0092 | 1 | 289 | 1.0000 | 1.0131 | 2 | 289 | 1.0000 | 0.9485 | 3 |
| 144.58 | 290 | 0.0000 | 0.0092 | 1 | 290 | 1.0000 | 1.0131 | 2 | 290 | 1.0000 | 0.9501 | 3 |
| 145.08 | 291 | 0.0000 | 0.0092 | 1 | 291 | 1.0000 | 1.0131 | 2 | 291 | 1.0000 | 0.9516 | 3 |
| 145.58 | 292 | 0.0000 | 0.0092 | 1 | 292 | 1.0000 | 1.0132 | 2 | 292 | 1.0000 | 0.9526 | 3 |
| 146.08 | 293 | 0.0000 | 0.0092 | 1 | 293 | 1.0000 | 1.0132 | 2 | 293 | 1.0000 | 0.9535 | 3 |
| 146.58 | 294 | 0.0000 | 0.0092 | 1 | 294 | 1.0000 | 1.0132 | 2 | 294 | 1.0000 | 0.9542 | 3 |
| 147.08 | 295 | 0.0000 | 0.0092 | 1 | 295 | 1.0000 | 1.0132 | 2 | 295 | 1.0000 | 0.9547 | 3 |
| 147.58 | 296 | 0.0000 | 0.0092 | 1 | 296 | 1.0000 | 1.0132 | 2 | 296 | 1.0000 | 0.9552 | 3 |
| 148.08 | 297 | 0.0000 | 0.0092 | 1 | 297 | 1.0000 | 1.0132 | 2 | 297 | 1.0000 | 0.9556 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 148.58 | 298 | 0.0000 | 0.0092 | 1 | 298 | 1.0000 | 1.0132 | 2 | 298 | 1.0000 | 0.9560 | 3 |
| 149.08 | 299 | 0.0000 | 0.0092 | 1 | 299 | 1.0000 | 1.0132 | 2 | 299 | 1.0000 | 0.9563 | 3 |
| 149.58 | 300 | 0.0000 | 0.0092 | 1 | 300 | 1.0000 | 1.0132 | 2 | 300 | 1.0000 | 0.9565 | 3 |
| 150.08 | 301 | 0.0000 | 0.0092 | 1 | 301 | 1.0000 | 1.0132 | 2 | 301 | 1.0000 | 0.9567 | 3 |
| 150.58 | 302 | 0.0000 | 0.0092 | 1 | 302 | 1.0000 | 1.0132 | 2 | 302 | 1.0000 | 0.9568 | 3 |
| 151.08 | 303 | 0.0000 | 0.0092 | 1 | 303 | 1.0000 | 1.0132 | 2 | 303 | 1.0000 | 0.9570 | 3 |
| 151.58 | 304 | 0.0000 | 0.0092 | 1 | 304 | 1.0000 | 1.0132 | 2 | 304 | 1.0000 | 0.9572 | 3 |
| 152.08 | 305 | 0.0000 | 0.0092 | 1 | 305 | 1.0000 | 1.0132 | 2 | 305 | 1.0000 | 0.9575 | 3 |
| 152.58 | 306 | 0.0000 | 0.0092 | 1 | 306 | 1.0000 | 1.0132 | 2 | 306 | 1.0000 | 0.9576 | 3 |
| 153.08 | 307 | 0.0000 | 0.0092 | 1 | 307 | 1.0000 | 1.0132 | 2 | 307 | 1.0000 | 0.9577 | 3 |
| 153.58 | 308 | 0.0000 | 0.0092 | 1 | 308 | 1.0000 | 1.0133 | 2 | 308 | 1.0000 | 0.9579 | 3 |
| 154.08 | 309 | 0.0000 | 0.0092 | 1 | 309 | 1.0000 | 1.0133 | 2 | 309 | 1.0000 | 0.9580 | 3 |
| 154.58 | 310 | 0.0000 | 0.0092 | 1 | 310 | 1.0000 | 1.0133 | 2 | 310 | 1.0000 | 0.9582 | 3 |
| 155.08 | 311 | 0.0000 | 0.0092 | 1 | 311 | 1.0000 | 1.0133 | 2 | 311 | 1.0000 | 0.9582 | 3 |
| 155.58 | 312 | 0.0000 | 0.0092 | 1 | 312 | 1.0000 | 1.0132 | 2 | 312 | 1.0000 | 0.9582 | 3 |
| 156.08 | 313 | 0.0000 | 0.0092 | 1 | 313 | 1.0000 | 1.0132 | 2 | 313 | 1.0000 | 0.9582 | 3 |
| 156.58 | 314 | 0.0000 | 0.0092 | 1 | 314 | 1.0000 | 1.0132 | 2 | 314 | 1.0000 | 0.9578 | 3 |
| 157.08 | 315 | 0.0000 | 0.0092 | 1 | 315 | 1.0000 | 1.0132 | 2 | 315 | 1.0000 | 0.9575 | 3 |
| 157.58 | 316 | 0.0000 | 0.0092 | 1 | 316 | 1.0000 | 1.0132 | 2 | 316 | 1.0000 | 0.9572 | 3 |
| 158.08 | 317 | 0.0000 | 0.0092 | 1 | 317 | 1.0000 | 1.0132 | 2 | 317 | 1.0000 | 0.9571 | 3 |
| 158.58 | 318 | 0.0000 | 0.0092 | 1 | 318 | 1.0000 | 1.0132 | 2 | 318 | 1.0000 | 0.9568 | 3 |
| 159.08 | 319 | 0.0000 | 0.0092 | 1 | 319 | 1.0000 | 1.0132 | 2 | 319 | 1.0000 | 0.9566 | 3 |
| 159.58 | 320 | 0.0000 | 0.0092 | 1 | 320 | 1.0000 | 1.0132 | 2 | 320 | 1.0000 | 0.9564 | 3 |
| 160.08 | 321 | 0.0000 | 0.0092 | 1 | 321 | 1.0000 | 1.0132 | 2 | 321 | 1.0000 | 0.9560 | 3 |
| 160.58 | 322 | 0.0000 | 0.0092 | 1 | 322 | 1.0000 | 1.0132 | 2 | 322 | 1.0000 | 0.9556 | 3 |
| 161.08 | 323 | 0.0000 | 0.0092 | 1 | 323 | 1.0000 | 1.0132 | 2 | 323 | 1.0000 | 0.9554 | 3 |
| 161.58 | 324 | 0.0000 | 0.0092 | 1 | 324 | 1.0000 | 1.0132 | 2 | 324 | 1.0000 | 0.9554 | 3 |
| 162.08 | 325 | 0.0000 | 0.0092 | 1 | 325 | 1.0000 | 1.0132 | 2 | 325 | 1.0000 | 0.9553 | 3 |
| 162.58 | 326 | 0.0000 | 0.0092 | 1 | 326 | 1.0000 | 1.0132 | 2 | 326 | 1.0000 | 0.9551 | 3 |
| 163.08 | 327 | 0.0000 | 0.0092 | 1 | 327 | 1.0000 | 1.0132 | 2 | 327 | 1.0000 | 0.9549 | 3 |
| 163.58 | 328 | 0.0000 | 0.0092 | 1 | 328 | 1.0000 | 1.0132 | 2 | 328 | 1.0000 | 0.9549 | 3 |
| 164.08 | 329 | 0.0000 | 0.0092 | 1 | 329 | 1.0000 | 1.0132 | 2 | 329 | 1.0000 | 0.9547 | 3 |
| 164.58 | 330 | 0.0000 | 0.0092 | 1 | 330 | 1.0000 | 1.0132 | 2 | 330 | 1.0000 | 0.9545 | 3 |
| 165.08 | 331 | 0.0000 | 0.0092 | 1 | 331 | 1.0000 | 1.0132 | 2 | 331 | 1.0000 | 0.9542 | 3 |
| 165.58 | 332 | 0.0000 | 0.0092 | 1 | 332 | 1.0000 | 1.0132 | 2 | 332 | 1.0000 | 0.9539 | 3 |
| 166.08 | 333 | 0.0000 | 0.0092 | 1 | 333 | 1.0000 | 1.0132 | 2 | 333 | 1.0000 | 0.9534 | 3 |
| 166.58 | 334 | 0.0000 | 0.0092 | 1 | 334 | 1.0000 | 1.0132 | 2 | 334 | 1.0000 | 0.9532 | 3 |
| 167.08 | 335 | 0.0000 | 0.0092 | 1 | 335 | 1.0000 | 1.0132 | 2 | 335 | 1.0000 | 0.9530 | 3 |
| 167.58 | 336 | 0.0000 | 0.0092 | 1 | 336 | 1.0000 | 1.0132 | 2 | 336 | 1.0000 | 0.9530 | 3 |
| 168.08 | 337 | 0.0000 | 0.0092 | 1 | 337 | 1.0000 | 1.0132 | 2 | 337 | 1.0000 | 0.9531 | 3 |
| 168.58 | 338 | 0.0000 | 0.0092 | 1 | 338 | 1.0000 | 1.0132 | 2 | 338 | 1.0000 | 0.9532 | 3 |
| 169.08 | 339 | 0.0000 | 0.0092 | 1 | 339 | 1.0000 | 1.0133 | 2 | 339 | 1.0000 | 0.9536 | 3 |
| 169.58 | 340 | 0.0000 | 0.0092 | 1 | 340 | 1.0000 | 1.0133 | 2 | 340 | 1.0000 | 0.9540 | 3 |
| 170.08 | 341 | 0.0000 | 0.0092 | 1 | 341 | 1.0000 | 1.0133 | 2 | 341 | 1.0000 | 0.9545 | 3 |
| 170.58 | 342 | 0.0000 | 0.0092 | 1 | 342 | 1.0000 | 1.0133 | 2 | 342 | 1.0000 | 0.9548 | 3 |
| 171.08 | 343 | 0.0000 | 0.0092 | 1 | 343 | 1.0000 | 1.0133 | 2 | 343 | 1.0000 | 0.9552 | 3 |
| 171.58 | 344 | 0.0000 | 0.0092 | 1 | 344 | 1.0000 | 1.0133 | 2 | 344 | 1.0000 | 0.9556 | 3 |
| 172.08 | 345 | 0.0000 | 0.0092 | 1 | 345 | 1.0000 | 1.0133 | 2 | 345 | 1.0000 | 0.9560 | 3 |
| 172.58 | 346 | 0.0000 | 0.0092 | 1 | 346 | 1.0000 | 1.0133 | 2 | 346 | 1.0000 | 0.9565 | 3 |
| 173.08 | 347 | 0.0000 | 0.0092 | 1 | 347 | 1.0000 | 1.0133 | 2 | 347 | 1.0000 | 0.9567 | 3 |
| 173.58 | 348 | 0.0000 | 0.0092 | 1 | 348 | 1.0000 | 1.0133 | 2 | 348 | 1.0000 | 0.9571 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 174.08 | 349 | 0.0000 | 0.0092 | 1 | 349 | 1.0000 | 1.0133 | 2 | 349 | 1.0000 | 0.9574 | 3 |
| 174.58 | 350 | 0.0000 | 0.0092 | 1 | 350 | 1.0000 | 1.0133 | 2 | 350 | 1.0000 | 0.9575 | 3 |
| 175.08 | 351 | 0.0000 | 0.0092 | 1 | 351 | 1.0000 | 1.0133 | 2 | 351 | 1.0000 | 0.9577 | 3 |
| 175.58 | 352 | 0.0000 | 0.0092 | 1 | 352 | 1.0000 | 1.0133 | 2 | 352 | 1.0000 | 0.9578 | 3 |
| 176.08 | 353 | 0.0000 | 0.0092 | 1 | 353 | 1.0000 | 1.0133 | 2 | 353 | 1.0000 | 0.9580 | 3 |
| 176.58 | 354 | 0.0000 | 0.0092 | 1 | 354 | 1.0000 | 1.0133 | 2 | 354 | 1.0000 | 0.9582 | 3 |
| 177.08 | 355 | 0.0000 | 0.0092 | 1 | 355 | 1.0000 | 1.0133 | 2 | 355 | 1.0000 | 0.9584 | 3 |
| 177.58 | 356 | 0.0000 | 0.0092 | 1 | 356 | 1.0000 | 1.0133 | 2 | 356 | 1.0000 | 0.9585 | 3 |
| 178.08 | 357 | 0.0000 | 0.0092 | 1 | 357 | 1.0000 | 1.0133 | 2 | 357 | 1.0000 | 0.9586 | 3 |
| 178.58 | 358 | 0.0000 | 0.0092 | 1 | 358 | 1.0000 | 1.0133 | 2 | 358 | 1.0000 | 0.9587 | 3 |
| 179.08 | 359 | 0.0000 | 0.0092 | 1 | 359 | 1.0000 | 1.0133 | 2 | 359 | 1.0000 | 0.9588 | 3 |
| 179.58 | 360 | 0.0000 | 0.0092 | 1 | 360 | 1.0000 | 1.0133 | 2 | 360 | 1.0000 | 0.9588 | 3 |
| 180.08 | 361 | 0.0000 | 0.0092 | 1 | 361 | 1.0000 | 1.0133 | 2 | 361 | 1.0000 | 0.9589 | 3 |
| 180.58 | 362 | 0.0000 | 0.0092 | 1 | 362 | 1.0000 | 1.0133 | 2 | 362 | 1.0000 | 0.9590 | 3 |
| 181.08 | 363 | 0.0000 | 0.0092 | 1 | 363 | 1.0000 | 1.0133 | 2 | 363 | 1.0000 | 0.9590 | 3 |
| 181.58 | 364 | 0.0000 | 0.0092 | 1 | 364 | 1.0000 | 1.0133 | 2 | 364 | 1.0000 | 0.9591 | 3 |
| 182.08 | 365 | 0.0000 | 0.0092 | 1 | 365 | 1.0000 | 1.0133 | 2 | 365 | 1.0000 | 0.9591 | 3 |
| 182.58 | 366 | 0.0000 | 0.0092 | 1 | 366 | 1.0000 | 1.0133 | 2 | 366 | 1.0000 | 0.9591 | 3 |
| 183.08 | 367 | 0.0000 | 0.0092 | 1 | 367 | 1.0000 | 1.0133 | 2 | 367 | 1.0000 | 0.9590 | 3 |
| 183.58 | 368 | 0.0000 | 0.0092 | 1 | 368 | 1.0000 | 1.0133 | 2 | 368 | 1.0000 | 0.9590 | 3 |
| 184.08 | 369 | 0.0000 | 0.0092 | 1 | 369 | 1.0000 | 1.0133 | 2 | 369 | 1.0000 | 0.9589 | 3 |
| 184.58 | 370 | 0.0000 | 0.0092 | 1 | 370 | 1.0000 | 1.0133 | 2 | 370 | 1.0000 | 0.9589 | 3 |
| 185.08 | 371 | 0.0000 | 0.0092 | 1 | 371 | 1.0000 | 1.0133 | 2 | 371 | 1.0000 | 0.9588 | 3 |
| 185.58 | 372 | 0.0000 | 0.0092 | 1 | 372 | 1.0000 | 1.0133 | 2 | 372 | 1.0000 | 0.9588 | 3 |
| 186.08 | 373 | 0.0000 | 0.0092 | 1 | 373 | 1.0000 | 1.0133 | 2 | 373 | 1.0000 | 0.9587 | 3 |
| 186.58 | 374 | 0.0000 | 0.0092 | 1 | 374 | 1.0000 | 1.0133 | 2 | 374 | 1.0000 | 0.9586 | 3 |
| 187.08 | 375 | 0.0000 | 0.0092 | 1 | 375 | 1.0000 | 1.0133 | 2 | 375 | 1.0000 | 0.9586 | 3 |
| 187.58 | 376 | 0.0000 | 0.0092 | 1 | 376 | 1.0000 | 1.0133 | 2 | 376 | 1.0000 | 0.9585 | 3 |
| 188.08 | 377 | 0.0000 | 0.0092 | 1 | 377 | 1.0000 | 1.0133 | 2 | 377 | 1.0000 | 0.9585 | 3 |
| 188.58 | 378 | 0.0000 | 0.0092 | 1 | 378 | 1.0000 | 1.0133 | 2 | 378 | 1.0000 | 0.9585 | 3 |
| 189.08 | 379 | 0.0000 | 0.0092 | 1 | 379 | 1.0000 | 1.0133 | 2 | 379 | 1.0000 | 0.9584 | 3 |
| 189.58 | 380 | 0.0000 | 0.0092 | 1 | 380 | 1.0000 | 1.0133 | 2 | 380 | 1.0000 | 0.9584 | 3 |
| 190.08 | 381 | 0.0000 | 0.0092 | 1 | 381 | 1.0000 | 1.0133 | 2 | 381 | 1.0000 | 0.9584 | 3 |
| 190.58 | 382 | 0.0000 | 0.0092 | 1 | 382 | 1.0000 | 1.0133 | 2 | 382 | 1.0000 | 0.9584 | 3 |
| 191.08 | 383 | 0.0000 | 0.0092 | 1 | 383 | 1.0000 | 1.0133 | 2 | 383 | 1.0000 | 0.9584 | 3 |
| 191.58 | 384 | 0.0000 | 0.0092 | 1 | 384 | 1.0000 | 1.0133 | 2 | 384 | 1.0000 | 0.9587 | 3 |
| 192.08 | 385 | 0.0000 | 0.0092 | 1 | 385 | 1.0000 | 1.0133 | 2 | 385 | 1.0000 | 0.9590 | 3 |
| 192.58 | 386 | 0.0000 | 0.0092 | 1 | 386 | 1.0000 | 1.0133 | 2 | 386 | 1.0000 | 0.9592 | 3 |
| 193.08 | 387 | 0.0000 | 0.0092 | 1 | 387 | 1.0000 | 1.0133 | 2 | 387 | 1.0000 | 0.9594 | 3 |
| 193.58 | 388 | 0.0000 | 0.0092 | 1 | 388 | 1.0000 | 1.0133 | 2 | 388 | 1.0000 | 0.9596 | 3 |
| 194.08 | 389 | 0.0000 | 0.0091 | 1 | 389 | 1.0000 | 1.0133 | 2 | 389 | 1.0000 | 0.9597 | 3 |
| 194.58 | 390 | 0.0000 | 0.0091 | 1 | 390 | 1.0000 | 1.0133 | 2 | 390 | 1.0000 | 0.9598 | 3 |
| 195.08 | 391 | 0.0000 | 0.0091 | 1 | 391 | 1.0000 | 1.0134 | 2 | 391 | 1.0000 | 0.9599 | 3 |
| 195.58 | 392 | 0.0000 | 0.0091 | 1 | 392 | 1.0000 | 1.0134 | 2 | 392 | 1.0000 | 0.9599 | 3 |
| 196.08 | 393 | 0.0000 | 0.0091 | 1 | 393 | 1.0000 | 1.0134 | 2 | 393 | 1.0000 | 0.9599 | 3 |
| 196.58 | 394 | 0.0000 | 0.0091 | 1 | 394 | 1.0000 | 1.0134 | 2 | 394 | 1.0000 | 0.9599 | 3 |
| 197.08 | 395 | 0.0000 | 0.0091 | 1 | 395 | 1.0000 | 1.0134 | 2 | 395 | 1.0000 | 0.9598 | 3 |
| 197.58 | 396 | 0.0000 | 0.0091 | 1 | 396 | 1.0000 | 1.0134 | 2 | 396 | 1.0000 | 0.9598 | 3 |
| 198.08 | 397 | 0.0000 | 0.0091 | 1 | 397 | 1.0000 | 1.0134 | 2 | 397 | 1.0000 | 0.9598 | 3 |
| 198.58 | 398 | 0.0000 | 0.0091 | 1 | 398 | 1.0000 | 1.0134 | 2 | 398 | 1.0000 | 0.9597 | 3 |
| 199.08 | 399 | 0.0000 | 0.0091 | 1 | 399 | 1.0000 | 1.0134 | 2 | 399 | 1.0000 | 0.9596 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 199.58 | 400 | 0.0000 | 0.0091 | 1 | 400 | 1.0000 | 1.0134 | 2 | 400 | 1.0000 | 0.9594 | 3 |
| 200.08 | 401 | 0.0000 | 0.0091 | 1 | 401 | 1.0000 | 1.0134 | 2 | 401 | 1.0000 | 0.9592 | 3 |
| 200.58 | 402 | 0.0000 | 0.0091 | 1 | 402 | 1.0000 | 1.0134 | 2 | 402 | 1.0000 | 0.9590 | 3 |
| 201.08 | 403 | 0.0000 | 0.0091 | 1 | 403 | 1.0000 | 1.0134 | 2 | 403 | 1.0000 | 0.9588 | 3 |
| 201.58 | 404 | 0.0000 | 0.0092 | 1 | 404 | 1.0000 | 1.0134 | 2 | 404 | 1.0000 | 0.9586 | 3 |
| 202.08 | 405 | 0.0000 | 0.0092 | 1 | 405 | 1.0000 | 1.0134 | 2 | 405 | 1.0000 | 0.9584 | 3 |
| 202.58 | 406 | 0.0000 | 0.0092 | 1 | 406 | 1.0000 | 1.0134 | 2 | 406 | 1.0000 | 0.9582 | 3 |
| 203.08 | 407 | 0.0000 | 0.0092 | 1 | 407 | 1.0000 | 1.0134 | 2 | 407 | 1.0000 | 0.9581 | 3 |
| 203.58 | 408 | 0.0000 | 0.0092 | 1 | 408 | 1.0000 | 1.0134 | 2 | 408 | 1.0000 | 0.9580 | 3 |
| 204.08 | 409 | 0.0000 | 0.0092 | 1 | 409 | 1.0000 | 1.0134 | 2 | 409 | 1.0000 | 0.9579 | 3 |
| 204.58 | 410 | 0.0000 | 0.0092 | 1 | 410 | 1.0000 | 1.0134 | 2 | 410 | 1.0000 | 0.9578 | 3 |
| 205.08 | 411 | 0.0000 | 0.0092 | 1 | 411 | 1.0000 | 1.0134 | 2 | 411 | 1.0000 | 0.9577 | 3 |
| 205.58 | 412 | 0.0000 | 0.0092 | 1 | 412 | 1.0000 | 1.0134 | 2 | 412 | 1.0000 | 0.9577 | 3 |
| 206.08 | 413 | 0.0000 | 0.0092 | 1 | 413 | 1.0000 | 1.0134 | 2 | 413 | 1.0000 | 0.9576 | 3 |
| 206.58 | 414 | 0.0000 | 0.0092 | 1 | 414 | 1.0000 | 1.0134 | 2 | 414 | 1.0000 | 0.9576 | 3 |
| 207.08 | 415 | 0.0000 | 0.0092 | 1 | 415 | 1.0000 | 1.0134 | 2 | 415 | 1.0000 | 0.9575 | 3 |
| 207.58 | 416 | 0.0000 | 0.0092 | 1 | 416 | 1.0000 | 1.0134 | 2 | 416 | 1.0000 | 0.9575 | 3 |
| 208.08 | 417 | 0.0000 | 0.0092 | 1 | 417 | 1.0000 | 1.0134 | 2 | 417 | 1.0000 | 0.9573 | 3 |
| 208.58 | 418 | 0.0000 | 0.0092 | 1 | 418 | 1.0000 | 1.0134 | 2 | 418 | 1.0000 | 0.9570 | 3 |
| 209.08 | 419 | 0.0000 | 0.0092 | 1 | 419 | 1.0000 | 1.0134 | 2 | 419 | 1.0000 | 0.9569 | 3 |
| 209.58 | 420 | 0.0000 | 0.0092 | 1 | 420 | 1.0000 | 1.0134 | 2 | 420 | 1.0000 | 0.9569 | 3 |
| 210.08 | 421 | 0.0000 | 0.0092 | 1 | 421 | 1.0000 | 1.0134 | 2 | 421 | 1.0000 | 0.9569 | 3 |
| 210.58 | 422 | 0.0000 | 0.0092 | 1 | 422 | 1.0000 | 1.0134 | 2 | 422 | 1.0000 | 0.9569 | 3 |
| 211.08 | 423 | 0.0000 | 0.0092 | 1 | 423 | 1.0000 | 1.0134 | 2 | 423 | 1.0000 | 0.9567 | 3 |
| 211.58 | 424 | 0.0000 | 0.0092 | 1 | 424 | 1.0000 | 1.0134 | 2 | 424 | 1.0000 | 0.9563 | 3 |
| 212.08 | 425 | 0.0000 | 0.0092 | 1 | 425 | 1.0000 | 1.0134 | 2 | 425 | 1.0000 | 0.9558 | 3 |
| 212.58 | 426 | 0.0000 | 0.0092 | 1 | 426 | 1.0000 | 1.0134 | 2 | 426 | 1.0000 | 0.9557 | 3 |
| 213.08 | 427 | 0.0000 | 0.0092 | 1 | 427 | 1.0000 | 1.0134 | 2 | 427 | 1.0000 | 0.9557 | 3 |
| 213.58 | 428 | 0.0000 | 0.0092 | 1 | 428 | 1.0000 | 1.0134 | 2 | 428 | 1.0000 | 0.9556 | 3 |
| 214.08 | 429 | 0.0000 | 0.0092 | 1 | 429 | 1.0000 | 1.0134 | 2 | 429 | 1.0000 | 0.9554 | 3 |
| 214.58 | 430 | 0.0000 | 0.0092 | 1 | 430 | 1.0000 | 1.0134 | 2 | 430 | 1.0000 | 0.9554 | 3 |
| 215.08 | 431 | 0.0000 | 0.0092 | 1 | 431 | 1.0000 | 1.0134 | 2 | 431 | 1.0000 | 0.9554 | 3 |
| 215.58 | 432 | 0.0000 | 0.0092 | 1 | 432 | 1.0000 | 1.0134 | 2 | 432 | 1.0000 | 0.9552 | 3 |
| 216.08 | 433 | 0.0000 | 0.0092 | 1 | 433 | 1.0000 | 1.0134 | 2 | 433 | 1.0000 | 0.9548 | 3 |
| 216.58 | 434 | 0.0000 | 0.0092 | 1 | 434 | 1.0000 | 1.0133 | 2 | 434 | 1.0000 | 0.9545 | 3 |
| 217.08 | 435 | 0.0000 | 0.0092 | 1 | 435 | 1.0000 | 1.0133 | 2 | 435 | 1.0000 | 0.9541 | 3 |
| 217.58 | 436 | 0.0000 | 0.0092 | 1 | 436 | 1.0000 | 1.0133 | 2 | 436 | 1.0000 | 0.9540 | 3 |
| 218.08 | 437 | 0.0000 | 0.0092 | 1 | 437 | 1.0000 | 1.0133 | 2 | 437 | 1.0000 | 0.9539 | 3 |
| 218.58 | 438 | 0.0000 | 0.0092 | 1 | 438 | 1.0000 | 1.0133 | 2 | 438 | 1.0000 | 0.9537 | 3 |
| 219.08 | 439 | 0.0000 | 0.0092 | 1 | 439 | 1.0000 | 1.0133 | 2 | 439 | 1.0000 | 0.9536 | 3 |
| 219.58 | 440 | 0.0000 | 0.0092 | 1 | 440 | 1.0000 | 1.0133 | 2 | 440 | 1.0000 | 0.9535 | 3 |
| 220.08 | 441 | 0.0000 | 0.0092 | 1 | 441 | 1.0000 | 1.0133 | 2 | 441 | 1.0000 | 0.9533 | 3 |
| 220.58 | 442 | 0.0000 | 0.0092 | 1 | 442 | 1.0000 | 1.0133 | 2 | 442 | 1.0000 | 0.9532 | 3 |
| 221.08 | 443 | 0.0000 | 0.0092 | 1 | 443 | 1.0000 | 1.0133 | 2 | 443 | 1.0000 | 0.9531 | 3 |
| 221.58 | 444 | 0.0000 | 0.0092 | 1 | 444 | 1.0000 | 1.0133 | 2 | 444 | 1.0000 | 0.9529 | 3 |
| 222.08 | 445 | 0.0000 | 0.0092 | 1 | 445 | 1.0000 | 1.0133 | 2 | 445 | 1.0000 | 0.9528 | 3 |
| 222.58 | 446 | 0.0000 | 0.0092 | 1 | 446 | 1.0000 | 1.0133 | 2 | 446 | 1.0000 | 0.9526 | 3 |
| 223.08 | 447 | 0.0000 | 0.0092 | 1 | 447 | 1.0000 | 1.0133 | 2 | 447 | 1.0000 | 0.9525 | 3 |
| 223.58 | 448 | 0.0000 | 0.0092 | 1 | 448 | 1.0000 | 1.0133 | 2 | 448 | 1.0000 | 0.9524 | 3 |
| 224.08 | 449 | 0.0000 | 0.0092 | 1 | 449 | 1.0000 | 1.0134 | 2 | 449 | 1.0000 | 0.9524 | 3 |
| 224.58 | 450 | 0.0000 | 0.0092 | 1 | 450 | 1.0000 | 1.0134 | 2 | 450 | 1.0000 | 0.9524 | 3 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 225.08 | 451 | 0.0000 | 0.0092 | 1 | 451 | 1.0000 | 1.0134 | 2 | 451 | 1.0000 | 0.9523 | 3 |
| 225.58 | 452 | 0.0000 | 0.0092 | 1 | 452 | 1.0000 | 1.0134 | 2 | 452 | 1.0000 | 0.9524 | 3 |
| 226.08 | 453 | 0.0000 | 0.0092 | 1 | 453 | 1.0000 | 1.0134 | 2 | 453 | 1.0000 | 0.9523 | 3 |
| 226.58 | 454 | 0.0000 | 0.0092 | 1 | 454 | 1.0000 | 1.0134 | 2 | 454 | 1.0000 | 0.9523 | 3 |
| 227.08 | 455 | 0.0000 | 0.0092 | 1 | 455 | 1.0000 | 1.0134 | 2 | 455 | 1.0000 | 0.9522 | 3 |
| 227.58 | 456 | 0.0000 | 0.0092 | 1 | 456 | 1.0000 | 1.0134 | 2 | 456 | 1.0000 | 0.9522 | 3 |
| 228.08 | 457 | 0.0000 | 0.0092 | 1 | 457 | 1.0000 | 1.0134 | 2 | 457 | 1.0000 | 0.9522 | 3 |
| 228.58 | 458 | 0.0000 | 0.0092 | 1 | 458 | 1.0000 | 1.0134 | 2 | 458 | 1.0000 | 0.9523 | 3 |
| 229.08 | 459 | 0.0000 | 0.0092 | 1 | 459 | 1.0000 | 1.0134 | 2 | 459 | 1.0000 | 0.9523 | 3 |
| 229.58 | 460 | 0.0000 | 0.0092 | 1 | 460 | 1.0000 | 1.0134 | 2 | 460 | 1.0000 | 0.9522 | 3 |
| 230.08 | 461 | 0.0000 | 0.0092 | 1 | 461 | 1.0000 | 1.0134 | 2 | 461 | 1.0000 | 0.9521 | 3 |
| 230.58 | 462 | 0.0000 | 0.0092 | 1 | 462 | 1.0000 | 1.0134 | 2 | 462 | 1.0000 | 0.9520 | 3 |
| 231.08 | 463 | 0.0000 | 0.0092 | 1 | 463 | 1.0000 | 1.0133 | 2 | 463 | 1.0000 | 0.9517 | 3 |
| 231.58 | 464 | 0.0000 | 0.0092 | 1 | 464 | 1.0000 | 1.0133 | 2 | 464 | 1.0000 | 0.9514 | 3 |
| 232.08 | 465 | 0.0000 | 0.0092 | 1 | 465 | 1.0000 | 1.0133 | 2 | 465 | 1.0000 | 0.9510 | 3 |
| 232.58 | 466 | 0.0000 | 0.0092 | 1 | 466 | 1.0000 | 1.0133 | 2 | 466 | 1.0000 | 0.9508 | 3 |
| 233.08 | 467 | 0.0000 | 0.0092 | 1 | 467 | 1.0000 | 1.0133 | 2 | 467 | 1.0000 | 0.9505 | 3 |
| 233.58 | 468 | 0.0000 | 0.0092 | 1 | 468 | 1.0000 | 1.0133 | 2 | 468 | 1.0000 | 0.9502 | 3 |
| 234.08 | 469 | 0.0000 | 0.0092 | 1 | 469 | 1.0000 | 1.0133 | 2 | 469 | 1.0000 | 0.9500 | 3 |
| 234.58 | 470 | 0.0000 | 0.0092 | 1 | 470 | 1.0000 | 1.0133 | 2 | 470 | 1.0000 | 0.9497 | 3 |
| 235.08 | 471 | 0.0000 | 0.0093 | 1 | 471 | 1.0000 | 1.0133 | 2 | 471 | 1.0000 | 0.9495 | 3 |
| 235.58 | 472 | 0.0000 | 0.0093 | 1 | 472 | 1.0000 | 1.0133 | 2 | 472 | 1.0000 | 0.9494 | 3 |
| 236.08 | 473 | 0.0000 | 0.0093 | 1 | 473 | 1.0000 | 1.0133 | 2 | 473 | 1.0000 | 0.9494 | 3 |
| 236.58 | 474 | 0.0000 | 0.0093 | 1 | 474 | 1.0000 | 1.0133 | 2 | 474 | 1.0000 | 0.9492 | 3 |
| 237.08 | 475 | 0.0000 | 0.0093 | 1 | 475 | 1.0000 | 1.0133 | 2 | 475 | 1.0000 | 0.9491 | 3 |
| 237.58 | 476 | 0.0000 | 0.0093 | 1 | 476 | 1.0000 | 1.0133 | 2 | 476 | 1.0000 | 0.9490 | 3 |
| 238.08 | 477 | 0.0000 | 0.0093 | 1 | 477 | 1.0000 | 1.0133 | 2 | 477 | 1.0000 | 0.9486 | 3 |
| 238.58 | 478 | 0.0000 | 0.0093 | 1 | 478 | 1.0000 | 1.0133 | 2 | 478 | 1.0000 | 0.9473 | 3 |
| 239.08 | 479 | 0.0000 | 0.0093 | 1 | 479 | 1.0000 | 1.0133 | 2 | 479 | 1.0000 | 0.9460 | 3 |
| 239.58 | 480 | 0.0000 | 0.0093 | 1 | 480 | 1.0000 | 1.0133 | 2 | 480 | 1.0000 | 0.9454 | 3 |
| 240.08 | 481 | 0.0000 | 0.0093 | 1 | 481 | 1.0000 | 1.0133 | 2 | 481 | 1.0000 | 0.9450 | 3 |
| 240.58 | 482 | 0.0000 | 0.0093 | 1 | 482 | 1.0000 | 1.0132 | 2 | 482 | 1.0000 | 0.9452 | 3 |
| 241.08 | 483 | 0.0000 | 0.0093 | 1 | 483 | 1.0000 | 1.0132 | 2 | 483 | 1.0000 | 0.9458 | 3 |
| 241.58 | 484 | 0.0000 | 0.0093 | 1 | 484 | 1.0000 | 1.0132 | 2 | 484 | 1.0000 | 0.9464 | 3 |
| 242.08 | 485 | 0.0000 | 0.0093 | 1 | 485 | 1.0000 | 1.0132 | 2 | 485 | 1.0000 | 0.9470 | 3 |
| 242.58 | 486 | 0.0000 | 0.0093 | 1 | 486 | 1.0000 | 1.0132 | 2 | 486 | 1.0000 | 0.9476 | 3 |
| 243.08 | 487 | 0.0000 | 0.0093 | 1 | 487 | 1.0000 | 1.0132 | 2 | 487 | 1.0000 | 0.9478 | 3 |
| 243.58 | 488 | 0.0000 | 0.0093 | 1 | 488 | 1.0000 | 1.0132 | 2 | 488 | 1.0000 | 0.9477 | 3 |
| 244.08 | 489 | 0.0000 | 0.0093 | 1 | 489 | 1.0000 | 1.0132 | 2 | 489 | 1.0000 | 0.9473 | 3 |
| 244.58 | 490 | 0.0000 | 0.0093 | 1 | 490 | 1.0000 | 1.0132 | 2 | 490 | 1.0000 | 0.9468 | 3 |
| 245.08 | 491 | 0.0000 | 0.0093 | 1 | 491 | 1.0000 | 1.0132 | 2 | 491 | 1.0000 | 0.9463 | 3 |
| 245.58 | 492 | 0.0000 | 0.0093 | 1 | 492 | 1.0000 | 1.0132 | 2 | 492 | 1.0000 | 0.9458 | 3 |
| 246.08 | 493 | 0.0000 | 0.0093 | 1 | 493 | 1.0000 | 1.0132 | 2 | 493 | 1.0000 | 0.9457 | 3 |
| 246.58 | 494 | 0.0000 | 0.0093 | 1 | 494 | 1.0000 | 1.0132 | 2 | 494 | 1.0000 | 0.9455 | 3 |
| 247.08 | 495 | 0.0000 | 0.0093 | 1 | 495 | 1.0000 | 1.0132 | 2 | 495 | 1.0000 | 0.9453 | 3 |
| 247.58 | 496 | 0.0000 | 0.0093 | 1 | 496 | 1.0000 | 1.0132 | 2 | 496 | 1.0000 | 0.9452 | 3 |
| 248.08 | 497 | 0.0000 | 0.0093 | 1 | 497 | 1.0000 | 1.0132 | 2 | 497 | 1.0000 | 0.9452 | 3 |
| 248.58 | 498 | 0.0000 | 0.0093 | 1 | 498 | 1.0000 | 1.0132 | 2 | 498 | 1.0000 | 0.9455 | 3 |

| | |
|---|---|
| RECALL SET SIZE | 498 |
| RECALL SET ERROR RMS | 0.134259 |
| MAX BIAS OR WEIGHT | 20.0000 |
| MAX GAIN OR CONSTANT | 2.0000 |

## D.6 Scenario TH2 No-Noise

Below are the no-noise results for the TH2 scenario. These results are file TH2.PRX.

| Time (sec) | Node 1 | Desired Output | Actual Output | | Node 2 | Desired Output | Actual Output | | Node 3 | Desired Output | Actual Output | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.08 | 1 | 0.0000 | 0.0474 | 1 | 1 | 0.0000 | 0.0108 | 2 | 1 | 0.0000 | 0.0361 | 3 |
| 0.58 | 2 | 0.0000 | 0.0474 | 1 | 2 | 0.0000 | 0.0108 | 2 | 2 | 0.0000 | 0.0361 | 3 |
| 1.08 | 3 | 0.0000 | 0.0474 | 1 | 3 | 0.0000 | 0.0108 | 2 | 3 | 0.0000 | 0.0361 | 3 |
| 1.58 | 4 | 0.0000 | 0.0474 | 1 | 4 | 0.0000 | 0.0108 | 2 | 4 | 0.0000 | 0.0361 | 3 |
| 2.08 | 5 | 0.0000 | 0.0474 | 1 | 5 | 0.0000 | 0.0108 | 2 | 5 | 0.0000 | 0.0361 | 3 |
| 2.58 | 6 | 0.0000 | 0.0474 | 1 | 6 | 0.0000 | 0.0108 | 2 | 6 | 0.0000 | 0.0361 | 3 |
| 3.08 | 7 | 0.0000 | 0.0474 | 1 | 7 | 0.0000 | 0.0108 | 2 | 7 | 0.0000 | 0.0361 | 3 |
| 3.58 | 8 | 0.0000 | 0.0474 | 1 | 8 | 0.0000 | 0.0108 | 2 | 8 | 0.0000 | 0.0361 | 3 |
| 4.08 | 9 | 0.0000 | 0.0474 | 1 | 9 | 0.0000 | 0.0108 | 2 | 9 | 0.0000 | 0.0361 | 3 |
| 4.58 | 10 | 0.0000 | 0.0473 | 1 | 10 | 0.0000 | 0.0108 | 2 | 10 | 0.0000 | 0.0361 | 3 |
| 5.08 | 11 | 0.0000 | 0.0474 | 1 | 11 | 0.0000 | 0.0108 | 2 | 11 | 0.0000 | 0.0361 | 3 |
| 5.58 | 12 | 0.0000 | 0.0473 | 1 | 12 | 0.0000 | 0.0108 | 2 | 12 | 0.0000 | 0.0361 | 3 |
| 6.08 | 13 | 0.0000 | 0.0473 | 1 | 13 | 0.0000 | 0.0108 | 2 | 13 | 0.0000 | 0.0361 | 3 |
| 6.58 | 14 | 0.0000 | 0.0473 | 1 | 14 | 0.0000 | 0.0108 | 2 | 14 | 0.0000 | 0.0361 | 3 |
| 7.08 | 15 | 0.0000 | 0.0473 | 1 | 15 | 0.0000 | 0.0108 | 2 | 15 | 0.0000 | 0.0361 | 3 |
| 7.58 | 16 | 0.0000 | 0.0473 | 1 | 16 | 0.0000 | 0.0108 | 2 | 16 | 0.0000 | 0.0361 | 3 |
| 8.08 | 17 | 0.0000 | 0.0473 | 1 | 17 | 0.0000 | 0.0108 | 2 | 17 | 0.0000 | 0.0361 | 3 |
| 8.58 | 18 | 0.0000 | 0.0473 | 1 | 18 | 0.0000 | 0.0108 | 2 | 18 | 0.0000 | 0.0361 | 3 |
| 9.08 | 19 | 0.0000 | 0.0473 | 1 | 19 | 0.0000 | 0.0108 | 2 | 19 | 0.0000 | 0.0361 | 3 |
| 9.58 | 20 | 0.0000 | 0.0473 | 1 | 20 | 0.0000 | 0.0108 | 2 | 20 | 0.0000 | 0.0361 | 3 |
| 10.08 | 21 | 0.0000 | 0.0473 | 1 | 21 | 0.0000 | 0.0108 | 2 | 21 | 0.0000 | 0.0361 | 3 |
| 10.58 | 22 | 0.0000 | 0.0473 | 1 | 22 | 0.0000 | 0.0108 | 2 | 22 | 0.0000 | 0.0361 | 3 |
| 11.08 | 23 | 0.0000 | 0.0473 | 1 | 23 | 0.0000 | 0.0108 | 2 | 23 | 0.0000 | 0.0361 | 3 |
| 11.58 | 24 | 0.0000 | 0.0473 | 1 | 24 | 0.0000 | 0.0108 | 2 | 24 | 0.0000 | 0.0361 | 3 |
| 12.08 | 25 | 0.0000 | 0.0473 | 1 | 25 | 0.0000 | 0.0108 | 2 | 25 | 0.0000 | 0.0361 | 3 |
| 12.58 | 26 | 0.0000 | 0.0472 | 1 | 26 | 0.0000 | 0.0108 | 2 | 26 | 0.0000 | 0.0361 | 3 |
| 13.08 | 27 | 0.0000 | 0.0473 | 1 | 27 | 0.0000 | 0.0108 | 2 | 27 | 0.0000 | 0.0361 | 3 |
| 13.58 | 28 | 0.0000 | 0.0472 | 1 | 28 | 0.0000 | 0.0108 | 2 | 28 | 0.0000 | 0.0361 | 3 |
| 14.08 | 29 | 0.0000 | 0.0473 | 1 | 29 | 0.0000 | 0.0108 | 2 | 29 | 0.0000 | 0.0361 | 3 |
| 14.58 | 30 | 0.0000 | 0.0472 | 1 | 30 | 1.0000 | 0.0108 | 2 | 30 | 0.0000 | 0.0361 | 3 |
| 15.08 | 31 | 0.0000 | 0.0045 | 1 | 31 | 1.0000 | 0.0139 | 2 | 31 | 0.0000 | 0.0403 | 3 |
| 15.58 | 32 | 0.0000 | 0.0054 | 1 | 32 | 1.0000 | 0.0135 | 2 | 32 | 0.0000 | 0.0428 | 3 |
| 16.08 | 33 | 0.0000 | 0.0062 | 1 | 33 | 1.0000 | 0.0229 | 2 | 33 | 0.0000 | 0.8767 | 3 |
| 16.58 | 34 | 0.0000 | 0.0458 | 1 | 34 | 1.0000 | 0.0107 | 2 | 34 | 0.0000 | 0.0292 | 3 |
| 17.08 | 35 | 0.0000 | 0.4421 | 1 | 35 | 1.0000 | 0.0133 | 2 | 35 | 0.0000 | 0.0255 | 3 |
| 17.58 | 36 | 0.0000 | 0.0075 | 1 | 36 | 1.0000 | 0.0207 | 2 | 36 | 0.0000 | 0.8673 | 3 |
| 18.08 | 37 | 0.0000 | 0.0042 | 1 | 37 | 1.0000 | 0.0246 | 2 | 37 | 0.0000 | 0.9337 | 3 |
| 18.58 | 38 | 0.0000 | 0.0039 | 1 | 38 | 1.0000 | 0.0243 | 2 | 38 | 0.0000 | 0.9280 | 3 |
| 19.08 | 39 | 0.0000 | 0.0049 | 1 | 39 | 1.0000 | 0.0226 | 2 | 39 | 0.0000 | 0.9531 | 3 |
| 19.58 | 40 | 0.0000 | 0.0060 | 1 | 40 | 1.0000 | 0.0206 | 2 | 40 | 0.0000 | 0.9623 | 3 |
| 20.08 | 41 | 0.0000 | 0.0069 | 1 | 41 | 1.0000 | 0.0195 | 2 | 41 | 0.0000 | 0.9679 | 3 |
| 20.58 | 42 | 0.0000 | 0.0073 | 1 | 42 | 1.0000 | 0.0198 | 2 | 42 | 0.0000 | 0.9711 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 21.08 | 43 | 0.0000 | 0.0074 | 1 | 43 | 1.0000 | 0.0228 | 2 | 43 | 0.0000 | 0.9719 | 3 |
| 21.58 | 44 | 0.0000 | 0.0074 | 1 | 44 | 1.0000 | 0.0284 | 2 | 44 | 0.0000 | 0.9720 | 3 |
| 22.08 | 45 | 0.0000 | 0.0075 | 1 | 45 | 1.0000 | 0.0415 | 2 | 45 | 0.0000 | 0.9722 | 3 |
| 22.58 | 46 | 0.0000 | 0.0075 | 1 | 46 | 1.0000 | 0.0691 | 2 | 46 | 0.0000 | 0.9725 | 3 |
| 23.08 | 47 | 0.0000 | 0.0077 | 1 | 47 | 1.0000 | 0.4532 | 2 | 47 | 0.0000 | 0.9731 | 3 |
| 23.58 | 48 | 0.0000 | 0.0078 | 1 | 48 | 1.0000 | 0.9436 | 2 | 48 | 0.0000 | 0.9737 | 3 |
| 24.08 | 49 | 0.0000 | 0.0080 | 1 | 49 | 1.0000 | 0.9901 | 2 | 49 | 0.0000 | 0.9746 | 3 |
| 24.58 | 50 | 0.0000 | 0.0083 | 1 | 50 | 1.0000 | 1.0005 | 2 | 50 | 0.0000 | 0.9753 | 3 |
| 25.08 | 51 | 0.0000 | 0.0086 | 1 | 51 | 1.0000 | 1.0063 | 2 | 51 | 0.0000 | 0.9762 | 3 |
| 25.58 | 52 | 0.0000 | 0.0087 | 1 | 52 | 1.0000 | 1.0077 | 2 | 52 | 0.0000 | 0.9766 | 3 |
| 26.08 | 53 | 0.0000 | 0.0090 | 1 | 53 | 1.0000 | 1.0088 | 2 | 53 | 0.0000 | 0.9770 | 3 |
| 26.58 | 54 | 0.0000 | 0.0093 | 1 | 54 | 1.0000 | 1.0103 | 2 | 54 | 0.0000 | 0.9778 | 3 |
| 27.08 | 55 | 0.0000 | 0.0096 | 1 | 55 | 1.0000 | 1.0110 | 2 | 55 | 0.0000 | 0.9785 | 3 |
| 27.58 | 56 | 0.0000 | 0.0099 | 1 | 56 | 1.0000 | 1.0114 | 2 | 56 | 0.0000 | 0.9791 | 3 |
| 28.08 | 57 | 0.0000 | 0.0101 | 1 | 57 | 1.0000 | 1.0116 | 2 | 57 | 0.0000 | 0.9797 | 3 |
| 28.58 | 58 | 0.0000 | 0.0104 | 1 | 58 | 1.0000 | 1.0118 | 2 | 58 | 0.0000 | 0.9803 | 3 |
| 29.08 | 59 | 0.0000 | 0.0107 | 1 | 59 | 1.0000 | 1.0118 | 2 | 59 | 0.0000 | 0.9808 | 3 |
| 29.58 | 60 | 0.0000 | 0.0110 | 1 | 60 | 1.0000 | 1.0119 | 2 | 60 | 0.0000 | 0.9814 | 3 |
| 30.08 | 61 | 0.0000 | 0.0114 | 1 | 61 | 1.0000 | 1.0119 | 2 | 61 | 0.0000 | 0.9820 | 3 |
| 30.58 | 62 | 0.0000 | 0.0118 | 1 | 62 | 1.0000 | 1.0118 | 2 | 62 | 0.0000 | 0.9827 | 3 |
| 31.08 | 63 | 0.0000 | 0.0122 | 1 | 63 | 1.0000 | 1.0117 | 2 | 63 | 0.0000 | 0.9833 | 3 |
| 31.58 | 64 | 0.0000 | 0.0127 | 1 | 64 | 1.0000 | 1.0116 | 2 | 64 | 0.0000 | 0.9840 | 3 |
| 32.08 | 65 | 0.0000 | 0.0132 | 1 | 65 | 1.0000 | 1.0114 | 2 | 65 | 0.0000 | 0.9846 | 3 |
| 32.58 | 66 | 0.0000 | 0.0133 | 1 | 66 | 1.0000 | 1.0114 | 2 | 66 | 0.0000 | 0.9846 | 3 |
| 33.08 | 67 | 0.0000 | 0.0120 | 1 | 67 | 1.0000 | 1.0120 | 2 | 67 | 0.0000 | 0.9808 | 3 |
| 33.58 | 68 | 0.0000 | 0.0128 | 1 | 68 | 1.0000 | 1.0121 | 2 | 68 | 0.0000 | 0.9209 | 3 |
| 34.08 | 69 | 0.0000 | 0.0441 | 1 | 69 | 1.0000 | 1.0096 | 2 | 69 | 0.0000 | 0.0634 | 3 |
| 34.58 | 70 | 0.0000 | 0.0790 | 1 | 70 | 1.0000 | 1.0091 | 2 | 70 | 0.0000 | 0.0498 | 3 |
| 35.08 | 71 | 0.0000 | 0.0725 | 1 | 71 | 1.0000 | 1.0093 | 2 | 71 | 0.0000 | 0.0510 | 3 |
| 35.58 | 72 | 0.0000 | 0.0569 | 1 | 72 | 1.0000 | 1.0096 | 2 | 72 | 0.0000 | 0.0555 | 3 |
| 36.08 | 73 | 0.0000 | 0.0437 | 1 | 73 | 1.0000 | 1.0100 | 2 | 73 | 0.0000 | 0.0636 | 3 |
| 36.58 | 74 | 0.0000 | 0.0431 | 1 | 74 | 1.0000 | 1.0100 | 2 | 74 | 0.0000 | 0.0642 | 3 |
| 37.08 | 75 | 0.0000 | 0.0426 | 1 | 75 | 1.0000 | 1.0101 | 2 | 75 | 0.0000 | 0.0649 | 3 |
| 37.58 | 76 | 0.0000 | 0.0455 | 1 | 76 | 1.0000 | 1.0100 | 2 | 76 | 0.0000 | 0.0624 | 3 |
| 38.08 | 77 | 0.0000 | 0.0478 | 1 | 77 | 1.0000 | 1.0099 | 2 | 77 | 0.0000 | 0.0608 | 3 |
| 38.58 | 78 | 0.0000 | 0.0492 | 1 | 78 | 1.0000 | 1.0098 | 2 | 78 | 0.0000 | 0.0600 | 3 |
| 39.08 | 79 | 0.0000 | 0.0488 | 1 | 79 | 1.0000 | 1.0098 | 2 | 79 | 0.0000 | 0.0604 | 3 |
| 39.58 | 80 | 0.0000 | 0.0475 | 1 | 80 | 1.0000 | 1.0099 | 2 | 80 | 0.0000 | 0.0614 | 3 |
| 40.08 | 81 | 0.0000 | 0.0454 | 1 | 81 | 1.0000 | 1.0099 | 2 | 81 | 0.0000 | 0.0632 | 3 |
| 40.58 | 82 | 0.0000 | 0.0428 | 1 | 82 | 1.0000 | 1.0100 | 2 | 82 | 0.0000 | 0.0658 | 3 |
| 41.08 | 83 | 0.0000 | 0.0399 | 1 | 83 | 1.0000 | 1.0101 | 2 | 83 | 0.0000 | 0.0691 | 3 |
| 41.58 | 84 | 0.0000 | 0.0376 | 1 | 84 | 1.0000 | 1.0101 | 2 | 84 | 0.0000 | 0.0727 | 3 |
| 42.08 | 85 | 0.0000 | 0.0355 | 1 | 85 | 1.0000 | 1.0102 | 2 | 85 | 0.0000 | 0.0766 | 3 |
| 42.58 | 86 | 0.0000 | 0.0335 | 1 | 86 | 1.0000 | 1.0103 | 2 | 86 | 0.0000 | 0.0813 | 3 |
| 43.08 | 87 | 0.0000 | 0.0321 | 1 | 87 | 1.0000 | 1.0104 | 2 | 87 | 0.0000 | 0.0854 | 3 |
| 43.58 | 88 | 0.0000 | 0.0321 | 1 | 88 | 1.0000 | 1.0104 | 2 | 88 | 0.0000 | 0.0854 | 3 |
| 44.08 | 89 | 0.0000 | 0.0305 | 1 | 89 | 1.0000 | 1.0104 | 2 | 89 | 0.0000 | 0.0913 | 3 |
| 44.58 | 90 | 0.0000 | 0.0285 | 1 | 90 | 1.0000 | 1.0105 | 2 | 90 | 0.0000 | 0.1010 | 3 |
| 45.08 | 91 | 0.0000 | 0.0269 | 1 | 91 | 1.0000 | 1.0106 | 2 | 91 | 0.0000 | 0.1116 | 3 |
| 45.58 | 92 | 0.0000 | 0.0255 | 1 | 92 | 1.0000 | 1.0107 | 2 | 92 | 0.0000 | 0.1250 | 3 |
| 46.08 | 93 | 0.0000 | 0.0273 | 1 | 93 | 1.0000 | 1.0106 | 2 | 93 | 0.0000 | 0.1090 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 46.58 | 94 | 0.0000 | 0.0241 | 1 | 94 | 1.0000 | 1.0108 | 2 | 94 | 0.0000 | 0.1429 | 3 |
| 47.08 | 95 | 0.0000 | 0.0236 | 1 | 95 | 1.0000 | 1.0108 | 2 | 95 | 0.0000 | 0.1531 | 3 |
| 47.58 | 96 | 0.0000 | 0.0229 | 1 | 96 | 1.0000 | 1.0109 | 2 | 96 | 0.0000 | 0.1679 | 3 |
| 48.08 | 97 | 0.0000 | 0.0224 | 1 | 97 | 1.0000 | 1.0109 | 2 | 97 | 0.0000 | 0.1810 | 3 |
| 48.58 | 98 | 0.0000 | 0.0219 | 1 | 98 | 1.0000 | 1.0109 | 2 | 98 | 0.0000 | 0.1998 | 3 |
| 49.08 | 99 | 0.0000 | 0.0217 | 1 | 99 | 1.0000 | 1.0109 | 2 | 99 | 0.0000 | 0.2070 | 3 |
| 49.58 | 100 | 0.0000 | 0.0214 | 1 | 100 | 1.0000 | 1.0110 | 2 | 100 | 0.0000 | 0.2213 | 3 |
| 50.08 | 101 | 0.0000 | 0.0217 | 1 | 101 | 1.0000 | 1.0109 | 2 | 101 | 0.0000 | 0.2078 | 3 |
| 50.58 | 102 | 0.0000 | 0.0220 | 1 | 102 | 1.0000 | 1.0109 | 2 | 102 | 0.0000 | 0.1967 | 3 |
| 51.08 | 103 | 0.0000 | 0.0229 | 1 | 103 | 1.0000 | 1.0108 | 2 | 103 | 0.0000 | 0.1698 | 3 |
| 51.58 | 104 | 0.0000 | 0.0232 | 1 | 104 | 1.0000 | 1.0108 | 2 | 104 | 0.0000 | 0.1629 | 3 |
| 52.08 | 105 | 0.0000 | 0.0237 | 1 | 105 | 1.0000 | 1.0108 | 2 | 105 | 0.0000 | 0.1513 | 3 |
| 52.58 | 106 | 0.0000 | 0.0237 | 1 | 106 | 1.0000 | 1.0108 | 2 | 106 | 0.0000 | 0.1497 | 3 |
| 53.08 | 107 | 0.0000 | 0.0246 | 1 | 107 | 1.0000 | 1.0107 | 2 | 107 | 0.0000 | 0.1349 | 3 |
| 53.58 | 108 | 0.0000 | 0.0245 | 1 | 108 | 1.0000 | 1.0107 | 2 | 108 | 0.0000 | 0.1340 | 3 |
| 54.08 | 109 | 0.0000 | 0.0244 | 1 | 109 | 1.0000 | 1.0107 | 2 | 109 | 0.0000 | 0.1325 | 3 |
| 54.58 | 110 | 0.0000 | 0.0238 | 1 | 110 | 1.0000 | 1.0108 | 2 | 110 | 0.0000 | 0.1374 | 3 |
| 55.08 | 111 | 0.0000 | 0.0239 | 1 | 111 | 1.0000 | 1.0108 | 2 | 111 | 0.0000 | 0.1316 | 3 |
| 55.58 | 112 | 0.0000 | 0.0296 | 1 | 112 | 1.0000 | 1.0103 | 2 | 112 | 0.0000 | 0.0888 | 3 |
| 56.08 | 113 | 0.0000 | 0.0378 | 1 | 113 | 1.0000 | 1.0098 | 2 | 113 | 0.0000 | 0.0663 | 3 |
| 56.58 | 114 | 0.0000 | 0.0498 | 1 | 114 | 1.0000 | 1.0094 | 2 | 114 | 0.0000 | 0.0538 | 3 |
| 57.08 | 115 | 0.0000 | 0.0664 | 1 | 115 | 1.0000 | 1.0092 | 2 | 115 | 0.0000 | 0.0466 | 3 |
| 57.58 | 116 | 0.0000 | 0.0923 | 1 | 116 | 1.0000 | 1.0090 | 2 | 116 | 0.0000 | 0.0417 | 3 |
| 58.08 | 117 | 0.0000 | 0.1138 | 1 | 117 | 1.0000 | 1.0089 | 2 | 117 | 0.0000 | 0.0394 | 3 |
| 58.58 | 118 | 0.0000 | 0.1656 | 1 | 118 | 1.0000 | 1.0089 | 2 | 118 | 0.0000 | 0.0370 | 3 |
| 59.08 | 119 | 0.0000 | 0.1767 | 1 | 119 | 1.0000 | 1.0090 | 2 | 119 | 0.0000 | 0.0364 | 3 |
| 59.58 | 120 | 0.0000 | 0.1688 | 1 | 120 | 1.0000 | 1.0091 | 2 | 120 | 0.0000 | 0.0363 | 3 |
| 60.08 | 121 | 0.0000 | 0.1307 | 1 | 121 | 1.0000 | 1.0093 | 2 | 121 | 0.0000 | 0.0372 | 3 |
| 60.58 | 122 | 0.0000 | 0.1107 | 1 | 122 | 1.0000 | 1.0094 | 2 | 122 | 0.0000 | 0.0380 | 3 |
| 61.08 | 123 | 0.0000 | 0.0897 | 1 | 123 | 1.0000 | 1.0096 | 2 | 123 | 0.0000 | 0.0393 | 3 |
| 61.58 | 124 | 0.0000 | 0.0738 | 1 | 124 | 1.0000 | 1.0098 | 2 | 124 | 0.0000 | 0.0408 | 3 |
| 62.08 | 125 | 0.0000 | 0.0624 | 1 | 125 | 1.0000 | 1.0099 | 2 | 125 | 0.0000 | 0.0425 | 3 |
| 62.58 | 126 | 0.0000 | 0.0556 | 1 | 126 | 1.0000 | 1.0101 | 2 | 126 | 0.0000 | 0.0440 | 3 |
| 63.08 | 127 | 0.0000 | 0.0500 | 1 | 127 | 1.0000 | 1.0102 | 2 | 127 | 0.0000 | 0.0456 | 3 |
| 63.58 | 128 | 0.0000 | 0.0463 | 1 | 128 | 1.0000 | 1.0103 | 2 | 128 | 0.0000 | 0.0469 | 3 |
| 64.08 | 129 | 0.0000 | 0.0427 | 1 | 129 | 1.0000 | 1.0104 | 2 | 129 | 0.0000 | 0.0485 | 3 |
| 64.58 | 130 | 0.0000 | 0.0403 | 1 | 130 | 1.0000 | 1.0104 | 2 | 130 | 0.0000 | 0.0498 | 3 |
| 65.08 | 131 | 0.0000 | 0.0389 | 1 | 131 | 1.0000 | 1.0105 | 2 | 131 | 0.0000 | 0.0506 | 3 |
| 65.58 | 132 | 0.0000 | 0.0376 | 1 | 132 | 1.0000 | 1.0105 | 2 | 132 | 0.0000 | 0.0514 | 3 |
| 66.08 | 133 | 0.0000 | 0.0361 | 1 | 133 | 1.0000 | 1.0106 | 2 | 133 | 0.0000 | 0.0523 | 3 |
| 66.58 | 134 | 0.0000 | 0.0361 | 1 | 134 | 1.0000 | 1.0106 | 2 | 134 | 0.0000 | 0.0522 | 3 |
| 67.08 | 135 | 0.0000 | 0.0359 | 1 | 135 | 1.0000 | 1.0105 | 2 | 135 | 0.0000 | 0.0523 | 3 |
| 67.58 | 136 | 0.0000 | 0.0429 | 1 | 136 | 1.0000 | 1.0101 | 2 | 136 | 0.0000 | 0.0476 | 3 |
| 68.08 | 137 | 0.0000 | 0.0425 | 1 | 137 | 1.0000 | 1.0101 | 2 | 137 | 0.0000 | 0.0478 | 3 |
| 68.58 | 138 | 0.0000 | 0.0395 | 1 | 138 | 1.0000 | 1.0101 | 2 | 138 | 0.0000 | 0.0494 | 3 |
| 69.08 | 139 | 0.0000 | 0.0351 | 1 | 139 | 1.0000 | 1.0102 | 2 | 139 | 0.0000 | 0.0530 | 3 |
| 69.58 | 140 | 0.0000 | 0.0316 | 1 | 140 | 1.0000 | 1.0103 | 2 | 140 | 0.0000 | 0.0571 | 3 |
| 70.08 | 141 | 0.0000 | 0.0403 | 1 | 141 | 1.0000 | 1.0094 | 2 | 141 | 0.0000 | 0.0494 | 3 |
| 70.58 | 142 | 0.0000 | 0.0610 | 1 | 142 | 1.0000 | 1.0083 | 2 | 142 | 0.0000 | 0.0421 | 3 |
| 71.08 | 143 | 0.0000 | 0.0611 | 1 | 143 | 1.0000 | 1.0082 | 2 | 143 | 0.0000 | 0.0423 | 3 |
| 71.58 | 144 | 0.0000 | 0.0474 | 1 | 144 | 1.0000 | 1.0087 | 2 | 144 | 0.0000 | 0.0467 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 72.08 | 145 | 0.0000 | 0.0489 | 1 | 145 | 1.0000 | 1.0085 | 2 | 145 | 0.0000 | 0.0463 | 3 |
| 72.58 | 146 | 0.0000 | 0.0553 | 1 | 146 | 1.0000 | 1.0082 | 2 | 146 | 0.0000 | 0.0442 | 3 |
| 73.08 | 147 | 0.0000 | 0.0872 | 1 | 147 | 1.0000 | 1.0068 | 2 | 147 | 0.0000 | 0.0387 | 3 |
| 73.58 | 148 | 0.0000 | 0.0722 | 1 | 148 | 1.0000 | 1.0073 | 2 | 148 | 0.0000 | 0.0406 | 3 |
| 74.08 | 149 | 0.0000 | 0.0678 | 1 | 149 | 1.0000 | 1.0074 | 2 | 149 | 0.0000 | 0.0411 | 3 |
| 74.58 | 150 | 0.0000 | 0.0787 | 1 | 150 | 1.0000 | 1.0069 | 2 | 150 | 0.0000 | 0.0391 | 3 |
| 75.08 | 151 | 0.0000 | 0.0925 | 1 | 151 | 1.0000 | 1.0061 | 2 | 151 | 0.0000 | 0.0369 | 3 |
| 75.58 | 152 | 0.0000 | 0.0999 | 1 | 152 | 1.0000 | 1.0050 | 2 | 152 | 0.0000 | 0.0351 | 3 |
| 76.08 | 153 | 0.0000 | 0.0933 | 1 | 153 | 1.0000 | 1.0043 | 2 | 153 | 0.0000 | 0.0344 | 3 |
| 76.58 | 154 | 0.0000 | 0.0854 | 1 | 154 | 1.0000 | 1.0037 | 2 | 154 | 0.0000 | 0.0340 | 3 |
| 77.08 | 155 | 0.0000 | 0.0760 | 1 | 155 | 1.0000 | 1.0028 | 2 | 155 | 0.0000 | 0.0335 | 3 |
| 77.58 | 156 | 0.0000 | 0.0701 | 1 | 156 | 1.0000 | 1.0022 | 2 | 156 | 0.0000 | 0.0333 | 3 |
| 78.08 | 157 | 0.0000 | 0.0575 | 1 | 157 | 1.0000 | 1.0006 | 2 | 157 | 0.0000 | 0.0327 | 3 |
| 78.58 | 158 | 0.0000 | 0.0601 | 1 | 158 | 1.0000 | 1.0008 | 2 | 158 | 0.0000 | 0.0328 | 3 |
| 79.08 | 159 | 0.0000 | 0.0651 | 1 | 159 | 1.0000 | 1.0012 | 2 | 159 | 0.0000 | 0.0331 | 3 |
| 79.58 | 160 | 0.0000 | 0.0654 | 1 | 160 | 1.0000 | 1.0010 | 2 | 160 | 0.0000 | 0.0331 | 3 |
| 80.08 | 161 | 0.0000 | 0.0652 | 1 | 161 | 1.0000 | 1.0008 | 2 | 161 | 0.0000 | 0.0330 | 3 |
| 80.58 | 162 | 0.0000 | 0.0620 | 1 | 162 | 1.0000 | 1.0003 | 2 | 162 | 0.0000 | 0.0329 | 3 |
| 81.08 | 163 | 0.0000 | 0.0653 | 1 | 163 | 1.0000 | 1.0004 | 2 | 163 | 0.0000 | 0.0330 | 3 |
| 81.58 | 164 | 0.0000 | 0.0681 | 1 | 164 | 1.0000 | 1.0006 | 2 | 164 | 0.0000 | 0.0331 | 3 |
| 82.08 | 165 | 0.0000 | 0.0653 | 1 | 165 | 1.0000 | 1.0002 | 2 | 165 | 0.0000 | 0.0330 | 3 |
| 82.58 | 166 | 0.0000 | 0.0592 | 1 | 166 | 1.0000 | 0.9997 | 2 | 166 | 0.0000 | 0.0328 | 3 |
| 83.08 | 167 | 0.0000 | 0.0518 | 1 | 167 | 1.0000 | 0.9988 | 2 | 167 | 0.0000 | 0.0326 | 3 |
| 83.58 | 168 | 0.0000 | 0.0495 | 1 | 168 | 1.0000 | 0.9985 | 2 | 168 | 0.0000 | 0.0325 | 3 |
| 84.08 | 169 | 0.0000 | 0.0437 | 1 | 169 | 1.0000 | 0.9978 | 2 | 169 | 0.0000 | 0.0324 | 3 |
| 84.58 | 170 | 0.0000 | 0.0365 | 1 | 170 | 1.0000 | 0.9967 | 2 | 170 | 0.0000 | 0.0322 | 3 |
| 85.08 | 171 | 0.0000 | 0.0303 | 1 | 171 | 1.0000 | 0.9956 | 2 | 171 | 0.0000 | 0.0320 | 3 |
| 85.58 | 172 | 0.0000 | 0.0266 | 1 | 172 | 1.0000 | 0.9948 | 2 | 172 | 0.0000 | 0.0320 | 3 |
| 86.08 | 173 | 0.0000 | 0.0252 | 1 | 173 | 1.0000 | 0.9946 | 2 | 173 | 0.0000 | 0.0320 | 3 |
| 86.58 | 174 | 0.0000 | 0.0256 | 1 | 174 | 1.0000 | 0.9941 | 2 | 174 | 0.0000 | 0.0320 | 3 |
| 87.08 | 175 | 0.0000 | 0.0267 | 1 | 175 | 1.0000 | 0.9936 | 2 | 175 | 0.0000 | 0.0320 | 3 |
| 87.58 | 176 | 0.0000 | 0.0284 | 1 | 176 | 1.0000 | 0.9934 | 2 | 176 | 0.0000 | 0.0320 | 3 |
| 88.08 | 177 | 0.0000 | 0.0297 | 1 | 177 | 1.0000 | 0.9935 | 2 | 177 | 0.0000 | 0.0321 | 3 |
| 88.58 | 178 | 0.0000 | 0.0292 | 1 | 178 | 1.0000 | 0.9932 | 2 | 178 | 0.0000 | 0.0321 | 3 |
| 89.08 | 179 | 0.0000 | 0.0277 | 1 | 179 | 1.0000 | 0.9922 | 2 | 179 | 0.0000 | 0.0321 | 3 |
| 89.58 | 180 | 0.0000 | 0.0297 | 1 | 180 | 1.0000 | 0.9924 | 2 | 180 | 0.0000 | 0.0322 | 3 |
| 90.08 | 181 | 0.0000 | 0.0333 | 1 | 181 | 1.0000 | 0.9929 | 2 | 181 | 0.0000 | 0.0323 | 3 |
| 90.58 | 182 | 0.0000 | 0.0348 | 1 | 182 | 1.0000 | 0.9932 | 2 | 182 | 0.0000 | 0.0324 | 3 |
| 91.08 | 183 | 0.0000 | 0.0349 | 1 | 183 | 1.0000 | 0.9932 | 2 | 183 | 0.0000 | 0.0324 | 3 |
| 91.58 | 184 | 0.0000 | 0.0349 | 1 | 184 | 1.0000 | 0.9931 | 2 | 184 | 0.0000 | 0.0324 | 3 |
| 92.08 | 185 | 0.0000 | 0.0338 | 1 | 185 | 1.0000 | 0.9928 | 2 | 185 | 0.0000 | 0.0324 | 3 |
| 92.58 | 186 | 0.0000 | 0.0305 | 1 | 186 | 1.0000 | 0.9922 | 2 | 186 | 0.0000 | 0.0323 | 3 |
| 93.08 | 187 | 0.0000 | 0.0269 | 1 | 187 | 1.0000 | 0.9913 | 2 | 187 | 0.0000 | 0.0323 | 3 |
| 93.58 | 188 | 0.0000 | 0.0242 | 1 | 188 | 1.0000 | 0.9904 | 2 | 188 | 0.0000 | 0.0322 | 3 |
| 94.08 | 189 | 0.0000 | 0.0218 | 1 | 189 | 1.0000 | 0.9896 | 2 | 189 | 0.0000 | 0.0322 | 3 |
| 94.58 | 190 | 0.0000 | 0.0199 | 1 | 190 | 1.0000 | 0.9890 | 2 | 190 | 0.0000 | 0.0322 | 3 |
| 95.08 | 191 | 0.0000 | 0.0185 | 1 | 191 | 1.0000 | 0.9884 | 2 | 191 | 0.0000 | 0.0322 | 3 |
| 95.58 | 192 | 0.0000 | 0.0179 | 1 | 192 | 1.0000 | 0.9881 | 2 | 192 | 0.0000 | 0.0322 | 3 |
| 96.08 | 193 | 0.0000 | 0.0177 | 1 | 193 | 1.0000 | 0.9881 | 2 | 193 | 0.0000 | 0.0323 | 3 |
| 96.58 | 194 | 0.0000 | 0.0177 | 1 | 194 | 1.0000 | 0.9880 | 2 | 194 | 0.0000 | 0.0323 | 3 |
| 97.08 | 195 | 0.0000 | 0.0181 | 1 | 195 | 1.0000 | 0.9882 | 2 | 195 | 0.0000 | 0.0323 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 97.58 | 196 | 0.0000 | 0.0187 | 1 | 196 | 1.0000 | 0.9885 | 2 | 196 | 0.0000 | 0.0324 | 3 |
| 98.08 | 197 | 0.0000 | 0.0191 | 1 | 197 | 1.0000 | 0.9887 | 2 | 197 | 0.0000 | 0.0324 | 3 |
| 98.58 | 198 | 0.0000 | 0.0198 | 1 | 198 | 1.0000 | 0.9891 | 2 | 198 | 0.0000 | 0.0325 | 3 |
| 99.08 | 199 | 0.0000 | 0.0206 | 1 | 199 | 1.0000 | 0.9895 | 2 | 199 | 0.0000 | 0.0326 | 3 |
| 99.58 | 200 | 0.0000 | 0.0212 | 1 | 200 | 1.0000 | 0.9895 | 2 | 200 | 0.0000 | 0.0326 | 3 |
| 100.08 | 201 | 0.0000 | 0.0209 | 1 | 201 | 1.0000 | 0.9894 | 2 | 201 | 0.0000 | 0.0326 | 3 |
| 100.58 | 202 | 0.0000 | 0.0202 | 1 | 202 | 1.0000 | 0.9890 | 2 | 202 | 0.0000 | 0.0326 | 3 |
| 101.08 | 203 | 0.0000 | 0.0189 | 1 | 203 | 1.0000 | 0.9886 | 2 | 203 | 0.0000 | 0.0325 | 3 |
| 101.58 | 204 | 0.0000 | 0.0174 | 1 | 204 | 1.0000 | 0.9880 | 2 | 204 | 0.0000 | 0.0325 | 3 |
| 102.08 | 205 | 0.0000 | 0.0160 | 1 | 205 | 1.0000 | 0.9873 | 2 | 205 | 0.0000 | 0.0324 | 3 |
| 102.58 | 206 | 0.0000 | 0.0146 | 1 | 206 | 1.0000 | 0.9864 | 2 | 206 | 0.0000 | 0.0324 | 3 |
| 103.08 | 207 | 0.0000 | 0.0131 | 1 | 207 | 1.0000 | 0.9853 | 2 | 207 | 0.0000 | 0.0323 | 3 |
| 103.58 | 208 | 0.0000 | 0.0112 | 1 | 208 | 1.0000 | 0.9845 | 2 | 208 | 0.0000 | 0.0323 | 3 |
| 104.08 | 209 | 0.0000 | 0.0096 | 1 | 209 | 1.0000 | 0.9846 | 2 | 209 | 0.0000 | 0.0324 | 3 |
| 104.58 | 210 | 0.0000 | 0.0087 | 1 | 210 | 1.0000 | 0.9845 | 2 | 210 | 0.0000 | 0.0324 | 3 |
| 105.08 | 211 | 0.0000 | 0.0082 | 1 | 211 | 1.0000 | 0.9848 | 2 | 211 | 0.0000 | 0.0324 | 3 |
| 105.58 | 212 | 0.0000 | 0.0078 | 1 | 212 | 1.0000 | 0.9852 | 2 | 212 | 0.0000 | 0.0325 | 3 |
| 106.08 | 213 | 0.0000 | 0.0076 | 1 | 213 | 1.0000 | 0.9855 | 2 | 213 | 0.0000 | 0.0325 | 3 |
| 106.58 | 214 | 0.0000 | 0.0075 | 1 | 214 | 1.0000 | 0.9859 | 2 | 214 | 0.0000 | 0.0326 | 3 |
| 107.08 | 215 | 0.0000 | 0.0074 | 1 | 215 | 1.0000 | 0.9861 | 2 | 215 | 0.0000 | 0.0326 | 3 |
| 107.58 | 216 | 0.0000 | 0.0074 | 1 | 216 | 1.0000 | 0.9863 | 2 | 216 | 0.0000 | 0.0327 | 3 |
| 108.08 | 217 | 0.0000 | 0.0073 | 1 | 217 | 1.0000 | 0.9866 | 2 | 217 | 0.0000 | 0.0327 | 3 |
| 108.58 | 218 | 0.0000 | 0.0072 | 1 | 218 | 1.0000 | 0.9868 | 2 | 218 | 0.0000 | 0.0327 | 3 |
| 109.08 | 219 | 0.0000 | 0.0071 | 1 | 219 | 1.0000 | 0.9871 | 2 | 219 | 0.0000 | 0.0327 | 3 |
| 109.58 | 220 | 0.0000 | 0.0070 | 1 | 220 | 1.0000 | 0.9872 | 2 | 220 | 0.0000 | 0.0328 | 3 |
| 110.08 | 221 | 0.0000 | 0.0069 | 1 | 221 | 1.0000 | 0.9875 | 2 | 221 | 0.0000 | 0.0328 | 3 |
| 110.58 | 222 | 0.0000 | 0.0067 | 1 | 222 | 1.0000 | 0.9877 | 2 | 222 | 0.0000 | 0.0328 | 3 |
| 111.08 | 223 | 0.0000 | 0.0065 | 1 | 223 | 1.0000 | 0.9879 | 2 | 223 | 0.0000 | 0.0328 | 3 |
| 111.58 | 224 | 0.0000 | 0.0064 | 1 | 224 | 1.0000 | 0.9881 | 2 | 224 | 0.0000 | 0.0328 | 3 |
| 112.08 | 225 | 0.0000 | 0.0063 | 1 | 225 | 1.0000 | 0.9882 | 2 | 225 | 0.0000 | 0.0328 | 3 |
| 112.58 | 226 | 0.0000 | 0.0061 | 1 | 226 | 1.0000 | 0.9882 | 2 | 226 | 0.0000 | 0.0329 | 3 |
| 113.08 | 227 | 0.0000 | 0.0061 | 1 | 227 | 1.0000 | 0.9889 | 2 | 227 | 0.0000 | 0.0329 | 3 |
| 113.58 | 228 | 0.0000 | 0.0060 | 1 | 228 | 1.0000 | 0.9895 | 2 | 228 | 0.0000 | 0.0330 | 3 |
| 114.08 | 229 | 0.0000 | 0.0059 | 1 | 229 | 1.0000 | 0.9899 | 2 | 229 | 0.0000 | 0.0330 | 3 |
| 114.58 | 230 | 0.0000 | 0.0059 | 1 | 230 | 1.0000 | 0.9905 | 2 | 230 | 0.0000 | 0.0331 | 3 |
| 115.08 | 231 | 0.0000 | 0.0059 | 1 | 231 | 1.0000 | 0.9913 | 2 | 231 | 0.0000 | 0.0332 | 3 |
| 115.58 | 232 | 0.0000 | 0.0058 | 1 | 232 | 1.0000 | 0.9920 | 2 | 232 | 0.0000 | 0.0333 | 3 |
| 116.08 | 233 | 0.0000 | 0.0058 | 1 | 233 | 1.0000 | 0.9928 | 2 | 233 | 0.0000 | 0.0334 | 3 |
| 116.58 | 234 | 0.0000 | 0.0058 | 1 | 234 | 1.0000 | 0.9931 | 2 | 234 | 0.0000 | 0.0335 | 3 |
| 117.08 | 235 | 0.0000 | 0.0058 | 1 | 235 | 1.0000 | 0.9938 | 2 | 235 | 0.0000 | 0.0336 | 3 |
| 117.58 | 236 | 0.0000 | 0.0058 | 1 | 236 | 1.0000 | 0.9947 | 2 | 236 | 0.0000 | 0.0338 | 3 |
| 118.08 | 237 | 0.0000 | 0.0059 | 1 | 237 | 1.0000 | 0.9956 | 2 | 237 | 0.0000 | 0.0339 | 3 |
| 118.58 | 238 | 0.0000 | 0.0059 | 1 | 238 | 1.0000 | 0.9960 | 2 | 238 | 0.0000 | 0.0340 | 3 |
| 119.08 | 239 | 0.0000 | 0.0058 | 1 | 239 | 1.0000 | 0.9962 | 2 | 239 | 0.0000 | 0.0340 | 3 |
| 119.58 | 240 | 0.0000 | 0.0059 | 1 | 240 | 1.0000 | 0.9970 | 2 | 240 | 0.0000 | 0.0341 | 3 |
| 120.08 | 241 | 0.0000 | 0.0060 | 1 | 241 | 1.0000 | 0.9975 | 2 | 241 | 0.0000 | 0.0342 | 3 |
| 120.58 | 242 | 0.0000 | 0.0060 | 1 | 242 | 1.0000 | 0.9977 | 2 | 242 | 0.0000 | 0.0343 | 3 |
| 121.08 | 243 | 0.0000 | 0.0059 | 1 | 243 | 1.0000 | 0.9975 | 2 | 243 | 0.0000 | 0.0343 | 3 |
| 121.58 | 244 | 0.0000 | 0.0057 | 1 | 244 | 1.0000 | 0.9968 | 2 | 244 | 0.0000 | 0.0342 | 3 |
| 122.08 | 245 | 0.0000 | 0.0056 | 1 | 245 | 1.0000 | 0.9958 | 2 | 245 | 0.0000 | 0.0341 | 3 |
| 122.58 | 246 | 0.0000 | 0.0055 | 1 | 246 | 1.0000 | 0.9955 | 2 | 246 | 0.0000 | 0.0341 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 123.08 | 247 | 0.0000 | 0.0055 | 1 | 247 | 1.0000 | 0.9954 | 2 | 247 | 0.0000 | 0.0342 | 3 |
| 123.58 | 248 | 0.0000 | 0.0054 | 1 | 248 | 1.0000 | 0.9952 | 2 | 248 | 0.0000 | 0.0342 | 3 |
| 124.08 | 249 | 0.0000 | 0.0054 | 1 | 249 | 1.0000 | 0.9948 | 2 | 249 | 0.0000 | 0.0342 | 3 |
| 124.58 | 250 | 0.0000 | 0.0054 | 1 | 250 | 1.0000 | 0.9953 | 2 | 250 | 0.0000 | 0.0343 | 3 |
| 125.08 | 251 | 0.0000 | 0.0055 | 1 | 251 | 1.0000 | 0.9961 | 2 | 251 | 0.0000 | 0.0345 | 3 |
| 125.58 | 252 | 0.0000 | 0.0055 | 1 | 252 | 1.0000 | 0.9965 | 2 | 252 | 0.0000 | 0.0346 | 3 |
| 126.08 | 253 | 0.0000 | 0.0055 | 1 | 253 | 1.0000 | 0.9970 | 2 | 253 | 0.0000 | 0.0347 | 3 |
| 126.58 | 254 | 0.0000 | 0.0055 | 1 | 254 | 1.0000 | 0.9972 | 2 | 254 | 0.0000 | 0.0348 | 3 |
| 127.08 | 255 | 0.0000 | 0.0055 | 1 | 255 | 1.0000 | 0.9974 | 2 | 255 | 0.0000 | 0.0349 | 3 |
| 127.58 | 256 | 0.0000 | 0.0055 | 1 | 256 | 1.0000 | 0.9974 | 2 | 256 | 0.0000 | 0.0349 | 3 |
| 128.08 | 257 | 0.0000 | 0.0055 | 1 | 257 | 1.0000 | 0.9972 | 2 | 257 | 0.0000 | 0.0349 | 3 |
| 128.58 | 258 | 0.0000 | 0.0055 | 1 | 258 | 1.0000 | 0.9971 | 2 | 258 | 0.0000 | 0.0349 | 3 |
| 129.08 | 259 | 0.0000 | 0.0054 | 1 | 259 | 1.0000 | 0.9967 | 2 | 259 | 0.0000 | 0.0348 | 3 |
| 129.58 | 260 | 0.0000 | 0.0054 | 1 | 260 | 1.0000 | 0.9961 | 2 | 260 | 0.0000 | 0.0347 | 3 |
| 130.08 | 261 | 0.0000 | 0.0053 | 1 | 261 | 1.0000 | 0.9953 | 2 | 261 | 0.0000 | 0.0346 | 3 |
| 130.58 | 262 | 0.0000 | 0.0053 | 1 | 262 | 1.0000 | 0.9945 | 2 | 262 | 0.0000 | 0.0345 | 3 |
| 131.08 | 263 | 0.0000 | 0.0053 | 1 | 263 | 1.0000 | 0.9936 | 2 | 263 | 0.0000 | 0.0344 | 3 |
| 131.58 | 264 | 0.0000 | 0.0052 | 1 | 264 | 1.0000 | 0.9928 | 2 | 264 | 0.0000 | 0.0343 | 3 |
| 132.08 | 265 | 0.0000 | 0.0052 | 1 | 265 | 1.0000 | 0.9921 | 2 | 265 | 0.0000 | 0.0343 | 3 |
| 132.58 | 266 | 0.0000 | 0.0052 | 1 | 266 | 1.0000 | 0.9918 | 2 | 266 | 0.0000 | 0.0342 | 3 |
| 133.08 | 267 | 0.0000 | 0.0052 | 1 | 267 | 1.0000 | 0.9912 | 2 | 267 | 0.0000 | 0.0342 | 3 |
| 133.58 | 268 | 0.0000 | 0.0052 | 1 | 268 | 1.0000 | 0.9906 | 2 | 268 | 0.0000 | 0.0341 | 3 |
| 134.08 | 269 | 0.0000 | 0.0052 | 1 | 269 | 1.0000 | 0.9900 | 2 | 269 | 0.0000 | 0.0341 | 3 |
| 134.58 | 270 | 0.0000 | 0.0052 | 1 | 270 | 1.0000 | 0.9898 | 2 | 270 | 0.0000 | 0.0341 | 3 |
| 135.08 | 271 | 0.0000 | 0.0052 | 1 | 271 | 1.0000 | 0.9896 | 2 | 271 | 0.0000 | 0.0341 | 3 |
| 135.58 | 272 | 0.0000 | 0.0052 | 1 | 272 | 1.0000 | 0.9894 | 2 | 272 | 0.0000 | 0.0340 | 3 |
| 136.08 | 273 | 0.0000 | 0.0052 | 1 | 273 | 1.0000 | 0.9889 | 2 | 273 | 0.0000 | 0.0340 | 3 |
| 136.58 | 274 | 0.0000 | 0.0052 | 1 | 274 | 1.0000 | 0.9877 | 2 | 274 | 0.0000 | 0.0339 | 3 |
| 137.08 | 275 | 0.0000 | 0.0052 | 1 | 275 | 1.0000 | 0.9862 | 2 | 275 | 0.0000 | 0.0338 | 3 |
| 137.58 | 276 | 0.0000 | 0.0052 | 1 | 276 | 1.0000 | 0.9871 | 2 | 276 | 0.0000 | 0.0337 | 3 |
| 138.08 | 277 | 0.0000 | 0.0052 | 1 | 277 | 1.0000 | 0.9897 | 2 | 277 | 0.0000 | 0.0338 | 3 |
| 138.58 | 278 | 0.0000 | 0.0052 | 1 | 278 | 1.0000 | 0.9924 | 2 | 278 | 0.0000 | 0.0339 | 3 |
| 139.08 | 279 | 0.0000 | 0.0052 | 1 | 279 | 1.0000 | 0.9944 | 2 | 279 | 0.0000 | 0.0341 | 3 |
| 139.58 | 280 | 0.0000 | 0.0053 | 1 | 280 | 1.0000 | 0.9956 | 2 | 280 | 0.0000 | 0.0341 | 3 |
| 140.08 | 281 | 0.0000 | 0.0053 | 1 | 281 | 1.0000 | 0.9961 | 2 | 281 | 0.0000 | 0.0342 | 3 |
| 140.58 | 282 | 0.0000 | 0.0053 | 1 | 282 | 1.0000 | 0.9961 | 2 | 282 | 0.0000 | 0.0342 | 3 |
| 141.08 | 283 | 0.0000 | 0.0053 | 1 | 283 | 1.0000 | 0.9958 | 2 | 283 | 0.0000 | 0.0342 | 3 |
| 141.58 | 284 | 0.0000 | 0.0053 | 1 | 284 | 1.0000 | 0.9953 | 2 | 284 | 0.0000 | 0.0341 | 3 |
| 142.08 | 285 | 0.0000 | 0.0053 | 1 | 285 | 1.0000 | 0.9948 | 2 | 285 | 0.0000 | 0.0341 | 3 |
| 142.58 | 286 | 0.0000 | 0.0053 | 1 | 286 | 1.0000 | 0.9943 | 2 | 286 | 0.0000 | 0.0341 | 3 |
| 143.08 | 287 | 0.0000 | 0.0053 | 1 | 287 | 1.0000 | 0.9941 | 2 | 287 | 0.0000 | 0.0340 | 3 |
| 143.58 | 288 | 0.0000 | 0.0053 | 1 | 288 | 1.0000 | 0.9936 | 2 | 288 | 0.0000 | 0.0340 | 3 |
| 144.08 | 289 | 0.0000 | 0.0053 | 1 | 289 | 1.0000 | 0.9932 | 2 | 289 | 0.0000 | 0.0340 | 3 |
| 144.58 | 290 | 0.0000 | 0.0054 | 1 | 290 | 1.0000 | 0.9927 | 2 | 290 | 0.0000 | 0.0339 | 3 |
| 145.08 | 291 | 0.0000 | 0.0054 | 1 | 291 | 1.0000 | 0.9924 | 2 | 291 | 0.0000 | 0.0339 | 3 |
| 145.58 | 292 | 0.0000 | 0.0054 | 1 | 292 | 1.0000 | 0.9918 | 2 | 292 | 0.0000 | 0.0339 | 3 |
| 146.08 | 293 | 0.0000 | 0.0054 | 1 | 293 | 1.0000 | 0.9914 | 2 | 293 | 0.0000 | 0.0338 | 3 |
| 146.58 | 294 | 0.0000 | 0.0053 | 1 | 294 | 1.0000 | 0.9908 | 2 | 294 | 0.0000 | 0.0338 | 3 |
| 147.08 | 295 | 0.0000 | 0.0053 | 1 | 295 | 1.0000 | 0.9904 | 2 | 295 | 0.0000 | 0.0338 | 3 |
| 147.58 | 296 | 0.0000 | 0.0053 | 1 | 296 | 1.0000 | 0.9903 | 2 | 296 | 0.0000 | 0.0337 | 3 |
| 148.08 | 297 | 0.0000 | 0.0053 | 1 | 297 | 1.0000 | 0.9902 | 2 | 297 | 0.0000 | 0.0337 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 148.58 | 298 | 0.0000 | 0.0053 | 1 | 298 | 1.0000 | 0.9898 | 2 | 298 | 0.0000 | 0.0337 | 3 |
| 149.08 | 299 | 0.0000 | 0.0053 | 1 | 299 | 1.0000 | 0.9892 | 2 | 299 | 0.0000 | 0.0337 | 3 |
| 149.58 | 300 | 0.0000 | 0.0053 | 1 | 300 | 1.0000 | 0.9889 | 2 | 300 | 0.0000 | 0.0337 | 3 |
| 150.08 | 301 | 0.0000 | 0.0053 | 1 | 301 | 1.0000 | 0.9896 | 2 | 301 | 0.0000 | 0.0337 | 3 |
| 150.58 | 302 | 0.0000 | 0.0054 | 1 | 302 | 1.0000 | 0.9918 | 2 | 302 | 0.0000 | 0.0339 | 3 |
| 151.08 | 303 | 0.0000 | 0.0055 | 1 | 303 | 1.0000 | 0.9934 | 2 | 303 | 0.0000 | 0.0340 | 3 |
| 151.58 | 304 | 0.0000 | 0.0055 | 1 | 304 | 1.0000 | 0.9938 | 2 | 304 | 0.0000 | 0.0341 | 3 |
| 152.08 | 305 | 0.0000 | 0.0055 | 1 | 305 | 1.0000 | 0.9929 | 2 | 305 | 0.0000 | 0.0340 | 3 |
| 152.58 | 306 | 0.0000 | 0.0054 | 1 | 306 | 1.0000 | 0.9918 | 2 | 306 | 0.0000 | 0.0339 | 3 |
| 153.08 | 307 | 0.0000 | 0.0054 | 1 | 307 | 1.0000 | 0.9917 | 2 | 307 | 0.0000 | 0.0340 | 3 |
| 153.58 | 308 | 0.0000 | 0.0054 | 1 | 308 | 1.0000 | 0.9914 | 2 | 308 | 0.0000 | 0.0339 | 3 |
| 154.08 | 309 | 0.0000 | 0.0054 | 1 | 309 | 1.0000 | 0.9903 | 2 | 309 | 0.0000 | 0.0339 | 3 |
| 154.58 | 310 | 0.0000 | 0.0054 | 1 | 310 | 1.0000 | 0.9893 | 2 | 310 | 0.0000 | 0.0338 | 3 |
| 155.08 | 311 | 0.0000 | 0.0054 | 1 | 311 | 1.0000 | 0.9890 | 2 | 311 | 0.0000 | 0.0338 | 3 |
| 155.58 | 312 | 0.0000 | 0.0054 | 1 | 312 | 1.0000 | 0.9885 | 2 | 312 | 0.0000 | 0.0338 | 3 |
| 156.08 | 313 | 0.0000 | 0.0053 | 1 | 313 | 1.0000 | 0.9873 | 2 | 313 | 0.0000 | 0.0337 | 3 |
| 156.58 | 314 | 0.0000 | 0.0053 | 1 | 314 | 1.0000 | 0.9864 | 2 | 314 | 0.0000 | 0.0337 | 3 |
| 157.08 | 315 | 0.0000 | 0.0053 | 1 | 315 | 1.0000 | 0.9856 | 2 | 315 | 0.0000 | 0.0336 | 3 |
| 157.58 | 316 | 0.0000 | 0.0053 | 1 | 316 | 1.0000 | 0.9848 | 2 | 316 | 0.0000 | 0.0336 | 3 |
| 158.08 | 317 | 0.0000 | 0.0053 | 1 | 317 | 1.0000 | 0.9837 | 2 | 317 | 0.0000 | 0.0336 | 3 |
| 158.58 | 318 | 0.0000 | 0.0053 | 1 | 318 | 1.0000 | 0.9824 | 2 | 318 | 0.0000 | 0.0335 | 3 |
| 159.08 | 319 | 0.0000 | 0.0053 | 1 | 319 | 1.0000 | 0.9811 | 2 | 319 | 0.0000 | 0.0335 | 3 |
| 159.58 | 320 | 0.0000 | 0.0052 | 1 | 320 | 1.0000 | 0.9796 | 2 | 320 | 0.0000 | 0.0335 | 3 |
| 160.08 | 321 | 0.0000 | 0.0052 | 1 | 321 | 1.0000 | 0.9782 | 2 | 321 | 0.0000 | 0.0334 | 3 |
| 160.58 | 322 | 0.0000 | 0.0052 | 1 | 322 | 1.0000 | 0.9770 | 2 | 322 | 0.0000 | 0.0334 | 3 |
| 161.08 | 323 | 0.0000 | 0.0052 | 1 | 323 | 1.0000 | 0.9757 | 2 | 323 | 0.0000 | 0.0334 | 3 |
| 161.58 | 324 | 0.0000 | 0.0052 | 1 | 324 | 1.0000 | 0.9748 | 2 | 324 | 0.0000 | 0.0333 | 3 |
| 162.08 | 325 | 0.0000 | 0.0052 | 1 | 325 | 1.0000 | 0.9730 | 2 | 325 | 0.0000 | 0.0333 | 3 |
| 162.58 | 326 | 0.0000 | 0.0052 | 1 | 326 | 1.0000 | 0.9723 | 2 | 326 | 0.0000 | 0.0333 | 3 |
| 163.08 | 327 | 0.0000 | 0.0052 | 1 | 327 | 1.0000 | 0.9717 | 2 | 327 | 0.0000 | 0.0333 | 3 |
| 163.58 | 328 | 0.0000 | 0.0051 | 1 | 328 | 1.0000 | 0.9719 | 2 | 328 | 0.0000 | 0.0333 | 3 |
| 164.08 | 329 | 0.0000 | 0.0052 | 1 | 329 | 1.0000 | 0.9725 | 2 | 329 | 0.0000 | 0.0333 | 3 |
| 164.58 | 330 | 0.0000 | 0.0051 | 1 | 330 | 1.0000 | 0.9723 | 2 | 330 | 0.0000 | 0.0333 | 3 |
| 165.08 | 331 | 0.0000 | 0.0051 | 1 | 331 | 1.0000 | 0.9716 | 2 | 331 | 0.0000 | 0.0333 | 3 |
| 165.58 | 332 | 0.0000 | 0.0051 | 1 | 332 | 1.0000 | 0.9705 | 2 | 332 | 0.0000 | 0.0332 | 3 |
| 166.08 | 333 | 0.0000 | 0.0051 | 1 | 333 | 1.0000 | 0.9688 | 2 | 333 | 0.0000 | 0.0332 | 3 |
| 166.58 | 334 | 0.0000 | 0.0051 | 1 | 334 | 1.0000 | 0.9663 | 2 | 334 | 0.0000 | 0.0331 | 3 |
| 167.08 | 335 | 0.0000 | 0.0051 | 1 | 335 | 1.0000 | 0.9636 | 2 | 335 | 0.0000 | 0.0331 | 3 |
| 167.58 | 336 | 0.0000 | 0.0051 | 1 | 336 | 1.0000 | 0.9605 | 2 | 336 | 0.0000 | 0.0330 | 3 |
| 168.08 | 337 | 0.0000 | 0.0051 | 1 | 337 | 1.0000 | 0.9678 | 2 | 337 | 0.0000 | 0.0331 | 3 |
| 168.58 | 338 | 0.0000 | 0.0051 | 1 | 338 | 1.0000 | 0.9759 | 2 | 338 | 0.0000 | 0.0332 | 3 |
| 169.08 | 339 | 0.0000 | 0.0051 | 1 | 339 | 1.0000 | 0.9848 | 2 | 339 | 0.0000 | 0.0335 | 3 |
| 169.58 | 340 | 0.0000 | 0.0052 | 1 | 340 | 1.0000 | 0.9938 | 2 | 340 | 0.0000 | 0.0341 | 3 |
| 170.08 | 341 | 0.0000 | 0.0052 | 1 | 341 | 1.0000 | 0.9969 | 2 | 341 | 0.0000 | 0.0344 | 3 |
| 170.58 | 342 | 0.0000 | 0.0053 | 1 | 342 | 1.0000 | 0.9991 | 2 | 342 | 0.0000 | 0.0347 | 3 |
| 171.08 | 343 | 0.0000 | 0.0054 | 1 | 343 | 1.0000 | 1.0007 | 2 | 343 | 0.0000 | 0.0351 | 3 |
| 171.58 | 344 | 0.0000 | 0.0055 | 1 | 344 | 1.0000 | 1.0017 | 2 | 344 | 0.0000 | 0.0355 | 3 |
| 172.08 | 345 | 0.0000 | 0.0056 | 1 | 345 | 1.0000 | 1.0026 | 2 | 345 | 0.0000 | 0.0359 | 3 |
| 172.58 | 346 | 0.0000 | 0.0057 | 1 | 346 | 1.0000 | 1.0032 | 2 | 346 | 0.0000 | 0.0362 | 3 |
| 173.08 | 347 | 0.0000 | 0.0058 | 1 | 347 | 1.0000 | 1.0036 | 2 | 347 | 0.0000 | 0.0366 | 3 |
| 173.58 | 348 | 0.0000 | 0.0058 | 1 | 348 | 1.0000 | 1.0039 | 2 | 348 | 0.0000 | 0.0368 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 174.08 | 349 | 0.0000 | 0.0059 | 1 | 349 | 1.0000 | 1.0041 | 2 | 349 | 0.0000 | 0.0370 | 3 |
| 174.58 | 350 | 0.0000 | 0.0059 | 1 | 350 | 1.0000 | 1.0043 | 2 | 350 | 0.0000 | 0.0372 | 3 |
| 175.08 | 351 | 0.0000 | 0.0059 | 1 | 351 | 1.0000 | 1.0044 | 2 | 351 | 0.0000 | 0.0373 | 3 |
| 175.58 | 352 | 0.0000 | 0.0059 | 1 | 352 | 1.0000 | 1.0044 | 2 | 352 | 0.0000 | 0.0374 | 3 |
| 176.08 | 353 | 0.0000 | 0.0059 | 1 | 353 | 1.0000 | 1.0046 | 2 | 353 | 0.0000 | 0.0375 | 3 |
| 176.58 | 354 | 0.0000 | 0.0060 | 1 | 354 | 1.0000 | 1.0048 | 2 | 354 | 0.0000 | 0.0377 | 3 |
| 177.08 | 355 | 0.0000 | 0.0061 | 1 | 355 | 1.0000 | 1.0051 | 2 | 355 | 0.0000 | 0.0379 | 3 |
| 177.58 | 356 | 0.0000 | 0.0062 | 1 | 356 | 1.0000 | 1.0051 | 2 | 356 | 0.0000 | 0.0380 | 3 |
| 178.08 | 357 | 0.0000 | 0.0061 | 1 | 357 | 1.0000 | 1.0051 | 2 | 357 | 0.0000 | 0.0380 | 3 |
| 178.58 | 358 | 0.0000 | 0.0061 | 1 | 358 | 1.0000 | 1.0051 | 2 | 358 | 0.0000 | 0.0380 | 3 |
| 179.08 | 359 | 0.0000 | 0.0062 | 1 | 359 | 1.0000 | 1.0051 | 2 | 359 | 0.0000 | 0.0381 | 3 |
| 179.58 | 360 | 0.0000 | 0.0062 | 1 | 360 | 1.0000 | 1.0053 | 2 | 360 | 0.0000 | 0.0382 | 3 |
| 180.08 | 361 | 0.0000 | 0.0062 | 1 | 361 | 1.0000 | 1.0053 | 2 | 361 | 0.0000 | 0.0382 | 3 |
| 180.58 | 362 | 0.0000 | 0.0062 | 1 | 362 | 1.0000 | 1.0053 | 2 | 362 | 0.0000 | 0.0382 | 3 |
| 181.08 | 363 | 0.0000 | 0.0063 | 1 | 363 | 1.0000 | 1.0053 | 2 | 363 | 0.0000 | 0.0383 | 3 |
| 181.58 | 364 | 0.0000 | 0.0063 | 1 | 364 | 1.0000 | 1.0054 | 2 | 364 | 0.0000 | 0.0383 | 3 |
| 182.08 | 365 | 0.0000 | 0.0063 | 1 | 365 | 1.0000 | 1.0054 | 2 | 365 | 0.0000 | 0.0384 | 3 |
| 182.58 | 366 | 0.0000 | 0.0066 | 1 | 366 | 1.0000 | 1.0056 | 2 | 366 | 0.0000 | 0.0386 | 3 |
| 183.08 | 367 | 0.0000 | 0.0068 | 1 | 367 | 1.0000 | 1.0057 | 2 | 367 | 0.0000 | 0.0389 | 3 |
| 183.58 | 368 | 0.0000 | 0.0069 | 1 | 368 | 1.0000 | 1.0057 | 2 | 368 | 0.0000 | 0.0389 | 3 |
| 184.08 | 369 | 0.0000 | 0.0068 | 1 | 369 | 1.0000 | 1.0055 | 2 | 369 | 0.0000 | 0.0385 | 3 |
| 184.58 | 370 | 0.0000 | 0.0065 | 1 | 370 | 1.0000 | 1.0051 | 2 | 370 | 0.0000 | 0.0379 | 3 |
| 185.08 | 371 | 0.0000 | 0.0063 | 1 | 371 | 1.0000 | 1.0049 | 2 | 371 | 0.0000 | 0.0376 | 3 |
| 185.58 | 372 | 0.0000 | 0.0062 | 1 | 372 | 1.0000 | 1.0048 | 2 | 372 | 0.0000 | 0.0375 | 3 |
| 186.08 | 373 | 0.0000 | 0.0061 | 1 | 373 | 1.0000 | 1.0047 | 2 | 373 | 0.0000 | 0.0374 | 3 |
| 186.58 | 374 | 0.0000 | 0.0059 | 1 | 374 | 1.0000 | 1.0042 | 2 | 374 | 0.0000 | 0.0369 | 3 |
| 187.08 | 375 | 0.0000 | 0.0058 | 1 | 375 | 1.0000 | 1.0040 | 2 | 375 | 0.0000 | 0.0367 | 3 |
| 187.58 | 376 | 0.0000 | 0.0058 | 1 | 376 | 1.0000 | 1.0039 | 2 | 376 | 0.0000 | 0.0367 | 3 |
| 188.08 | 377 | 0.0000 | 0.0058 | 1 | 377 | 1.0000 | 1.0039 | 2 | 377 | 0.0000 | 0.0367 | 3 |
| 188.58 | 378 | 0.0000 | 0.0058 | 1 | 378 | 1.0000 | 1.0039 | 2 | 378 | 0.0000 | 0.0367 | 3 |
| 189.08 | 379 | 0.0000 | 0.0058 | 1 | 379 | 1.0000 | 1.0038 | 2 | 379 | 0.0000 | 0.0366 | 3 |
| 189.58 | 380 | 0.0000 | 0.0058 | 1 | 380 | 1.0000 | 1.0038 | 2 | 380 | 0.0000 | 0.0366 | 3 |
| 190.08 | 381 | 0.0000 | 0.0058 | 1 | 381 | 1.0000 | 1.0037 | 2 | 381 | 0.0000 | 0.0365 | 3 |
| 190.58 | 382 | 0.0000 | 0.0057 | 1 | 382 | 1.0000 | 1.0036 | 2 | 382 | 0.0000 | 0.0364 | 3 |
| 191.08 | 383 | 0.0000 | 0.0057 | 1 | 383 | 1.0000 | 1.0035 | 2 | 383 | 0.0000 | 0.0364 | 3 |
| 191.58 | 384 | 0.0000 | 0.0057 | 1 | 384 | 1.0000 | 1.0034 | 2 | 384 | 0.0000 | 0.0363 | 3 |
| 192.08 | 385 | 0.0000 | 0.0057 | 1 | 385 | 1.0000 | 1.0034 | 2 | 385 | 0.0000 | 0.0362 | 3 |
| 192.58 | 386 | 0.0000 | 0.0057 | 1 | 386 | 1.0000 | 1.0033 | 2 | 386 | 0.0000 | 0.0362 | 3 |
| 193.08 | 387 | 0.0000 | 0.0057 | 1 | 387 | 1.0000 | 1.0032 | 2 | 387 | 0.0000 | 0.0361 | 3 |
| 193.58 | 388 | 0.0000 | 0.0057 | 1 | 388 | 1.0000 | 1.0031 | 2 | 388 | 0.0000 | 0.0361 | 3 |
| 194.08 | 389 | 0.0000 | 0.0057 | 1 | 389 | 1.0000 | 1.0031 | 2 | 389 | 0.0000 | 0.0360 | 3 |
| 194.58 | 390 | 0.0000 | 0.0057 | 1 | 390 | 1.0000 | 1.0030 | 2 | 390 | 0.0000 | 0.0360 | 3 |
| 195.08 | 391 | 0.0000 | 0.0057 | 1 | 391 | 1.0000 | 1.0031 | 2 | 391 | 0.0000 | 0.0361 | 3 |
| 195.58 | 392 | 0.0000 | 0.0056 | 1 | 392 | 1.0000 | 1.0030 | 2 | 392 | 0.0000 | 0.0360 | 3 |
| 196.08 | 393 | 0.0000 | 0.0056 | 1 | 393 | 1.0000 | 1.0029 | 2 | 393 | 0.0000 | 0.0360 | 3 |
| 196.58 | 394 | 0.0000 | 0.0056 | 1 | 394 | 1.0000 | 1.0029 | 2 | 394 | 0.0000 | 0.0360 | 3 |
| 197.08 | 395 | 0.0000 | 0.0056 | 1 | 395 | 1.0000 | 1.0028 | 2 | 395 | 0.0000 | 0.0360 | 3 |
| 197.58 | 396 | 0.0000 | 0.0055 | 1 | 396 | 1.0000 | 1.0026 | 2 | 396 | 0.0000 | 0.0359 | 3 |
| 198.08 | 397 | 0.0000 | 0.0055 | 1 | 397 | 1.0000 | 1.0024 | 2 | 397 | 0.0000 | 0.0359 | 3 |
| 198.58 | 398 | 0.0000 | 0.0054 | 1 | 398 | 1.0000 | 1.0022 | 2 | 398 | 0.0000 | 0.0358 | 3 |
| 199.08 | 399 | 0.0000 | 0.0054 | 1 | 399 | 1.0000 | 1.0020 | 2 | 399 | 0.0000 | 0.0357 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 199.58 | 400 | 0.0000 | 0.0054 | 1 | 400 | 1.0000 | 1.0018 | 2 | 400 | 0.0000 | 0.0357 | 3 |
| 200.08 | 401 | 0.0000 | 0.0053 | 1 | 401 | 1.0000 | 1.0016 | 2 | 401 | 0.0000 | 0.0356 | 3 |
| 200.58 | 402 | 0.0000 | 0.0053 | 1 | 402 | 1.0000 | 1.0014 | 2 | 402 | 0.0000 | 0.0355 | 3 |
| 201.08 | 403 | 0.0000 | 0.0053 | 1 | 403 | 1.0000 | 1.0011 | 2 | 403 | 0.0000 | 0.0355 | 3 |
| 201.58 | 404 | 0.0000 | 0.0053 | 1 | 404 | 1.0000 | 1.0009 | 2 | 404 | 0.0000 | 0.0354 | 3 |
| 202.08 | 405 | 0.0000 | 0.0052 | 1 | 405 | 1.0000 | 1.0006 | 2 | 405 | 0.0000 | 0.0353 | 3 |
| 202.58 | 406 | 0.0000 | 0.0052 | 1 | 406 | 1.0000 | 1.0004 | 2 | 406 | 0.0000 | 0.0353 | 3 |
| 203.08 | 407 | 0.0000 | 0.0052 | 1 | 407 | 1.0000 | 1.0001 | 2 | 407 | 0.0000 | 0.0351 | 3 |
| 203.58 | 408 | 0.0000 | 0.0052 | 1 | 408 | 1.0000 | 0.9998 | 2 | 408 | 0.0000 | 0.0350 | 3 |
| 204.08 | 409 | 0.0000 | 0.0052 | 1 | 409 | 1.0000 | 0.9995 | 2 | 409 | 0.0000 | 0.0349 | 3 |
| 204.58 | 410 | 0.0000 | 0.0052 | 1 | 410 | 1.0000 | 0.9991 | 2 | 410 | 0.0000 | 0.0348 | 3 |
| 205.08 | 411 | 0.0000 | 0.0052 | 1 | 411 | 1.0000 | 0.9987 | 2 | 411 | 0.0000 | 0.0348 | 3 |
| 205.58 | 412 | 0.0000 | 0.0052 | 1 | 412 | 1.0000 | 0.9987 | 2 | 412 | 0.0000 | 0.0348 | 3 |
| 206.08 | 413 | 0.0000 | 0.0052 | 1 | 413 | 1.0000 | 0.9990 | 2 | 413 | 0.0000 | 0.0349 | 3 |
| 206.58 | 414 | 0.0000 | 0.0052 | 1 | 414 | 1.0000 | 0.9993 | 2 | 414 | 0.0000 | 0.0349 | 3 |
| 207.08 | 415 | 0.0000 | 0.0052 | 1 | 415 | 1.0000 | 0.9995 | 2 | 415 | 0.0000 | 0.0350 | 3 |
| 207.58 | 416 | 0.0000 | 0.0052 | 1 | 416 | 1.0000 | 0.9995 | 2 | 416 | 0.0000 | 0.0350 | 3 |
| 208.08 | 417 | 0.0000 | 0.0052 | 1 | 417 | 1.0000 | 0.9995 | 2 | 417 | 0.0000 | 0.0350 | 3 |
| 208.58 | 418 | 0.0000 | 0.0052 | 1 | 418 | 1.0000 | 0.9994 | 2 | 418 | 0.0000 | 0.0350 | 3 |
| 209.08 | 419 | 0.0000 | 0.0052 | 1 | 419 | 1.0000 | 0.9992 | 2 | 419 | 0.0000 | 0.0350 | 3 |
| 209.58 | 420 | 0.0000 | 0.0052 | 1 | 420 | 1.0000 | 0.9990 | 2 | 420 | 0.0000 | 0.0350 | 3 |
| 210.08 | 421 | 0.0000 | 0.0052 | 1 | 421 | 1.0000 | 0.9987 | 2 | 421 | 0.0000 | 0.0349 | 3 |
| 210.58 | 422 | 0.0000 | 0.0052 | 1 | 422 | 1.0000 | 0.9985 | 2 | 422 | 0.0000 | 0.0349 | 3 |
| 211.08 | 423 | 0.0000 | 0.0051 | 1 | 423 | 1.0000 | 0.9982 | 2 | 423 | 0.0000 | 0.0349 | 3 |
| 211.58 | 424 | 0.0000 | 0.0051 | 1 | 424 | 1.0000 | 0.9980 | 2 | 424 | 0.0000 | 0.0348 | 3 |
| 212.08 | 425 | 0.0000 | 0.0051 | 1 | 425 | 1.0000 | 0.9978 | 2 | 425 | 0.0000 | 0.0348 | 3 |
| 212.58 | 426 | 0.0000 | 0.0051 | 1 | 426 | 1.0000 | 0.9977 | 2 | 426 | 0.0000 | 0.0348 | 3 |
| 213.08 | 427 | 0.0000 | 0.0051 | 1 | 427 | 1.0000 | 0.9976 | 2 | 427 | 0.0000 | 0.0348 | 3 |
| 213.58 | 428 | 0.0000 | 0.0051 | 1 | 428 | 1.0000 | 0.9975 | 2 | 428 | 0.0000 | 0.0348 | 3 |
| 214.08 | 429 | 0.0000 | 0.0051 | 1 | 429 | 1.0000 | 0.9973 | 2 | 429 | 0.0000 | 0.0348 | 3 |
| 214.58 | 430 | 0.0000 | 0.0051 | 1 | 430 | 1.0000 | 0.9972 | 2 | 430 | 0.0000 | 0.0348 | 3 |
| 215.08 | 431 | 0.0000 | 0.0051 | 1 | 431 | 1.0000 | 0.9971 | 2 | 431 | 0.0000 | 0.0347 | 3 |
| 215.58 | 432 | 0.0000 | 0.0051 | 1 | 432 | 1.0000 | 0.9969 | 2 | 432 | 0.0000 | 0.0347 | 3 |
| 216.08 | 433 | 0.0000 | 0.0051 | 1 | 433 | 1.0000 | 0.9966 | 2 | 433 | 0.0000 | 0.0347 | 3 |
| 216.58 | 434 | 0.0000 | 0.0051 | 1 | 434 | 1.0000 | 0.9979 | 2 | 434 | 0.0000 | 0.0348 | 3 |
| 217.08 | 435 | 0.0000 | 0.0051 | 1 | 435 | 1.0000 | 0.9993 | 2 | 435 | 0.0000 | 0.0351 | 3 |
| 217.58 | 436 | 0.0000 | 0.0051 | 1 | 436 | 1.0000 | 1.0006 | 2 | 436 | 0.0000 | 0.0354 | 3 |
| 218.08 | 437 | 0.0000 | 0.0052 | 1 | 437 | 1.0000 | 1.0020 | 2 | 437 | 0.0000 | 0.0357 | 3 |
| 218.58 | 438 | 0.0000 | 0.0053 | 1 | 438 | 1.0000 | 1.0032 | 2 | 438 | 0.0000 | 0.0362 | 3 |
| 219.08 | 439 | 0.0000 | 0.0054 | 1 | 439 | 1.0000 | 1.0042 | 2 | 439 | 0.0000 | 0.0368 | 3 |
| 219.58 | 440 | 0.0000 | 0.0055 | 1 | 440 | 1.0000 | 1.0050 | 2 | 440 | 0.0000 | 0.0374 | 3 |
| 220.08 | 441 | 0.0000 | 0.0057 | 1 | 441 | 1.0000 | 1.0057 | 2 | 441 | 0.0000 | 0.0380 | 3 |
| 220.58 | 442 | 0.0000 | 0.0059 | 1 | 442 | 1.0000 | 1.0061 | 2 | 442 | 0.0000 | 0.0387 | 3 |
| 221.08 | 443 | 0.0000 | 0.0062 | 1 | 443 | 1.0000 | 1.0065 | 2 | 443 | 0.0000 | 0.0393 | 3 |
| 221.58 | 444 | 0.0000 | 0.0065 | 1 | 444 | 1.0000 | 1.0068 | 2 | 444 | 0.0000 | 0.0400 | 3 |
| 222.08 | 445 | 0.0000 | 0.0068 | 1 | 445 | 1.0000 | 1.0069 | 2 | 445 | 0.0000 | 0.0403 | 3 |
| 222.58 | 446 | 0.0000 | 0.0070 | 1 | 446 | 1.0000 | 1.0070 | 2 | 446 | 0.0000 | 0.0405 | 3 |
| 223.08 | 447 | 0.0000 | 0.0073 | 1 | 447 | 1.0000 | 1.0070 | 2 | 447 | 0.0000 | 0.0404 | 3 |
| 223.58 | 448 | 0.0000 | 0.0075 | 1 | 448 | 1.0000 | 1.0070 | 2 | 448 | 0.0000 | 0.0405 | 3 |
| 224.08 | 449 | 0.0000 | 0.0077 | 1 | 449 | 1.0000 | 1.0071 | 2 | 449 | 0.0000 | 0.0406 | 3 |
| 224.58 | 450 | 0.0000 | 0.0081 | 1 | 450 | 1.0000 | 1.0071 | 2 | 450 | 0.0000 | 0.0409 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 225.08 | 451 | 0.0000 | 0.0086 | 1 | 451 | 1.0000 | 1.0072 | 2 | 451 | 0.0000 | 0.0413 | 3 |
| 225.58 | 452 | 0.0000 | 0.0090 | 1 | 452 | 1.0000 | 1.0072 | 2 | 452 | 0.0000 | 0.0416 | 3 |
| 226.08 | 453 | 0.0000 | 0.0092 | 1 | 453 | 1.0000 | 1.0072 | 2 | 453 | 0.0000 | 0.0417 | 3 |
| 226.58 | 454 | 0.0000 | 0.0092 | 1 | 454 | 1.0000 | 1.0072 | 2 | 454 | 0.0000 | 0.0419 | 3 |
| 227.08 | 455 | 0.0000 | 0.0092 | 1 | 455 | 1.0000 | 1.0072 | 2 | 455 | 0.0000 | 0.0419 | 3 |
| 227.58 | 456 | 0.0000 | 0.0092 | 1 | 456 | 1.0000 | 1.0072 | 2 | 456 | 0.0000 | 0.0419 | 3 |
| 228.08 | 457 | 0.0000 | 0.0091 | 1 | 457 | 1.0000 | 1.0072 | 2 | 457 | 0.0000 | 0.0419 | 3 |
| 228.58 | 458 | 0.0000 | 0.0089 | 1 | 458 | 1.0000 | 1.0072 | 2 | 458 | 0.0000 | 0.0418 | 3 |
| 229.08 | 459 | 0.0000 | 0.0087 | 1 | 459 | 1.0000 | 1.0072 | 2 | 459 | 0.0000 | 0.0417 | 3 |
| 229.58 | 460 | 0.0000 | 0.0083 | 1 | 460 | 1.0000 | 1.0071 | 2 | 460 | 0.0000 | 0.0414 | 3 |
| 230.08 | 461 | 0.0000 | 0.0081 | 1 | 461 | 1.0000 | 1.0071 | 2 | 461 | 0.0000 | 0.0411 | 3 |
| 230.58 | 462 | 0.0000 | 0.0076 | 1 | 462 | 1.0000 | 1.0070 | 2 | 462 | 0.0000 | 0.0407 | 3 |
| 231.08 | 463 | 0.0000 | 0.0072 | 1 | 463 | 1.0000 | 1.0069 | 2 | 463 | 0.0000 | 0.0402 | 3 |
| 231.58 | 464 | 0.0000 | 0.0068 | 1 | 464 | 1.0000 | 1.0068 | 2 | 464 | 0.0000 | 0.0396 | 3 |
| 232.08 | 465 | 0.0000 | 0.0065 | 1 | 465 | 1.0000 | 1.0067 | 2 | 465 | 0.0000 | 0.0393 | 3 |
| 232.58 | 466 | 0.0000 | 0.0063 | 1 | 466 | 1.0000 | 1.0066 | 2 | 466 | 0.0000 | 0.0390 | 3 |
| 233.08 | 467 | 0.0000 | 0.0061 | 1 | 467 | 1.0000 | 1.0065 | 2 | 467 | 0.0000 | 0.0388 | 3 |
| 233.58 | 468 | 0.0000 | 0.0061 | 1 | 468 | 1.0000 | 1.0064 | 2 | 468 | 0.0000 | 0.0386 | 3 |
| 234.08 | 469 | 0.0000 | 0.0060 | 1 | 469 | 1.0000 | 1.0064 | 2 | 469 | 0.0000 | 0.0384 | 3 |
| 234.58 | 470 | 0.0000 | 0.0060 | 1 | 470 | 1.0000 | 1.0063 | 2 | 470 | 0.0000 | 0.0383 | 3 |
| 235.08 | 471 | 0.0000 | 0.0060 | 1 | 471 | 1.0000 | 1.0063 | 2 | 471 | 0.0000 | 0.0383 | 3 |
| 235.58 | 472 | 0.0000 | 0.0060 | 1 | 472 | 1.0000 | 1.0063 | 2 | 472 | 0.0000 | 0.0382 | 3 |
| 236.08 | 473 | 0.0000 | 0.0060 | 1 | 473 | 1.0000 | 1.0063 | 2 | 473 | 0.0000 | 0.0382 | 3 |
| 236.58 | 474 | 0.0000 | 0.0060 | 1 | 474 | 1.0000 | 1.0063 | 2 | 474 | 0.0000 | 0.0382 | 3 |
| 237.08 | 475 | 0.0000 | 0.0060 | 1 | 475 | 1.0000 | 1.0062 | 2 | 475 | 0.0000 | 0.0382 | 3 |
| 237.58 | 476 | 0.0000 | 0.0060 | 1 | 476 | 1.0000 | 1.0062 | 2 | 476 | 0.0000 | 0.0382 | 3 |
| 238.08 | 477 | 0.0000 | 0.0059 | 1 | 477 | 1.0000 | 1.0062 | 2 | 477 | 0.0000 | 0.0382 | 3 |
| 238.58 | 478 | 0.0000 | 0.0059 | 1 | 478 | 1.0000 | 1.0062 | 2 | 478 | 0.0000 | 0.0382 | 3 |
| 239.08 | 479 | 0.0000 | 0.0059 | 1 | 479 | 1.0000 | 1.0061 | 2 | 479 | 0.0000 | 0.0381 | 3 |
| 239.58 | 480 | 0.0000 | 0.0058 | 1 | 480 | 1.0000 | 1.0061 | 2 | 480 | 0.0000 | 0.0382 | 3 |
| 240.08 | 481 | 0.0000 | 0.0058 | 1 | 481 | 1.0000 | 1.0061 | 2 | 481 | 0.0000 | 0.0382 | 3 |
| 240.58 | 482 | 0.0000 | 0.0058 | 1 | 482 | 1.0000 | 1.0061 | 2 | 482 | 0.0000 | 0.0382 | 3 |
| 241.08 | 483 | 0.0000 | 0.0058 | 1 | 483 | 1.0000 | 1.0061 | 2 | 483 | 0.0000 | 0.0382 | 3 |
| 241.58 | 484 | 0.0000 | 0.0058 | 1 | 484 | 1.0000 | 1.0061 | 2 | 484 | 0.0000 | 0.0383 | 3 |
| 242.08 | 485 | 0.0000 | 0.0058 | 1 | 485 | 1.0000 | 1.0061 | 2 | 485 | 0.0000 | 0.0383 | 3 |
| 242.58 | 486 | 0.0000 | 0.0058 | 1 | 486 | 1.0000 | 1.0061 | 2 | 486 | 0.0000 | 0.0384 | 3 |
| 243.08 | 487 | 0.0000 | 0.0058 | 1 | 487 | 1.0000 | 1.0061 | 2 | 487 | 0.0000 | 0.0384 | 3 |
| 243.58 | 488 | 0.0000 | 0.0058 | 1 | 488 | 1.0000 | 1.0062 | 2 | 488 | 0.0000 | 0.0385 | 3 |
| 244.08 | 489 | 0.0000 | 0.0058 | 1 | 489 | 1.0000 | 1.0062 | 2 | 489 | 0.0000 | 0.0385 | 3 |
| 244.58 | 490 | 0.0000 | 0.0058 | 1 | 490 | 1.0000 | 1.0062 | 2 | 490 | 0.0000 | 0.0385 | 3 |
| 245.08 | 491 | 0.0000 | 0.0058 | 1 | 491 | 1.0000 | 1.0061 | 2 | 491 | 0.0000 | 0.0385 | 3 |
| 245.58 | 492 | 0.0000 | 0.0058 | 1 | 492 | 1.0000 | 1.0061 | 2 | 492 | 0.0000 | 0.0385 | 3 |
| 246.08 | 493 | 0.0000 | 0.0057 | 1 | 493 | 1.0000 | 1.0061 | 2 | 493 | 0.0000 | 0.0385 | 3 |
| 246.58 | 494 | 0.0000 | 0.0057 | 1 | 494 | 1.0000 | 1.0060 | 2 | 494 | 0.0000 | 0.0384 | 3 |
| 247.08 | 495 | 0.0000 | 0.0057 | 1 | 495 | 1.0000 | 1.0060 | 2 | 495 | 0.0000 | 0.0384 | 3 |
| 247.58 | 496 | 0.0000 | 0.0057 | 1 | 496 | 1.0000 | 1.0060 | 2 | 496 | 0.0000 | 0.0384 | 3 |
| 248.08 | 497 | 0.0000 | 0.0057 | 1 | 497 | 1.0000 | 1.0060 | 2 | 497 | 0.0000 | 0.0384 | 3 |
| 248.58 | 498 | 0.0000 | 0.0057 | 1 | 498 | 1.0000 | 1.0060 | 2 | 498 | 0.0000 | 0.0384 | 3 |

| | |
|---|---|
| RECALL SET SIZE | 498 |
| RECALL SET ERROR RMS | 0.183317 |
| MAX BIAS OR WEIGHT | 20.0000 |
| MAX GAIN OR CONSTANT | 2.0000 |

## D.7 Scenario TH5 No-Noise

Below are the no-noise results for the TH5 scenario. These results are file TH5.PRX.

| Time (sec) | Node 1 | Desired Output | Actual Output | | Node 2 | Desired Output | Actual Output | | Node 3 | Desired Output | Actual Output | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.08 | 1 | 0.0000 | 0.0474 | 1 | 1 | 0.0000 | 0.0108 | 2 | 1 | 0.0000 | 0.0361 | 3 |
| 1.08 | 2 | 0.0000 | 0.0474 | 1 | 2 | 0.0000 | 0.0108 | 2 | 2 | 0.0000 | 0.0361 | 3 |
| 2.08 | 3 | 0.0000 | 0.0474 | 1 | 3 | 0.0000 | 0.0108 | 2 | 3 | 0.0000 | 0.0361 | 3 |
| 3.08 | 4 | 0.0000 | 0.0474 | 1 | 4 | 0.0000 | 0.0108 | 2 | 4 | 0.0000 | 0.0361 | 3 |
| 4.08 | 5 | 0.0000 | 0.0474 | 1 | 5 | 0.0000 | 0.0108 | 2 | 5 | 0.0000 | 0.0361 | 3 |
| 5.08 | 6 | 0.0000 | 0.0474 | 1 | 6 | 0.0000 | 0.0108 | 2 | 6 | 0.0000 | 0.0361 | 3 |
| 6.08 | 7 | 0.0000 | 0.0473 | 1 | 7 | 0.0000 | 0.0108 | 2 | 7 | 0.0000 | 0.0361 | 3 |
| 7.08 | 8 | 0.0000 | 0.0472 | 1 | 8 | 0.0000 | 0.0108 | 2 | 8 | 0.0000 | 0.0361 | 3 |
| 8.08 | 9 | 0.0000 | 0.0473 | 1 | 9 | 0.0000 | 0.0108 | 2 | 9 | 0.0000 | 0.0361 | 3 |
| 9.08 | 10 | 0.0000 | 0.0473 | 1 | 10 | 0.0000 | 0.0108 | 2 | 10 | 0.0000 | 0.0361 | 3 |
| 10.08 | 11 | 0.0000 | 0.0473 | 1 | 11 | 0.0000 | 0.0108 | 2 | 11 | 0.0000 | 0.0361 | 3 |
| 11.08 | 12 | 0.0000 | 0.0472 | 1 | 12 | 0.0000 | 0.0108 | 2 | 12 | 0.0000 | 0.0361 | 3 |
| 12.08 | 13 | 0.0000 | 0.0472 | 1 | 13 | 0.0000 | 0.0108 | 2 | 13 | 0.0000 | 0.0361 | 3 |
| 13.08 | 14 | 0.0000 | 0.0472 | 1 | 14 | 0.0000 | 0.0108 | 2 | 14 | 0.0000 | 0.0361 | 3 |
| 14.08 | 15 | 0.0000 | 0.0472 | 1 | 15 | 0.0000 | 0.0108 | 2 | 15 | 0.0000 | 0.0361 | 3 |
| 15.08 | 16 | 0.0000 | 0.0472 | 1 | 16 | 0.0000 | 0.0108 | 2 | 16 | 0.0000 | 0.0361 | 3 |
| 16.08 | 17 | 0.0000 | 0.0472 | 1 | 17 | 0.0000 | 0.0108 | 2 | 17 | 0.0000 | 0.0361 | 3 |
| 17.08 | 18 | 0.0000 | 0.0471 | 1 | 18 | 0.0000 | 0.0108 | 2 | 18 | 0.0000 | 0.0361 | 3 |
| 18.08 | 19 | 0.0000 | 0.0471 | 1 | 19 | 0.0000 | 0.0108 | 2 | 19 | 0.0000 | 0.0362 | 3 |
| 19.08 | 20 | 0.0000 | 0.0471 | 1 | 20 | 0.0000 | 0.0108 | 2 | 20 | 0.0000 | 0.0362 | 3 |
| 20.08 | 21 | 0.0000 | 0.0470 | 1 | 21 | 0.0000 | 0.0108 | 2 | 21 | 0.0000 | 0.0362 | 3 |
| 21.08 | 22 | 0.0000 | 0.0471 | 1 | 22 | 0.0000 | 0.0108 | 2 | 22 | 0.0000 | 0.0362 | 3 |
| 22.08 | 23 | 0.0000 | 0.0470 | 1 | 23 | 0.0000 | 0.0108 | 2 | 23 | 0.0000 | 0.0362 | 3 |
| 23.08 | 24 | 0.0000 | 0.0470 | 1 | 24 | 0.0000 | 0.0108 | 2 | 24 | 0.0000 | 0.0362 | 3 |
| 24.08 | 25 | 0.0000 | 0.0470 | 1 | 25 | 0.0000 | 0.0108 | 2 | 25 | 0.0000 | 0.0362 | 3 |
| 25.08 | 26 | 0.0000 | 0.0470 | 1 | 26 | 0.0000 | 0.0108 | 2 | 26 | 0.0000 | 0.0362 | 3 |
| 26.08 | 27 | 0.0000 | 0.0469 | 1 | 27 | 0.0000 | 0.0108 | 2 | 27 | 0.0000 | 0.0362 | 3 |
| 27.08 | 28 | 0.0000 | 0.0469 | 1 | 28 | 0.0000 | 0.0108 | 2 | 28 | 0.0000 | 0.0362 | 3 |
| 28.08 | 29 | 0.0000 | 0.0470 | 1 | 29 | 0.0000 | 0.0108 | 2 | 29 | 0.0000 | 0.0362 | 3 |
| 29.08 | 30 | 0.0000 | 0.0471 | 1 | 30 | 0.0000 | 0.0108 | 2 | 30 | 0.0000 | 0.0362 | 3 |
| 30.08 | 31 | 0.0000 | 0.0470 | 1 | 31 | 0.0000 | 0.0108 | 2 | 31 | 0.0000 | 0.0362 | 3 |
| 31.08 | 32 | 0.0000 | 0.0470 | 1 | 32 | 0.0000 | 0.0108 | 2 | 32 | 0.0000 | 0.0362 | 3 |
| 32.08 | 33 | 0.0000 | 0.0467 | 1 | 33 | 0.0000 | 0.0108 | 2 | 33 | 1.0000 | 0.0362 | 3 |
| 33.08 | 34 | 0.0000 | 0.0458 | 1 | 34 | 0.0000 | 0.0108 | 2 | 34 | 1.0000 | 0.0364 | 3 |
| 34.08 | 35 | 0.0000 | 0.0444 | 1 | 35 | 0.0000 | 0.0109 | 2 | 35 | 1.0000 | 0.0367 | 3 |
| 35.08 | 36 | 0.0000 | 0.0432 | 1 | 36 | 0.0000 | 0.0109 | 2 | 36 | 1.0000 | 0.0370 | 3 |
| 36.08 | 37 | 0.0000 | 0.0416 | 1 | 37 | 0.0000 | 0.0109 | 2 | 37 | 1.0000 | 0.0373 | 3 |
| 37.08 | 38 | 0.0000 | 0.0403 | 1 | 38 | 0.0000 | 0.0110 | 2 | 38 | 1.0000 | 0.0377 | 3 |
| 38.08 | 39 | 0.0000 | 0.0389 | 1 | 39 | 0.0000 | 0.0110 | 2 | 39 | 1.0000 | 0.0381 | 3 |
| 39.08 | 40 | 0.0000 | 0.0377 | 1 | 40 | 0.0000 | 0.0110 | 2 | 40 | 1.0000 | 0.0385 | 3 |
| 40.08 | 41 | 0.0000 | 0.0364 | 1 | 41 | 0.0000 | 0.0111 | 2 | 41 | 1.0000 | 0.0389 | 3 |
| 41.08 | 42 | 0.0000 | 0.0352 | 1 | 42 | 0.0000 | 0.0111 | 2 | 42 | 1.0000 | 0.0394 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 42.08 | 43 | 0.0000 | 0.0342 | 1 | 43 | 0.0000 | 0.0112 | 2 | 43 | 1.0000 | 0.0398 | 3 |
| 43.08 | 44 | 0.0000 | 0.0330 | 1 | 44 | 0.0000 | 0.0112 | 2 | 44 | 1.0000 | 0.0404 | 3 |
| 44.08 | 45 | 0.0000 | 0.0320 | 1 | 45 | 0.0000 | 0.0113 | 2 | 45 | 1.0000 | 0.0409 | 3 |
| 45.08 | 46 | 0.0000 | 0.0310 | 1 | 46 | 0.0000 | 0.0113 | 2 | 46 | 1.0000 | 0.0415 | 3 |
| 46.08 | 47 | 0.0000 | 0.0300 | 1 | 47 | 0.0000 | 0.0114 | 2 | 47 | 1.0000 | 0.0421 | 3 |
| 47.08 | 48 | 0.0000 | 0.0291 | 1 | 48 | 0.0000 | 0.0115 | 2 | 48 | 1.0000 | 0.0427 | 3 |
| 48.08 | 49 | 0.0000 | 0.0282 | 1 | 49 | 0.0000 | 0.0115 | 2 | 49 | 1.0000 | 0.0434 | 3 |
| 49.08 | 50 | 0.0000 | 0.0274 | 1 | 50 | 0.0000 | 0.0116 | 2 | 50 | 1.0000 | 0.0441 | 3 |
| 50.08 | 51 | 0.0000 | 0.0265 | 1 | 51 | 0.0000 | 0.0116 | 2 | 51 | 1.0000 | 0.0449 | 3 |
| 51.08 | 52 | 0.0000 | 0.0257 | 1 | 52 | 0.0000 | 0.0117 | 2 | 52 | 1.0000 | 0.0458 | 3 |
| 52.08 | 53 | 0.0000 | 0.0249 | 1 | 53 | 0.0000 | 0.0118 | 2 | 53 | 1.0000 | 0.0467 | 3 |
| 53.08 | 54 | 0.0000 | 0.0242 | 1 | 54 | 0.0000 | 0.0119 | 2 | 54 | 1.0000 | 0.0476 | 3 |
| 54.08 | 55 | 0.0000 | 0.0235 | 1 | 55 | 0.0000 | 0.0120 | 2 | 55 | 1.0000 | 0.0486 | 3 |
| 55.08 | 56 | 0.0000 | 0.0228 | 1 | 56 | 0.0000 | 0.0120 | 2 | 56 | 1.0000 | 0.0496 | 3 |
| 56.08 | 57 | 0.0000 | 0.0222 | 1 | 57 | 0.0000 | 0.0121 | 2 | 57 | 1.0000 | 0.0508 | 3 |
| 57.08 | 58 | 0.0000 | 0.0215 | 1 | 58 | 0.0000 | 0.0122 | 2 | 58 | 1.0000 | 0.0520 | 3 |
| 58.08 | 59 | 0.0000 | 0.0209 | 1 | 59 | 0.0000 | 0.0123 | 2 | 59 | 1.0000 | 0.0533 | 3 |
| 59.08 | 60 | 0.0000 | 0.0203 | 1 | 60 | 0.0000 | 0.0124 | 2 | 60 | 1.0000 | 0.0547 | 3 |
| 60.08 | 61 | 0.0000 | 0.0198 | 1 | 61 | 0.0000 | 0.0125 | 2 | 61 | 1.0000 | 0.0562 | 3 |
| 61.08 | 62 | 0.0000 | 0.0193 | 1 | 62 | 0.0000 | 0.0126 | 2 | 62 | 1.0000 | 0.0577 | 3 |
| 62.08 | 63 | 0.0000 | 0.0187 | 1 | 63 | 0.0000 | 0.0127 | 2 | 63 | 1.0000 | 0.0595 | 3 |
| 63.08 | 64 | 0.0000 | 0.0182 | 1 | 64 | 0.0000 | 0.0128 | 2 | 64 | 1.0000 | 0.0614 | 3 |
| 64.08 | 65 | 0.0000 | 0.0178 | 1 | 65 | 0.0000 | 0.0129 | 2 | 65 | 1.0000 | 0.0632 | 3 |
| 65.08 | 66 | 0.0000 | 0.0174 | 1 | 66 | 0.0000 | 0.0130 | 2 | 66 | 1.0000 | 0.0653 | 3 |
| 66.08 | 67 | 0.0000 | 0.0170 | 1 | 67 | 0.0000 | 0.0131 | 2 | 67 | 1.0000 | 0.0675 | 3 |
| 67.08 | 68 | 0.0000 | 0.0166 | 1 | 68 | 0.0000 | 0.0133 | 2 | 68 | 1.0000 | 0.0698 | 3 |
| 68.08 | 69 | 0.0000 | 0.0162 | 1 | 69 | 0.0000 | 0.0134 | 2 | 69 | 1.0000 | 0.0725 | 3 |
| 69.08 | 70 | 0.0000 | 0.0158 | 1 | 70 | 0.0000 | 0.0135 | 2 | 70 | 1.0000 | 0.0754 | 3 |
| 70.08 | 71 | 0.0000 | 0.0155 | 1 | 71 | 0.0000 | 0.0136 | 2 | 71 | 1.0000 | 0.0781 | 3 |
| 71.08 | 72 | 0.0000 | 0.0151 | 1 | 72 | 0.0000 | 0.0138 | 2 | 72 | 1.0000 | 0.0813 | 3 |
| 72.08 | 73 | 0.0000 | 0.0148 | 1 | 73 | 0.0000 | 0.0139 | 2 | 73 | 1.0000 | 0.0846 | 3 |
| 73.08 | 74 | 0.0000 | 0.0146 | 1 | 74 | 0.0000 | 0.0140 | 2 | 74 | 1.0000 | 0.0880 | 3 |
| 74.08 | 75 | 0.0000 | 0.0143 | 1 | 75 | 0.0000 | 0.0141 | 2 | 75 | 1.0000 | 0.0919 | 3 |
| 75.08 | 76 | 0.0000 | 0.0140 | 1 | 76 | 0.0000 | 0.0142 | 2 | 76 | 1.0000 | 0.0960 | 3 |
| 76.08 | 77 | 0.0000 | 0.0138 | 1 | 77 | 0.0000 | 0.0144 | 2 | 77 | 1.0000 | 0.1003 | 3 |
| 77.08 | 78 | 0.0000 | 0.0135 | 1 | 78 | 0.0000 | 0.0145 | 2 | 78 | 1.0000 | 0.1052 | 3 |
| 78.08 | 79 | 0.0000 | 0.0133 | 1 | 79 | 0.0000 | 0.0146 | 2 | 79 | 1.0000 | 0.1099 | 3 |
| 79.08 | 80 | 0.0000 | 0.0131 | 1 | 80 | 0.0000 | 0.0147 | 2 | 80 | 1.0000 | 0.1147 | 3 |
| 80.08 | 81 | 0.0000 | 0.0129 | 1 | 81 | 0.0000 | 0.0149 | 2 | 81 | 1.0000 | 0.1207 | 3 |
| 81.08 | 82 | 0.0000 | 0.0127 | 1 | 82 | 0.0000 | 0.0150 | 2 | 82 | 1.0000 | 0.1259 | 3 |
| 82.08 | 83 | 0.0000 | 0.0126 | 1 | 83 | 0.0000 | 0.0151 | 2 | 83 | 1.0000 | 0.1323 | 3 |
| 83.08 | 84 | 0.0000 | 0.0124 | 1 | 84 | 0.0000 | 0.0152 | 2 | 84 | 1.0000 | 0.1397 | 3 |
| 84.08 | 85 | 0.0000 | 0.0122 | 1 | 85 | 0.0000 | 0.0153 | 2 | 85 | 1.0000 | 0.1467 | 3 |
| 85.08 | 86 | 0.0000 | 0.0121 | 1 | 86 | 0.0000 | 0.0154 | 2 | 86 | 1.0000 | 0.1550 | 3 |
| 86.08 | 87 | 0.0000 | 0.0119 | 1 | 87 | 0.0000 | 0.0155 | 2 | 87 | 1.0000 | 0.1626 | 3 |
| 87.08 | 88 | 0.0000 | 0.0118 | 1 | 88 | 0.0000 | 0.0157 | 2 | 88 | 1.0000 | 0.1719 | 3 |
| 88.08 | 89 | 0.0000 | 0.0116 | 1 | 89 | 0.0000 | 0.0158 | 2 | 89 | 1.0000 | 0.1827 | 3 |
| 89.08 | 90 | 0.0000 | 0.0115 | 1 | 90 | 0.0000 | 0.0159 | 2 | 90 | 1.0000 | 0.1929 | 3 |
| 90.08 | 91 | 0.0000 | 0.0114 | 1 | 91 | 0.0000 | 0.0160 | 2 | 91 | 1.0000 | 0.2049 | 3 |
| 91.08 | 92 | 0.0000 | 0.0113 | 1 | 92 | 0.0000 | 0.0161 | 2 | 92 | 1.0000 | 0.2177 | 3 |
| 92.08 | 93 | 0.0000 | 0.0111 | 1 | 93 | 0.0000 | 0.0162 | 2 | 93 | 1.0000 | 0.2317 | 3 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 93.08 | 94 | 0.0000 | 0.0110 | 1 | 94 | 0.0000 | 0.0163 | 2 | 94 | 1.0000 | 0.2472 | 3 |
| 94.08 | 95 | 0.0000 | 0.0109 | 1 | 95 | 0.0000 | 0.0164 | 2 | 95 | 1.0000 | 0.2626 | 3 |
| 95.08 | 96 | 0.0000 | 0.0108 | 1 | 96 | 0.0000 | 0.0165 | 2 | 96 | 1.0000 | 0.2807 | 3 |
| 96.08 | 97 | 0.0000 | 0.0107 | 1 | 97 | 0.0000 | 0.0166 | 2 | 97 | 1.0000 | 0.2961 | 3 |
| 97.08 | 98 | 0.0000 | 0.0106 | 1 | 98 | 0.0000 | 0.0167 | 2 | 98 | 1.0000 | 0.3173 | 3 |
| 98.08 | 99 | 0.0000 | 0.0106 | 1 | 99 | 0.0000 | 0.0168 | 2 | 99 | 1.0000 | 0.3380 | 3 |
| 99.08 | 100 | 0.0000 | 0.0105 | 1 | 100 | 0.0000 | 0.0169 | 2 | 100 | 1.0000 | 0.3614 | 3 |
| 100.08 | 101 | 0.0000 | 0.0104 | 1 | 101 | 0.0000 | 0.0170 | 2 | 101 | 1.0000 | 0.3847 | 3 |
| 101.08 | 102 | 0.0000 | 0.0103 | 1 | 102 | 0.0000 | 0.0171 | 2 | 102 | 1.0000 | 0.4085 | 3 |
| 102.08 | 103 | 0.0000 | 0.0102 | 1 | 103 | 0.0000 | 0.0172 | 2 | 103 | 1.0000 | 0.4295 | 3 |
| 103.08 | 104 | 0.0000 | 0.0102 | 1 | 104 | 0.0000 | 0.0173 | 2 | 104 | 1.0000 | 0.4534 | 3 |
| 104.08 | 105 | 0.0000 | 0.0101 | 1 | 105 | 0.0000 | 0.0174 | 2 | 105 | 1.0000 | 0.4829 | 3 |
| 105.08 | 106 | 0.0000 | 0.0100 | 1 | 106 | 0.0000 | 0.0175 | 2 | 106 | 1.0000 | 0.5038 | 3 |
| 106.08 | 107 | 0.0000 | 0.0100 | 1 | 107 | 0.0000 | 0.0176 | 2 | 107 | 1.0000 | 0.5265 | 3 |
| 107.08 | 108 | 0.0000 | 0.0099 | 1 | 108 | 0.0000 | 0.0177 | 2 | 108 | 1.0000 | 0.5518 | 3 |
| 108.08 | 109 | 0.0000 | 0.0098 | 1 | 109 | 0.0000 | 0.0177 | 2 | 109 | 1.0000 | 0.5718 | 3 |
| 109.08 | 110 | 0.0000 | 0.0098 | 1 | 110 | 0.0000 | 0.0178 | 2 | 110 | 1.0000 | 0.5940 | 3 |
| 110.08 | 111 | 0.0000 | 0.0097 | 1 | 111 | 0.0000 | 0.0179 | 2 | 111 | 1.0000 | 0.6130 | 3 |
| 111.08 | 112 | 0.0000 | 0.0097 | 1 | 112 | 0.0000 | 0.0180 | 2 | 112 | 1.0000 | 0.6330 | 3 |
| 112.08 | 113 | 0.0000 | 0.0096 | 1 | 113 | 0.0000 | 0.0181 | 2 | 113 | 1.0000 | 0.6498 | 3 |
| 113.08 | 114 | 0.0000 | 0.0095 | 1 | 114 | 0.0000 | 0.0182 | 2 | 114 | 1.0000 | 0.6706 | 3 |
| 114.08 | 115 | 0.0000 | 0.0095 | 1 | 115 | 0.0000 | 0.0183 | 2 | 115 | 1.0000 | 0.6924 | 3 |
| 115.08 | 116 | 0.0000 | 0.0094 | 1 | 116 | 0.0000 | 0.0184 | 2 | 116 | 1.0000 | 0.7133 | 3 |
| 116.08 | 117 | 0.0000 | 0.0093 | 1 | 117 | 0.0000 | 0.0185 | 2 | 117 | 1.0000 | 0.7312 | 3 |
| 117.08 | 118 | 0.0000 | 0.0093 | 1 | 118 | 0.0000 | 0.0186 | 2 | 118 | 1.0000 | 0.7479 | 3 |
| 118.08 | 119 | 0.0000 | 0.0092 | 1 | 119 | 0.0000 | 0.0187 | 2 | 119 | 1.0000 | 0.7627 | 3 |
| 119.08 | 120 | 0.0000 | 0.0091 | 1 | 120 | 0.0000 | 0.0188 | 2 | 120 | 1.0000 | 0.7766 | 3 |
| 120.08 | 121 | 0.0000 | 0.0091 | 1 | 121 | 0.0000 | 0.0189 | 2 | 121 | 1.0000 | 0.7878 | 3 |
| 121.08 | 122 | 0.0000 | 0.0090 | 1 | 122 | 0.0000 | 0.0190 | 2 | 122 | 1.0000 | 0.7972 | 3 |
| 122.08 | 123 | 0.0000 | 0.0090 | 1 | 123 | 0.0000 | 0.0191 | 2 | 123 | 1.0000 | 0.8072 | 3 |
| 123.08 | 124 | 0.0000 | 0.0089 | 1 | 124 | 0.0000 | 0.0192 | 2 | 124 | 1.0000 | 0.8164 | 3 |
| 124.08 | 125 | 0.0000 | 0.0089 | 1 | 125 | 0.0000 | 0.0192 | 2 | 125 | 1.0000 | 0.8240 | 3 |
| 125.08 | 126 | 0.0000 | 0.0088 | 1 | 126 | 0.0000 | 0.0193 | 2 | 126 | 1.0000 | 0.8305 | 3 |
| 126.08 | 127 | 0.0000 | 0.0088 | 1 | 127 | 0.0000 | 0.0194 | 2 | 127 | 1.0000 | 0.8372 | 3 |
| 127.08 | 128 | 0.0000 | 0.0087 | 1 | 128 | 0.0000 | 0.0195 | 2 | 128 | 1.0000 | 0.8429 | 3 |
| 128.08 | 129 | 0.0000 | 0.0087 | 1 | 129 | 0.0000 | 0.0196 | 2 | 129 | 1.0000 | 0.8478 | 3 |
| 129.08 | 130 | 0.0000 | 0.0087 | 1 | 130 | 0.0000 | 0.0196 | 2 | 130 | 1.0000 | 0.8529 | 3 |
| 130.08 | 131 | 0.0000 | 0.0086 | 1 | 131 | 0.0000 | 0.0197 | 2 | 131 | 1.0000 | 0.8571 | 3 |
| 131.08 | 132 | 0.0000 | 0.0086 | 1 | 132 | 0.0000 | 0.0198 | 2 | 132 | 1.0000 | 0.8612 | 3 |
| 132.08 | 133 | 0.0000 | 0.0086 | 1 | 133 | 0.0000 | 0.0198 | 2 | 133 | 1.0000 | 0.8651 | 3 |
| 133.08 | 134 | 0.0000 | 0.0085 | 1 | 134 | 0.0000 | 0.0199 | 2 | 134 | 1.0000 | 0.8686 | 3 |
| 134.08 | 135 | 0.0000 | 0.0085 | 1 | 135 | 0.0000 | 0.0200 | 2 | 135 | 1.0000 | 0.8723 | 3 |
| 135.08 | 136 | 0.0000 | 0.0085 | 1 | 136 | 0.0000 | 0.0200 | 2 | 136 | 1.0000 | 0.8754 | 3 |
| 136.08 | 137 | 0.0000 | 0.0084 | 1 | 137 | 0.0000 | 0.0201 | 2 | 137 | 1.0000 | 0.8780 | 3 |
| 137.08 | 138 | 0.0000 | 0.0084 | 1 | 138 | 0.0000 | 0.0201 | 2 | 138 | 1.0000 | 0.8807 | 3 |
| 138.08 | 139 | 0.0000 | 0.0084 | 1 | 139 | 0.0000 | 0.0202 | 2 | 139 | 1.0000 | 0.8832 | 3 |
| 139.08 | 140 | 0.0000 | 0.0083 | 1 | 140 | 0.0000 | 0.0202 | 2 | 140 | 1.0000 | 0.8856 | 3 |
| 140.08 | 141 | 0.0000 | 0.0083 | 1 | 141 | 0.0000 | 0.0203 | 2 | 141 | 1.0000 | 0.8877 | 3 |
| 141.08 | 142 | 0.0000 | 0.0083 | 1 | 142 | 0.0000 | 0.0203 | 2 | 142 | 1.0000 | 0.8898 | 3 |
| 142.08 | 143 | 0.0000 | 0.0083 | 1 | 143 | 0.0000 | 0.0204 | 2 | 143 | 1.0000 | 0.8916 | 3 |
| 143.08 | 144 | 0.0000 | 0.0082 | 1 | 144 | 0.0000 | 0.0204 | 2 | 144 | 1.0000 | 0.8936 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 144.08 | 145 | 0.0000 | 0.0082 | 1 | 145 | 0.0000 | 0.0205 | 2 | 145 | 1.0000 | 0.8954 | 3 |
| 145.08 | 146 | 0.0000 | 0.0082 | 1 | 146 | 0.0000 | 0.0205 | 2 | 146 | 1.0000 | 0.8969 | 3 |
| 146.08 | 147 | 0.0000 | 0.0082 | 1 | 147 | 0.0000 | 0.0205 | 2 | 147 | 1.0000 | 0.8985 | 3 |
| 147.08 | 148 | 0.0000 | 0.0081 | 1 | 148 | 0.0000 | 0.0206 | 2 | 148 | 1.0000 | 0.8999 | 3 |
| 148.08 | 149 | 0.0000 | 0.0081 | 1 | 149 | 0.0000 | 0.0206 | 2 | 149 | 1.0000 | 0.9013 | 3 |
| 149.08 | 150 | 0.0000 | 0.0081 | 1 | 150 | 0.0000 | 0.0206 | 2 | 150 | 1.0000 | 0.9027 | 3 |
| 150.08 | 151 | 0.0000 | 0.0081 | 1 | 151 | 0.0000 | 0.0207 | 2 | 151 | 1.0000 | 0.9039 | 3 |
| 151.08 | 152 | 0.0000 | 0.0081 | 1 | 152 | 0.0000 | 0.0207 | 2 | 152 | 1.0000 | 0.9051 | 3 |
| 152.08 | 153 | 0.0000 | 0.0080 | 1 | 153 | 0.0000 | 0.0207 | 2 | 153 | 1.0000 | 0.9063 | 3 |
| 153.08 | 154 | 0.0000 | 0.0080 | 1 | 154 | 0.0000 | 0.0208 | 2 | 154 | 1.0000 | 0.9074 | 3 |
| 154.08 | 155 | 0.0000 | 0.0080 | 1 | 155 | 0.0000 | 0.0208 | 2 | 155 | 1.0000 | 0.9084 | 3 |
| 155.08 | 156 | 0.0000 | 0.0080 | 1 | 156 | 0.0000 | 0.0208 | 2 | 156 | 1.0000 | 0.9094 | 3 |
| 156.08 | 157 | 0.0000 | 0.0080 | 1 | 157 | 0.0000 | 0.0209 | 2 | 157 | 1.0000 | 0.9103 | 3 |
| 157.08 | 158 | 0.0000 | 0.0080 | 1 | 158 | 0.0000 | 0.0209 | 2 | 158 | 1.0000 | 0.9113 | 3 |
| 158.08 | 159 | 0.0000 | 0.0079 | 1 | 159 | 0.0000 | 0.0209 | 2 | 159 | 1.0000 | 0.9122 | 3 |
| 159.08 | 160 | 0.0000 | 0.0079 | 1 | 160 | 0.0000 | 0.0210 | 2 | 160 | 1.0000 | 0.9130 | 3 |
| 160.08 | 161 | 0.0000 | 0.0079 | 1 | 161 | 0.0000 | 0.0210 | 2 | 161 | 1.0000 | 0.9138 | 3 |
| 161.08 | 162 | 0.0000 | 0.0079 | 1 | 162 | 0.0000 | 0.0210 | 2 | 162 | 1.0000 | 0.9146 | 3 |
| 162.08 | 163 | 0.0000 | 0.0079 | 1 | 163 | 0.0000 | 0.0210 | 2 | 163 | 1.0000 | 0.9153 | 3 |
| 163.08 | 164 | 0.0000 | 0.0079 | 1 | 164 | 0.0000 | 0.0210 | 2 | 164 | 1.0000 | 0.9161 | 3 |
| 164.08 | 165 | 0.0000 | 0.0078 | 1 | 165 | 0.0000 | 0.0211 | 2 | 165 | 1.0000 | 0.9167 | 3 |
| 165.08 | 166 | 0.0000 | 0.0078 | 1 | 166 | 0.0000 | 0.0211 | 2 | 166 | 1.0000 | 0.9174 | 3 |
| 166.08 | 167 | 0.0000 | 0.0078 | 1 | 167 | 0.0000 | 0.0211 | 2 | 167 | 1.0000 | 0.9181 | 3 |
| 167.08 | 168 | 0.0000 | 0.0078 | 1 | 168 | 0.0000 | 0.0211 | 2 | 168 | 1.0000 | 0.9186 | 3 |
| 168.08 | 169 | 0.0000 | 0.0078 | 1 | 169 | 0.0000 | 0.0212 | 2 | 169 | 1.0000 | 0.9192 | 3 |
| 169.08 | 170 | 0.0000 | 0.0078 | 1 | 170 | 0.0000 | 0.0212 | 2 | 170 | 1.0000 | 0.9198 | 3 |
| 170.08 | 171 | 0.0000 | 0.0078 | 1 | 171 | 0.0000 | 0.0212 | 2 | 171 | 1.0000 | 0.9203 | 3 |
| 171.08 | 172 | 0.0000 | 0.0077 | 1 | 172 | 0.0000 | 0.0212 | 2 | 172 | 1.0000 | 0.9209 | 3 |
| 172.08 | 173 | 0.0000 | 0.0077 | 1 | 173 | 0.0000 | 0.0212 | 2 | 173 | 1.0000 | 0.9214 | 3 |
| 173.08 | 174 | 0.0000 | 0.0077 | 1 | 174 | 0.0000 | 0.0212 | 2 | 174 | 1.0000 | 0.9218 | 3 |
| 174.08 | 175 | 0.0000 | 0.0077 | 1 | 175 | 0.0000 | 0.0213 | 2 | 175 | 1.0000 | 0.9223 | 3 |
| 175.08 | 176 | 0.0000 | 0.0077 | 1 | 176 | 0.0000 | 0.0213 | 2 | 176 | 1.0000 | 0.9228 | 3 |
| 176.08 | 177 | 0.0000 | 0.0077 | 1 | 177 | 0.0000 | 0.0213 | 2 | 177 | 1.0000 | 0.9232 | 3 |
| 177.08 | 178 | 0.0000 | 0.0077 | 1 | 178 | 0.0000 | 0.0213 | 2 | 178 | 1.0000 | 0.9237 | 3 |
| 178.08 | 179 | 0.0000 | 0.0077 | 1 | 179 | 0.0000 | 0.0213 | 2 | 179 | 1.0000 | 0.9241 | 3 |
| 179.08 | 180 | 0.0000 | 0.0076 | 1 | 180 | 0.0000 | 0.0213 | 2 | 180 | 1.0000 | 0.9245 | 3 |
| 180.08 | 181 | 0.0000 | 0.0076 | 1 | 181 | 0.0000 | 0.0214 | 2 | 181 | 1.0000 | 0.9249 | 3 |
| 181.08 | 182 | 0.0000 | 0.0076 | 1 | 182 | 0.0000 | 0.0214 | 2 | 182 | 1.0000 | 0.9252 | 3 |
| 182.08 | 183 | 0.0000 | 0.0076 | 1 | 183 | 0.0000 | 0.0214 | 2 | 183 | 1.0000 | 0.9256 | 3 |
| 183.08 | 184 | 0.0000 | 0.0076 | 1 | 184 | 0.0000 | 0.0214 | 2 | 184 | 1.0000 | 0.9259 | 3 |
| 184.08 | 185 | 0.0000 | 0.0076 | 1 | 185 | 0.0000 | 0.0214 | 2 | 185 | 1.0000 | 0.9263 | 3 |
| 185.08 | 186 | 0.0000 | 0.0076 | 1 | 186 | 0.0000 | 0.0214 | 2 | 186 | 1.0000 | 0.9266 | 3 |
| 186.08 | 187 | 0.0000 | 0.0076 | 1 | 187 | 0.0000 | 0.0214 | 2 | 187 | 1.0000 | 0.9269 | 3 |
| 187.08 | 188 | 0.0000 | 0.0076 | 1 | 188 | 0.0000 | 0.0214 | 2 | 188 | 1.0000 | 0.9272 | 3 |
| 188.08 | 189 | 0.0000 | 0.0075 | 1 | 189 | 0.0000 | 0.0215 | 2 | 189 | 1.0000 | 0.9275 | 3 |
| 189.08 | 190 | 0.0000 | 0.0075 | 1 | 190 | 0.0000 | 0.0215 | 2 | 190 | 1.0000 | 0.9278 | 3 |
| 190.08 | 191 | 0.0000 | 0.0075 | 1 | 191 | 0.0000 | 0.0215 | 2 | 191 | 1.0000 | 0.9281 | 3 |
| 191.08 | 192 | 0.0000 | 0.0075 | 1 | 192 | 0.0000 | 0.0215 | 2 | 192 | 1.0000 | 0.9284 | 3 |
| 192.08 | 193 | 0.0000 | 0.0075 | 1 | 193 | 0.0000 | 0.0215 | 2 | 193 | 1.0000 | 0.9287 | 3 |
| 193.08 | 194 | 0.0000 | 0.0075 | 1 | 194 | 0.0000 | 0.0215 | 2 | 194 | 1.0000 | 0.9289 | 3 |
| 194.08 | 195 | 0.0000 | 0.0075 | 1 | 195 | 0.0000 | 0.0215 | 2 | 195 | 1.0000 | 0.9292 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 195.08 | 196 | 0.0000 | 0.0075 | 1 | 196 | 0.0000 | 0.0215 | 2 | 196 | 1.0000 | 0.9294 | 3 |
| 196.08 | 197 | 0.0000 | 0.0075 | 1 | 197 | 0.0000 | 0.0215 | 2 | 197 | 1.0000 | 0.9296 | 3 |
| 197.08 | 198 | 0.0000 | 0.0075 | 1 | 198 | 0.0000 | 0.0215 | 2 | 198 | 1.0000 | 0.9298 | 3 |
| 198.08 | 199 | 0.0000 | 0.0075 | 1 | 199 | 0.0000 | 0.0216 | 2 | 199 | 1.0000 | 0.9301 | 3 |
| 199.08 | 200 | 0.0000 | 0.0074 | 1 | 200 | 0.0000 | 0.0216 | 2 | 200 | 1.0000 | 0.9303 | 3 |
| 200.08 | 201 | 0.0000 | 0.0074 | 1 | 201 | 0.0000 | 0.0216 | 2 | 201 | 1.0000 | 0.9305 | 3 |
| 201.08 | 202 | 0.0000 | 0.0074 | 1 | 202 | 0.0000 | 0.0216 | 2 | 202 | 1.0000 | 0.9307 | 3 |
| 202.08 | 203 | 0.0000 | 0.0074 | 1 | 203 | 0.0000 | 0.0216 | 2 | 203 | 1.0000 | 0.9309 | 3 |
| 203.08 | 204 | 0.0000 | 0.0074 | 1 | 204 | 0.0000 | 0.0216 | 2 | 204 | 1.0000 | 0.9311 | 3 |
| 204.08 | 205 | 0.0000 | 0.0074 | 1 | 205 | 0.0000 | 0.0216 | 2 | 205 | 1.0000 | 0.9313 | 3 |
| 205.08 | 206 | 0.0000 | 0.0074 | 1 | 206 | 0.0000 | 0.0216 | 2 | 206 | 1.0000 | 0.9315 | 3 |
| 206.08 | 207 | 0.0000 | 0.0074 | 1 | 207 | 0.0000 | 0.0216 | 2 | 207 | 1.0000 | 0.9316 | 3 |
| 207.08 | 208 | 0.0000 | 0.0074 | 1 | 208 | 0.0000 | 0.0216 | 2 | 208 | 1.0000 | 0.9318 | 3 |
| 208.08 | 209 | 0.0000 | 0.0074 | 1 | 209 | 0.0000 | 0.0216 | 2 | 209 | 1.0000 | 0.9320 | 3 |
| 209.08 | 210 | 0.0000 | 0.0074 | 1 | 210 | 0.0000 | 0.0216 | 2 | 210 | 1.0000 | 0.9322 | 3 |
| 210.08 | 211 | 0.0000 | 0.0073 | 1 | 211 | 0.0000 | 0.0216 | 2 | 211 | 1.0000 | 0.9323 | 3 |
| 211.08 | 212 | 0.0000 | 0.0073 | 1 | 212 | 0.0000 | 0.0216 | 2 | 212 | 1.0000 | 0.9325 | 3 |
| 212.08 | 213 | 0.0000 | 0.0073 | 1 | 213 | 0.0000 | 0.0216 | 2 | 213 | 1.0000 | 0.9326 | 3 |
| 213.08 | 214 | 0.0000 | 0.0073 | 1 | 214 | 0.0000 | 0.0217 | 2 | 214 | 1.0000 | 0.9328 | 3 |
| 214.08 | 215 | 0.0000 | 0.0073 | 1 | 215 | 0.0000 | 0.0217 | 2 | 215 | 1.0000 | 0.9329 | 3 |
| 215.08 | 216 | 0.0000 | 0.0073 | 1 | 216 | 0.0000 | 0.0217 | 2 | 216 | 1.0000 | 0.9331 | 3 |
| 216.08 | 217 | 0.0000 | 0.0073 | 1 | 217 | 0.0000 | 0.0217 | 2 | 217 | 1.0000 | 0.9332 | 3 |
| 217.08 | 218 | 0.0000 | 0.0073 | 1 | 218 | 0.0000 | 0.0217 | 2 | 218 | 1.0000 | 0.9333 | 3 |
| 218.08 | 219 | 0.0000 | 0.0073 | 1 | 219 | 0.0000 | 0.0217 | 2 | 219 | 1.0000 | 0.9335 | 3 |
| 219.08 | 220 | 0.0000 | 0.0073 | 1 | 220 | 0.0000 | 0.0217 | 2 | 220 | 1.0000 | 0.9336 | 3 |
| 220.08 | 221 | 0.0000 | 0.0073 | 1 | 221 | 0.0000 | 0.0217 | 2 | 221 | 1.0000 | 0.9337 | 3 |
| 221.08 | 222 | 0.0000 | 0.0073 | 1 | 222 | 0.0000 | 0.0217 | 2 | 222 | 1.0000 | 0.9338 | 3 |
| 222.08 | 223 | 0.0000 | 0.0073 | 1 | 223 | 0.0000 | 0.0217 | 2 | 223 | 1.0000 | 0.9339 | 3 |
| 223.08 | 224 | 0.0000 | 0.0072 | 1 | 224 | 0.0000 | 0.0217 | 2 | 224 | 1.0000 | 0.9341 | 3 |
| 224.08 | 225 | 0.0000 | 0.0072 | 1 | 225 | 0.0000 | 0.0217 | 2 | 225 | 1.0000 | 0.9342 | 3 |
| 225.08 | 226 | 0.0000 | 0.0072 | 1 | 226 | 0.0000 | 0.0217 | 2 | 226 | 1.0000 | 0.9343 | 3 |
| 226.08 | 227 | 0.0000 | 0.0072 | 1 | 227 | 0.0000 | 0.0217 | 2 | 227 | 1.0000 | 0.9344 | 3 |
| 227.08 | 228 | 0.0000 | 0.0072 | 1 | 228 | 0.0000 | 0.0217 | 2 | 228 | 1.0000 | 0.9345 | 3 |
| 228.08 | 229 | 0.0000 | 0.0072 | 1 | 229 | 0.0000 | 0.0217 | 2 | 229 | 1.0000 | 0.9346 | 3 |
| 229.08 | 230 | 0.0000 | 0.0072 | 1 | 230 | 0.0000 | 0.0217 | 2 | 230 | 1.0000 | 0.9347 | 3 |
| 230.08 | 231 | 0.0000 | 0.0072 | 1 | 231 | 0.0000 | 0.0217 | 2 | 231 | 1.0000 | 0.9348 | 3 |
| 231.08 | 232 | 0.0000 | 0.0072 | 1 | 232 | 0.0000 | 0.0217 | 2 | 232 | 1.0000 | 0.9349 | 3 |
| 232.08 | 233 | 0.0000 | 0.0072 | 1 | 233 | 0.0000 | 0.0217 | 2 | 233 | 1.0000 | 0.9350 | 3 |
| 233.08 | 234 | 0.0000 | 0.0072 | 1 | 234 | 0.0000 | 0.0217 | 2 | 234 | 1.0000 | 0.9350 | 3 |
| 234.08 | 235 | 0.0000 | 0.0072 | 1 | 235 | 0.0000 | 0.0217 | 2 | 235 | 1.0000 | 0.9351 | 3 |
| 235.08 | 236 | 0.0000 | 0.0072 | 1 | 236 | 0.0000 | 0.0218 | 2 | 236 | 1.0000 | 0.9352 | 3 |
| 236.08 | 237 | 0.0000 | 0.0071 | 1 | 237 | 0.0000 | 0.0218 | 2 | 237 | 1.0000 | 0.9353 | 3 |
| 237.08 | 238 | 0.0000 | 0.0071 | 1 | 238 | 0.0000 | 0.0218 | 2 | 238 | 1.0000 | 0.9354 | 3 |
| 238.08 | 239 | 0.0000 | 0.0071 | 1 | 239 | 0.0000 | 0.0218 | 2 | 239 | 1.0000 | 0.9355 | 3 |
| 239.08 | 240 | 0.0000 | 0.0071 | 1 | 240 | 0.0000 | 0.0218 | 2 | 240 | 1.0000 | 0.9355 | 3 |
| 240.08 | 241 | 0.0000 | 0.0071 | 1 | 241 | 0.0000 | 0.0218 | 2 | 241 | 1.0000 | 0.9356 | 3 |
| 241.08 | 242 | 0.0000 | 0.0071 | 1 | 242 | 0.0000 | 0.0218 | 2 | 242 | 1.0000 | 0.9357 | 3 |
| 242.08 | 243 | 0.0000 | 0.0071 | 1 | 243 | 0.0000 | 0.0218 | 2 | 243 | 1.0000 | 0.9354 | 3 |
| 243.08 | 244 | 0.0000 | 0.0072 | 1 | 244 | 0.0000 | 0.0217 | 2 | 244 | 1.0000 | 0.9354 | 3 |
| 244.08 | 245 | 0.0000 | 0.0073 | 1 | 245 | 0.0000 | 0.0217 | 2 | 245 | 1.0000 | 0.9356 | 3 |
| 245.08 | 246 | 0.0000 | 0.0072 | 1 | 246 | 0.0000 | 0.0217 | 2 | 246 | 1.0000 | 0.9357 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 246.08 | 247 | 0.0000 | 0.0072 | 1 | 247 | 0.0000 | 0.0217 | 2 | 247 | 1.0000 | 0.9361 | 3 |
| 247.08 | 248 | 0.0000 | 0.0072 | 1 | 248 | 0.0000 | 0.0217 | 2 | 248 | 1.0000 | 0.9364 | 3 |
| 248.08 | 249 | 0.0000 | 0.0072 | 1 | 249 | 0.0000 | 0.0217 | 2 | 249 | 1.0000 | 0.9364 | 3 |
| 249.08 | 250 | 0.0000 | 0.0072 | 1 | 250 | 0.0000 | 0.0217 | 2 | 250 | 1.0000 | 0.9365 | 3 |
| 250.08 | 251 | 0.0000 | 0.0072 | 1 | 251 | 0.0000 | 0.0217 | 2 | 251 | 1.0000 | 0.9367 | 3 |
| 251.08 | 252 | 0.0000 | 0.0072 | 1 | 252 | 0.0000 | 0.0217 | 2 | 252 | 1.0000 | 0.9368 | 3 |
| 252.08 | 253 | 0.0000 | 0.0072 | 1 | 253 | 0.0000 | 0.0217 | 2 | 253 | 1.0000 | 0.9369 | 3 |
| 253.08 | 254 | 0.0000 | 0.0072 | 1 | 254 | 0.0000 | 0.0217 | 2 | 254 | 1.0000 | 0.9369 | 3 |
| 254.08 | 255 | 0.0000 | 0.0072 | 1 | 255 | 0.0000 | 0.0217 | 2 | 255 | 1.0000 | 0.9369 | 3 |
| 255.08 | 256 | 0.0000 | 0.0072 | 1 | 256 | 0.0000 | 0.0217 | 2 | 256 | 1.0000 | 0.9369 | 3 |
| 256.08 | 257 | 0.0000 | 0.0072 | 1 | 257 | 0.0000 | 0.0217 | 2 | 257 | 1.0000 | 0.9369 | 3 |
| 257.08 | 258 | 0.0000 | 0.0072 | 1 | 258 | 0.0000 | 0.0218 | 2 | 258 | 1.0000 | 0.9370 | 3 |
| 258.08 | 259 | 0.0000 | 0.0071 | 1 | 259 | 0.0000 | 0.0218 | 2 | 259 | 1.0000 | 0.9370 | 3 |
| 259.08 | 260 | 0.0000 | 0.0071 | 1 | 260 | 0.0000 | 0.0218 | 2 | 260 | 1.0000 | 0.9371 | 3 |
| 260.08 | 261 | 0.0000 | 0.0071 | 1 | 261 | 0.0000 | 0.0218 | 2 | 261 | 1.0000 | 0.9371 | 3 |
| 261.08 | 262 | 0.0000 | 0.0071 | 1 | 262 | 0.0000 | 0.0218 | 2 | 262 | 1.0000 | 0.9372 | 3 |
| 262.08 | 263 | 0.0000 | 0.0071 | 1 | 263 | 0.0000 | 0.0218 | 2 | 263 | 1.0000 | 0.9372 | 3 |
| 263.08 | 264 | 0.0000 | 0.0071 | 1 | 264 | 0.0000 | 0.0218 | 2 | 264 | 1.0000 | 0.9373 | 3 |
| 264.08 | 265 | 0.0000 | 0.0071 | 1 | 265 | 0.0000 | 0.0218 | 2 | 265 | 1.0000 | 0.9374 | 3 |
| 265.08 | 266 | 0.0000 | 0.0071 | 1 | 266 | 0.0000 | 0.0218 | 2 | 266 | 1.0000 | 0.9375 | 3 |
| 266.08 | 267 | 0.0000 | 0.0071 | 1 | 267 | 0.0000 | 0.0218 | 2 | 267 | 1.0000 | 0.9376 | 3 |
| 267.08 | 268 | 0.0000 | 0.0071 | 1 | 268 | 0.0000 | 0.0218 | 2 | 268 | 1.0000 | 0.9376 | 3 |
| 268.08 | 269 | 0.0000 | 0.0071 | 1 | 269 | 0.0000 | 0.0218 | 2 | 269 | 1.0000 | 0.9377 | 3 |
| 269.08 | 270 | 0.0000 | 0.0071 | 1 | 270 | 0.0000 | 0.0218 | 2 | 270 | 1.0000 | 0.9378 | 3 |
| 270.08 | 271 | 0.0000 | 0.0071 | 1 | 271 | 0.0000 | 0.0218 | 2 | 271 | 1.0000 | 0.9379 | 3 |
| 271.08 | 272 | 0.0000 | 0.0071 | 1 | 272 | 0.0000 | 0.0218 | 2 | 272 | 1.0000 | 0.9380 | 3 |
| 272.08 | 273 | 0.0000 | 0.0071 | 1 | 273 | 0.0000 | 0.0218 | 2 | 273 | 1.0000 | 0.9380 | 3 |
| 273.08 | 274 | 0.0000 | 0.0071 | 1 | 274 | 0.0000 | 0.0218 | 2 | 274 | 1.0000 | 0.9381 | 3 |
| 274.08 | 275 | 0.0000 | 0.0070 | 1 | 275 | 0.0000 | 0.0218 | 2 | 275 | 1.0000 | 0.9382 | 3 |
| 275.08 | 276 | 0.0000 | 0.0070 | 1 | 276 | 0.0000 | 0.0218 | 2 | 276 | 1.0000 | 0.9383 | 3 |
| 276.08 | 277 | 0.0000 | 0.0070 | 1 | 277 | 0.0000 | 0.0218 | 2 | 277 | 1.0000 | 0.9383 | 3 |
| 277.08 | 278 | 0.0000 | 0.0070 | 1 | 278 | 0.0000 | 0.0218 | 2 | 278 | 1.0000 | 0.9384 | 3 |
| 278.08 | 279 | 0.0000 | 0.0070 | 1 | 279 | 0.0000 | 0.0218 | 2 | 279 | 1.0000 | 0.9385 | 3 |
| 279.08 | 280 | 0.0000 | 0.0070 | 1 | 280 | 0.0000 | 0.0218 | 2 | 280 | 1.0000 | 0.9385 | 3 |
| 280.08 | 281 | 0.0000 | 0.0070 | 1 | 281 | 0.0000 | 0.0218 | 2 | 281 | 1.0000 | 0.9385 | 3 |
| 281.08 | 282 | 0.0000 | 0.0070 | 1 | 282 | 0.0000 | 0.0218 | 2 | 282 | 1.0000 | 0.9386 | 3 |
| 282.08 | 283 | 0.0000 | 0.0070 | 1 | 283 | 0.0000 | 0.0218 | 2 | 283 | 1.0000 | 0.9386 | 3 |
| 283.08 | 284 | 0.0000 | 0.0070 | 1 | 284 | 0.0000 | 0.0218 | 2 | 284 | 1.0000 | 0.9387 | 3 |
| 284.08 | 285 | 0.0000 | 0.0070 | 1 | 285 | 0.0000 | 0.0218 | 2 | 285 | 1.0000 | 0.9387 | 3 |
| 285.08 | 286 | 0.0000 | 0.0070 | 1 | 286 | 0.0000 | 0.0218 | 2 | 286 | 1.0000 | 0.9387 | 3 |
| 286.08 | 287 | 0.0000 | 0.0070 | 1 | 287 | 0.0000 | 0.0218 | 2 | 287 | 1.0000 | 0.9388 | 3 |
| 287.08 | 288 | 0.0000 | 0.0070 | 1 | 288 | 0.0000 | 0.0218 | 2 | 288 | 1.0000 | 0.9388 | 3 |
| 288.08 | 289 | 0.0000 | 0.0069 | 1 | 289 | 0.0000 | 0.0218 | 2 | 289 | 1.0000 | 0.9388 | 3 |
| 289.08 | 290 | 0.0000 | 0.0069 | 1 | 290 | 0.0000 | 0.0218 | 2 | 290 | 1.0000 | 0.9389 | 3 |
| 290.08 | 291 | 0.0000 | 0.0069 | 1 | 291 | 0.0000 | 0.0218 | 2 | 291 | 1.0000 | 0.9388 | 3 |
| 291.08 | 292 | 0.0000 | 0.0069 | 1 | 292 | 0.0000 | 0.0218 | 2 | 292 | 1.0000 | 0.9389 | 3 |
| 292.08 | 293 | 0.0000 | 0.0069 | 1 | 293 | 0.0000 | 0.0218 | 2 | 293 | 1.0000 | 0.9389 | 3 |
| 293.08 | 294 | 0.0000 | 0.0069 | 1 | 294 | 0.0000 | 0.0218 | 2 | 294 | 1.0000 | 0.9390 | 3 |
| 294.08 | 295 | 0.0000 | 0.0069 | 1 | 295 | 0.0000 | 0.0218 | 2 | 295 | 1.0000 | 0.9390 | 3 |
| 295.08 | 296 | 0.0000 | 0.0069 | 1 | 296 | 0.0000 | 0.0218 | 2 | 296 | 1.0000 | 0.9390 | 3 |
| 296.08 | 297 | 0.0000 | 0.0069 | 1 | 297 | 0.0000 | 0.0218 | 2 | 297 | 1.0000 | 0.9390 | 3 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 297.08 | 298 | 0.0000 | 0.0069 | 1 | 298 | 0.0000 | 0.0218 | 2 | 298 | 1.0000 | 0.9391 | 3 |
| 298.08 | 299 | 0.0000 | 0.0069 | 1 | 299 | 0.0000 | 0.0218 | 2 | 299 | 1.0000 | 0.9391 | 3 |
| 299.08 | 300 | 0.0000 | 0.0069 | 1 | 300 | 0.0000 | 0.0218 | 2 | 300 | 1.0000 | 0.9392 | 3 |
| 300.08 | 301 | 0.0000 | 0.0069 | 1 | 301 | 0.0000 | 0.0218 | 2 | 301 | 1.0000 | 0.9392 | 3 |
| 301.08 | 302 | 0.0000 | 0.0069 | 1 | 302 | 0.0000 | 0.0218 | 2 | 302 | 1.0000 | 0.9392 | 3 |
| 302.08 | 303 | 0.0000 | 0.0069 | 1 | 303 | 0.0000 | 0.0218 | 2 | 303 | 1.0000 | 0.9392 | 3 |
| 303.08 | 304 | 0.0000 | 0.0069 | 1 | 304 | 0.0000 | 0.0218 | 2 | 304 | 1.0000 | 0.9393 | 3 |
| 304.08 | 305 | 0.0000 | 0.0068 | 1 | 305 | 0.0000 | 0.0218 | 2 | 305 | 1.0000 | 0.9393 | 3 |
| 305.08 | 306 | 0.0000 | 0.0068 | 1 | 306 | 0.0000 | 0.0218 | 2 | 306 | 1.0000 | 0.9393 | 3 |
| 306.08 | 307 | 0.0000 | 0.0068 | 1 | 307 | 0.0000 | 0.0218 | 2 | 307 | 1.0000 | 0.9394 | 3 |
| 307.08 | 308 | 0.0000 | 0.0068 | 1 | 308 | 0.0000 | 0.0218 | 2 | 308 | 1.0000 | 0.9394 | 3 |
| 308.08 | 309 | 0.0000 | 0.0068 | 1 | 309 | 0.0000 | 0.0218 | 2 | 309 | 1.0000 | 0.9394 | 3 |
| 309.08 | 310 | 0.0000 | 0.0068 | 1 | 310 | 0.0000 | 0.0218 | 2 | 310 | 1.0000 | 0.9395 | 3 |
| 310.08 | 311 | 0.0000 | 0.0068 | 1 | 311 | 0.0000 | 0.0218 | 2 | 311 | 1.0000 | 0.9395 | 3 |
| 311.08 | 312 | 0.0000 | 0.0068 | 1 | 312 | 0.0000 | 0.0219 | 2 | 312 | 1.0000 | 0.9395 | 3 |
| 312.08 | 313 | 0.0000 | 0.0068 | 1 | 313 | 0.0000 | 0.0219 | 2 | 313 | 1.0000 | 0.9395 | 3 |
| 313.08 | 314 | 0.0000 | 0.0068 | 1 | 314 | 0.0000 | 0.0219 | 2 | 314 | 1.0000 | 0.9396 | 3 |
| 314.08 | 315 | 0.0000 | 0.0068 | 1 | 315 | 0.0000 | 0.0219 | 2 | 315 | 1.0000 | 0.9396 | 3 |
| 315.08 | 316 | 0.0000 | 0.0068 | 1 | 316 | 0.0000 | 0.0219 | 2 | 316 | 1.0000 | 0.9396 | 3 |
| 316.08 | 317 | 0.0000 | 0.0068 | 1 | 317 | 0.0000 | 0.0219 | 2 | 317 | 1.0000 | 0.9397 | 3 |
| 317.08 | 318 | 0.0000 | 0.0068 | 1 | 318 | 0.0000 | 0.0219 | 2 | 318 | 1.0000 | 0.9397 | 3 |
| 318.08 | 319 | 0.0000 | 0.0068 | 1 | 319 | 0.0000 | 0.0219 | 2 | 319 | 1.0000 | 0.9397 | 3 |
| 319.08 | 320 | 0.0000 | 0.0067 | 1 | 320 | 0.0000 | 0.0219 | 2 | 320 | 1.0000 | 0.9397 | 3 |
| 320.08 | 321 | 0.0000 | 0.0067 | 1 | 321 | 0.0000 | 0.0219 | 2 | 321 | 1.0000 | 0.9397 | 3 |
| 321.08 | 322 | 0.0000 | 0.0067 | 1 | 322 | 0.0000 | 0.0219 | 2 | 322 | 1.0000 | 0.9398 | 3 |
| 322.08 | 323 | 0.0000 | 0.0067 | 1 | 323 | 0.0000 | 0.0219 | 2 | 323 | 1.0000 | 0.9398 | 3 |
| 323.08 | 324 | 0.0000 | 0.0067 | 1 | 324 | 0.0000 | 0.0219 | 2 | 324 | 1.0000 | 0.9398 | 3 |
| 324.08 | 325 | 0.0000 | 0.0067 | 1 | 325 | 0.0000 | 0.0219 | 2 | 325 | 1.0000 | 0.9398 | 3 |
| 325.08 | 326 | 0.0000 | 0.0067 | 1 | 326 | 0.0000 | 0.0219 | 2 | 326 | 1.0000 | 0.9398 | 3 |
| 326.08 | 327 | 0.0000 | 0.0067 | 1 | 327 | 0.0000 | 0.0219 | 2 | 327 | 1.0000 | 0.9399 | 3 |
| 327.08 | 328 | 0.0000 | 0.0067 | 1 | 328 | 0.0000 | 0.0219 | 2 | 328 | 1.0000 | 0.9399 | 3 |
| 328.08 | 329 | 0.0000 | 0.0067 | 1 | 329 | 0.0000 | 0.0219 | 2 | 329 | 1.0000 | 0.9399 | 3 |
| 329.08 | 330 | 0.0000 | 0.0067 | 1 | 330 | 0.0000 | 0.0219 | 2 | 330 | 1.0000 | 0.9399 | 3 |
| 330.08 | 331 | 0.0000 | 0.0067 | 1 | 331 | 0.0000 | 0.0219 | 2 | 331 | 1.0000 | 0.9399 | 3 |
| 331.08 | 332 | 0.0000 | 0.0067 | 1 | 332 | 0.0000 | 0.0219 | 2 | 332 | 1.0000 | 0.9399 | 3 |
| 332.08 | 333 | 0.0000 | 0.0067 | 1 | 333 | 0.0000 | 0.0219 | 2 | 333 | 1.0000 | 0.9400 | 3 |
| 333.08 | 334 | 0.0000 | 0.0067 | 1 | 334 | 0.0000 | 0.0219 | 2 | 334 | 1.0000 | 0.9400 | 3 |
| 334.08 | 335 | 0.0000 | 0.0067 | 1 | 335 | 0.0000 | 0.0219 | 2 | 335 | 1.0000 | 0.9400 | 3 |
| 335.08 | 336 | 0.0000 | 0.0066 | 1 | 336 | 0.0000 | 0.0219 | 2 | 336 | 1.0000 | 0.9400 | 3 |
| 336.08 | 337 | 0.0000 | 0.0066 | 1 | 337 | 0.0000 | 0.0219 | 2 | 337 | 1.0000 | 0.9400 | 3 |
| 337.08 | 338 | 0.0000 | 0.0066 | 1 | 338 | 0.0000 | 0.0219 | 2 | 338 | 1.0000 | 0.9401 | 3 |
| 338.08 | 339 | 0.0000 | 0.0066 | 1 | 339 | 0.0000 | 0.0219 | 2 | 339 | 1.0000 | 0.9401 | 3 |
| 339.08 | 340 | 0.0000 | 0.0066 | 1 | 340 | 0.0000 | 0.0219 | 2 | 340 | 1.0000 | 0.9401 | 3 |
| 340.08 | 341 | 0.0000 | 0.0066 | 1 | 341 | 0.0000 | 0.0219 | 2 | 341 | 1.0000 | 0.9401 | 3 |
| 341.08 | 342 | 0.0000 | 0.0066 | 1 | 342 | 0.0000 | 0.0219 | 2 | 342 | 1.0000 | 0.9401 | 3 |
| 342.08 | 343 | 0.0000 | 0.0066 | 1 | 343 | 0.0000 | 0.0219 | 2 | 343 | 1.0000 | 0.9401 | 3 |
| 343.08 | 344 | 0.0000 | 0.0066 | 1 | 344 | 0.0000 | 0.0219 | 2 | 344 | 1.0000 | 0.9402 | 3 |
| 344.08 | 345 | 0.0000 | 0.0066 | 1 | 345 | 0.0000 | 0.0219 | 2 | 345 | 1.0000 | 0.9402 | 3 |
| 345.08 | 346 | 0.0000 | 0.0066 | 1 | 346 | 0.0000 | 0.0219 | 2 | 346 | 1.0000 | 0.9402 | 3 |
| 346.08 | 347 | 0.0000 | 0.0066 | 1 | 347 | 0.0000 | 0.0219 | 2 | 347 | 1.0000 | 0.9402 | 3 |
| 347.08 | 348 | 0.0000 | 0.0066 | 1 | 348 | 0.0000 | 0.0219 | 2 | 348 | 1.0000 | 0.9402 | 3 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 348.08 | 349 | 0.0000 | 0.0066 | 1 | 349 | 0.0000 | 0.0219 | 2 | 349 | 1.0000 | 0.9402 | 3 |
| 349.08 | 350 | 0.0000 | 0.0066 | 1 | 350 | 0.0000 | 0.0219 | 2 | 350 | 1.0000 | 0.9402 | 3 |
| 350.08 | 351 | 0.0000 | 0.0066 | 1 | 351 | 0.0000 | 0.0219 | 2 | 351 | 1.0000 | 0.9402 | 3 |
| 351.08 | 352 | 0.0000 | 0.0065 | 1 | 352 | 0.0000 | 0.0219 | 2 | 352 | 1.0000 | 0.9402 | 3 |
| 352.08 | 353 | 0.0000 | 0.0065 | 1 | 353 | 0.0000 | 0.0219 | 2 | 353 | 1.0000 | 0.9402 | 3 |
| 353.08 | 354 | 0.0000 | 0.0065 | 1 | 354 | 0.0000 | 0.0219 | 2 | 354 | 1.0000 | 0.9402 | 3 |
| 354.08 | 355 | 0.0000 | 0.0065 | 1 | 355 | 0.0000 | 0.0219 | 2 | 355 | 1.0000 | 0.9402 | 3 |
| 355.08 | 356 | 0.0000 | 0.0065 | 1 | 356 | 0.0000 | 0.0219 | 2 | 356 | 1.0000 | 0.9403 | 3 |
| 356.08 | 357 | 0.0000 | 0.0065 | 1 | 357 | 0.0000 | 0.0219 | 2 | 357 | 1.0000 | 0.9402 | 3 |
| 357.08 | 358 | 0.0000 | 0.0065 | 1 | 358 | 0.0000 | 0.0219 | 2 | 358 | 1.0000 | 0.9403 | 3 |
| 358.08 | 359 | 0.0000 | 0.0065 | 1 | 359 | 0.0000 | 0.0219 | 2 | 359 | 1.0000 | 0.9403 | 3 |
| 359.08 | 360 | 0.0000 | 0.0065 | 1 | 360 | 0.0000 | 0.0219 | 2 | 360 | 1.0000 | 0.9403 | 3 |
| 360.08 | 361 | 0.0000 | 0.0065 | 1 | 361 | 0.0000 | 0.0219 | 2 | 361 | 1.0000 | 0.9403 | 3 |
| 361.08 | 362 | 0.0000 | 0.0065 | 1 | 362 | 0.0000 | 0.0219 | 2 | 362 | 1.0000 | 0.9403 | 3 |
| 362.08 | 363 | 0.0000 | 0.0065 | 1 | 363 | 0.0000 | 0.0219 | 2 | 363 | 1.0000 | 0.9403 | 3 |
| 363.08 | 364 | 0.0000 | 0.0065 | 1 | 364 | 0.0000 | 0.0219 | 2 | 364 | 1.0000 | 0.9403 | 3 |
| 364.08 | 365 | 0.0000 | 0.0065 | 1 | 365 | 0.0000 | 0.0219 | 2 | 365 | 1.0000 | 0.9403 | 3 |
| 365.08 | 366 | 0.0000 | 0.0064 | 1 | 366 | 0.0000 | 0.0219 | 2 | 366 | 1.0000 | 0.9403 | 3 |
| 366.08 | 367 | 0.0000 | 0.0064 | 1 | 367 | 0.0000 | 0.0219 | 2 | 367 | 1.0000 | 0.9403 | 3 |
| 367.08 | 368 | 0.0000 | 0.0064 | 1 | 368 | 0.0000 | 0.0219 | 2 | 368 | 1.0000 | 0.9403 | 3 |
| 368.08 | 369 | 0.0000 | 0.0064 | 1 | 369 | 0.0000 | 0.0220 | 2 | 369 | 1.0000 | 0.9403 | 3 |
| 369.08 | 370 | 0.0000 | 0.0064 | 1 | 370 | 0.0000 | 0.0220 | 2 | 370 | 1.0000 | 0.9403 | 3 |
| 370.08 | 371 | 0.0000 | 0.0064 | 1 | 371 | 0.0000 | 0.0220 | 2 | 371 | 1.0000 | 0.9403 | 3 |
| 371.08 | 372 | 0.0000 | 0.0064 | 1 | 372 | 0.0000 | 0.0220 | 2 | 372 | 1.0000 | 0.9403 | 3 |
| 372.08 | 373 | 0.0000 | 0.0064 | 1 | 373 | 0.0000 | 0.0220 | 2 | 373 | 1.0000 | 0.9403 | 3 |
| 373.08 | 374 | 0.0000 | 0.0064 | 1 | 374 | 0.0000 | 0.0220 | 2 | 374 | 1.0000 | 0.9403 | 3 |
| 374.08 | 375 | 0.0000 | 0.0064 | 1 | 375 | 0.0000 | 0.0220 | 2 | 375 | 1.0000 | 0.9403 | 3 |
| 375.08 | 376 | 0.0000 | 0.0064 | 1 | 376 | 0.0000 | 0.0220 | 2 | 376 | 1.0000 | 0.9403 | 3 |
| 376.08 | 377 | 0.0000 | 0.0064 | 1 | 377 | 0.0000 | 0.0220 | 2 | 377 | 1.0000 | 0.9402 | 3 |
| 377.08 | 378 | 0.0000 | 0.0064 | 1 | 378 | 0.0000 | 0.0220 | 2 | 378 | 1.0000 | 0.9402 | 3 |
| 378.08 | 379 | 0.0000 | 0.0064 | 1 | 379 | 0.0000 | 0.0220 | 2 | 379 | 1.0000 | 0.9402 | 3 |
| 379.08 | 380 | 0.0000 | 0.0063 | 1 | 380 | 0.0000 | 0.0220 | 2 | 380 | 1.0000 | 0.9402 | 3 |
| 380.08 | 381 | 0.0000 | 0.0063 | 1 | 381 | 0.0000 | 0.0220 | 2 | 381 | 1.0000 | 0.9402 | 3 |
| 381.08 | 382 | 0.0000 | 0.0063 | 1 | 382 | 0.0000 | 0.0220 | 2 | 382 | 1.0000 | 0.9402 | 3 |
| 382.08 | 383 | 0.0000 | 0.0063 | 1 | 383 | 0.0000 | 0.0220 | 2 | 383 | 1.0000 | 0.9401 | 3 |
| 383.08 | 384 | 0.0000 | 0.0063 | 1 | 384 | 0.0000 | 0.0220 | 2 | 384 | 1.0000 | 0.9401 | 3 |
| 384.08 | 385 | 0.0000 | 0.0063 | 1 | 385 | 0.0000 | 0.0220 | 2 | 385 | 1.0000 | 0.9400 | 3 |
| 385.08 | 386 | 0.0000 | 0.0063 | 1 | 386 | 0.0000 | 0.0220 | 2 | 386 | 1.0000 | 0.9400 | 3 |
| 386.08 | 387 | 0.0000 | 0.0063 | 1 | 387 | 0.0000 | 0.0220 | 2 | 387 | 1.0000 | 0.9400 | 3 |
| 387.08 | 388 | 0.0000 | 0.0063 | 1 | 388 | 0.0000 | 0.0220 | 2 | 388 | 1.0000 | 0.9400 | 3 |
| 388.08 | 389 | 0.0000 | 0.0063 | 1 | 389 | 0.0000 | 0.0221 | 2 | 389 | 1.0000 | 0.9422 | 3 |
| 389.08 | 390 | 0.0000 | 0.0063 | 1 | 390 | 0.0000 | 0.0221 | 2 | 390 | 1.0000 | 0.9430 | 3 |
| 390.08 | 391 | 0.0000 | 0.0063 | 1 | 391 | 0.0000 | 0.0221 | 2 | 391 | 1.0000 | 0.9435 | 3 |
| 391.08 | 392 | 0.0000 | 0.0063 | 1 | 392 | 0.0000 | 0.0221 | 2 | 392 | 1.0000 | 0.9434 | 3 |
| 392.08 | 393 | 0.0000 | 0.0063 | 1 | 393 | 0.0000 | 0.0221 | 2 | 393 | 1.0000 | 0.9435 | 3 |
| 393.08 | 394 | 0.0000 | 0.0063 | 1 | 394 | 0.0000 | 0.0221 | 2 | 394 | 1.0000 | 0.9434 | 3 |
| 394.08 | 395 | 0.0000 | 0.0063 | 1 | 395 | 0.0000 | 0.0221 | 2 | 395 | 1.0000 | 0.9433 | 3 |
| 395.08 | 396 | 0.0000 | 0.0063 | 1 | 396 | 0.0000 | 0.0221 | 2 | 396 | 1.0000 | 0.9434 | 3 |
| 396.08 | 397 | 0.0000 | 0.0063 | 1 | 397 | 0.0000 | 0.0221 | 2 | 397 | 1.0000 | 0.9434 | 3 |
| 397.08 | 398 | 0.0000 | 0.0063 | 1 | 398 | 0.0000 | 0.0221 | 2 | 398 | 1.0000 | 0.9434 | 3 |
| 398.08 | 399 | 0.0000 | 0.0063 | 1 | 399 | 0.0000 | 0.0221 | 2 | 399 | 1.0000 | 0.9434 | 3 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 399.08 | 400 | 0.0000 | 0.0063 | 1 | 400 | 0.0000 | 0.0221 | 2 | 400 | 1.0000 | 0.9434 | 3 |
| 400.08 | 401 | 0.0000 | 0.0063 | 1 | 401 | 0.0000 | 0.0221 | 2 | 401 | 1.0000 | 0.9433 | 3 |
| 401.08 | 402 | 0.0000 | 0.0063 | 1 | 402 | 0.0000 | 0.0221 | 2 | 402 | 1.0000 | 0.9432 | 3 |
| 402.08 | 403 | 0.0000 | 0.0063 | 1 | 403 | 0.0000 | 0.0221 | 2 | 403 | 1.0000 | 0.9430 | 3 |
| 403.08 | 404 | 0.0000 | 0.0063 | 1 | 404 | 0.0000 | 0.0221 | 2 | 404 | 1.0000 | 0.9430 | 3 |
| 404.08 | 405 | 0.0000 | 0.0063 | 1 | 405 | 0.0000 | 0.0221 | 2 | 405 | 1.0000 | 0.9430 | 3 |
| 405.08 | 406 | 0.0000 | 0.0063 | 1 | 406 | 0.0000 | 0.0221 | 2 | 406 | 1.0000 | 0.9429 | 3 |
| 406.08 | 407 | 0.0000 | 0.0063 | 1 | 407 | 0.0000 | 0.0221 | 2 | 407 | 1.0000 | 0.9429 | 3 |
| 407.08 | 408 | 0.0000 | 0.0063 | 1 | 408 | 0.0000 | 0.0221 | 2 | 408 | 1.0000 | 0.9429 | 3 |
| 408.08 | 409 | 0.0000 | 0.0057 | 1 | 409 | 0.0000 | 0.0230 | 2 | 409 | 1.0000 | 0.9480 | 3 |
| 409.08 | 410 | 0.0000 | 0.0045 | 1 | 410 | 0.0000 | 0.0255 | 2 | 410 | 1.0000 | 0.9669 | 3 |
| 410.08 | 411 | 0.0000 | 0.0036 | 1 | 411 | 0.0000 | 0.0291 | 2 | 411 | 1.0000 | 0.9687 | 3 |
| 411.08 | 412 | 0.0000 | 0.0031 | 1 | 412 | 0.0000 | 0.0305 | 2 | 412 | 1.0000 | 0.9412 | 3 |
| 412.08 | 413 | 0.0000 | 0.0031 | 1 | 413 | 0.0000 | 0.0301 | 2 | 413 | 1.0000 | 0.9528 | 3 |
| 413.08 | 414 | 0.0000 | 0.0032 | 1 | 414 | 0.0000 | 0.0301 | 2 | 414 | 1.0000 | 0.9579 | 3 |
| 414.08 | 415 | 0.0000 | 0.0033 | 1 | 415 | 0.0000 | 0.0301 | 2 | 415 | 1.0000 | 0.9599 | 3 |
| 415.08 | 416 | 0.0000 | 0.0033 | 1 | 416 | 0.0000 | 0.0299 | 2 | 416 | 1.0000 | 0.9612 | 3 |
| 416.08 | 417 | 0.0000 | 0.0033 | 1 | 417 | 0.0000 | 0.0298 | 2 | 417 | 1.0000 | 0.9616 | 3 |
| 417.08 | 418 | 0.0000 | 0.0034 | 1 | 418 | 0.0000 | 0.0291 | 2 | 418 | 1.0000 | 0.9622 | 3 |
| 418.08 | 419 | 0.0000 | 0.0034 | 1 | 419 | 0.0000 | 0.0282 | 2 | 419 | 1.0000 | 0.9627 | 3 |
| 419.08 | 420 | 0.0000 | 0.0036 | 1 | 420 | 0.0000 | 0.0268 | 2 | 420 | 1.0000 | 0.9630 | 3 |
| 420.08 | 421 | 0.0000 | 0.0038 | 1 | 421 | 0.0000 | 0.0252 | 2 | 421 | 1.0000 | 0.9630 | 3 |
| 421.08 | 422 | 0.0000 | 0.0042 | 1 | 422 | 0.0000 | 0.0235 | 2 | 422 | 1.0000 | 0.9629 | 3 |
| 422.08 | 423 | 0.0000 | 0.0045 | 1 | 423 | 0.0000 | 0.0226 | 2 | 423 | 1.0000 | 0.9629 | 3 |
| 423.08 | 424 | 0.0000 | 0.0044 | 1 | 424 | 0.0000 | 0.0225 | 2 | 424 | 1.0000 | 0.9632 | 3 |
| 424.08 | 425 | 0.0000 | 0.0041 | 1 | 425 | 0.0000 | 0.0234 | 2 | 425 | 1.0000 | 0.9636 | 3 |
| 425.08 | 426 | 0.0000 | 0.0039 | 1 | 426 | 0.0000 | 0.0242 | 2 | 426 | 1.0000 | 0.9639 | 3 |
| 426.08 | 427 | 0.0000 | 0.0036 | 1 | 427 | 0.0000 | 0.0253 | 2 | 427 | 1.0000 | 0.9639 | 3 |
| 427.08 | 428 | 0.0000 | 0.0035 | 1 | 428 | 0.0000 | 0.0258 | 2 | 428 | 1.0000 | 0.9639 | 3 |
| 428.08 | 429 | 0.0000 | 0.0055 | 1 | 429 | 0.0000 | 0.0205 | 2 | 429 | 1.0000 | 0.9650 | 3 |
| 429.08 | 430 | 0.0000 | 0.0069 | 1 | 430 | 0.0000 | 0.0191 | 2 | 430 | 1.0000 | 0.9683 | 3 |
| 430.08 | 431 | 0.0000 | 0.0072 | 1 | 431 | 0.0000 | 0.0195 | 2 | 431 | 1.0000 | 0.9700 | 3 |
| 431.08 | 432 | 0.0000 | 0.0072 | 1 | 432 | 0.0000 | 0.0194 | 2 | 432 | 1.0000 | 0.9702 | 3 |
| 432.08 | 433 | 0.0000 | 0.0072 | 1 | 433 | 0.0000 | 0.0194 | 2 | 433 | 1.0000 | 0.9703 | 3 |
| 433.08 | 434 | 0.0000 | 0.0072 | 1 | 434 | 0.0000 | 0.0193 | 2 | 434 | 1.0000 | 0.9704 | 3 |
| 434.08 | 435 | 0.0000 | 0.0072 | 1 | 435 | 0.0000 | 0.0192 | 2 | 435 | 1.0000 | 0.9704 | 3 |
| 435.08 | 436 | 0.0000 | 0.0072 | 1 | 436 | 0.0000 | 0.0191 | 2 | 436 | 1.0000 | 0.9705 | 3 |
| 436.08 | 437 | 0.0000 | 0.0071 | 1 | 437 | 0.0000 | 0.0191 | 2 | 437 | 1.0000 | 0.9705 | 3 |
| 437.08 | 438 | 0.0000 | 0.0071 | 1 | 438 | 0.0000 | 0.0190 | 2 | 438 | 1.0000 | 0.9705 | 3 |
| 438.08 | 439 | 0.0000 | 0.0070 | 1 | 439 | 0.0000 | 0.0190 | 2 | 439 | 1.0000 | 0.9706 | 3 |
| 439.08 | 440 | 0.0000 | 0.0070 | 1 | 440 | 0.0000 | 0.0190 | 2 | 440 | 1.0000 | 0.9706 | 3 |
| 440.08 | 441 | 0.0000 | 0.0070 | 1 | 441 | 0.0000 | 0.0190 | 2 | 441 | 1.0000 | 0.9706 | 3 |
| 441.08 | 442 | 0.0000 | 0.0070 | 1 | 442 | 0.0000 | 0.0190 | 2 | 442 | 1.0000 | 0.9706 | 3 |
| 442.08 | 443 | 0.0000 | 0.0071 | 1 | 443 | 0.0000 | 0.0190 | 2 | 443 | 1.0000 | 0.9707 | 3 |
| 443.08 | 444 | 0.0000 | 0.0071 | 1 | 444 | 0.0000 | 0.0190 | 2 | 444 | 1.0000 | 0.9707 | 3 |
| 444.08 | 445 | 0.0000 | 0.0071 | 1 | 445 | 0.0000 | 0.0190 | 2 | 445 | 1.0000 | 0.9707 | 3 |
| 445.08 | 446 | 0.0000 | 0.0071 | 1 | 446 | 0.0000 | 0.0190 | 2 | 446 | 1.0000 | 0.9708 | 3 |
| 446.08 | 447 | 0.0000 | 0.0071 | 1 | 447 | 0.0000 | 0.0190 | 2 | 447 | 1.0000 | 0.9708 | 3 |
| 447.08 | 448 | 0.0000 | 0.0071 | 1 | 448 | 0.0000 | 0.0190 | 2 | 448 | 1.0000 | 0.9707 | 3 |
| 448.08 | 449 | 0.0000 | 0.0071 | 1 | 449 | 0.0000 | 0.0190 | 2 | 449 | 1.0000 | 0.9707 | 3 |
| 449.08 | 450 | 0.0000 | 0.0071 | 1 | 450 | 0.0000 | 0.0190 | 2 | 450 | 1.0000 | 0.9707 | 3 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 450.08 | 451 | 0.0000 | 0.0071 | 1 | 451 | 0.0000 | 0.0190 | 2 | 451 | 1.0000 | 0.9706 | 3 |
| 451.08 | 452 | 0.0000 | 0.0071 | 1 | 452 | 0.0000 | 0.0190 | 2 | 452 | 1.0000 | 0.9706 | 3 |
| 452.08 | 453 | 0.0000 | 0.0071 | 1 | 453 | 0.0000 | 0.0190 | 2 | 453 | 1.0000 | 0.9706 | 3 |
| 453.08 | 454 | 0.0000 | 0.0071 | 1 | 454 | 0.0000 | 0.0190 | 2 | 454 | 1.0000 | 0.9705 | 3 |
| 454.08 | 455 | 0.0000 | 0.0071 | 1 | 455 | 0.0000 | 0.0191 | 2 | 455 | 1.0000 | 0.9705 | 3 |
| 455.08 | 456 | 0.0000 | 0.0071 | 1 | 456 | 0.0000 | 0.0191 | 2 | 456 | 1.0000 | 0.9705 | 3 |
| 456.08 | 457 | 0.0000 | 0.0071 | 1 | 457 | 0.0000 | 0.0191 | 2 | 457 | 1.0000 | 0.9705 | 3 |
| 457.08 | 458 | 0.0000 | 0.0071 | 1 | 458 | 0.0000 | 0.0191 | 2 | 458 | 1.0000 | 0.9705 | 3 |
| 458.08 | 459 | 0.0000 | 0.0071 | 1 | 459 | 0.0000 | 0.0191 | 2 | 459 | 1.0000 | 0.9704 | 3 |
| 459.08 | 460 | 0.0000 | 0.0071 | 1 | 460 | 0.0000 | 0.0190 | 2 | 460 | 1.0000 | 0.9704 | 3 |
| 460.08 | 461 | 0.0000 | 0.0070 | 1 | 461 | 0.0000 | 0.0190 | 2 | 461 | 1.0000 | 0.9704 | 3 |
| 461.08 | 462 | 0.0000 | 0.0070 | 1 | 462 | 0.0000 | 0.0190 | 2 | 462 | 1.0000 | 0.9703 | 3 |
| 462.08 | 463 | 0.0000 | 0.0070 | 1 | 463 | 0.0000 | 0.0190 | 2 | 463 | 1.0000 | 0.9703 | 3 |
| 463.08 | 464 | 0.0000 | 0.0070 | 1 | 464 | 0.0000 | 0.0190 | 2 | 464 | 1.0000 | 0.9703 | 3 |
| 464.08 | 465 | 0.0000 | 0.0070 | 1 | 465 | 0.0000 | 0.0190 | 2 | 465 | 1.0000 | 0.9703 | 3 |
| 465.08 | 466 | 0.0000 | 0.0070 | 1 | 466 | 0.0000 | 0.0190 | 2 | 466 | 1.0000 | 0.9703 | 3 |
| 466.08 | 467 | 0.0000 | 0.0070 | 1 | 467 | 0.0000 | 0.0190 | 2 | 467 | 1.0000 | 0.9703 | 3 |
| 467.08 | 468 | 0.0000 | 0.0070 | 1 | 468 | 0.0000 | 0.0190 | 2 | 468 | 1.0000 | 0.9703 | 3 |
| 468.08 | 469 | 0.0000 | 0.0071 | 1 | 469 | 0.0000 | 0.0191 | 2 | 469 | 1.0000 | 0.9703 | 3 |
| 469.08 | 470 | 0.0000 | 0.0071 | 1 | 470 | 0.0000 | 0.0191 | 2 | 470 | 1.0000 | 0.9704 | 3 |
| 470.08 | 471 | 0.0000 | 0.0071 | 1 | 471 | 0.0000 | 0.0191 | 2 | 471 | 1.0000 | 0.9704 | 3 |
| 471.08 | 472 | 0.0000 | 0.0071 | 1 | 472 | 0.0000 | 0.0191 | 2 | 472 | 1.0000 | 0.9704 | 3 |
| 472.08 | 473 | 0.0000 | 0.0071 | 1 | 473 | 0.0000 | 0.0191 | 2 | 473 | 1.0000 | 0.9704 | 3 |
| 473.08 | 474 | 0.0000 | 0.0071 | 1 | 474 | 0.0000 | 0.0191 | 2 | 474 | 1.0000 | 0.9704 | 3 |
| 474.08 | 475 | 0.0000 | 0.0071 | 1 | 475 | 0.0000 | 0.0191 | 2 | 475 | 1.0000 | 0.9704 | 3 |
| 475.08 | 476 | 0.0000 | 0.0071 | 1 | 476 | 0.0000 | 0.0191 | 2 | 476 | 1.0000 | 0.9704 | 3 |
| 476.08 | 477 | 0.0000 | 0.0071 | 1 | 477 | 0.0000 | 0.0191 | 2 | 477 | 1.0000 | 0.9704 | 3 |
| 477.08 | 478 | 0.0000 | 0.0072 | 1 | 478 | 0.0000 | 0.0191 | 2 | 478 | 1.0000 | 0.9705 | 3 |
| 478.08 | 479 | 0.0000 | 0.0072 | 1 | 479 | 0.0000 | 0.0191 | 2 | 479 | 1.0000 | 0.9705 | 3 |
| 479.08 | 480 | 0.0000 | 0.0071 | 1 | 480 | 0.0000 | 0.0191 | 2 | 480 | 1.0000 | 0.9705 | 3 |
| 480.08 | 481 | 0.0000 | 0.0071 | 1 | 481 | 0.0000 | 0.0191 | 2 | 481 | 1.0000 | 0.9705 | 3 |
| 481.08 | 482 | 0.0000 | 0.0071 | 1 | 482 | 0.0000 | 0.0191 | 2 | 482 | 1.0000 | 0.9705 | 3 |
| 482.08 | 483 | 0.0000 | 0.0071 | 1 | 483 | 0.0000 | 0.0191 | 2 | 483 | 1.0000 | 0.9705 | 3 |
| 483.08 | 484 | 0.0000 | 0.0071 | 1 | 484 | 0.0000 | 0.0190 | 2 | 484 | 1.0000 | 0.9705 | 3 |
| 484.08 | 485 | 0.0000 | 0.0071 | 1 | 485 | 0.0000 | 0.0190 | 2 | 485 | 1.0000 | 0.9705 | 3 |
| 485.08 | 486 | 0.0000 | 0.0071 | 1 | 486 | 0.0000 | 0.0190 | 2 | 486 | 1.0000 | 0.9705 | 3 |
| 486.08 | 487 | 0.0000 | 0.0071 | 1 | 487 | 0.0000 | 0.0190 | 2 | 487 | 1.0000 | 0.9705 | 3 |
| 487.08 | 488 | 0.0000 | 0.0071 | 1 | 488 | 0.0000 | 0.0190 | 2 | 488 | 1.0000 | 0.9705 | 3 |
| 488.08 | 489 | 0.0000 | 0.0071 | 1 | 489 | 0.0000 | 0.0190 | 2 | 489 | 1.0000 | 0.9705 | 3 |
| 489.08 | 490 | 0.0000 | 0.0071 | 1 | 490 | 0.0000 | 0.0190 | 2 | 490 | 1.0000 | 0.9705 | 3 |
| 490.08 | 491 | 0.0000 | 0.0071 | 1 | 491 | 0.0000 | 0.0190 | 2 | 491 | 1.0000 | 0.9705 | 3 |
| 491.08 | 492 | 0.0000 | 0.0071 | 1 | 492 | 0.0000 | 0.0190 | 2 | 492 | 1.0000 | 0.9705 | 3 |
| 492.08 | 493 | 0.0000 | 0.0071 | 1 | 493 | 0.0000 | 0.0190 | 2 | 493 | 1.0000 | 0.9705 | 3 |
| 493.08 | 494 | 0.0000 | 0.0071 | 1 | 494 | 0.0000 | 0.0190 | 2 | 494 | 1.0000 | 0.9705 | 3 |
| 494.08 | 495 | 0.0000 | 0.0071 | 1 | 495 | 0.0000 | 0.0190 | 2 | 495 | 1.0000 | 0.9705 | 3 |
| 495.08 | 496 | 0.0000 | 0.0071 | 1 | 496 | 0.0000 | 0.0190 | 2 | 496 | 1.0000 | 0.9705 | 3 |
| 496.08 | 497 | 0.0000 | 0.0071 | 1 | 497 | 0.0000 | 0.0190 | 2 | 497 | 1.0000 | 0.9705 | 3 |
| 497.08 | 498 | 0.0000 | 0.0071 | 1 | 498 | 0.0000 | 0.0190 | 2 | 498 | 1.0000 | 0.9705 | 3 |

| | |
|---|---|
| RECALL SET SIZE | 498 |
| RECALL SET ERROR RMS | 0.201660 |
| MAX BIAS OR WEIGHT | 20.0000 |
| MAX GAIN OR CONSTANT | 2.0000 |

# APPENDIX E.

## COMPUTER PROGRAM LISTINGS

This Appendix contains an alphabetical listing of the computer programs written for use in this dissertation. Listed are the training, recall, and data generation and manipulation programs.

### E.1 Program BPN.FOR

The File BPN.FOR contains the fortran backpropagation program which was used as a benchmark in the analyses shown in Appendix A. Below is a complete computer code listing.

```
      PROGRAM   BPN
C      BACKPROPAGATION (see [He4 p601])
      COMMON        NL,IDPRS,N(5),PI,TOT
      COMMON /XS/   XD(101,40),X1(5,101,40)
      COMMON /WTS/  WT(4,40,40),GAIN,DWT(4,40,40),ERR(4,101,40)
      COMMON /GS/   GSWX(4,101,40)
      INTEGER*4     IREPMX,JRNA
      CHARACTER     STUF*1,FRNT*3,FNAME*15,FNAME2*15,TITLE*79
      WRITE(*,'('' PROGRAM BPN.FOR  '')')
      WRITE(*,'('' INPUT FILE NAME ROOT = [###.NNI] '')')
      READ (*,'(A3)')                          FNRT
      WRITE(FNAME,'(A3,''.NNB'')')             FNRT
      OPEN (1,FILE=FNAME,STATUS='OLD')
      WRITE(FNAME2,'(A3,''.PRB'')')            FNRT
      WRITE(FNAME,'(A3,''.DDI'')')             FNRT
      OPEN (8,FILE=FNAME,STATUS='OLD')
```

```
      WRITE(FNAME,'(A3,''.WTB'')')          FNRT
C      READ INPUT FILE
      READ (1,'(1X,A79)')       TITLE
      READ (1,'(1X,12I5)')      NL,N(1),IDPRS,IREPMX,NHM,IFWTS,ISMAX,
     &                          IRCL,IDPRSM
      READ (1,'(1X,10I5)')      (N(I),I=1,NL)
      READ (1,'(1X,5F10.6)')    GAIN,RATE
      WRITE(*,'(5X,'' PROGRAM BPN.FOR  '')')
      WRITE(*,'(5X,A70)')       TITLE
      WRITE(*,'(5X,'' GAIN                    '',F10.6)')    GAIN
      WRITE(*,'(5X,'' RATE                    '',F10.6)')    RATE
      WRITE(*,'('' # OF LAYERS '',I5,''   # OF INPUTS     '',I5,/,
     &          '' i-d PAIRS   '',I5,''   # OF REPETITIONS'',I5,/,
     &          '' REPS PER PRN'',I5,''   WEIGHT FILE     '',I5,/,
     &          '' PRN SAVE    '',I5,''   RECALL MODE     '',I5,/,
     &          '' RCL IDPRS   '',I5)')
     & NL,N(1),IDPRS,IREPMX,NHM,IFWTS,ISMAX,IRCL,IDPRSM
      IF(IRCL.EQ.1) IDPRS=IDPRSM
      FIDPRS=FLOAT(IDPRS)
      PI=3.14159265
      NL1=NL-1
      WRITE(*,'('' NETWORK GEOMETRY '')')
      DO  5 II=NL,1,-1
      WRITE(*,'(20I4)') (I+II*100,I=1,N(II))
    5 CONTINUE
      DO  10 ID=1,IDPRS
      READ(8,'(2X,10F7.4)')          (X1(1,ID,I),I=1,N(1))
      READ(8,'(2X,10F7.4)')          (XD(ID,I), I=1,N(NL))
C      WRITE(*,'(2X,10E10.4)')        (X1(1,ID,I),I=1,N(1))
C      WRITE(*,'(2X,  E10.4)')        (XD(ID,I),I=1,N(NL))
   10 CONTINUE
      IF(IRCL.EQ.1)  THEN
      WRITE(*,'(5X,''RECALL MODE'')')
      OPEN (4,FILE=FNAME,STATUS='OLD')
      CALL WTS1(1)
      OPEN (5,FILE=FNAME2,STATUS='NEW')
      CALL RCL2
      DO 7298 ID=1,IDPRSM
      DO 7298 IO=1,N(NL)
      WRITE(5,'(1X,2I6,3F10.7,I6)')  ISETS,ID,XD(ID,IO),
     &             X1(NL,ID,IO),XD(ID,IO)-X1(NL,ID,IO),IO
 7298 CONTINUE
      WRITE(5,'(5X,''ISETS  IDPR    XD       X  '',
     &''     ERROR    IO'')')
      WRITE(5,'(5X,''RECALL SET SIZE            '',I10)')   IDPRSM
      WRITE(5,'(5X,''RECALL SET ERROR RMS       '',F10.6)') TOT
      WRITE(5,'(5X,''GAIN IS                    '',F10.6,/,5X,
     &            ''RATE IS                     '',F10.6,/,5X,
```

```
     &             ''NETWORK ARCHITECTURE   '',5I3)')
     &               GAIN,RATE,(N(II),II=1,NL)
      GO TO 999
      ENDIF
      IF(IFWIS.EQ.0) WRITE(*,'(6X,''###.WIS ERASE MODE'')')
      IF(IFWIS.EQ.1) WRITE(*,'(6X,''###.WIS READ MODE'')')
C      READ ###.WIS FILE
      IF(IFWIS.NE.1) GOTO 15
      OPEN (4,FILE=FNAME,STATUS='OLD')
      CALL WIS1(1)
      GO TO 30
   15 CONTINUE
      OPEN (4,FILE=FNAME,STATUS='NEW')
      WRITE(*,'(6X,''INPUT RANDOM SEED (I5), [37591=DEFAULT]'')')
      READ(*,'(I6)') JRNA
      IF(JRNA.GT.0.) GO TO 160
      JRNA=37591
  160 CONTINUE
      DO  20 L3=2,NL
      L31=L3-1
      DO  20 L2=1,N(L3)
      DO  20 L1=1,N(L31)
      CALL RANDOM(JRNA,RN)
      WT(L31,L2,L1)=RN
C      WRITE(*,'('' RN,WT(L31,L2,L1),L3,L2,L1'',2E10.4,3I5)')
C     &             RN,WT(L31,L2,L1),L31,L2,L1
   20 CONTINUE
   30 CONTINUE
      WRITE(*,'(''    IREPS     XD      ERROR    TOT      '')')
C      FORWARD RECALL
      DO 500 IREPS=1,IREPMX
      CALL RCL2
      NH=NH+1
      IF(NH.LT.NHM) GO TO 399
      NH=0
      WRITE(*,'(1X,I6,5F10.6)') IREPS,XD(1,1),X1(NL,1,1)-XD(1,1),TOT
      ISAVE=ISAVE+1
      IF(ISAVE.LT.ISMAX) GO TO 399
      ISAVE=0
      CALL WIS1(0)
  399 CONTINUE
C      ERROR OF OUTPUT LAYER
      DO 650 ID=1,IDPRS
      DO 550 L2=1,N(NL)
      ERR(NL1,ID,L2)=-2.*(XD(ID,L2)-X1(NL,ID,L2))
     &                    /(PI*(1.+GSWX(NL1,ID,L2)**2))
  550 CONTINUE
C      ERRORS FOR HIDDEN LAYERS
```

```
      DO 650 L3=NL1,2,-1
      L31=L3-1
      L3P1=L3+1
      DO 650 L2=1,N(L3)
      ERR(L31,ID,L2)=0.
      DO 651 L1=1,N(L3P1)
      ERR(L31,ID,L2)=ERR(L31,ID,L2)+ERR(L3,ID,L1)*WT(L3,L1,L2)
  651 CONTINUE
      ERR(L31,ID,L2)=ERR(L31,ID,L2)/(PI*(1.+GSWX(L31,ID,L2)**2))
  650 CONTINUE
C      FIND DELTA WEIGHTS
      DO 750 L3=2,NL
      L31=L3-1
      DO 750 L2=1,N(L3)
      DO 750 L1=1,N(L31)
      DWT(L31,L2,L1)=0.
      DO 751 ID=1,IDPRS
      DWT(L31,L2,L1)=DWT(L31,L2,L1)+ERR(L31,ID,L2)*X1(L31,ID,L1)
  751 CONTINUE
      WT(L31,L2,L1)=WT(L31,L2,L1)-RATE*DWT(L31,L2,L1)/FIDPRS
  750 CONTINUE
  500 CONTINUE
      CALL WTS1(0)
  999 STOP
      END
C
      SUBROUTINE    RCL2
      COMMON        NL,IDPRS,N(5),PI,TOT
      COMMON /XS/   XD(101,40),X1(5,101,40)
      COMMON /WTS/  WT(4,40,40),GAIN,DWT(4,40,40),ERR(4,101,40)
      COMMON /GS/   GSWX(4,101,40)
      TOT=0.
      DO 290 ID=1,IDPRS
      DO 270 L3=2,NL
      L31=L3-1
      DO 270 L2=1,N(L3)
      GSWX(L31,ID,L2)=0.
      DO 260 L1=1,N(L31)
      GSWX(L31,ID,L2)=GSWX(L31,ID,L2)+WT(L31,L2,L1)*X1(L31,ID,L1)
  260 CONTINUE
      X1(L3,ID,L2)=ATAN(GSWX(L31,ID,L2)*GAIN)/PI+.5
  270 CONTINUE
      DO 280 L2=1,N(NL)
C      WRITE(*,'('' XD(ID,L2),X1(NL,ID,L2)'',2E10.4)')
C     &             XD(ID,L2),X1(NL,ID,L2)
      TOT=TOT+(XD(ID,L2)-X1(NL,ID,L2))**2
  280 CONTINUE
  290 CONTINUE
```

```
C       RMS ERROR
        TOT=SQRT(TOT/FLOAT(IDPRS*N(NL)))
        RETURN
        END
C
        SUBROUTINE    RANDOM(JRN1,RN5)
        INTEGER*4     JRN1
        JRN1=MOD(JRN1*7141+54773,259200)
        RN5=FLOAT(JRN1)/259200.
        RETURN
        END
C
        SUBROUTINE    WTS1(IN)
        COMMON        NL,IDPRS,N(5),PI,TOT
        COMMON /WTS/  WT(4,40,40),GAIN,DWT(4,40,40),ERR(4,101,40)
        REWIND(4)
        DO 30 L31=1,NL-1
        DO 30 L2=1,N(L31+1)
        GO TO (10) IN
        WRITE(4,'(1X,44E13.7)') (WT(L31,L2,L1),L1=1,N(L31))
        GO TO 30
   10   CONTINUE
        READ(4,'(1X,44E13.7)')  (WT(L31,L2,L1),L1=1,N(L31))
   30   CONTINUE
        RETURN
        END
```

## E.2 Program GDGEN.FOR

This fortran program generates the Gaussian distribution input file GDS.DDI used in the benchmark example of Appendix A.4. A complete code listing is given below.

```
C      FILE GDGEN.FOR ;  GAUSSIAN DISTRIBUTION GENERATOR
       REAL*4 M,SIG,XI,RND,XD,X1,X0,XIMAX,X2,XIOUT
       REAL*8 RN,RNSUM,RNSD,A
       INTEGER*4 N,J3,J5,IG,J100,JRAN,IA,IM,IC,II,IOUT
       CHARACTER*3   FNRT
       CHARACTER*15  FNAME
       DIMENSION M(9),SIG(9),XI(9,201),XD(9),XIOUT(9)
       WRITE(*,'('' GDGEN.FOR ; GAUSSIAN DISTRIBUTION'',
      &'' GENERATOR'')')
       WRITE(*,'('' FOR NEURAL NETWORK INPUT'')')
       WRITE(*,'('' HOW MANY IPRD'')')
       READ (*,'(I10)') IPRD
       WRITE(*,'('' HOW MANY IDPRS [FOR EACH DISTRIBUTION]'')')
       READ (*,'(I10)') IDPRS
       WRITE(*,'('' HOW MANY GAUSSIANS [MAX=9]'')')
       READ (*,'(I10)') IG
       WRITE(*,'('' M(1), SIG(1) ARE THE GOOD [XD=1.] '')')
       WRITE(*,'('' ALL OTHERS XD=0.]                 '')')
       DO 661 J100=1,IG
       WRITE(*,'('' :  M('',I1,''):SIG('',I1,''):'')') J100,J100
       READ (*,524) M(J100),SIG(J100)
       WRITE(*,524) M(J100),SIG(J100)
  524 FORMAT(1X,2F7.3)
  661 CONTINUE
       WRITE(*,'('' SINGLE OUTPUT [1] OR MULTIPLE OUTPUT [2]'')')
       READ (*,'(I10)')  IOUT
       WRITE(*,'('' INPUT FILE NAME ROOT = [###.DDI] '')')
       READ (*,'(A3)')                  FNRT
       WRITE(FNAME,'(A3,''.DDI'')')     FNRT
       OPEN(4,FILE=FNAME,STATUS='NEW')
       WRITE(FNAME,'(A3,''.ACT'')')     FNRT
       OPEN(2,FILE=FNAME,STATUS='NEW')
       WRITE(FNAME,'(A3,''.TXT'')')     FNRT
       OPEN(1,FILE=FNAME,STATUS='NEW')
```

```
      WRITE(1,'('' GDGEN.FOR ; GAUSSIAN DISTRIBUTION'',
     &'' GENERATOR'')')
      WRITE(1,'('' FOR NEURAL NETWORK INPUT'')')
      WRITE(1,'('' HOW MANY IPRD'')')
      WRITE(1,'(I10)') IPRD
      WRITE(1,'('' HOW MANY IDPRS [FOR EACH DISTRIBUTION]'')')
      WRITE(1,'(I10)') IDPRS
      WRITE(1,'('' HOW MANY GAUSSIANS [MAX=9]'')')
      WRITE(1,'(I10)') IG
      WRITE(1,'('' M(1), SIG(1) ARE THE GOOD [XD=1.] '')')
      WRITE(1,'('' ALL OTHERS XD=0.]                  '')')
      DO 1661 J100=1,IG
      WRITE(1,'('' :  M('',I1,''):SIG('',I1,''):'')') J100,J100
      WRITE(1,524) M(J100),SIG(J100)
 1661 CONTINUE
      WRITE(1,'('' SINGLE OUTPUT [1] OR MULTIPLE OUTPUT [2]'')')
      WRITE(1,'(I10)')  IOUT
      WRITE(1,'('' INPUT FILE NAME ROOT = [###.DDI] '')')
C      RANDOM # SEED AND MULTIPLIER
      IM=259200
      IA=7141
      IC=54773
      JRAN=37591
      WRITE(*,'('' INPUT RANDOM SEED (I25), [37591=DEFAULT] '')')
      READ (*,'(I25)') JRAN
      IF   (JRAN.NE.0.) GO TO 160
      JRAN=37591
  160 CONTINUE
      X0=0.0
      X1=1.0
C      MAKE GAUSSIAN, FOR M(1), USE THE REJECTION METHOD
C      M(1)=MEAN ,SIG(1)=SIGMA
      WRITE(*,'('' WORKING !'')')
      DO 700 ID=1,IDPRS
      DO 710 J3=1,IG
      DO 720 J5=1,IPRD
  550 CONTINUE
C      RANDOM # GENERATOR
      JRAN=MOD(JRAN*IA+IC,IM)
      RN=FLOAT(JRAN)/FLOAT(IM)
      XI(J3,J5)=(-4.*SIG(J3))+RN*(8.*SIG(J3))
      RND=EXP(-(XI(J3,J5)**2)/(2*SIG(J3)**2))
C      REJECTION CRITERIA FOR CREATING A GAUSSIAN
      JRAN=MOD(JRAN*IA+IC,IM)
      RN=FLOAT(JRAN)/FLOAT(IM)
      IF(RN.LE.RND) GOTO 600
C      OPEN(3,FILE='INTER.ACT',STATUS='NEW')
      GOTO 550
```

```
  600 CONTINUE
  720 CONTINUE
C      PRINT OUT TO ###.ACT FILE
      WRITE(2,'(2X,20E12.6)')     (XI(J3,II)+M(J3),II=1,IPRD)
  710 CONTINUE
  700 CONTINUE
      WRITE(*,'('' WRITING ###.DDI FILE'')')
      REWIND(2)
      DO 2700 ID=1,IDPRS
      DO 2710 J3=1,IG
      READ (2,'(2X,20E12.6)')    (XI(J3,II),II=1,IPRD)
      WRITE(4,'(''i '',20F7.4)')     (XI(J3,II),II=1,IPRD)
      IF    (IOUT.EQ.1) THEN
      IF    (J3.EQ.1)    THEN
      WRITE(4,'(''d '',  F7.4)')     X1
      ELSE
      WRITE(4,'(''d '',  F7.4)')     X0
      ENDIF
      ELSE
      DO 7000 J5=1,IG
      XIOUT(J5)=0
 7000 CONTINUE
      XIOUT(J3)=1.0
      WRITE(4,'(''d '', 9F7.4)')     (XIOUT(II),II=1,IG)
      ENDIF
 2710 CONTINUE
 2700 CONTINUE
 9998 STOP
      END
```

## E.3 Program RCL.FOR

This fortran program is used to recall a network trained by the SCN.FOR simulated condensation methodology. A complete code listing is given below.

```
C$STORAGE:2
C$NOLIST
C$DEBUG
      PROGRAM       RCL
      CHARACTER     FNRT*3,TYPE*4,FNAME*7,WTSNM*7,TITLE*79,PRX*1
      COMMON NL,NL1,IDPRS,N(5),PI,B(17),TOT(4),FIDPRS,XVAL(5,40)
      COMMON /XS/   XD(501,40) ,X1(5,501,40),TIME(501)
      COMMON /WTS/  WT(2,4,40,40),BGK(3,2,4,40)
      DIMENSION     IREPMX(4),IBGK(4),TYPE(4),ADR(4)
      DATA          TYPE/'WTS ','BIAS','GAIN','KONS'/
      WRITE(*,'(''  CONDENSATION RECALL PROGRAM RCL.FOR'')')
      WRITE(*,'(''  INPUT-FILE NAME ROOT = [###.NNI] '')')
      READ(*,'(A3)')                FNRT
      WRITE(*,'(''  HOW MANY CLASSES IN THIS FILE [1...8] ?'')')
      READ(*,'(I10)')               IINF
      WRITE(*,'(''  HOW MANY IN THE RECALL SET ? [MAX=500]'')')
      READ(*,'(I10)')               IDPRSM
      WRITE(*,'(''  READ IN ONLY THE [1...8]th CLASS [0=ALL]'')')
      READ(*,'(I10)')               IOUT
      WRITE(*,'(''  OUTPUT ONLY THE [1...8]th OUTPUT NODE [0=ALL]'')')
      READ(*,'(I10)')               IIOUT
      IF(IIOUT.EQ.0) THEN
      WRITE(*,'(''  OUTPUT ALL EXCEPT [1..8]th [OUTPUT ALL=0]'')')
      READ(*,'(I10)')               IEXC
      ENDIF
      WRITE(*,'(''  DO YOU WANT THE 0/1 OPTION [1=YES]'')')
      READ(*,'(I10)')               IZ1
      IF(IZ1.EQ.1) THEN
      WRITE(*,'(''  MIN XMAX [.2],[F12.6]'')')
      READ(*,'(F12.6)')             XMXMAX
      WRITE(*,'(''  XMXMAX'',F12.6)') XMXMAX
      ENDIF
      WRITE(FNAME,'(A3,''.NNI'')')  FNRT
      OPEN(7,FILE=FNAME,STATUS='OLD')
      WRITE(FNAME,'(A3,''.DDI'')')  FNRT
      OPEN(8,FILE=FNAME,STATUS='OLD')
      WRITE(WTSNM,'(A3,''.WTS'')')  FNRT
```

```
      READ(7,'(1X,A70)')              TITLE
      WRITE(*,'(5X,A70)')    TITLE
      READ(7,'(1X,12I5)')  NL,IDPRS,ISETMX,IREPMX(1),IREPMX(2),
     &     IREPMX(3),IREPMX(4),ITOTMX,ISCMAX,IDPRSX,NHM,IFWTS
      READ(7,'(1X,10I5)')    (N(I),I=1,NL)
      READ(7,'(1X,8F10.6)') B(1),B(2),B(3),B(4),B(5),B(6),B(7),B(16)
      READ(7,'(1X,8F10.6)') B(8),B(9),B(10),B(11),B(12),B(13),B(14),
     &                      B(15)
      WRITE(*,'(5X,
     &     '' # OF LAYERS     '',I5,''   # OF SYSTEM INPUTS '',I5,/,
     &  5X,'' i-d PAIRS      '',I5,''   .WTS REP PER SET   '',I5,/,
     &  5X,'' RCLS PR PRNT   '',I5,''   WEIGHT FILE        '',I5,/,
     &  5X,'' ISETS          '',I5,''   PRINT KICK EVRY    '',I5,/,
     &  5X,'' BIAS REPS      '',I5,''   GAIN REPS          '',I5,/,
     &  5X,'' K1 REPS        '',I5,''   MAX SUCCESS REP    '',I5,/,
     &  5X,'' IDPRS FOR RCL  '',I5)')
     &  NL,N(1),IDPRS,IREPMX(1),NHM,IFWTS,ISETMX,ITOTMX,IREPMX(2),
     &  IREPMX(3),IREPMX(4),ISCMAX,IXX
      WRITE(*,'(5X,'' READING INPUT DATA !'')')
      NL1=NL-1
      DO 40 ID=1,IDPRSM
      IF(IOUT.EQ.0) THEN
      READ(8,'(2X,10F7.4)') (X1(1,ID,I),I=1,N(1))
      READ(8,'(2X,10F7.4)') (XD(ID,I), I=1,N(NL)),TIME(ID)
      ENDIF
      DO 40 IOP=1,IINF
      IF(IOUT.EQ.IOP) THEN
      DO 21 IUO=1,IOP-1
      READ(8,'(2X,10F7.4)') (XX,I=1,N(1))
      READ(8,'(2X,10F7.4)') (XX,I=1,N(NL))
   21 CONTINUE
      READ(8,'(2X,10F7.4)') (X1(1,ID,I),I=1,N(1))
      READ(8,'(2X,10F7.4)') (XD(ID,I), I=1,N(NL)),TIME(ID)
      DO 22 IOU=IOP+1,IINF
      READ(8,'(2X,10F7.4)') (XX,I=1,N(1))
      READ(8,'(2X,10F7.4)') (XX,I=1,N(NL))
   22 CONTINUE
      ENDIF
   40 CONTINUE
      OPEN(1,FILE=WTSNM,STATUS='OLD')
      READ(1,'(1X,2E13.7,6I10)') B(5),B(10),NL,(N(II),II=1,NL)
      PI=3.141593
      PI2=PI/2.
      IDPRSO=IDPRS
      FIDPRS=FLOAT(IDPRS)
      SMALL=0.00001
      IF(IZ1.NE.1) THEN
```

```
      IF((IIOUT.EQ.0).AND.(IEXC.EQ.0))
     &WRITE(FNAME,'(A3,''.PRN'')') FNRT
      IF(IEXC.NE.0) THEN
      WRITE(FNAME,'(A3,''.PRX'')') FNRT
      ELSE
      IF(IIOUT.EQ.1)WRITE(FNAME,'(A3,''.PR1'')') FNRT
      IF(IIOUT.EQ.2)WRITE(FNAME,'(A3,''.PR2'')') FNRT
      IF(IIOUT.EQ.3)WRITE(FNAME,'(A3,''.PR3'')') FNRT
      IF(IIOUT.EQ.4)WRITE(FNAME,'(A3,''.PR4'')') FNRT
      IF(IIOUT.EQ.5)WRITE(FNAME,'(A3,''.PR5'')') FNRT
      IF(IIOUT.EQ.6)WRITE(FNAME,'(A3,''.PR6'')') FNRT
      IF(IIOUT.EQ.7)WRITE(FNAME,'(A3,''.PR7'')') FNRT
      IF(IIOUT.EQ.8)WRITE(FNAME,'(A3,''.PR8'')') FNRT
      ENDIF
      ELSE
      IF((IIOUT.EQ.0).AND.(IEXC.EQ.0))
     &WRITE(FNAME,'(A3,''.PRZ'')') FNRT
      IF(IEXC.NE.0) THEN
      WRITE(FNAME,'(A3,''.PXZ'')') FNRT
      ELSE
      IF(IIOUT.EQ.1)WRITE(FNAME,'(A3,''.PZ1'')') FNRT
      IF(IIOUT.EQ.2)WRITE(FNAME,'(A3,''.PZ2'')') FNRT
      IF(IIOUT.EQ.3)WRITE(FNAME,'(A3,''.PZ3'')') FNRT
      IF(IIOUT.EQ.4)WRITE(FNAME,'(A3,''.PZ4'')') FNRT
      IF(IIOUT.EQ.5)WRITE(FNAME,'(A3,''.PZ5'')') FNRT
      IF(IIOUT.EQ.6)WRITE(FNAME,'(A3,''.PZ6'')') FNRT
      IF(IIOUT.EQ.7)WRITE(FNAME,'(A3,''.PZ7'')') FNRT
      IF(IIOUT.EQ.8)WRITE(FNAME,'(A3,''.PZ8'')') FNRT
      ENDIF
      ENDIF
      OPEN(6,FILE=FNAME,RECL=16000,STATUS='NEW')
      CALL WTS1(1,1)
      CALL RCL2(2,2,2,2)
      IDPRS=IDPRSM
      CALL RCL2(2,2,2,2)
      IF(IZ1.EQ.1) THEN
      DO 1496 ID=1,IDPRSM
      XMAX=-1000.
      DO 1497 IO=1,N(NL)
C      FIND LARGEST X IN EACH IO SET
      IF(X1(NL,ID,IO).GT.XMAX) THEN
      XMAX=X1(NL,ID,IO)
      IMAX=IO
      ENDIF
 1497 CONTINUE
      DO 1496 IO=1,N(NL)
      IF((IO.EQ.IMAX).AND.(X1(NL,ID,IO).GT.XMXMAX))
     &                THEN
```

```
      X1(NL,ID,IO)=1.
      ELSE
      X1(NL,ID,IO)=0.
      ENDIF
 1496 CONTINUE
C      SETS HIGHEST X TO ONE, ALL OTHERS=ZERO
      ENDIF
      IF((IOUT.EQ.0).AND.(IIOUT.EQ.0).AND.(IEXC.NE.0))THEN
      DO 496 ID=1,IDPRSM
      X1(NL,ID,IEXC)=0.
      WRITE(6,'(1X,F8.2,8(I5,2F8.4,I5))')
     &100.*TIME(ID),(ID,XD(ID,IO),X1(NL,ID,IO),IO,IO=1,N(NL))
  496 CONTINUE
      ELSE
      DO 7298 ID=1,IDPRSM
      DO 7298 IO=1,N(NL)
      IF(IIOUT.EQ.0) THEN
      IF(IOUT.EQ.0)
     &WRITE(6,'(1X,F8.2,I5,3F8.4,I5)') 100.*TIME(ID),ID,
     &XD(ID,IO),X1(NL,ID,IO),XD(ID,IO)-X1(NL,ID,IO),IO
      ELSE
      IF(IIOUT.EQ.IO) THEN
      IF(IOUT.EQ.0)
     &WRITE(6,'(1X,F8.2,I5,3F8.4,I5)') 100.*TIME(ID),ID,
     &XD(ID,IO),X1(NL,ID,IO),XD(ID,IO)-X1(NL,ID,IO),IO
      ENDIF
      ENDIF
      DO 7298 IOP=1,IINF
      IF(IOUT.EQ.IOP)
     &WRITE(6,'(1X,F8.2,I5,3F8.4,I5)') 100.*TIME(ID),ID,
     &XD(ID,IO),X1(NL,ID,IO),XD(ID,IO)-X1(NL,ID,IO),IO
 7298 CONTINUE
      ENDIF
      WRITE(6,'(5X,''TIME   IDPR    XD       X  '',
     &''     ERROR    IO'')')
      WRITE(6,'(5X,''RECALL SET SIZE           '',I10)')   IDPRSM
      WRITE(6,'(5X,''RECALL SET ERROR RMS      '',F10.6)') TOT(1)
      WRITE(6,'(5X,''MAX BIAS OR WEIGHT        '',F10.4,/,5X,
     &             ''MAX GAIN OR CONSTANT      '',F10.4,/,5X,
     &             ''FINAL NETWORK ARCHITECTURE '',5I3)')
     &              B(10),B(5),(N(II),II=1,NL)
  999 STOP
      END
C
      SUBROUTINE    RCL2(LJ1,LJ2,LJ3,LJ4)
      COMMON NL,NL1,IDPRS,N(5),PI,B(17),TOT(4),FIDPRS,XVAL(5,40)
      COMMON /XS/   XD(501,40) ,X1(5,501,40),TIME(501)
      COMMON /WTS/  WT(2,4,40,40),BGK(3,2,4,40)
```

```
      TOT(1)=0.
      DO 290 ID=1,IDPRS
      DO 270 L3=2,NL
      L31=L3-1
      DO 270 L2=1,N(L3)
      AA=0.
      DO 260 L1=1,N(L31)
      AA=AA+WT(LJ4,L31,L2,L1)*X1(L31,ID,L1)
  260 CONTINUE
      X1(L3,ID,L2)=BGK(3,LJ3,L31,L2)*(ATAN(AA*BGK(2,LJ2,L31,L2)
     &            +BGK(1,LJ1,L31,L2))/PI+.5)
  270 CONTINUE
      DO 280 IO=1,N(NL)
      TOT(1)=TOT(1)+(XD(ID,IO)-X1(NL,ID,IO))**2
  280 CONTINUE
  290 CONTINUE
      TOT(1)=SQRT(TOT(1)/FLOAT(IDPRS*N(NL)))
      RETURN
      END
C
      SUBROUTINE    WTS1(IN,NFL)
      COMMON NL,NL1,IDPRS,N(5),PI,B(17),TOT(4),FIDPRS,XVAL(5,40)
      COMMON /XS/   XD(501,40) ,X1(5,501,40),TIME(501)
      COMMON /WTS/  WT(2,4,40,40),BGK(3,2,4,40)
      REWIND(NFL)
      IF(IN.EQ.1) THEN
      READ(NFL,'(1X,E13.7)') AA
      ELSE
      WRITE(NFL,'(1X,2E13.7,6I10)') B(5),B(10),NL,(N(II),II=1,NL)
      ENDIF
      DO 30 L31=1,NL1
      DO 30 L2=1,N(L31+1)
      GO TO (10) IN
      WRITE(NFL,'(1X,44E13.7)') BGK(1,2,L31,L2),BGK(2,2,L31,L2),
     &            BGK(3,2,L31,L2),(WT(2,L31,L2,L1),L1=1,N(L31))
      GO TO 30
   10 CONTINUE
      READ(NFL,'(1X,44E13.7)') BGK(1,2,L31,L2),BGK(2,2,L31,L2),
     &           BGK(3,2,L31,L2),(WT(2,L31,L2,L1),L1=1,N(L31))
   30 CONTINUE
      RETURN
      END
```

## E.4 Program SCN.FOR

File SCN.FOR contains the simulated condensation program. This program executes the simulated condensation paradigm set forth in Section 4 of this dissertation. Below is a complete code listing.

```
C$STORAGE:2
C$NOLIST
C$DEBUG
      PROGRAM        SCN
      INTEGER*4      JRNA,JRNB,JRNC,JRND
      CHARACTER      FNRT*3,TYPE*4,FNAME*7,WISNM*7,TITLE*79
      COMMON NL,NL1,IDPRS,N(5),PI,B(17),TOT(4),FIDPRS,XVAL(5,40)
      COMMON /XS/    XD(501,40)    ,XAVE(2,5,40)    ,X1(5,501,40)
      COMMON /WIS/   WT(2,4,40,40),BGK(3,2,4,40)   ,SWX(4,40)
      COMMON /DBD/   DWT(2,4,40,40),DBGK(2,2,4,40),DSWX(2,4,40)
      DIMENSION      IREPMX(4),IBGK(4),TYPE(4),ADR(4)
      DATA           TYPE/'WIS ','BIAS','GAIN','KONS'/
      WRITE(*,'(''  CONDENSATION LEARNING PROGRAM SCN.FOR'')')
      WRITE(*,'(''  INPUT-FILE NAME ROOT = [###.NNI] '')')
      READ(*,'(A3)')                  FNRT
      WRITE(FNAME,'(A3,''.NNI'')')  FNRT
      OPEN(7,FILE=FNAME,STATUS='OLD')
      WRITE(FNAME,'(A3,''.DNA'')')  FNRT
      OPEN(5,FILE=FNAME,STATUS='NEW')
      WRITE(FNAME,'(A3,''.DDI'')')  FNRT
      OPEN(8,FILE=FNAME,STATUS='OLD')
      WRITE(WISNM,'(A3,''.WIS'')')  FNRT
      READ(7,'(1X,A70)')              TITLE
      READ(7,'(1X,12I5)')  NL,IDPRS,ISETMX,IREPMX(1),IREPMX(2),
     &     IREPMX(3),IREPMX(4),ITOTMX,ISCMAX,IDPRSM,NHM,IFWIS
      READ(7,'(1X,10I5)')    (N(I),I=1,NL)
      READ(7,'(1X,8F10.6)') B(1),B(2),B(3),B(4),B(5),B(6),B(7),B(16)
      READ(7,'(1X,8F10.6)') B(8),B(9),B(10),B(11),B(12),B(13),B(14),
     &                      B(15)
      READ(7,'(1X,F20.10)',END=111) SMALL
      GO TO 112
  111 CONTINUE
      SMALL=0.00001
  112 CONTINUE
      WRITE(*,'(5X,A70)')   TITLE
      WRITE(*,'(5X,'' B(1) [PHI=              (1.04)] '',F10.4)')
     &B(1)
```

```
      WRITE(*,'(5X,'' B(2) [ADR=   ADR*B2 STALL{.75}] '',F10.4)')
     &B(2)
      WRITE(*,'(5X,'' B(3) [WT(0,,,)= B(3)*RN5   {2}] '',F10.4)')
     &B(3)
      WRITE(*,'(5X,'' B(4) [IFT2/T1<B(4) DNAP5{1.05}] '',F10.4)')
     &B(4)
      WRITE(*,'(5X,'' B(5) [MAXGAIN,KONS(1-NL1){1.5}] '',F10.4)')
     &B(5)
      WRITE(*,'(5X,'' B(6) [ADR=   (1-B8)()+B8(){.6}] '',F10.4)')
     &B(6)
      WRITE(*,'(5X,'' B(7) [ADR(0,I)=B(7)       {.1}] '',F10.4)')
     &B(7)
      WRITE(*,'(5X,'' B(8) [KONS LIMIT DECREASE{.95}] '',F10.4)')
     *B(8)
      WRITE(*,'(5X,'' B(9) [WTS  LIMIT DECREASE{.95}] '',F10.4)')
     &B(9)
      WRITE(*,'(5X,'' B(10)[MAX WTS,BIAS       {10.}] '',F10.4)')
     &B(10)
      WRITE(*,'(5X,'' B(11)[C(W)MIN FOR PRUNING{.10}] '',F10.4)')
     &B(11)
      WRITE(*,'(5X,'' B(12)[KON LIMIT INCREASE{1.02}] '',F10.4)')
     &B(12)
      WRITE(*,'(5X,'' B(13)[WTS LIMIT INCREASE{1.02}] '',F10.4)')
     &B(13)
      WRITE(*,'(5X,'' B(14)[GAIN(0),KON(0)      {.5}] '',F10.4)')
     &B(14)
      WRITE(*,'(5X,'' B(15)[MIN XAVE           {.15}] '',F10.4)')
     &B(15)
      WRITE(*,'(5X,'' B(16)[MAX XAVE FOR PRUNE {40.}] '',F10.4)')
     &B(16)
      WRITE(*,'(5X,
     &          '' # OF LAYERS    '',I5,''   # OF SYSTEM INPUTS '',I5,/,
     &       5X,'' i-d PAIRS      '',I5,''   .WTS REP PER SET   '',I5,/,
     &       5X,'' RCLS PR PRNT   '',I5,''   WEIGHT FILE        '',I5,/,
     &       5X,'' ISETS          '',I5,''   PRINT KICK EVRY    '',I5,/,
     &       5X,'' BIAS REPS      '',I5,''   GAIN REPS          '',I5,/,
     &       5X,'' K1 REPS        '',I5,''   MAX SUCCESS REP    '',I5,/,
     &       5X,'' IDPRS FOR RCL  '',I5)')
     &       NL,N(1),IDPRS,IREPMX(1),NHM,IFWTS,ISETMX,ITOTMX,IREPMX(2),
     &       IREPMX(3),IREPMX(4),ISCMAX,IDPRSM
      WRITE(*,'(5X,'' READING INPUT DATA !'')')
      IF(IDPRS.GT.IDPRSM) IDPRSM=IDPRS
      NL1=NL-1
      DO 40 ID=1,IDPRSM
      READ(8,'(2X,10F7.4)') (X1(1,ID,I),I=1,N(1))
      READ(8,'(2X,10F7.4)') (XD(ID,I), I=1,N(NL))
   40 CONTINUE
   50 CONTINUE
```

```
      IF(IFWTS.EQ.0) WRITE(*,'(6X,''###.WTS ERASE MODE'')')
      IF(IFWTS.EQ.1) WRITE(*,'(6X,''###.WTS READ MODE'')')
      WRITE(*,'(6X,''INPUT RANDOM SEED (I5), [ 37591 = DEFAULT ]'')')
      READ(*,'(I6)') JRNA
      IF(JRNA.GT.0.) GO TO 160
      JRNA=37591
  160 CONTINUE
      IF(IFWTS.EQ.1) THEN
      OPEN(1,FILE=WTSNM,STATUS='OLD',RECL=16000)
      READ(1,'(1X,2E13.7,6I10)') B(5),B(10),NL,(N(II),II=1,NL)
      CALL WTS1(1,1)
      DO 155 L31=1,NL1
      DO 155 L2=1,N(L31+1)
      BGK(1,1,L31,L2)=BGK(1,2,L31,L2)
      BGK(2,1,L31,L2)=BGK(2,2,L31,L2)
      BGK(3,1,L31,L2)=BGK(3,2,L31,L2)
      DO 155 L1=1,N(L31)
      WT(1,L31,L2,L1)=WT(2,L31,L2,L1)
  155 CONTINUE
      ELSE
      OPEN(1,FILE=WTSNM,STATUS='NEW',RECL=16000)
      DO 170 II=1,2
      DO 170 L31=1,NL1
      DO 170 L2=1,N(L31+1)
      CALL RANDOM(JRNA,RN5)
      BGK(1,II,L31,L2)=B(3)*RN5
      BGK(2,II,L31,L2)=B(14)
      BGK(3,II,L31,L2)=B(14)
      DO 170 L1=1,N(L31)
      CALL RANDOM(JRNA,RN5)
      WT(II,L31,L2,L1)=B(3)*RN5
  170 CONTINUE
      ENDIF
      WRITE(*,'(5X,''IREPS  TOT(1)  TOT(2)  X1(I)  ADR '')')
      JRNC=JRNA
      PI=3.141593
      PI2=PI/2.
      IDPRSO=IDPRS
      FIDPRS=FLOAT(IDPRS)
C      SMALL=0.00001
      WRITE(*,'('' SMALL'',F15.8)') SMALL
      RMSGL=10.
      B61=1.-B(6)
      PHI=B(1)*B61
      DO 232 II=1,4
      ADR(II)=B(7)
  232 CONTINUE
      CALL RCL2(2,2,2,2)
```

```
      TOT(2)=TOT(1)
      TOT(3)=TOT(2)
      TOT(4)=0.
      DO 222 L2=1,N(1)
      AA=0.
      DO 223 ID=1,IDPRS
      AA=AA+X1(1,ID,L2)
  223 CONTINUE
      AA=AA/FIDPRS
      XAVE(2,1,L2)=SIGN(AMAX1(ABS(AA),SMALL),AA)
      XAVE(1,1,L2)=XAVE(2,1,L2)
  222 CONTINUE
      CALL UPDATE
      OPEN(9,FILE='DNA.WTS',STATUS='NEW',RECL=16000)
      OPEN(2,FILE='RCL.WTS',STATUS='NEW',RECL=16000)
C
      DO 500 ISETS=1,ISETMX
      DO 450 LJJ=1,4
      DO 235 II=1,4
      IBGK(II)=2
  235 CONTINUE
      IBGK(LJJ)=1
      IF(LJJ.EQ.1) TOTOLD=TOT(2)
      WRITE(*,'(1X,A5,'' REPS RMSG,L,WT,KN'',4F9.4,'' ARCH'',5I3)')
     &              TYPE(LJJ),RMSG,RMSGL,B(10),B(5),(N(II),II=1,NL)
      IF(LJJ.EQ.1)
     &WRITE(5,'(1X,''RMSG,L,WT,KN'',4F9.4,'' ARCH'',5I3)')
     &              RMSG,RMSGL,B(10),B(5),(N(II),II=1,NL)
C
      DO 430 IREPS=1,IREPMX(LJJ)
      DO 400 NH=1,NHM
      JRND=JRNC
      JRNC=JRNA
      ISC=0
  240 CONTINUE
      CALL RCL2(IBGK(2),IBGK(3),IBGK(4),IBGK(1))
      ADR(LJJ)=AMAX1((TOT(2)*PHI/TOT(1)+B(6))*ADR(LJJ),SMALL)
      IF(TOT(1).GE.TOT(2)) GO TO 396
      ISC=ISC+1
      IF(ISC.GT.ISCMAX) GO TO 422
      TOT(2)=TOT(1)
      JRNB=JRND
      IF(ISC.NE.1) GO TO 231
C
      DO 360 L3=2,NL
      L31=L3-1
      DO 360 L2=1,N(L3)
      GO TO (4000,1000,2000,3000) LJJ
```

```
 1000 CONTINUE
C      BIAS A
       BGK(1,2,L31,L2)=BGK(1,1,L31,L2)
       CALL RANDOM(JRNB,RN5)
       AA=BGK(1,2,L31,L2)+RN5*ADR(LJJ)*DBGK(1,2,L31,L2)
       BGK(1,1,L31,L2)=SIGN(AMIN1(ABS(AA),B(10)),AA)
       GO TO 361
 2000 CONTINUE
C      GAIN A
       BGK(2,2,L31,L2)=BGK(2,1,L31,L2)
       CALL RANDOM(JRNB,RN5)
       AA=BGK(2,2,L31,L2)+RN5*ADR(LJJ)*DBGK(2,2,L31,L2)
       BGK(2,1,L31,L2)=SIGN(AMIN1(ABS(AA),B(5)),AA)
       GO TO 361
 3000 CONTINUE
C      KONS A
       BGK(3,2,L31,L2)=BGK(3,1,L31,L2)
       CALL RANDOM(JRNB,RN5)
       AA=BGK(3,2,L31,L2)*(1.+RN5*ADR(LJJ)/XAVE(2,L3,L2))
       IF(L31.LT.NL1) THEN
       BGK(3,1,L31,L2)=SIGN(AMIN1(ABS(AA),B(5)),AA)
       ELSE
       BGK(3,1,L31,L2)=SIGN(AMIN1(ABS(AA),1.2),AA)
       ENDIF
       GO TO 361
 4000 CONTINUE
C      WTS A
       DO 362 L1=1,N(L31)
       WT(2,L31,L2,L1)=WT(1,L31,L2,L1)
       CALL RANDOM(JRNB,RN5)
       AA=WT(2,L31,L2,L1)+RN5*ADR(LJJ)*DWT(2,L31,L2,L1)
       WT(1,L31,L2,L1)=SIGN(AMIN1(ABS(AA),B(10)),AA)
  362 CONTINUE
  361 CONTINUE
       XAVE(1,L3,L2)=XAVE(2,L3,L2)
       DBGK(1,1,L31,L2)=DBGK(1,2,L31,L2)
       DBGK(2,1,L31,L2)=DBGK(2,2,L31,L2)
       DO 333 L1=1,N(L31)
       DWT(1,L31,L2,L1)=DWT(2,L31,L2,L1)
  333 CONTINUE
  360 CONTINUE
       CALL UPDATE
       GO TO 240
  231 CONTINUE
       DO 340 L3=2,NL
       L31=L3-1
       DO 340 L2=1,N(L3)
       GO TO (4100,1100,2100,3100) LJJ
```

```
 1100 CONTINUE
C      BIAS B
       CALL RANDOM(JRNB,RN5)
       BGK(1,2,L31,L2)=BGK(1,1,L31,L2)
       AA=BGK(1,2,L31,L2)+RN5*ADR(LJJ)*DBGK(1,1,L31,L2)
       BGK(1,1,L31,L2)=SIGN(AMIN1(ABS(AA),B(10)),AA)
       GO TO 340
 2100 CONTINUE
C      GAIN B
       CALL RANDOM(JRNB,RN5)
       BGK(2,2,L31,L2)=BGK(2,1,L31,L2)
       AA=BGK(2,2,L31,L2)+RN5*ADR(LJJ)*DBGK(2,1,L31,L2)
       BGK(2,1,L31,L2)=SIGN(AMIN1(ABS(AA),B(5)),AA)
       GO TO 340
 3100 CONTINUE
C      KONS B
       CALL RANDOM(JRNB,RN5)
       BGK(3,2,L31,L2)=BGK(3,1,L31,L2)
       AA=BGK(3,2,L31,L2)*(1.+RN5*ADR(LJJ)/XAVE(1,L3,L2))
       IF(L31.LT.NL1) THEN
       BGK(3,1,L31,L2)=SIGN(AMIN1(ABS(AA),B(5)),AA)
       ELSE
       BGK(3,1,L31,L2)=SIGN(AMIN1(ABS(AA),1.2),AA)
       ENDIF
       GO TO 340
 4100 CONTINUE
C      WTS B
       DO 342 L1=1,N(L31)
       CALL RANDOM(JRNB,RN5)
       WT(2,L31,L2,L1)=WT(1,L31,L2,L1)
       AA=WT(2,L31,L2,L1)+RN5*ADR(LJJ)*DWT(1,L31,L2,L1)
       WT(1,L31,L2,L1)=SIGN(AMIN1(ABS(AA),B(10)),AA)
  342 CONTINUE
  340 CONTINUE
       GO TO 240
  396 CONTINUE
       DO 410 L3=2,NL
       L31=L3-1
       DO 410 L2=1,N(L3)
       GO TO (4200,1200,2200,3200) LJJ
 1200 CONTINUE
C      BIAS C
       CALL RANDOM(JRNA,RN5)
       AA=BGK(1,2,L31,L2)+RN5*ADR(LJJ)*DBGK(1,2,L31,L2)
       BGK(1,1,L31,L2)=SIGN(AMIN1(ABS(AA),B(10)),AA)
       GO TO 410
 2200 CONTINUE
C      GAIN C
```

```
      CALL RANDOM(JRNA,RN5)
      AA=BGK(2,2,L31,L2)+RN5*ADR(LJJ)*DBGK(2,2,L31,L2)
      BGK(2,1,L31,L2)=SIGN(AMIN1(ABS(AA),B(5)),AA)
      GO TO 410
 3200 CONTINUE
C      KONS C
      CALL RANDOM(JRNA,RN5)
      AA=BGK(3,2,L31,L2)*(1.+RN5*ADR(LJJ)/XAVE(2,L3,L2))
      IF(L31.LT.NL1) THEN
      BGK(3,1,L31,L2)=SIGN(AMIN1(ABS(AA),B(5)),AA)
      ELSE
      BGK(3,1,L31,L2)=SIGN(AMIN1(ABS(AA),1.2),AA)
      ENDIF
      GO TO 410
 4200 CONTINUE
C      WTS C
      DO 411 L1=1,N(L31)
      CALL RANDOM(JRNA,RN5)
      AA=WT(2,L31,L2,L1)+RN5*ADR(LJJ)*DWT(2,L31,L2,L1)
      WT(1,L31,L2,L1)=SIGN(AMIN1(ABS(AA),B(10)),AA)
  411 CONTINUE
  410 CONTINUE
  422 CONTINUE
  400 CONTINUE
      WRITE(*,'(1X,I5,2F9.6,F7.4,F8.5)') IREPS,TOT(1),
     &     TOT(2),X1(NL,IDPRS,N(NL)),ADR(LJJ)
      IF((TOT(2).LE.B(11)).OR.(ADR(LJJ).LE.SMALL)) GO TO 440
      IF(ABS(TOT(2)-TOT(4)).GT.0.000001) THEN
      TOT(4)=TOT(2)
      ITOT=0
      ENDIF
      ITOT=ITOT+1
      IF(ITOT.GE.ITOTMX) THEN
      ITOT=0
      ADR(LJJ)=ADR(LJJ)*B(2)
      WRITE(*,'(6X,''ADR,B(2)''2F10.4)') ADR(LJJ),B(2)
      ENDIF
  430 CONTINUE
  440 CONTINUE
      ITOT=0
      TOT(4)=0.
  450 CONTINUE
      IDPRS=IDPRSM
      CALL RCL2(2,2,2,2)
      RMSG=TOT(1)
      IF(RMSG.LT.RMSGL) THEN
      RMSGL=RMSG
      CALL WTS1(2,1)
```

```
      ELSE
      CALL WTS1(2,2)
      ENDIF
      IDPRS=IDPRSO
      CALL RCL2(2,2,2,2)
      WRITE(*,'(6X,''ISETS,XD(I),B15,B16,B11'',I5,4F8.4)')
     &               ISETS,XD(IDPRS,N(NL)),B(15),B(16),B(11)
      WRITE(*,'(6X,''TLD/T2,TLD/T2MIN,PHI,TRGT,TOT3'',5F8.4)')
     &               TOTOLD/TOT(2),B(4),PHI/B61,B(11),TOT(3)
      CALL XVAL1
      IL3W=0
      L3W=0
      WMX=-1.E+20
      WMN=1.E+20
      DO 1305 L3=2,NL1
      AA=0
      DO 1304 L2=1,N(L3)
      IF(XVAL(L3,L2).LT.WMN) THEN
      WMN=XVAL(L3,L2)
      L3WN=L3
      L2WN=L2
      ENDIF
      AA=AA+XVAL(L3,L2)
C      WRITE(*,'(6X,''XVAL(L3,L2),L3,L2  '',E12.5,2I5)')
C     &               XVAL(L3,L2),L3,L2
 1304 CONTINUE
      AA=AA/FLOAT(N(L3))
      IF(AA.GT.WMX) THEN
      WMX=AA
      L3WX=L3
      ENDIF
 1305 CONTINUE
      IF(WMN.LT.B(15)) IL3W=10
      TOTO=TOTOLD/TOT(2)
      TT=TOT(2)
      ITT=0
      WRITE(*,'(6X,''WMN,WMX,L3WX'',2E12.5,I5)') WMN,WMX,L3WX
      IF((TOT(2).LE.B(11)).OR.(IL3W.EQ.10)) THEN
C      CALL DNAM5
      TOT(3)=TOT(2)
      IF(N(L3WN).LE.2) ITT=1
      IF((IL3W.EQ.10).AND.(N(L3WN).GT.2))  GO TO 476
      B(10)=B(9)*B(10)
      B(5)=B(8)*B(5)
      DO 300 L3=2,NL
      L31=L3-1
      DO 300 L2=1,N(L3)
      BGK(1,2,L31,L2)=SIGN(AMIN1(ABS(BGK(1,2,L31,L2)),B(10)),
```

```
     &                                  BGK(1,2,L31,L2))
      BGK(1,1,L31,L2)=BGK(1,2,L31,L2)
      BGK(2,2,L31,L2)=SIGN(AMIN1(ABS(BGK(2,2,L31,L2)),B(5)),
     &                                  BGK(2,2,L31,L2))
      BGK(2,1,L31,L2)=BGK(2,2,L31,L2)
      IF((L31.LT.NL1).OR.(B(5).GT.1.2)) THEN
      BGK(3,2,L31,L2)=SIGN(AMIN1(ABS(BGK(3,2,L31,L2)),B(5)),
     &                                  BGK(3,2,L31,L2))
      ELSE
      BGK(3,2,L31,L2)=SIGN(AMIN1(ABS(BGK(3,2,L31,L2)),1.2),
     &                                  BGK(3,2,L31,L2))
      ENDIF
      BGK(3,1,L31,L2)=BGK(3,2,L31,L2)
      DO 300 L1=1,N(L31)
      WT(2,L31,L2,L1)=SIGN(AMIN1(ABS(WT(2,L31,L2,L1)),B(10)),
     &                                  WT(2,L31,L2,L1))
      WT(1,L31,L2,L1)=WT(2,L31,L2,L1)
  300 CONTINUE
  476 CONTINUE
      IF((WMN.GE.B(16)).OR.(N(L3WN).LE.2)) GO TO 468
      WRITE(*,'(5X,'' ELIM NODE L3WN,L2WN,WMN,B(16)'',2I4,2E12.5)')
     &                           L3WN,L2WN,WMN,B(16)
      L31WN=L3WN-1
      DO 444 II=1,2
      DO 444 L2=1,N(L3WN+1)
      DO 444 L1=1,N(L3WN)-1
      IF(L1.GE.L2WN) WT(II,L3WN,L2,L1)=WT(II,L3WN,L2,L1+1)
  444 CONTINUE
      REWIND(9)
      WRITE(9,'(1X,2E13.7,6I10)') B(5),B(10),NL,(N(II),II=1,NL)
      DO 4456 L31=1,NL1
      DO 4456 L2=1,N(L31+1)
      IF((L31WN.EQ.L31).AND.(L2.EQ.L2WN)) GO TO 4456
      WRITE(9,'(1X,44E13.7)') BGK(1,2,L31,L2),BGK(2,2,L31,L2),
     &            BGK(3,2,L31,L2),(WT(2,L31,L2,L1),L1=1,N(L31))
 4456 CONTINUE
      N(L3WN)=N(L3WN)-1
      CALL WIS1(1,9)
      CALL RCL2(2,2,2,2)
      CALL UPDATE
  468 CONTINUE
      TOT(2)=1.
      ENDIF
      IF((TOTO.LE.B(4)).AND.(TT.GT.B(11))) THEN
C      CALL DNAP5
      IF(N(L3WX).LE.2) GO TO 304
      B(10)=B(10)*B(13)
      B(5)=B(5)*B(12)
```

```
  304 CONTINUE
      IF(N(L3WX).GE.40) GO TO 9201
      L31WX=L3WX-1
      N(L3WX)=N(L3WX)+1
      DO 101 ID=1,IDPRS
      X1(L3WX,ID,N(L3WX))=.5
  101 CONTINUE
      DO 1232 IIIX=1,4
      ADR(IIIX)=B(7)
 1232 CONTINUE
      CALL RANDOM(JRNA,RN5)
      BGK(1,2,L31WX,N(L3WX))=SIGN(AMIN1(B(3)*ABS(RN5),B(10)),RN5)
      BGK(1,1,L31WX,N(L3WX))=BGK(1,2,L31WX,N(L3WX))
      BGK(2,2,L31WX,N(L3WX))=AMIN1(B(5),B(14))
      BGK(2,1,L31WX,N(L3WX))=AMIN1(B(5),B(14))
      BGK(3,2,L31WX,N(L3WX))=AMIN1(B(5),B(14))
      BGK(3,1,L31WX,N(L3WX))=AMIN1(B(5),B(14))
      DBGK(1,1,L31WX,N(L3WX))=1.
      DBGK(2,1,L31WX,N(L3WX))=1.
      DBGK(1,2,L31WX,N(L3WX))=1.
      DBGK(2,2,L31WX,N(L3WX))=1.
      XAVE(2,L3WX,N(L3WX))=.5
      XAVE(1,L3WX,N(L3WX))=.5
      DO 9100 L1=1,N(L31WX)
      CALL RANDOM(JRNA,RN5)
      WT(1,L31WX,N(L3WX),L1)=SIGN(AMIN1(B(3)*ABS(RN5),B(10)),RN5)
      WT(2,L31WX,N(L3WX),L1)=WT(1,L31WX,N(L3WX),L1)
      DWT(1,L31WX,N(L3WX),L1)=1.
      DWT(2,L31WX,N(L3WX),L1)=1.
 9100 CONTINUE
      DO 9200 L2=1,N(L3WX+1)
      CALL RANDOM(JRNA,RN5)
      WT(1,L3WX,L2,N(L3WX))=SIGN(AMIN1(ABS(RN5),B(10)),RN5)
      WT(2,L3WX,L2,N(L3WX))=WT(1,L3WX,L2,N(L3WX))
      DWT(1,L3WX,L2,N(L3WX))=1.
      DWT(2,L3WX,L2,N(L3WX))=1.
 9200 CONTINUE
 9201 CONTINUE
      WRITE(*,'(6X,''ADD A NODE LAYER L3WX,WMX'',I5,E10.4)') L3WX,WMX
      TOT(2)=1.
      ENDIF
C
  500 CONTINUE
      WRITE(FNAME,'(A3,''.PRN'')')      FNRT
      OPEN(6,FILE=FNAME,STATUS='NEW')
      CALL WIS1(1,1)
      CALL RCL2(2,2,2,2)
      IDPRS=IDPRSM
```

```
      CALL RCL2(2,2,2,2)
      DO 7298 ID=1,IDPRSM
      DO 7298 IO=1,N(NL)
      WRITE(6,'(1X,2I6,3F10.7,I6)')  ISETS,IREPS,XD(ID,IO),
     &             X1(NL,ID,IO),XD(ID,IO)-X1(NL,ID,IO),IO
 7298 CONTINUE
      WRITE(6,'(5X,''ISETS  IREPS    XD       X  '',
     &''     ERROR    IO'')')
      WRITE(6,'(5X,'' RECALL SET SIZE  '',I10)')        IDPRSM
      WRITE(6,'(5X,'' RMS  '',F10.6)')                  TOT(1)
      WRITE(6,'(5X,A5,'' REPS RMSG,L,WT,KN'',4F8.4,'' ARCH'',5I3)')
     &             TYPE(LJJ),RMSG,RMSGL,B(10),B(5),(N(II),II=1,NL)
  999 STOP
      END
C
      SUBROUTINE    RCL2(LJ1,LJ2,LJ3,LJ4)
      COMMON NL,NL1,IDPRS,N(5),PI,B(17),TOT(4),FIDPRS,XVAL(5,40)
      COMMON /XS/   XD(501,40)   ,XAVE(2,5,40) ,X1(5,501,40)
      COMMON /WTS/  WT(2,4,40,40),BGK(3,2,4,40),SWX(4,40)
      TOT(1)=0.
      DO 290 ID=1,IDPRS
      DO 270 L3=2,NL
      L31=L3-1
      DO 270 L2=1,N(L3)
      AA=0.
      DO 260 L1=1,N(L31)
      AA=AA+WT(LJ4,L31,L2,L1)*X1(L31,ID,L1)
  260 CONTINUE
      X1(L3,ID,L2)=BGK(3,LJ3,L31,L2)*(ATAN(AA*BGK(2,LJ2,L31,L2)
     &           +BGK(1,LJ1,L31,L2))/PI+.5)
  270 CONTINUE
      DO 280 IO=1,N(NL)
      TOT(1)=TOT(1)+(XD(ID,IO)-X1(NL,ID,IO))**2
  280 CONTINUE
  290 CONTINUE
      TOT(1)=SQRT(TOT(1)/FLOAT(IDPRS*N(NL)))
      RETURN
      END
C
      SUBROUTINE    RANDOM(JRN1,RN5)
      INTEGER*4     JRN1
      JRN1=MOD(JRN1*7141+54773,259200)
      RN5=FLOAT(JRN1)/259200.-.5
      RETURN
      END
C
      SUBROUTINE    WIS1(IN,NFL)
      COMMON NL,NL1,IDPRS,N(5),PI,B(17),TOT(4),FIDPRS,XVAL(5,40)
```

```
      COMMON /WTS/  WT(2,4,40,40),BGK(3,2,4,40),SWX(4,40)
      REWIND(NFL)
      IF(IN.EQ.1) THEN
      READ(NFL,'(1X,E13.7)') AA
      ELSE
      WRITE(NFL,'(1X,2E13.7,6I10)')
     &B(5),B(10),NL,(N(II),II=1,NL)
      ENDIF
      DO 30 L31=1,NL1
      DO 30 L2=1,N(L31+1)
      GO TO (10) IN
      WRITE(NFL,'(1X,44E13.7)')
     &            BGK(1,2,L31,L2),BGK(2,2,L31,L2),
     &            BGK(3,2,L31,L2),(WT(2,L31,L2,L1),L1=1,N(L31))
      GO TO 30
   10 CONTINUE
      READ(NFL,'(1X,44E13.7)')
     &           BGK(1,2,L31,L2),BGK(2,2,L31,L2),
     &           BGK(3,2,L31,L2),(WT(2,L31,L2,L1),L1=1,N(L31))
   30 CONTINUE
      RETURN
      END
C
      SUBROUTINE    UPDATE
      COMMON NL,NL1,IDPRS,N(5),PI,B(17),TOT(4),FIDPRS,XVAL(5,40)
      COMMON /XS/   XD(501,40)   ,XAVE(2,5,40)   ,X1(5,501,40)
      COMMON /WTS/  WT(2,4,40,40),BGK(3,2,4,40),SWX(4,40)
      COMMON /DBD/  DWT(2,4,40,40),DBGK(2,2,4,40),DSWX(2,4,40)
      DO 301 L3=2,NL
      L31=L3-1
      DO 301 L2=1,N(L3)
      SWX(L31,L2)=0.
      BB=0.
      DO 277 ID=1,IDPRS
      AA=0.
      DO 266 L1=1,N(L31)
      AA=AA+X1(L31,ID,L1)*WT(2,L31,L2,L1)
  266 CONTINUE
      SWX(L31,L2)=SWX(L31,L2)+AA
      BB=BB+X1(L3,ID,L2)
  277 CONTINUE
      SWX(L31,L2)=SWX(L31,L2)/FIDPRS
      BB=BB/FIDPRS
      XAVE(2,L3,L2)=SIGN(AMAX1(ABS(BB),SMALL),BB)
      DBGK(1,2,L31,L2)=PI/BGK(3,2,L31,L2)/
     &  COS(PI*XAVE(2,L3,L2)/BGK(3,2,L31,L2)-PI2)**2
      DBGK(2,2,L31,L2)=PI/(COS(PI*XAVE(2,L3,L2)/
     & BGK(3,2,L31,L2)-PI2)**2)/BGK(3,2,L31,L2)/SWX(L31,L2)
```

```
      DO 267 L1=1,N(L31)
      DWT(2,L31,L2,L1)=PI/(COS(PI*XAVE(2,L3,L2)/
     & BGK(3,2,L31,L2)-PI2)**2)/BGK(2,2,L31,L2)/
     & BGK(3,2,L31,L2)/XAVE(2,L31,L1)
  267 CONTINUE
  301 CONTINUE
      RETURN
      END
C
      SUBROUTINE    XVAL1
      COMMON NL,NL1,IDPRS,N(5),PI,B(17),TOT(4),FIDPRS,XVAL(5,40)
      COMMON /XS/   XD(501,40)    ,XAVE(2,5,40)    ,X1(5,501,40)
      COMMON /WTS/  WT(2,4,40,40),BGK(3,2,4,40),SWX(4,40)
      DO 301 L3=3,NL
      L31=L3-1
      DO 301 L1=1,N(L31)
      AA=0.
      DO 277 L2=1,N(L3)
      AA=ABS(BGK(3,2,L31,L2)*BGK(2,2,L31,L2)*WT(2,L31,L2,L1)/PI/
     &    (1.+(BGK(2,2,L31,L2)*SWX(L31,L2)+BGK(1,2,L31,L2))**2))+AA
  277 CONTINUE
      XVAL(L31,L1)=AA
  301 CONTINUE
      RETURN
      END
```

## E.5 Program TSG.FOR

This fortran program is used to organize the *.DDI files for the Watts Barr accident analysis shown in Section 5 of this dissertation. The program only manipulates *.DDI input files which do not contain added noise. A complete listing of the code is given below.

```
C$STORAGE:2
C$NOLIST
C$DEBUG
      PROGRAM       TSG
      CHARACTER     FNAME*7,FNRT*3
      DIMENSION     X1(65),XD(7),ITIM(7),TIME(7,50)
      WRITE(*,'(''  TRAINING FILE GEN (GIVEN 7 WB *.DDI FILES)'')')
      WRITE(*,'(''  ###.DDI TRAINING FILE NAME ROOT'')')
      READ(*,'(A3)')  FNRT
      WRITE(*,'(''  HOW MANY INPUT NODES [MAX=65]'')')
      READ(*,'(I10)') NIN
C
      WRITE(FNAME,'(''F23.DDI'')')
      OPEN(1,FILE=FNAME,STATUS='OLD')
      WRITE(FNAME,'(''MS1.DDI'')')
      OPEN(2,FILE=FNAME,STATUS='OLD')
      WRITE(FNAME,'(''RD6.DDI'')')
      OPEN(3,FILE=FNAME,STATUS='OLD')
      WRITE(FNAME,'(''TH1.DDI'')')
      OPEN(4,FILE=FNAME,STATUS='OLD')
      WRITE(FNAME,'(''TH2.DDI'')')
      OPEN(5,FILE=FNAME,STATUS='OLD')
      WRITE(FNAME,'(''ED1.DDI'')')
      OPEN(6,FILE=FNAME,STATUS='OLD')
      WRITE(FNAME,'(''TH5.DDI'')')
      OPEN(7,FILE=FNAME,STATUS='OLD')
      WRITE(FNAME,'(A3,''.TIM'')') FNRT
      OPEN(8,FILE=FNAME,STATUS='OLD')
      WRITE(FNAME,'(A3,''.DDI'')') FNRT
      OPEN(9,FILE=FNAME,STATUS='NEW')
```

```
      READ(8,'(7I5)') (ITIM(I),I=1,7)
      DO 122 JFK=1,7
      IID=1
      DO 123 LBJ=1,ITIM(JFK)
      READ(8,'(F10.2)') TIME(JFK,LBJ)
      WRITE(*,'(F10.2,3I5)') TIME(JFK,LBJ),JFK,LBJ,ITIM(JFK)
      DO 124 ID=IID,1000
      READ(JFK,'(2X,10F7.4)',END=122) (X1(I),I=1,NIN)
                  READ(JFK,'(2X,10F7.4)',END=122) (XD(I),I=1,7),TIM
      TIM=TIM*100.
C      WRITE(*,'(2F12.6,2I5)') TIM,TIME(JFK,LBJ),JFK,LBJ
      IF(ABS(TIM-TIME(JFK,LBJ)).LT.0.01)THEN
      WRITE(*,'('' FOUND'')')
      WRITE(9,'(2X,10F7.4)') (X1(I),I=1,NIN)
      WRITE(9,'(2X,10F7.4)') (XD(I),I=1,7),TIM/100.
      IID=ID
      GO TO 123
      ENDIF
  124 CONTINUE
  123 CONTINUE
  122 CONTINUE
  999 STOP
      END
```

## E.6 Program TSGN.FOR

This fortran program is used to organize the *.DDI files for the Watts Barr accident analysis shown in Section 5 of this dissertation. The program only manipulates *.DDI input files which contain added noise. A complete listing of the code is given below.

```
C$STORAGE:2
C$NOLIST
C$DEBUG
      PROGRAM       TSGN
      CHARACTER     FNAME*7,FNRT*3,STUF*1
      DIMENSION     X1(65),XD(7),ITIM(7),TIME(7,50)
      WRITE(*,'('' TRAINING FILE GEN (GIVEN 7 WB *.DDI FILES)'')')
      WRITE(*,'('' ###.DDI TRAINING FILE NAME ROOT'')')
      READ(*,'(A3)') FNRT
      WRITE(*,'('' HOW MANY INPUT NODES [MAX=65]'')')
      READ(*,'(I10)') NIN
      WRITE(*,'('' INPUT LAST CHAR [##_.DDI],[A1] '')')
      READ(*,'(A1)') STUF
C
      WRITE(FNAME,'(''F2'',A1,''.DDI'')') STUF
      OPEN(1,FILE=FNAME,STATUS='OLD')
      WRITE(FNAME,'(''MS'',A1,''.DDI'')') STUF
      OPEN(2,FILE=FNAME,STATUS='OLD')
      WRITE(FNAME,'(''RD'',A1,''.DDI'')') STUF
      OPEN(3,FILE=FNAME,STATUS='OLD')
      WRITE(FNAME,'(''T1'',A1,''.DDI'')') STUF
      OPEN(4,FILE=FNAME,STATUS='OLD')
      WRITE(FNAME,'(''T2'',A1,''.DDI'')') STUF
      OPEN(5,FILE=FNAME,STATUS='OLD')
      WRITE(FNAME,'(''ED'',A1,''.DDI'')') STUF
      OPEN(6,FILE=FNAME,STATUS='OLD')
      WRITE(FNAME,'(''T5'',A1,''.DDI'')') STUF
      OPEN(7,FILE=FNAME,STATUS='OLD')
      WRITE(FNAME,'(A3,''.TIM'')') FNRT
      OPEN(8,FILE=FNAME,STATUS='OLD')
      WRITE(FNAME,'(A3,''.DDI'')') FNRT
      OPEN(9,FILE=FNAME,STATUS='NEW')
      READ(8,'(7I5)') (ITIM(I),I=1,7)
```

```
      DO 122 JFK=1,7
      IID=1
      DO 123 LBJ=1,ITIM(JFK)
      READ(8,'(F10.2)') TIME(JFK,LBJ)
      WRITE(*,'(F10.2,3I5)') TIME(JFK,LBJ),JFK,LBJ,ITIM(JFK)
      DO 124 ID=IID,1000
      READ(JFK,'(2X,10F7.4)',END=122) (X1(I),I=1,NIN)
      READ(JFK,'(2X,10F7.4)',END=122) (XD(I),I=1,7),TIM
      TIM=TIM*100.
C      WRITE(*,'(2F12.6,2I5)') TIM,TIME(JFK,LBJ),JFK,LBJ
      IF(ABS(TIM-TIME(JFK,LBJ)).LT.0.01)THEN
      WRITE(*,'(''  FOUND'')')
      WRITE(9,'(2X,10F7.4)') (X1(I),I=1,NIN)
      WRITE(9,'(2X,10F7.4)') (XD(I),I=1,7),TIM/100.
      IID=ID
      GO TO 123
      ENDIF
  124 CONTINUE
  123 CONTINUE
  122 CONTINUE
  999 STOP
      END
```

## E.7 Program UDGEN.FOR

This fortran program generates the uniform distributions used in Appendix A.4. A listing of the fortran coding is given below.

```
C      FILE UDGEN.FOR ; UNIFORM DISTRIBUTION GENERATOR
       REAL*4 M,SIG,XI,RND,XD,X1,X0,XIMAX,X2,XIOUT
       REAL*8 RN,RNSUM,RNSD,A
       INTEGER*4 N,J3,J5,IG,J100,JRAN,IA,IM,IC,II,IOUT
       CHARACTER*3   FNRT
       CHARACTER*15  FNAME
       DIMENSION M(9),SIG(9),XI(9,201),XD(9),XIOUT(9)
       WRITE(*,'('' UDGEN.FOR ; UNIFORM DISTRIBUTION'',
      &'' GENERATOR'')')
       WRITE(*,'('' FOR NEURAL NEIWORK INPUT'')')
       WRITE(*,'('' HOW MANY IPRD'')')
       READ (*,'(I10)') IPRD
       WRITE(*,'('' HOW MANY IDPRS [FOR EACH DISTRIBUTION]'')')
       READ (*,'(I10)') IDPRS
       WRITE(*,'('' HOW MANY UNIFORM DISTRIBUTIONS [MAX=9]'')')
       READ (*,'(I10)') IG
       WRITE(*,'('' M(1), SIG(1) ARE THE GOOD [XD=1.]     '')')
       WRITE(*,'('' ALL OTHERS XD=0.]                     '')')
       WRITE(*,'('' DEVIATES ARE GENERATED M() +/- SIG()  '')')
       DO 661 J100=1,IG
       WRITE(*,'('' :  M('',I1,''):SIG('',I1,''):'')') J100,J100
       READ (*,524) M(J100),SIG(J100)
       WRITE(*,524) M(J100),SIG(J100)
  524  FORMAT(1X,2F7.3)
  661  CONTINUE
       WRITE(*,'('' SINGLE OUTPUT [1] OR MULTIPLE OUTPUT [2]'')')
       READ (*,'(I10)')  IOUT
       WRITE(*,'('' INPUT FILE NAME ROOT = [###.DDI] '')')
       READ (*,'(A3)')                  FNRT
       WRITE(FNAME,'(A3,''.DDI'')')     FNRT
       OPEN(4,FILE=FNAME,STATUS='NEW')
       WRITE(FNAME,'(A3,''.ACT'')')     FNRT
       OPEN(2,FILE=FNAME,STATUS='NEW')
       WRITE(FNAME,'(A3,''.TXT'')')     FNRT
       OPEN(1,FILE=FNAME,STATUS='NEW')
C      WRITE ###.TXT FILE
```

```
      WRITE(1,'('' UDGEN.FOR ; UNIFORM DISTRIBUTION'',
     &'' GENERATOR'')')
      WRITE(1,'('' FOR NEURAL NETWORK INPUT'')')
      WRITE(1,'('' HOW MANY IPRD'')')
      WRITE(1,'(I10)') IPRD
      WRITE(1,'('' HOW MANY IDPRS [FOR EACH DISTRIBUTION]'')')
      WRITE(1,'(I10)') IDPRS
      WRITE(1,'('' HOW MANY UNIFORM DISTRIBUTIONS [MAX=9]'')')
      WRITE(1,'(I10)') IG
      WRITE(1,'('' M(1), SIG(1) ARE THE GOOD [XD=1.]     '')')
      WRITE(1,'('' ALL OTHERS XD=0.]                     '')')
      WRITE(1,'('' DEVIATES ARE GENERATED M() +/- SIG()  '')')
      DO 1661 J100=1,IG
      WRITE(1,'('' :  M('',I1,''):SIG('',I1,''):'')') J100,J100
      WRITE(1,524) M(J100),SIG(J100)
C  524 FORMAT(1X,2F7.3)
 1661 CONTINUE
      WRITE(1,'('' SINGLE OUTPUT [1] OR MULTIPLE OUTPUT [2]'')')
      WRITE(1,'(I10)')  IOUT
      WRITE(1,'('' INPUT FILE NAME ROOT = [###.DDI] '')')
C      RANDOM # SEED AND MULTIPLIER
      IM=259200
      IA=7141
      IC=54773
      JRAN=37591
      WRITE(*,'('' INPUT RANDOM SEED (I25), [37591=DEFAULT] '')')
      READ (*,'(I25)') JRAN
      IF   (JRAN.NE.0.) GO TO 160
      JRAN=37591
  160 CONTINUE
      X0=0.0
      X1=1.0
C      START OF PROGRAM
C      M(1)=MEAN ,SIG(1)=SIGMA
      WRITE(*,'('' WORKING !'')')
      DO 700 ID=1,IDPRS
      DO 710 J3=1,IG
      DO 720 J5=1,IPRD
C      RANDOM # GENERATOR
      JRAN=MOD(JRAN*IA+IC,IM)
      RN=FLOAT(JRAN)/FLOAT(IM)
      XI(J3,J5)=-SIG(J3)+RN*2.*SIG(J3)
C      OPEN(3,FILE='INTER.ACT',STATUS='NEW')
  720 CONTINUE
C      PRINT OUT TO ###.ACT FILE
      WRITE(2,'(2X,20E12.6)')     (XI(J3,II)+M(J3),II=1,IPRD)
  710 CONTINUE
  700 CONTINUE
```

```
      WRITE(*,'('' WRITING ###.DDI FILE'')')
      REWIND(2)
      DO 2700 ID=1,IDPRS
      DO 2710 J3=1,IG
      READ (2,'(2X,20E12.6)')   (XI(J3,II),II=1,IPRD)
      WRITE(4,'(''i '',20F7.4)')    (XI(J3,II),II=1,IPRD)
      IF   (IOUT.EQ.1) THEN
      IF   (J3.EQ.1)   THEN
      WRITE(4,'(''d '',  F7.4)')    X1
      ELSE
      WRITE(4,'(''d '',  F7.4)')    X0
      ENDIF
      ELSE
      DO 7000 J5=1,IG
      XIOUT(J5)=0
 7000 CONTINUE
      XIOUT(J3)=1.0
      WRITE(4,'(''d '', 9F7.4)')    (XIOUT(II),II=1,IG)
      ENDIF
 2710 CONTINUE
 2700 CONTINUE
 9998 STOP
      END
```

## E.8 Program WB3OG.FOR

This program converts the seven output node *.DDI files, created by WBSIFG.FOR, WBSIGN.FOR or WBSIUN.FOR, into three output node training or recall files. Three output nodes are used in the analysis of Section 5.

```
C$STORAGE:2
C$NOLIST
C$DEBUG
      PROGRAM       WB3OG
      CHARACTER     FNAME*7,FNRT*3,FNRTO*3
      DIMENSION     X1(65),XD(7),XDO(3)
      WRITE(*,'(''  THREE OUTPUT TRAINING FILE GEN '')')
      WRITE(*,'(''  ###.DDI TRAINING FILE INPUT NAME ROOT'')')
      READ(*,'(A3)')  FNRT
      WRITE(*,'(''  ###.DDI TRAINING FILE OUTPUT NAME ROOT'')')
      READ(*,'(A3)')  FNRTO
      WRITE(*,'(''  HOW MANY INPUT NODES [MAX=65]'')')
      READ(*,'(I10)') NIN
      WRITE(FNAME,'(A3,''.DDI'')') FNRT
      OPEN(1,FILE=FNAME,STATUS='OLD')
      WRITE(FNAME,'(A3,''.DDI'')') FNRTO
      OPEN(9,FILE=FNAME,STATUS='NEW')
      DO 124 ID=IID,1000
      READ(1,'(2X,10F7.4)',END=122) (X1(I),I=1,NIN)
      READ(1,'(2X,10F7.4)',END=122) (XD(I),I=1,7),TIM
      WRITE(9,'(2X,10F7.4)') (X1(I),I=1,NIN)
      XDS=0.
      DO 454 III=1,7
      XDS=XDS+XD(III)
  454 CONTINUE
      IF(XD(6).EQ.1.) THEN
      XDO(1)=1.
      XDO(2)=1.
      XDO(3)=1.
      ENDIF
      IF(XD(1).EQ.1.) THEN
      XDO(1)=1.
      XDO(2)=1.
      XDO(3)=0.
```

```
      ENDIF
      IF(XD(2).EQ.1.) THEN
      XDO(1)=1.
      XDO(2)=0.
      XDO(3)=1.
      ENDIF
      IF(XD(3).EQ.1.) THEN
      XDO(1)=1.
      XDO(2)=0.
      XDO(3)=0.
      ENDIF
      IF(XD(4).EQ.1.) THEN
      XDO(1)=0.
      XDO(2)=1.
      XDO(3)=1.
      ENDIF
      IF(XD(5).EQ.1.) THEN
      XDO(1)=0.
      XDO(2)=1.
      XDO(3)=0.
      ENDIF
      IF(XD(7).EQ.1.) THEN
      XDO(1)=0.
      XDO(2)=0.
      XDO(3)=1.
      ENDIF
      IF(XDS.EQ.0.) THEN
      XDO(1)=0.
      XDO(2)=0.
      XDO(3)=0.
      ENDIF
      WRITE(9,'(2X,10F7.4)') (XDO(I),I=1,3),TIM
  124 CONTINUE
  122 CONTINUE
  999 STOP
      END
```

## E.9 Program WBSDR.FOR

This program reads the raw data from the Watts Barr power plant simulator data files and reduces the number of significant digits for all 81 of the variables. The conversion is from the E19.12 to the F7.4 format. See below for the code listing. The reason for this code is that the raw data file are extremely large and difficult to manipulate. The code not only reduces the number of significant digits but also allows the researcher to analysis only a specified time interval of data.

```
C$STORAGE:2
C$NOLIST
C$DEBUG
      PROGRAM       WBSDR
C      ORGANIZE THE WATTS BARR SIMULATOR DATA
      CHARACTER     FNAME*7,FNRT*3,FT*1,TOP*78,STUF*1
      DIMENSION     X(85)
      WRITE(*,'('' PROGRAM WBSDR.FOR '')')
      WRITE(*,'('' WATTS BARR SIMULATOR DATA ORGANIZER '')')
      WRITE(*,'('' MAKES ###.DAT FILES SMALLER '')')
      WRITE(*,'('' INPUT-FILE NAME ROOT = [###.DAT] '')')
      READ(*,'(A3)')                FNRT
      WRITE(FNAME,'(A3,''.DAT'')')  FNRT
      OPEN(7,FILE=FNAME,STATUS='OLD')
      WRITE(FNAME,'(A3,''.DAX'')')  FNRT
      OPEN(8,FILE=FNAME,STATUS='NEW')
      WRITE(*,'(5X,'' ORGANIZE HOW MANY TIME STEPS'')')
      READ(*,'(I10)') ITIMES
      WRITE(*,'(5X,'' ANALYZE EVERY Nth TIME, START /W 1st '')')
      READ(*,'(I10)') ISKIP
      WRITE(*,'(5X,'' # OF BLANK LINES AT TOP OF FILE'')')
      READ(*,'(I10)') ITOP
      WRITE(*,'(5X,'' WORKING'')')
      DO 777 IJK=1,ITOP
```

```
      READ(7,'(A78)',END=999) TOP
      WRITE(*,'(A78)') TOP
  777 CONTINUE
      LL=0
      DO 500 KK=1,ITIMES*ISKIP
      IF(KK.EQ.1) THEN
      ELSE
      READ(7,'(A1)') FT
      WRITE(FT,'(''F'')')
      ENDIF
      LL=LL+1
      IF(LL.GT.ISKIP) LL=1
      IF(LL.NE.1) THEN
      READ(7,'(1X,A1)',END=999) STUF
      DO 90 II=1,81
      READ(7,'(1X,A1)',END=999) STUF
   90 CONTINUE
      ELSE
      READ(7,'(1X,F12.6)',END=999) TIME
      WRITE(8,'(1X,A1)') FT
      WRITE(8,'(1X,F10.2)') TIME
      WRITE(*,'(1X,A1,F10.2)') FT,TIME
      DO 100 II=1,81
      READ(7,'(E19.12)',END=999) X(II)
      WRITE(8,'(1X,F6.4)') X(II)
  100 CONTINUE
      ENDIF
  500 CONTINUE
  999 STOP
      END
```

## E.10 Program WBSIFG.FOR

This program takes the data set *.DAT output by WBSDR.FOR and reduces the number of variables in the file from 81 to 37 or less. This is done by averaging similar variables together or ignoring certain variables altogether through the use of a *.INX file. For example, the steam flow rate variables for each of the four steam generators can be averaged together into one single value or ignored. The program then constructs an input data file *.DDI for use in training a network with SCN.FOR, or BPN.FOR. The output is set so that normal operations yields all zeros and a single unique node is activated for each different accident scenario. Only one *.DAT file is processed at time.

```
C$STORAGE:2
C$NOLIST
C$DEBUG
C       ORGANIZE THE WATTS BARR SIMULATOR DATA
C       THIS VERSION TAKES ONE ###.DAT FILE AND
C       SETS THE OUTPUT TO 0.,0.,... OR 1.,0.,... FOR THE FIRST,
C       OR 0.,1.,... FOR THE SECOND... FILES DEPENDING ON THE TIME
C       SPECIFIED BY THE USER.
C       ###.TXT IS THE OUTPUT FILE WHICH EXPLAINS THE FILES
C       THE OUTPUT ###.DDI FILE HAS 10F7.4 FORMAT
      PROGRAM       WBSIFG
      CHARACTER     FNAME*7,FNRT*3,FNRT1*3,FT1*1,TOP*7,STUF*1
      DIMENSION     X(85),Y(40),Z(40),IIM(40),OUT(8)
      WRITE(*,'('' PROGRAM WBSIFG.FOR '')')
```

```
WRITE(*,'('' 1-FILE, WATTS BARR SIMULATOR DATA ORGANIZER '')')
WRITE(*,'('' MAKES A ###.DDI FILE FOR SIM CON '')')
WRITE(*,'('' INPUT FILE NAME ROOT = [###.DAT] '')')
READ(*,'(A3)')                  FNRT
WRITE(FNAME,'(A3,''.INX'')')  FNRT
OPEN(6,FILE=FNAME,STATUS='OLD')
WRITE(FNAME,'(A3,''.DAT'')')  FNRT
OPEN(1,FILE=FNAME,STATUS='OLD')
WRITE(FNRT1,'(A3)')             FNRT
WRITE(*,'('' INPUT FILE TIME OF TRANSIENT [ROD DROP] '')')
READ(*,'(F10.2)')               TRNS1
WRITE(*,'('' IS THIS THE 1st, 2nd OR ...[8th] FILE '')')
READ(*,'(I10)')                 IFIL
WRITE(*,'('' OUTPUT FILE NAME ROOT = [###.DDI] '')')
READ(*,'(A3)')                  FNRT
WRITE(FNAME,'(A3,''.DDI'')')  FNRT
OPEN(8,FILE=FNAME,STATUS='NEW')
WRITE(FNAME,'(A3,''.TXT'')')  FNRT
OPEN(7,FILE=FNAME,STATUS='NEW')
WRITE(7,'(5X,'' FILE NAME ROOT = [###.DAT] '')')
WRITE(7,'(7X,A3)')              FNRT1
WRITE(7,'(5X,'' INPUT FILE TRANSIENT TIME,F10.2[ROD DROP]'')')
WRITE(7,'(F10.2)')              TRNS1
WRITE(7,'(5X,'' IS THIS THE 1st, 2nd OR ...[8th] FILE '')')
WRITE(7,'(I10)')                IFIL
WRITE(7,'(5X,'' OUTPUT FILE NAME ROOT = [###.DDI] '')')
WRITE(7,'(7X,A3)')              FNRT
WRITE(*,'(1X,'' ORGANIZE HOW MANY TIME STEPS FROM FILE'')')
READ(*,'(I10)')                 ITIMES
WRITE(*,'(1X,'' ANALYZE EVERY Nth TIME, START /W 1st '')')
READ(*,'(I10)')                 ISKIP
WRITE(*,'(1X,'' # OF BLANK LINES AT TOP OF FILE'')')
READ(*,'(I10)')                 ITOP
READ(6,'(1X,A1)')    STUF
READ(6,'(1X,10I5)') (ILM(II),II= 1,10)
READ(6,'(1X,10I5)') (ILM(II),II=11,20)
READ(6,'(1X,10I5)') (ILM(II),II=21,30)
READ(6,'(1X,10I5)') (ILM(II),II=31,40)
WRITE(7,'(5X,'' ORGANIZE HOW MANY TIME STEPS FROM FILE'')')
WRITE(7,'(I10)')                ITIMES
WRITE(7,'(5X,'' ANALYZE EVERY Nth TIME, START /W 1st '')')
WRITE(7,'(I10)')                ISKIP
WRITE(7,'(5X,'' # OF BLANK LINES AT TOP OF FILE'')')
WRITE(7,'(I10)')                ITOP
WRITE(7,'(5X,'' THE ###.INX FILE IS AS FOLLOWS'')')
WRITE(7,'(2X,10I5)') (ILM(II),II= 1,10)
WRITE(7,'(2X,10I5)') (ILM(II),II=11,20)
WRITE(7,'(2X,10I5)') (ILM(II),II=21,30)
```

```
    WRITE(7,'(2X,10I5)') (IIM(II),II=31,40)
    ZERO=0.
    ONE=1.
    WRITE(*,'(5X,'' WORKING'')')
    DO 777 IJK=1,ITOP
    READ(1,'(A7)',END=999) TOP
777 CONTINUE
    LL=0
    DO 500 KK=1,ITIMES*ISKIP
    IF(KK.EQ.1) THEN
    WRITE(FT1,'(''F'')')
    ELSE
    READ(1,'(A1)') FT1
    ENDIF
    LL=LL+1
    IF(LL.GT.ISKIP) LL=1
    IF(LL.NE.1) THEN
    READ(1,'(1X,A1)',END=999) STUF
    DO 90 II=1,81
    READ(1,'(1X,A1)',END=999) STUF
 90 CONTINUE
    ELSE
    READ(1,'(1X,F12.6)',END=999) TIME1
    DO 100 II=1,81
    READ(1,'(E19.12)',END=999) X(II)
100 CONTINUE
    IT1=0
    IT2=0
    IF(TRNS1.LE.TIME1) IT1=1
    WRITE(*,'(1X,A1,I5,F10.2,5X)') FT1,IT1,TIME1
    Y(1)=(X(1)+X(2)+X(3)+X(4))/4.
    Y(2)=(X(5)+X(6)+X(7)+X(8))/4.
    DO 350 II=1,6
    Y(2+II)=X(8+II)
350 CONTINUE
    Y(9)=(X(15)+X(16)+X(17)+X(18))/4.
    Y(10)=(X(19)+X(20)+X(21)+X(22))/4.
    Y(11)=(X(23)+X(24)+X(25)+X(26))/4.
    Y(12)=(X(27)+X(28)+X(29)+X(30))/4.
    Y(13)=(X(31)+X(32)+X(33)+X(34))/4.
    Y(14)=(X(35)+X(36)+X(37)+X(38))/4.
    Y(15)=(X(39)+X(41)+X(43)+X(45))/4.
    Y(16)=(X(40)+X(42)+X(44)+X(46))/4.
    DO 360 II=1,5
    Y(16+II)=X(46+II)
360 CONTINUE
    Y(22)=(X(52)+X(53))/2.
    Y(23)=X(54)
```

```
      Y(24)=X(55)
      Y(25)=(X(56)+X(57))/2.
      Y(26)=(X(58)+X(62)+X(66)+X(70))/4.
      Y(27)=(X(59)+X(63)+X(67)+X(71))/4.
      Y(28)=(X(60)+X(64)+X(68)+X(72))/4.
      Y(29)=(X(61)+X(65)+X(69)+X(74))/4.
      Y(30)=X(73)
      DO 370 II=1,7
      Y(30+II)=X(74+II)
  370 CONTINUE
C
      JJ=0
      DO 400 II=1,37
      IF(IIM(II).NE.1) GO TO 400
      JJ=JJ+1
      Z(JJ)=Y(II)
  400 CONTINUE
      WRITE(8,'(2X,10F7.4)') (Z(II),II=1,JJ)
      DO 966 LJJK=1,8
      OUT(LJJK)=0.
      IF((TRNS1.LE.TIME1).AND.(IFIL.EQ.LJJK))
     &  OUT(IFIL)=1.
  966 CONTINUE
      WRITE(8,'(2X, 8F7.4)') (OUT(LJX),LJX=1,8)
  866 CONTINUE
      ENDIF
  500 CONTINUE
  999 STOP
      END
```

## E.11 Program WBSIGN.FOR

This program performs the same function as WBSIFG.FOR except that random Gaussian noise can a be added to the *.DDI file values. This noise is added with the standard deviation of the distribution set to some desired fraction of the no-noise signal.

```
C$STORAGE:2
C$NOLIST
C$DEBUG
C      ORGANIZE THE WATTS BARR SIMULATOR DATA
C      SAME AS WBSIFG EXCEPT WITH ADDED GAUSSIAN NOISE
C
      PROGRAM       WBSIGN
      CHARACTER     FNAME*7,FNRT*3,FNRT1*3,FT1*1,TOP*7,STUF*1
      REAL*8 RN,RNSUM,RNSD,A
      INTEGER*4 N,J3,J5,IG,J100,JRAN,IA,IM,IC,II,IOUT
      DIMENSION X(85),Y(40),Z(40),IIM(40),OUT(8)
      WRITE(*,'('' PROGRAM WBSIGN.FOR '')')
      WRITE(*,'('' 1-FILE, WATTS BARR SIMULATOR DATA ORGANIZER '')')
      WRITE(*,'('' WITH ADDED GAUSSIAN NOISE '')')
      WRITE(*,'('' MAKES A ###.DDI FILE FOR SIM CON '')')
      WRITE(*,'('' INPUT FILE NAME ROOT = [###.DAT] '')')
      READ(*,'(A3)')                FNRT
      WRITE(*,'('' TOTAL # OF FILES IN SET [# OF OUTPUT NODES]'')')
      READ (*,'(I10)')              INNF
      WRITE(FNAME,'(A3,''.INX'')')  FNRT
      OPEN(6,FILE=FNAME,STATUS='OLD')
      WRITE(FNAME,'(A3,''.DAT'')')  FNRT
      OPEN(1,FILE=FNAME,STATUS='OLD')
      WRITE(FNRT1,'(A3)')           FNRT
      WRITE(*,'('' INPUT FILE TIME OF TRANSIENT [ROD DROP] '')')
      READ(*,'(F10.2)')             TRNS1
      WRITE(*,'('' IS THIS THE 1st, 2nd OR ...[8th] FILE '')')
      READ(*,'(I10)')               IFIL
      WRITE(*,'('' OUTPUT FILE NAME ROOT = [###.DDI] '')')
      READ(*,'(A3)')                FNRT
      WRITE(FNAME,'(A3,''.DDI'')')  FNRT
      OPEN(8,FILE=FNAME,STATUS='NEW')
      WRITE(FNAME,'(A3,''.TXT'')')  FNRT
```

```
      WRITE(*,'('' INPUT NOISE INFO''):'')')
      WRITE(*,'('' SIG [F12.6] AS A % OF ACTUAL VALUE'')')
      READ (*,524) SIG
      WRITE(*,524) SIG
  524 FORMAT(F12.6)
C      RANDOM # SEED AND MULTIPLIER
      IM=259200
      IA=7141
      IC=54773
      JRAN=37591
      WRITE(*,'('' INPUT RANDOM SEED (I25), [ 37591 = DEFAULT ] '')')
      READ (*,'(I25)') JRAN
      IF   (JRAN.NE.0.) GO TO 160
      JRAN=37591
  160 CONTINUE
      OPEN(7,FILE=FNAME,STATUS='NEW')
      WRITE(7,'(5X,'' FILE NAME ROOT = [###.DAT] '')')
      WRITE(7,'(7X,A3)')              FNRT1
      WRITE(7,'(5X,'' INPUT FILE TRANSIENT TIME,F10.2[ROD DROP]'')')
      WRITE(7,'(F10.2)')              TRNS1
      WRITE(7,'(5X,'' IS THIS THE 1st, 2nd OR ...[8th] FILE '')')
      WRITE(7,'(I10)')                IFIL
      WRITE(7,'(5X,'' OUTPUT FILE NAME ROOT = [###.DDI] '')')
      WRITE(7,'(7X,A3)')              FNRT
      WRITE(*,'(1X,'' ORGANIZE HOW MANY TIME STEPS FROM FILE'')')
      READ(*,'(I10)')                 ITIMES
      WRITE(*,'(1X,'' ANALYZE EVERY Nth TIME, START /W 1st '')')
      READ(*,'(I10)')                 ISKIP
      WRITE(*,'(1X,'' # OF BLANK LINES AT TOP OF FILE'')')
      READ(*,'(I10)')                 ITOP
      READ(6,'(1X,A1)')    STUF
      READ(6,'(1X,10I5)') (IIM(II),II= 1,10)
      READ(6,'(1X,10I5)') (IIM(II),II=11,20)
      READ(6,'(1X,10I5)') (IIM(II),II=21,30)
      READ(6,'(1X,10I5)') (IIM(II),II=31,40)
      WRITE(7,'(5X,'' ORGANIZE HOW MANY TIME STEPS FROM FILE'')')
      WRITE(7,'(I10)')                ITIMES
      WRITE(7,'(5X,'' ANALYZE EVERY Nth TIME, START /W 1st '')')
      WRITE(7,'(I10)')                ISKIP
      WRITE(7,'(5X,'' # OF BLANK LINES AT TOP OF FILE'')')
      WRITE(7,'(I10)')                ITOP
      WRITE(7,'(5X,'' THE ###.INX FILE IS AS FOLLOWS'')')
      WRITE(7,'(2X,10I5)') (IIM(II),II= 1,10)
      WRITE(7,'(2X,10I5)') (IIM(II),II=11,20)
      WRITE(7,'(2X,10I5)') (IIM(II),II=21,30)
      WRITE(7,'(2X,10I5)') (IIM(II),II=31,40)
      WRITE(7,'(5X,'' S.D AS % OF SIGNAL'')')
      WRITE(7,'(2X,F12.6)') SIG
```

```
      WRITE(7,'(5X,'' STARTING RANDOM #'')')
      WRITE(7,'(I10)') JRAN
      ZERO=0.
      ONE=1.
      WRITE(*,'(5X,'' WORKING'')')
      DO 777 LJK=1,ITOP
      READ(1,'(A7)',END=999) TOP
  777 CONTINUE
      LL=0
      DO 500 KK=1,ITIMES*ISKIP
      IF(KK.EQ.1) THEN
      WRITE(FT1,'(''F'')')
      ELSE
      READ(1,'(A1)') FT1
      ENDIF
      LL=LL+1
      IF(LL.GT.ISKIP) LL=1
      IF(LL.NE.1) THEN
      READ(1,'(1X,A1)',END=999) STUF
      DO 90 II=1,81
      READ(1,'(1X,A1)',END=999) STUF
   90 CONTINUE
      ELSE
      READ(1,'(1X,F12.6)',END=999) TIME1
      DO 100 II=1,81
      READ(1,'(E19.12)',END=999) X(II)
  100 CONTINUE
      IT1=0
      IT2=0
      IF(TRNS1.LE.TIME1) IT1=1
      WRITE(*,'(1X,A1,I5,F10.2,5X)') FT1,IT1,TIME1
      Y(1)=(X(1)+X(2)+X(3)+X(4))/4.
      Y(2)=(X(5)+X(6)+X(7)+X(8))/4.
      DO 350 II=1,6
      Y(2+II)=X(8+II)
  350 CONTINUE
      Y(9)=(X(15)+X(16)+X(17)+X(18))/4.
      Y(10)=(X(19)+X(20)+X(21)+X(22))/4.
      Y(11)=(X(23)+X(24)+X(25)+X(26))/4.
      Y(12)=(X(27)+X(28)+X(29)+X(30))/4.
      Y(13)=(X(31)+X(32)+X(33)+X(34))/4.
      Y(14)=(X(35)+X(36)+X(37)+X(38))/4.
      Y(15)=(X(39)+X(41)+X(43)+X(45))/4.
      Y(16)=(X(40)+X(42)+X(44)+X(46))/4.
      DO 360 II=1,5
      Y(16+II)=X(46+II)
  360 CONTINUE
      Y(22)=(X(52)+X(53))/2.
```

```
      Y(23)=X(54)
      Y(24)=X(55)
      Y(25)=(X(56)+X(57))/2.
      Y(26)=(X(58)+X(62)+X(66)+X(70))/4.
      Y(27)=(X(59)+X(63)+X(67)+X(71))/4.
      Y(28)=(X(60)+X(64)+X(68)+X(72))/4.
      Y(29)=(X(61)+X(65)+X(69)+X(74))/4.
      Y(30)=X(73)
      DO 370 II=1,7
      Y(30+II)=X(74+II)
  370 CONTINUE
      JJ=0
      DO 400 II=1,37
      IF(IIM(II).NE.1) GO TO 400
      JJ=JJ+1
      SIGY=Y(II)*SIG/100.
      SIGY=AMAX1(SIGY,.0001)
C      MAKE GAUSSIAN, USE THE REJECTION METHOD [St1 Unit1 p18]
  550 CONTINUE
C      RANDOM # GENERATOR
      JRAN=MOD(JRAN*IA+IC,IM)
      RN=FLOAT(JRAN)/FLOAT(IM)
      XI=(-3.*SIGY)+RN*(6.*SIGY)
      RND=EXP(-(XI**2)/(2*SIGY**2))
C      REJECTION CRITERIA FOR CREATING A GAUSSIAN
      JRAN=MOD(JRAN*IA+IC,IM)
      RN=FLOAT(JRAN)/FLOAT(IM)
      IF(RN.LE.RND) GOTO 600
      GOTO 550
  600 CONTINUE
C      WRITE(*,'('' SIGY,XI,RND,RN'',4E12.6)') SIGY,XI,RND,RN
      Z(JJ)=Y(II)+XI
  400 CONTINUE
      WRITE(8,'(2X,10F7.4)') (Z(II),II=1,JJ)
      DO 966 LJJK=1,INNF
      OUT(LJJK)=0.
      IF((TRNS1.LE.TIME1).AND.(IFIL.EQ.LJJK))
     &  OUT(IFIL)=1.
  966 CONTINUE
      WRITE(8,'(2X,9F7.4)') (OUT(LJX),LJX=1,INNF),TIME1/100.
  866 CONTINUE
      ENDIF
  500 CONTINUE
  999 STOP
      END
```

## E.12 Program WBSIUN.FOR

This program performs the same function as WBSIGN.FOR except that the random noise is taken from a uniform distribution. The limits of this distribution are set by the user as some fraction of the no-noise signal.

```
C$STORAGE:2
C$NOLIST
C$DEBUG
C       ORGANIZE THE WATTS BARR SIMULATOR DATA
C       SAME AS WBSIFG EXCEPT WITH ADDED UNIFORM NOISE
C
      PROGRAM       WBSIUN
      CHARACTER     FNAME*7,FNRT*3,FNRT1*3,FT1*1,TOP*7,STUF*1
      REAL*8 RN,RNSUM,RNSD,A
      INTEGER*4 N,J3,J5,IG,J100,JRAN,IA,IM,IC,II,IOUT
      DIMENSION X(85),Y(40),Z(40),ILM(40),OUT(8)
      WRITE(*,'('' PROGRAM WBSIUN.FOR '')')
      WRITE(*,'('' 1-FILE, WATTS BARR SIMULATOR DATA ORGANIZER '')')
      WRITE(*,'('' WITH ADDED UNIFORM NOISE '')')
      WRITE(*,'('' MAKES A ###.DDI FILE FOR SIM CON '')')
      WRITE(*,'('' INPUT FILE NAME ROOT = [###.DAT] '')')
      READ(*,'(A3)')                FNRT
      WRITE(*,'('' TOTAL # OF FILES IN SET [# OF OUTPUT NODES]'')')
      READ (*,'(I10)')              INNF
      WRITE(FNAME,'(A3,''.INX'')')  FNRT
      OPEN(6,FILE=FNAME,STATUS='OLD')
      WRITE(FNAME,'(A3,''.DAT'')')  FNRT
      OPEN(1,FILE=FNAME,STATUS='OLD')
      WRITE(FNRT1,'(A3)')           FNRT
      WRITE(*,'('' INPUT FILE TIME OF TRANSIENT [ROD DROP] '')')
      READ(*,'(F10.2)')             TRNS1
      WRITE(*,'('' IS THIS THE 1st, 2nd OR ...[8th] FILE '')')
      READ(*,'(I10)')               IFIL
      WRITE(*,'('' OUTPUT FILE NAME ROOT = [###.DDI] '')')
      READ(*,'(A3)')                FNRT
      WRITE(FNAME,'(A3,''.DDI'')')  FNRT
      OPEN(8,FILE=FNAME,STATUS='NEW')
```

```
      WRITE(FNAME,'(A3,''.TXT'')')  FNRT
      WRITE(*,'(''  INPUT NOISE INFO''):'')')
      WRITE(*,'('' SIG [F12.6] UNIFORM % OF ACTUAL VALUE'')')
      READ (*,524) SIG
      WRITE(*,524) SIG
  524 FORMAT(F12.6)
C      RANDOM # SEED AND MULTIPLIER
      IM=259200
      IA=7141
      IC=54773
      JRAN=37591
      WRITE(*,'('' INPUT RANDOM SEED (I25), [ 37591 = DEFAULT ] '')')
      READ (*,'(I25)') JRAN
      IF   (JRAN.NE.0.) GO TO 160
      JRAN=37591
  160 CONTINUE
      OPEN(7,FILE=FNAME,STATUS='NEW')
      WRITE(7,'(5X,'' FILE NAME ROOT = [###.DAT] '')')
      WRITE(7,'(7X,A3)')            FNRT1
      WRITE(7,'(5X,'' INPUT FILE TRANSIENT TIME,F10.2[ROD DROP]'')')
      WRITE(7,'(F10.2)')            TRNS1
      WRITE(7,'(5X,'' IS THIS THE 1st, 2nd OR ...[8th] FILE '')')
      WRITE(7,'(I10)')              IFIL
      WRITE(7,'(5X,'' OUTPUT FILE NAME ROOT = [###.DDI] '')')
      WRITE(7,'(7X,A3)')            FNRT
      WRITE(*,'(1X,'' ORGANIZE HOW MANY TIME STEPS FROM FILE'')')
      READ(*,'(I10)')               ITIMES
      WRITE(*,'(1X,'' ANALYZE EVERY Nth TIME, START /W 1st '')')
      READ(*,'(I10)')               ISKIP
      WRITE(*,'(1X,'' # OF BLANK LINES AT TOP OF FILE'')')
      READ(*,'(I10)')               ITOP
      READ(6,'(1X,A1)')    STUF
      READ(6,'(1X,10I5)') (ILM(II),II= 1,10)
      READ(6,'(1X,10I5)') (ILM(II),II=11,20)
      READ(6,'(1X,10I5)') (ILM(II),II=21,30)
      READ(6,'(1X,10I5)') (ILM(II),II=31,40)
      WRITE(7,'(5X,'' ORGANIZE HOW MANY TIME STEPS FROM FILE'')')
      WRITE(7,'(I10)')              ITIMES
      WRITE(7,'(5X,'' ANALYZE EVERY Nth TIME, START /W 1st '')')
      WRITE(7,'(I10)')              ISKIP
      WRITE(7,'(5X,'' # OF BLANK LINES AT TOP OF FILE'')')
      WRITE(7,'(I10)')              ITOP
      WRITE(7,'(5X,'' THE ###.INX FILE IS AS FOLLOWS'')')
      WRITE(7,'(2X,10I5)') (ILM(II),II= 1,10)
      WRITE(7,'(2X,10I5)') (ILM(II),II=11,20)
      WRITE(7,'(2X,10I5)') (ILM(II),II=21,30)
      WRITE(7,'(2X,10I5)') (ILM(II),II=31,40)
      WRITE(7,'(5X,'' UNIFORM +/- AS % OF SIGNAL'')')
```

```
      WRITE(7,'(2X,F12.6)') SIG
      WRITE(7,'(5X,'' STARTING RANDOM #'')')
      WRITE(7,'(I10)') JRAN
      ZERO=0.
      ONE=1.
      WRITE(*,'(5X,'' WORKING'')')
      DO 777 IJK=1,ITOP
      READ(1,'(A7)',END=999) TOP
  777 CONTINUE
      LL=0
      DO 500 KK=1,ITIMES*ISKIP
      IF(KK.EQ.1) THEN
      WRITE(FT1,'(''F'')')
      ELSE
      READ(1,'(A1)') FT1
      ENDIF
      LL=LL+1
      IF(LL.GT.ISKIP) LL=1
      IF(LL.NE.1) THEN
      READ(1,'(1X,A1)',END=999) STUF
      DO 90 II=1,81
      READ(1,'(1X,A1)',END=999) STUF
   90 CONTINUE
      ELSE
      READ(1,'(1X,F12.6)',END=999) TIME1
      DO 100 II=1,81
      READ(1,'(E19.12)',END=999) X(II)
  100 CONTINUE
      IT1=0
      IT2=0
      IF(TRNS1.LE.TIME1) IT1=1
      WRITE(*,'(1X,A1,I5,F10.2,5X)') FT1,IT1,TIME1
      Y(1)=(X(1)+X(2)+X(3)+X(4))/4.
      Y(2)=(X(5)+X(6)+X(7)+X(8))/4.
      DO 350 II=1,6
      Y(2+II)=X(8+II)
  350 CONTINUE
      Y(9)=(X(15)+X(16)+X(17)+X(18))/4.
      Y(10)=(X(19)+X(20)+X(21)+X(22))/4.
      Y(11)=(X(23)+X(24)+X(25)+X(26))/4.
      Y(12)=(X(27)+X(28)+X(29)+X(30))/4.
      Y(13)=(X(31)+X(32)+X(33)+X(34))/4.
      Y(14)=(X(35)+X(36)+X(37)+X(38))/4.
      Y(15)=(X(39)+X(41)+X(43)+X(45))/4.
      Y(16)=(X(40)+X(42)+X(44)+X(46))/4.
      DO 360 II=1,5
      Y(16+II)=X(46+II)
  360 CONTINUE
```

```
      Y(22)=(X(52)+X(53))/2.
      Y(23)=X(54)
      Y(24)=X(55)
      Y(25)=(X(56)+X(57))/2.
      Y(26)=(X(58)+X(62)+X(66)+X(70))/4.
      Y(27)=(X(59)+X(63)+X(67)+X(71))/4.
      Y(28)=(X(60)+X(64)+X(68)+X(72))/4.
      Y(29)=(X(61)+X(65)+X(69)+X(74))/4.
      Y(30)=X(73)
      DO 370 II=1,7
      Y(30+II)=X(74+II)
  370 CONTINUE
C
      JJ=0
      DO 400 II=1,37
      IF(ILM(II).NE.1) GO TO 400
      JJ=JJ+1
      SIGY=Y(II)*SIG/100.
      SIGY=AMAX1(SIGY,.0001)
C      MAKE A UNIFORM DISTRIBUTION
C      RANDOM # GENERATOR
      JRAN=MOD(JRAN*IA+IC,IM)
      RN=FLOAT(JRAN)/FLOAT(IM)
      XI=(-1.*SIGY)+RN*(2.*SIGY)
      Z(JJ)=Y(II)+XI
  400 CONTINUE
      WRITE(8,'(2X,10F7.4)') (Z(II),II=1,JJ)
      DO 966 LJJK=1,INNF
      OUT(LJJK)=0.
      IF((TRNS1.LE.TIME1).AND.(IFIL.EQ.LJJK))
     &  OUT(IFIL)=1.
  966 CONTINUE
      WRITE(8,'(2X,9F7.4)') (OUT(LJX),LJX=1,INNF),TIME1/100.
  866 CONTINUE
      ENDIF
  500 CONTINUE
  999 STOP
      END
```

# APPENDIX F.

## COMPUTER FILE INDEXES

### F.1 Index of File Prefixes

Below is a brief description of each of the computer file name prefixes used in this dissertation.

File Name: CFM.*

Purpose: Continuous function mapping benchmark

Description:

This benchmark example illustrates the continuous function mapping capabilities of artificial neural networks. The network building capability of the simulated condensation methodology is also demonstrated with this benchmark. This example is given in Appendix A.5.

File Name: GDS.*

Purpose: Gaussian distribution separation benchmark

Description:

The files with this prefix are used in Appendix A.4. Program GDGEN.FOR is used to generate the data for

this example. The GDS.* example shows the generalization capabilities of the artificial neural networks investigated. The dynamic node architecture option of simulated condensation is also demonstrated by this example.

File Name: SSP.*

Purpose: Simple sample problem benchmark

Description:

The files with this prefix are used in the benchmark analysis of Appendix A.2. This example illustrates the noise tolerance of the networks trained.

File Name: UDS.*

Purpose: Uniform distribution separation benchmark

Description:

The files with this prefix are used in uniform distribution separation benchmarks of Appendix A.3. Program UDGEN.FOR is used to generate the data needed for this benchmark. The UDS.* files show the generalization capabilities of the analyzed networks.

File Name: WB7.*

Purpose: Watts Barr seven scenario problem

Description:

The files with this prefix are the files used in Section 5. These files contain the main results of this investigation. Figure 3 through 16 of Section 5 show the results of the network trained for the purposes of nuclear power plant condition diagnoses. The network is saved in the files with this prefix.

File Name: XOR.*

Purpose: Exclusive-Or benchmark

Description:

The files with this prefix are used in the benchmark example of Appendix A.1. This is a classic benchmark and is easily compared to similar examples in the literature. The noise tolerance of the analyzed networks is also illustrated by this example.

## F.2 Index of File Suffixes

Below is an alphabetical listing and brief description of the file name suffixes used in this dissertation.

*.ACT - A temporary file.

*.DAT - Used for storage of the Watts Barr data.

*.DAX - The Watts Barr data set as output by WBSDR.FOR.

*.DDI - Input data file. This file is used as:

1. The training set for input to SCN.FOR;
2. The recall set for input to RCL.FOR;
3. The training or recall set for BPN.FOR.

Both of the environmental vectors, $X_1$, and $X_{I+1}$ are included in the file. The format for the contents is 2X,10(F7.4). The first group of lines contain the first exemplar input vector $X_1$, the second group of lines contain the desired output vector $XD_{I+1}$. The file continues this alternation for all of the exemplars.

*.DNA - Output file of network architecture changes. This file is output by SCN.FOR. See Appendix A.4 for an example and discussion.

*.EXE - An executable fortran program file.

*.FOR - This suffix is used for fortran programs. Appendix E contains a listing of all of the computer codes used in this dissertation.

*.INX - A parameter input file for the Watts Barr *.DDI generation codes WBSIFG.FOR, WBSIGN.FOR and WBSIUN.FOR. This file instructs these codes as to which of the 37 reduced variables to include in the *.DDI file to be created. See Appendix C.4 for an example of an *.INX file.

*.NNB - This is the suffix used for parameter input files for BPN.FOR. There is one title line and three data lines in this file. The formats of these lines are 1X,A79, 1X,9I5, 1X,5I5 and 1X,2F10.6 respectively. The first line is used as a title line. The second line includes integer input information such as, the number of

layers and the number of input nodes. The third line describes the number of nodes in each layer of the network. The fourth line contains the gain and learning rate values.

*.NNI - This suffix is used for parameter input files for SCN.FOR, or RCL.FOR. There are six lines of information in this file. The formats of these lines are 1X,A79, 1X,12I5, 1X,5I5, 1X,8F10.6, 1X,8F10.6 and F20.10 respectively. The first line is used as a title line. The second line contains integer input information such as, the number of layers and the number of input nodes. Also included on this second line is the number of repetitions for each of the trainable parameters as well as the number of repetitions executed between each printout line. The third line describes the number of nodes in each layer of the network. The fourth and fifth lines contain the learning and adaptive parameters as well as the regional constraints on the trainable parameters. The sixth line contains an optional smallest value used by the code when division by zero may occur.

*.PRB - An output file from BPN.FOR

*.PRN - An output file from RCL.FOR which includes all possible outputs

*.PRX - An output file from RCL.FOR which may exclude the output from one of the output nodes

*.TIM - These files are input to fortran programs TSG.FOR or TSGN.FOR. The file instructs the program to process the desired time steps from the seven accident scenario *.DDI files. A single *.DDI file is output by TSG.FOR or TSGN.FOR.

*.TXT - A file which describes what interactive input parameters were requested during a particular fortran code run.

*.WTB - A file of the stored weights. Output from a BPN.FOR code training run. This file can also be used as input for BPN.FOR in the recall mode or for BPN.FOR when it is desired to start training an existing network from a point to which it has already been trained.

*.WTS - A file of the stored bias, constant, gain, and weight parameters. It is output from SCN.FOR code training run. It is the *.WTS file with the lowest training set error. This file can also be used as input for RCL.FOR or SCN.FOR when it is desired to start training of an existing network from a point to which it has already been trained.

# VITA

Eric Bruce Bartlett was born in Battle Creek, Michigan on May 31, 1959, the son of Alfred. K. and Dorothy. J. Bartlett. In 1977, after graduation from Concord-Carlisle High School in Concord Massachusetts, he attended Rensselaer Polytechnic Institute where he obtained the Bachelor of Science degree in Electrical Engineering in 1981 and the Master of Engineering degree in Nuclear Engineering in 1983. Also in 1983, he began work at Yankee Atomic Electric Company in Framingham, Massachusetts. He spent two years in each of the Radiological Engineering Group and the Reactor Physics Group at Yankee Atomic Electric Company. In 1987 he enrolled at the University of Tennessee at Knoxville to pursue the Doctor of Philosophy degree and continue his study of nuclear engineering. During the 1987-1988 academic year he received an Institute of Nuclear Power Operations fellowship award. During the two subsequent academic years he was employed by the Department of Nuclear Engineering as a Graduate Research Assistant.