



Integrated Systems and Control
Research and Development

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TO: ISAC Customers
FROM: Ron Follmer, ISAC Inc.
RE: TRINET PCMxxxx Series Rule operator and operand Reference

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The TRINET PCMxxxx System's rules make use of a library of Operators and Operands.

An Operator is a relational operation used to make decisions. An example of an Operator is the ">" (greater than) relation. TRINET rules utilize three places where Operators may be used.

An Operand is a Function that represents a value or calculation using some data values maintained by TRINET. An example of a Operand is "SUM P1,P2,P3,P4" which represents, or "returns a value of" the arithmetic sum of Points 1+2+3+4.

This document will provide a brief description of each of these Operators and Operands.

OPERATORS of Trinet

- "+" **Addition** Operator.
- "-" **Subtraction** Operator.
- "*" **Multiplication** Operator.
- "/" **Division** Operator.
- "/%" **Ratio** Operator. Where P1 /% P2 results in a value of (P1 divided by P2) multiplied by 100.0 to express the ratio as a Percent.
- "%" **Percent** Operator. Where the P1 % P2 results in a value of the P2 percent of P1.
- ">" **Greater Than** Operator.
- "<" **Less Than** Operator.
- "<>" **Not Equal To** Operator.

“>=” **Greater Than or Equal To Operator.**

“<=” **Less Than or Equal To Operator.**

“=” **Equal To Operator.**

OPERANDS of Trinet

“**Alxxx**” **Analog Input Value.** This Operand represents the current value of Analog Input xxx. The range of values is determined by the Analog Input Definitions.

“**DIxxx**” **Digital Input Value.** This Operand represents the state of Digital Input xxx. The range of values is either OFF (0.0) or ON (1.0).

“**AOxxx**” **Analog Output Value.** This Operand represents the current value of Analog Output xxx. The range of values is determined by the Analog Output Definition.

“**Pxxx**” **Point Value.** This Operand represents the current value of Point xxx. The range of values include analog, digital (ON/OFF), dates, time of day or text labels.

“**TOD**” **Time Of Day.** This Operand represents the current time of day. When used to set a Point value that is defined to be a “Time” type Point, it is displayed as HH:MM.

“**DOW**” **Day of the Week.** This Operand represents the current day of the week. When used to set a Point value that is defined to be a “Label” type Point, it is displayed as “SUN”, “MON”, “TUE” etc.

“**DOY**” **Day of the Year.** This Operand represents the current day of the year. When used to set a Point value that is defined to be a “Date” type Point, it is displayed as “MM/DD/YY”.

“**OFF**” **Logical OFF.** This Operand represents the state of OFF or 0.0. An analog value of <= 0.0 is always interpreted as OFF in rule comparisons.

“**ON**” **Logical ON.** This Operand represents the state of ON or 1.0. An analog value of >= 0.1 is always interpreted as ON in rule comparisons.

““**{text}**”” **Text Label Value.** This Operand represents a predefined or user created Label text string of up to 7 characters. This Operand is recognized by the leading quotation mark that must always be the left most character. No trailing quotation mark is required.
Example: “DEFROST

“**TPOxxx**” **Point ON Timer Value.** This Operand represents the current value in x.x minutes that the Point xxx: has been ON for digital points, has been > 0.0 for analog points, or has displayed the current label for label points.

- “TPFxxx” Point OFF Timer Value.** This Operand represents the current value in x.x minutes that the Point xxx: has been OFF for digital points, has been ≤ 0.0 for analog points.
- “TPAxxx” Point Accumulated ON Timer Value.** This Operand represents the current value in x.x hours that the Point xxx: has been ON as defined for the “TPOxxx” Operand above.
- “T” Logical TRUE.** This Operand represents the state of TRUE or ON or 1.0. An analog value of ≥ 0.1 is always interpreted as “T” (TRUE) in rule comparisons.
- “F” Logical FALSE.** This Operand represents the state of FALSE or OFF or ≤ 0.0 . An analog value of ≤ 0.0 is always interpreted as “F” (FALSE) in rule comparisons.
- “KWHx” Demand Value.** This Operand represents the value of the current energy used demand measured by the DIx used as a pulse demand input expressed in KWH over the KWH demand period (5-30 minutes). The KWH demand period/interval is entered on the Digital Input Definition screen. This value is calculated by measuring the incoming demand pulses accumulated over the KWH interval and then multiplying by the Pulse Multiplier. For example, if 20 pulses are received at DI1 over a 5 minute demand interval and the multiplier is 0.5, then the KWH1 value will be 10 Kwh.
- “DMDx” Hourly Demand Value.** This Operand represents the value of the current energy used demand measured by the DIx used as a pulse demand input expressed as an hourly KWH value projected from the previous DMD demand interval (5-30 minutes). The DMD demand period/interval is entered on the Digital Input Definition screen. The value is calculated by multiplying the total pulses received over the interval by the Pulse Multiplier, and then projecting this value as if it remained constant over an hour. For example, 60 pulses measured over 15 minutes at DI1 with a multiplier of 0.5 is 30 Kwh. Projected over an hour by multiplying this value by 4 gives 120 Kwh, which is the value that the DMD1 value will return.
- “MWHx” Accumulated Demand Value.** This Operand represents the value of the accumulated energy used since the value was last cleared. A point number may be specified in the Digital Input Definition that will cause the MWHx value to be cleared when in the “ON” state..
- “OMDx” Optimizer Mode Value.** This Operand represents the Mode Label value of the specified Optimizer Logic Block.
- “OPHx” Optimizer Phase Value.** This Operand represents the Phase Label value of the specified Optimizer Logic Block.
- “OSPx” Optimizer Setpoint Value.** This Operand represents the currently valid analog setpoint value of the specified Optimizer Logic Block.

- “OCLx”** **Optimizer Control** Value. This Operand represents the current Control Label value of the specified Optimizer Logic Block.
- “MIN”** **Minimum List** Value. The Operand MIN and it's associated 4 parameters represents the value of the arithmetic minimum of the 4 parameter values.
Syntax: *MIN operand1, operand2, operand3, operand4*
- “MAX”** **Maximum List** Value. The Operand MAX and it's associated 4 parameters represents the value of the arithmetic maximum of the 4 parameter values.
Syntax: *MAX operand1, operand2, operand3, operand4*
- “AVG”** **Average List** Value. The Operand AVG and it's associated 4 parameters represents the value of the arithmetic average of the 4 parameter values.
Syntax: *AVG operand1, operand2, operand3, operand4*
- “SUM”** **Sum List** Value. The Operand SUM and it's associated 4 parameters represents the value of the arithmetic sum of the 4 parameter values.
Syntax: *SUM operand1, operand2, operand3, operand4*
- “AND”** **Logical AND List** Value. The Operand AND and it's associated 4 parameters represents the digital value of the logical AND of the 4 parameter values. The logical AND result represents ON/TRUE/1.0 if ALL 4 parameters meet the definition of being ON/TRUE/>0.1.
Syntax: *AND operand1, operand2, operand3, operand4*
- “ALL”** **Logical ALL List** Value. Identical in function to the “AND” Operand.
- “OR”** **Logical OR List** Value. The Operand OR and it's associated 4 parameters represents the digital value of the logical OR of the 4 parameter values. The logical OR result represents ON/TRUE/1.0 if ANY of the 4 parameters meet the definition of being ON/TRUE/>0.1.
Syntax: *OR operand1, operand2, operand3, operand4*
- “ANY”** **Logical ANY List** Value. Identical in function to the “OR” Operand.
- “DIF”** **Difference List** Value. The Operand DIF and it's associated 2 parameters represents the absolute value (always positive) of the arithmetic difference of the 2 parameter values.
Syntax: *DIF operand1, operand2*
- “CAL”** **Calculation List** Value. This Operand represents the arithmetic computation of the formula specified in the associated rule entry field.
Syntax: *CAL a mathematical formula up to 40 characters long*
Example: *CAL “(P1*(P2/AI22))+100.0”*
- “UMN”** **User Log Column Minimum List** Value. This Operand represents the lowest value in the specified User Log and the specified log Column of data.
Syntax: *UMN log number, column number (1 to 4)*

- “UMX” User Log Column Maximum List Value.** This Operand represents the highest value in the specified User Log and the specified log Column of data.
Syntax: *UMX log number, column number (1 to 4)*
- “USM” User Log Column Sum List Value.** This Operand represents the arithmetic sum of all the values in the specified User Log and the specified log Column of data.
Syntax: *USM log number, column number (1 to 4)*
- “UAV” User Log Column Average List Value.** This Operand represents the arithmetic average of all the values in the specified User Log and the specified log Column of data.
Syntax: *UAV log number, column number (1 to 4)*
- “URT” User Log Column Rate List Value.** This Operand represents the Rate of Change in the specified User Log and the specified log Column of data between the most recent entry and another specified entry (row) in the log.
Syntax: *URT log number, column number (1 to 4), entry number (1=most recent entry).*
Example: “URT 1, 1, 2” returns the value change per minute of log #1, col #1, and the most recent entry compared to the next most recent entry.
- “UVL” User Log Column List Value.** This Operand represents the value stored in the specified User Log and the specified log Column and the specified entry (where 1 is the most recent entry) of data.
Syntax: *UVL log number, column number (1 to 4), entry number (1=most recent entry).*
- “UTH” User Log Column Range High List Value.** This Operand represents the maximum value within a specified range of values of a particular User Log and a particular log Column.
Syntax: *UTH log number, column number (1 to 4), low range value, high range value.*
- “UTL” User Log Column Range Low List Value.** This Operand represents the minimum value within a specified range of values of a particular User Log and a particular log Column.
Syntax: *UTH log number, column number (1 to 4), low range value, high range value.*
- “LFD” Label Find List Value.** This Operand represents a logical TRUE/FALSE/ON/OFF value of a search of a specified sub-string within a specified text Label or Label Point. The associated set of 2 parameters specifying a Point value to search and a string of text to search for.
Syntax: *LFD operand to search, string to search for (<=7 chars and with a leading quotation mark).*
Example: LFD P10, “C1

“ALM” Alarm Find Value. This Operand represents a logical TRUE/FALSE/ON/OFF result of a search of the current Alarm Log contents for an open alarm of a specified type and a specified Item value.

The *alarm type* is: (based on the Trinet family)

<u>Alarm Description</u>	<u>MST</u>	<u>SAC</u>	<u>PCM</u>
No Response	1		
Bad CRC/Network Errors	2	2	2
Wrong Panel	3		
Relay/DO Fault	4	4	3
Panel Pwr Fail	5		
Low Battery	6	6	4
AI Range Error	7	7	5
Act'ty Log Full	8	8	6
Prog Corrupted	9	9	7
Modem Access	10	10	
User Log Alarm	11	11	8
Trinet Pwr Fail	12	12	9
Mailbox Failure	13	13	10
Alarm Point ON	14	14	11
Local Access	15	15	
Panel Disabled	16		
No Network		1	1
X10 Chan Fail		16	
User Log Corrupted			13
Act'ty Log Corrupted			14
Mn't Log Corrupted			15
Alarm Log Corrupted			16
Modbus Ntwk Slave Error			17 (Pcmnet)
Ethernet Chan Error			18 (Pcmnet)
XML Parse/Create Error			19 (Pcmnet)
Ethernet Ntwk Peer Error			20 (Pcmnet v7.20)

The *alarm related item* is: The item number such as the Mailbox # recorded along with Mailbox Failures. Enter 0 to ignore related item.

The *alarm related point* is: The point number that is recorded along with certain alarm types such as “Alarm Point ON”. Enter 0 to ignore point.

Syntax: *ALM alarm type, alarm related item#, alarm related point.*

Example: ALM 14, 0, 20 returns TRUE if an Alarm Point ON alarm is open and the related Point is 20.

“DECx” Decode Digital Inputs Value. This Operand represents the decimal value obtained by doing a Binary to Decimal decode function on the first specified number of Digital Inputs. For instance, if the first 3 digital inputs are to be decoded and DI1=ON, DI2=OFF, and DI3=ON, the “DEC3” value will be 5 (five). The digital input numbering always starts with DI1. An undefined digital input will be assumed to be OFF.

“CLAxix” Clear the Accumulated ON Time Function. This Operand does not represent a value, rather it performs the clearing of the specified Point. In

this regard it is different from all other Trinet Operands. The point, xxx specifies the point number. Using a point number of 0 will clear all point's accumulated ON times.

- “SQCso” Sequencer Control Value.** This Operand represents the digital ON/OFF value of the specified Output and specified Sequencer Logic Block.
Syntax: *SQCso* where “s” is the Sequencer Logic Block# (1-8) and “o” is the Output # (1-8).
- “SQMs” Sequencer Mode Value.** This Operand represents the text Label value of the specified Sequencer Logic Block. The allowable values are: “INCR”, “DECR”, “BALANCE”, “OFF” or “OVR’D”.
Syntax: *SQMs* where “s” is the Sequencer Logic Block# (1-8).
- “SQVs” Sequencer Capacity Value.** This Operand represents the analog capacity value of the specified Sequencer Logic Block.
Syntax: *SQVs* where “s” is the Sequencer Logic Block# (1-8).
- “SQSs” Sequencer Step Value.** This Operand represents the current numeric step of the specified Sequencer Logic Block in an analog format (0.0).
Syntax: *SQSs* where “s” is the Sequencer Logic Block# (1-8).
- “SQEs” Sequencer Error Value.** This Operand represents the error text Label (if any) of the specified Sequencer Logic Block. For example, a possible Label value would be “STGFLT”.
Syntax: *SQEs* where “s” is the Sequencer Logic Block# (1-8).
- “DEW” Dewpoint List Value.** This Operand represents the calculation of the Dewpoint value based on the current dry bulb outside air temperature and the current relative humidity.
Syntax: *DEW* dry bulb temp (degF), relative humidity (0-100%).
- “WET” Wetbulb List Value.** This Operand represents the calculation of the Wetbulb value based on the current dry bulb outside air temperature and the current relative humidity.
Syntax: *WET* dry bulb temp (degF), relative humidity (0-100%).
- “CHGxxx” Point Changed Flag Value.** This Operand represents the digital ON/OFF value of the specified Point's Change of State Flag. This logic flag value is valid for only ONE control scan.
Syntax: *CHGxxx* where “xxx” is the Point#.
- “PIDxx” PID Logic Block Value.** This Operand represents the current calculated PID Logic Block value.
Syntax: *PIDxx* where “xx” is the PID Logic Block#.
- “DOxx” Digital Output Value.** This Operand represents the current ON/OFF value of the Digital Output.
Syntax: *DOxx* where “xx” is the Digital Output#.

- “DIRx” Digital Input Pulse Rate Value.** This Operand represents the current analog Pulses Per Minute value of the specified Digital Input (1-8).
Syntax: *Dlx* where “x” is the Digital Input#.
- “SPOxxx” Point ON Timer Value.** This Operand represents the current value in x.x seconds that the Point xxx: has been ON for digital points, has been > 0.0 for analog points, or has displayed the current label for label points.
- “SPFxxx” Point OFF Timer Value.** This Operand represents the current value in x.x seconds that the Point xxx: has been OFF for digital points, has been <= 0.0 for analog points.
- “SPAxxx” Point Accumulated ON Timer Value.** This Operand represents the current value in x.x seconds that the Point xxx: has been ON as defined for the “SPOxxx” Operand above.
- “REGxxxx” Modbus Register Value.** This Operand represents the current value of a Modbus register that has been defined. The “xxx” portion of the operand represents the Slave Number (1-16) and the register definition number (1-32). These two numbers are combined such that the one or two digit slave number is followed by the 2 digit (always 2 digits) register definition number. For example, the value of the first register definition for slave 2 would be “REG201”, and the value of the fifth register definition of slave 10 would be “REG1005”, etc.

The following are new Operands for the PCM400I

- “AIHxx” Highest Analog Input Value.** This Operand represents the highest value (peak value) measured by the specified Analog Input.
- “AILxx” Lowest Analog Input Value.** This Operand represents the lowest value measured by the specified Analog Input.
- “AIAxx” Average Analog Input Value.** This Operand represents the average value measured by the specified Analog Input.
- “SCH” Schedule List Value.** This List Operand function returns an ON/OFF (True/False) value based on the current date and time compared to the date and time points passed in the list parameters. All the list parameters are date or list point numbers. If the current date/time is greater than or equal to date1/time1 AND less than date2/time2, then the result is ON or TRUE.
Syntax: SCH *date1Pt#, time1Pt#, date2Pt#, time2Pt#*.
- “CHR” Current Hour Value.** This Operand represents the current hour value 0 to 23.
- “CMN” Current Minute Value.** This Operand represents the current minute value 0 to 59.

- “CMO”** **Current Month** Value. This Operand represents the current month value 1 to 12.
- “CDY”** **Current Day of the Month** Value. This Operand represents the current day of the month 1 to 31.
- “ULU”** **User Log Table Lookup List** Value. This List Operand function returns a value from a User Log based on passed parameters. The purpose is to perform an interpolation of values in the table. Parameter 1 is the User Log #. Parameter 2 is the column to compare to the key value. Parameter 3 is a point # that holds the key/compare value. Parameter 4 is the column of the log from which an interpolated value is computed. The process is to compare the key value to values of column (Param 2). When two entries are found in the column that bracket the key value, the linear interpolation is performed on the column (Param 4) which matches the compare column's. Then the function returns representing the final interpolated value.
 Syntax: ULU *UserLog#, Compare Col#, key Pt#, Result Col#..*

The following are new/modified Operands for the PCMNET

- “ETH”** **Current Ethernet** Value. For the PCM400I, this Operand represents ON or TRUE when the PCM has successfully logged on to the Internet. For the PCMNET this Rule function returns a True/ON result when the Ethernet Port has a valid IP address (if DHCP or BOOTP is used) and is ready for use.
- “DTH”** **Dialup Network Status (PCMNET only)**. Rule function returns a True/ON result when a valid Dial-up Internet connection has been established. This means that an ISP has been called via Modem, a valid username and password has been validated, and an IP address and mask has been obtained.
- “MBD”** **Mailbox Email Pending (PCMNET only)**. Rule function returns True/ON when one or more Internet-dependent Mailbox has been triggered and is waiting for a valid Internet connection before accomplishing it's email or other Internet/Ethernet function. This function is useful to trigger logic to force a Dial-up connection when an alarm condition exists and needs to be reported. Once a valid Internet connection is present, the Mailbox logic will complete it's work. Note that you must ensure that the Dialup connection is designated as the email port (as apposed to the Ethernet port which is always ready).
- “NST”** **Network Scan Time (PCMNET v7.20+)**. Rule function returns the average network scan time for both Peer to Peer and Modbus network activity combined. The value returned is in seconds.

(PCM_Controls_Rule.doc)