



Integrated Systems and Control
Auburn, CA

DATE: July 30, 2003
TO: Customers
FROM: Ron Follmer, ISAC Inc.
RE: Revised V2, PCMNet Internet Data Communications

Revisions:

November 5, 2002 (orig)

Background

This document describes the Internet Data Communications design of the ISAC PCMNet Monitoring and Control System.

The PCMNet has 3 separate serial ports to serve communications needs, Port #1 may be factory assembled for a 33,600 baud Modem or as a RS232 port. Port #2 is dedicated to be used as a local RS232 monitoring/configuration port. Port #3 is dedicated as a RS485 Modbus network port. The PCMNet is equipped with a 10BaseT Ethernet port which may be connected to an existing building network to provide full time Internet access to the PCM for monitoring. The PCMNet is also equipped with digital and analog I/O to directly interface with building sensors and loads.

Internet/Ethernet Communications Methods

From the perspective of a User on the Internet, the ISAC controls have several different interface channels.

1. A Telnet protocol server within the ISAC PCM provides the User with a configuration interface. Through this channel, the User can view the internal mode and operation of the PCM in real time and interactively. The Telnet interface is password protected with 4 levels of permissions from administrator level to a read-only level.
2. A HTTP protocol server within the ISAC PCM provides the User, with the aid of automating software, with a means of retrieving real time data values or entire logs of data that have accumulated over many days. Using an HTTP GET command, including name and password parameters, a single data value, a list of values, or a complete log of data over a prescribed time span can be returned in a text file in one of several formats. Similarly, a mode change can be effected in the PCM by a correctly formed GET command, with a verification message returned in the response to the command. This mechanism can be used to implement a load curtailment action at the building site.

3. When configured to broadcast alarm/exception events, the PCMNet systems can send Email annunciation messages via the SMTP protocol.
4. When configured, the PCMNet system can check for incoming Email using a POP3 protocol server. The Email POP server is queried periodically (period programmable) while an active Ethernet (10BaseT) or dialup Internet connection is active. Using a properly formatted Email message, the user may send commands to the PCMNet to override Point values permanently or temporarily.

Data Document Format Options

Formatting of the various data/log reports may be one of several defined. For PCMNET firmware revisions 7.11 and higher, "R", "H" and "X" report formats are available.

The "R" format means that the date/time values are expressed as a 14 character string such as "05162001060000", which represents 5/16/2001 6:00 AM. In addition, the "R" format uses normal ASCII Carriage Return and Line Feed characters to end each line, which is fine for an automated software retrieval but will not always appear properly when displayed on a commercial Internet Browser window.

The "H" format appears the same as the "R" format except that the document will display properly formatted when using an Internet Browser such as Microsoft's Internet Explorer or Netscape's Navigator. This format is useful when manually embedding the commands into normal URL specifications.

Lastly, the "X" format outputs data reports in XML format. The XML format is a structured text format that provides a means to easily integrate data reports with other computer applications. The XML structure (Schema) is fixed for all defined reports. A separate document describes the DTD format of the reports.

In most cases, the reports and logs outputted end with a line that contains one word, "DONE". The presence of this final line indicates that the complete report or log has completed. If the "DONE" line is output without any other data preceding it, this indicates that no data per the requested parameters was present. For instance, if User Log data is requested from a particular date and no log entries exist after that date, the result would be a "DONE" line without any preceding log records being received.

If the last line of the report or log is "ERROR", then this indicates that the preceding data lines were valid, but some problem prevented the remaining data from being sent. If this occurs the proper response would be to repeat the command.

HTTP User Log Data Command

The HTTP protocol can be used to retrieve log data, retrieve current "point" status for all "points", and to send "curtailment" control commands. Logs are represented by a series of file names that are constructed to specify the particular log of interest. Additional Http Methods may accompany the Get command to further restrict the results of the log request.

Within the PCMNET, User Logs may be used to store energy usage history data and many other values of interest. These logs are fully programmable as to what data values are stored in which log, etc. There are 32 User Logs available. Each User Log entry is a database record that contains columns for date, time, and 4 data values.

To specify a particular User Log to be retrieved, the Http Get request should be "RUS_{log#}_{format}_{column}_{label}_{since date/time}.dat"

Where:

{log#}, is the log requested, 1-32. Each site type may have a different log configuration.

{format}, is the file format requested. Use "R" for standard ASCII format, use "H" for an HTML formatted log report and use a "X" for XML formatted reports.

{column}, is which of 4 possible data columns is requested. Use "1", "2", "3", or "4" to select the column, or use "0" to select all 4 columns to be printed on each line.

{label}, is any user supplied text label. This label is ignored, but it must not contain delimiter characters, space, underscore, comma or space.

{since date/time}, is a specification of the earliest LOCAL date/time stamped data that should be retrieved. This date/time specification consists of local month, day, year, hour, min, and sec. Example "05162001060000". All numbers have two digits with the exception of the year, which is 4 digits. This date/time specification is interpreted as local time. The first line of the outputted data will contain a value for the "GMTOffset:", which is the hour offset of the local unit's time from GMT. For instance in the Central Time Zone, the GMT offset is "-6". If the local unit is set to obey Daylight Savings, the GMT offset will be adjusted when Daylight Savings time is in force.

The User must know which User Log(s) are required to be retrieved. In some cases, more than one log may be required to obtain particular data values.

Data retrievals using the "RUS.." filename/command require Basic Authorization, with the name/password that is "get" and "isacboss" respectively. The realm for this name/password combination is "user2".

An example of a typical URL based HTTP GET command to retrieve a User Log of data gathered since a defined date might be:

```
"mysite.isacinc.net/RUS_2_R_0_meters_02112002000000.dat "
```

Example output:

```
GMTOffset: -6
```

```
2/11/2002,0:00:01,0.340,4.00,75.00,888.00
```

```
2/11/2002,0:05:01,0.340,4.030,76.00,896.00
```

```
2/11/2002,0:10:01,0.340,4.070,75.00,904.00
```

```
2/11/2002,0:15:01,0.340,4.070,75.00,904.00
```

```
DONE
```

HTTP Alarm Log data Command

The HTTP protocol can be used to retrieve the Alarm Log report. Logs are represented by a series of file names that are constructed to specify the particular log of interest. Additional Http Methods may accompany the Get command to further restrict the results of the log request.

Within the PCMNET, the Alarm Log stores exception events for further analysis.

To retrieve the Alarm Log, the Http Get request should be:

"RAL_{type}_{format}_{index}_{label}_{since date/time}.dat"

Where:

{type}, is "0" (zero) for all alarm log entry types, or a type number may be specified which will return only those log entries of that type. See TriNet programming documentation for a list of the alarm types.

{format}, is the file format requested. Use "R" for standard ASCII format, use "H" for an HTML formatted log report and use a "X" for XML formatted reports.

{index}, is "0" (zero) for any index, or an index number may be specified which will further sort out which alarm entries are requested. For instance if only "Point Alarm" log entries for point 45 are required, then the index=45.

{label}, is any user supplied text label. This label is ignored, but it must not contain delimiter characters, space, underscore, comma or space.

{since date/time}, is a specification of the earliest LOCAL date/time stamped data that should be retrieved. This date/time specification consists of local month, day, year, hour, min, and sec. Example "05162001060000". All numbers have two digits with the exception of the year, which is 4 digits. This date/time specification is interpreted as local time. The first line of the outputted data will contain a value for the "GMTOffset:", which is the hour offset of the local unit's time from GMT. For instance in the Central Time Zone, the GMT offset is "-6". If the local unit is set to obey Daylight Savings, the GMT offset will be adjusted when Daylight Savings time is in force.

Data retrievals using the "RAL.." filename/command require Basic Authorization, with the name/password that is "get" and "isacboss" respectively. The realm for this name/password combination is "user2".

An example of a typical URL based HTTP GET command to retrieve an Alarm Log of data gathered since a defined date might be:

"mysite.isacinc.net/RAL_0_R_0_allalm_02012002000000.dat"

Example output:

GMTOffset: -6

2/8/2002,17:00:43,2/8/2002,17:50:03,Alarm Point
ON_EthernetPortSts_M1,53,1,on,Mailed

2/8/2002,17:00:45,2/8/2002,17:06:48,Alarm Point ON_Email
PwrFail_M1,63,1,on,Mailed

2/8/2002,18:01:18,2/8/2002,18:02:38,Alarm Point
ON_EthernetPortSts_M1,53,1,on,?

2/8/2002,18:04:27,2/8/2002,18:50:02,Alarm Point
ON_EthernetPortSts_M1,53,1,on,Mailed

2/8/2002,19:01:11,2/8/2002,19:50:04,Alarm Point
ON_EthernetPortSts_M1,53,1,on,Mailed

DONE

HTTP Activity Log Data Command

The HTTP protocol can be used to retrieve the Activity Log report. Logs are represented by a series of file names that are constructed to specify the particular log of interest. Additional Http Methods may accompany the Get command to further restrict the results of the log request.

Within the PCMNET, the Activity Log stores realtime on/off events for further analysis.

To retrieve the Activity Log, the Http Get request should be:

`"RAT_{type}_{format}_{index}_{label}_{since date/time}.dat"`

Where:

{type}, is "0" (zero) for all activity log entry types, or a type number may be specified which will return only those log entries of that type. See TriNet programming documentation for a list of the activity types.

{format}, is the file format requested. Use "R" for standard ASCII format, use "H" for an HTML formatted log report and use a "X" for XML formatted reports.

{index}, is "0" (zero) for any index, or an index number may be specified which will further sort out which alarm entries are requested. For instance if only "Point ON" log entries for point 45 are required, then the index=45.

{label}, is any user supplied text label. This label is ignored, but it must not contain delimiter characters, space, underscore, comma or space.

{since date/time}, is a specification of the earliest LOCAL date/time stamped data that should be retrieved. This date/time specification consists of local month, day, year, hour, min, and sec. Example "05162001060000". All numbers have two digits with the exception of the year, which is 4 digits. This date/time specification is interpreted as local time. The first line of the outputted data will contain a value for the "GMTOffset: ", which is the hour offset of the local unit's time from GMT. For instance in the Central Time Zone, the GMT offset is "-6". If the local unit is set to obey Daylight Savings, the GMT offset will be adjusted when Daylight Savings time is in force.

Data retrievals using the "RAT.." filename/command require Basic Authorization, with the name/password that is "get" and "isacboss" respectively. The realm for this name/password combination is "user2".

An example of a typical URL based HTTP GET command to retrieve an Alarm Log of data gathered since a defined date might be:

`"mysite.isacinc.net/RAT_0_R_0_allact_02112002000000.dat"`

Example output:

GMTOffset: -6

2/11/2002,12:19:55,2/11/2002,12:20:56,PT-ON_test dig
pt,81,81,1,on

2/11/2002,12:24:32,2/11/2002,12:24:33,PT-ON_test dig
pt,81,81,1,on

2/11/2002,12:25:09,OPEN,OPEN,PT-ON_test dig pt,81,81,1,on

2/11/2002,13:00:01,OPEN,OPEN,PT-ON_Curtail Sch,39,39,1,on

DONE

HTTP Current Point Status Command

The HTTP protocol can be used to retrieve the Activity Log report. Logs are represented by a series of file names that are constructed to specify the particular log of interest. Additional Http Methods may accompany the Get command to further restrict the results of the log request.

Within the PCM400I, the Activity Log stores realtime on/off events for further analysis.

To retrieve the Activity Log, the Http Get request should be:

`"RPS_{type }_{format}_{index}_{label}.dat"`

Where:

{type}, is reserved for future use. Use "0" (zero).

{format}, is the file format requested. Use "R" for standard ASCII format, use "H" for an HTML formatted log report and use a "X" for XML formatted reports.

{index}, is reserved for future use. Use "0" (zero).

{label}, is any user supplied text label. This label is ignored, but it must not contain delimiter characters, space, underscore, comma or space.

Data retrievals using the "RPS.." filename/command require Basic Authorization, with the name/password that is "get" and "isacboss" respectively. The realm for this name/password combination is "user2".

An example of a typical URL based HTTP GET command to retrieve the current point status might be:

`"mysite.isacinc.net/RPS_0_R_0_ptstat.dat"`

Example output:

```
GMTOffset: -6
1,M,2/11/02,A
2,A,14.0,A
3,A,34.0,A
4,M,2/11/02,A
5,A,5.0,A
7,A,550.16,A
8,A,6544.06,A
10,A,0.34,A
```

DONE

HTTP General Data Command

The HTTP protocol can be used to retrieve the value of almost any Point or Rule Operand used within the PCM system.

To retrieve a general point of data, the Http Get request should be:

`"READ_{format}_{any Rule Operand string}.dat"`

Where:

{format}, is the file format requested. Use "R" for standard ASCII format and use "H" for an HTML formatted log report.

{any Rule Operand string}, allows the inclusion of the specification of any realtime variable within the PCM. For example a point value might be "P45" for the value of Point #45. Another example might be current value of a digital input, "DI3", which will return the current on/off status of this digital input.

No password authorization is required with this command.

An example of a typical URL based HTTP GET command to retrieve the current value of analog input #5 would be:

```
"mysite.isacinc.net/READ_R_AI5.dat"
```

Example output:

```
535.68,A
```

```
DONE
```

HTTP Identity Command

The HTTP protocol can be used to retrieve the identification of the PCMNET using a simple URL command.

To retrieve the identification of the PCM System, the Http Get request should be:

```
"IDN_{format}.dat"
```

Where:

{format}, is the file format requested. Use "R" for standard ASCII format and use "H" for an HTML formatted output.

No password authorization is required with this command.

An example of a typical URL based HTTP GET command to retrieve the identity would be:

```
"mysite.isacinc.net/IDN_H.dat"
```

Example output:

```
Site: Mega Mall      {the description of the site}
ID:PCMNET           {the Site ID of the site}
ST:4 PULSE STD     {the Configuration Type of the site}
SLA:0               {the slave address used for some systems}
V7.11o              {the firmware revision}
2/9/02 10:29:27 -6  {the current local time and the GMT offset}
DONE
```

HTTP Change Date/Time Command

The HTTP protocol can be used to set the local clock time.

To set the PCM System's clock, the Http Get request should be:

```
"TDCG_{GMT date/time}.dat"
```

Where:

{GMT date/time}, is a specification of the current GMT date/time. The PCM System will then convert this GMT time into local time based on it's GMT Offset setting. If the PCM is located in an area that is currently in Daylight Savings mode, that adjustment will also be made.

This command requires Basic Authorization, contact ISAC for the proper security information to use this command.

An example of a typical URL based Change Date/Time might be:

"mysite.isacinc.net/TDCG_01102001060000.dat"

HTTP Change Point Value Command

To provide an easy to use method to accomplish an override of a point value permanently or for a timed period (< 24hours).

The general form of a Point Change command is:

"PCG_{point#}_{new value}[_optional {timer value}].txt"

where:

{point#}, is the point number being modified. For the PCMNET the range is 1-480, it may be a different range for other systems.

{new value}, is the new value for the point. For a digital type point, use "0" (zero) for OFF and "1" (one) for ON. For analog type points, since a period is a significant delimiter for the internet and can't be used in an analog value, use a letter "p" or "P" to replace the decimal point. If the point type is a label or date or time, just use the value string. Regardless of the point type, if the new value is set to "A" or "a" (a single letter A), the point will be placed in "automatic" mode and the logic which has been defined will determine the value of the point. When resetting the point value to Auto, omit the timer value as a timer is not allowed for this transition.

{timer value}, is the optional timer value in seconds that the changed value will be maintained. After the timer value has elapsed, the point value will return to it's previous value or back to logic control. If the change is to be a permanent one, omit the timer value entirely and just follow the value with the final ".dat" suffix.

Point Change commands using the "PCG.." filename/command require Basic Authorization, contact ISAC for proper security information.

Examples of Point Change commands for the different point types are:

Digital Point: *"mysite.isacinc.net/PCG_5_1_300.dat"* which overrides Point #5 to the ON state for 300 seconds (5 minutes).

Analog Point: *"mysite.isacinc.net/PCG_200_123p45.dat"*, which overrides Point #200 to the value of 123.45 permanently. Note that the optional timer value is deleted for this permanent change request.

Label Point: *"mysite.isacinc.net/PCG_55_FH1_300.dat"* which overrides Point #55 to the label "FH1" for 300 seconds (5 minutes). Note that the label MUST match one that has been defined in the programming of the particular site for the value to be accepted.

Date Point: *"mysite.isacinc.net/PCG_22_5-22-02.dat"*, which overrides Point #22 to "5/22/02" permanently. Notice that the date format uses the dash "-" character rather than the usual slash, "/", character to separate the month day and year. This substitution is necessary to avoid the confusion of the date with normal URL separators used to separate different sections of the internet URL.

Time Point: *"mysite.isacinc.net/PCG_123_20:00.dat"*, which overrides Point #123 to "20:00", permanently.

Digital Point: *"mysite.isacinc.net/PCG_5_A.dat"*, which resets the value of point #5 to its automatic logic determined value.

The PCMNET will respond with "DONE" or "ERROR" to verify whether the command was successfully accepted.

HTTP Curtailment Command

To provide an easy to use method to accomplish a curtailment command, an HTTP GET command with a formatted filename is used.

The general form of a Curtail command is:

"ECT_{level}_{beg datetime}_{end datetime}.txt"

where:

{level}, is the level number of the curtailment effort. This number, 1-100, will be used by the internal user defined programming to implement the proper control actions for the level of curtailment desired.

{beg date/time}, is a specification of the LOCAL date/time to BEGIN the curtailment action. This date/time specification consists of local month, day, year, hour, min, and sec. Example "05162001060000". All numbers have two digits with the exception of the year, which is 4 digits.

{end date/time}, is a specification of the LOCAL date/time to END the curtailment action. This date/time specification consists of local month, day, year, hour, min, and sec. Example "05162001060000". All numbers have two digits with the exception of the year, which is 4 digits.

Curtailment commands using the "ECT.." filename/command require Basic Authorization, contact ISAC to obtain the necessary security. The response from the PCM is either the echo of the level number and the word "DONE" or "ERROR" if the command failed.

An example of a curtailment command for level 5 (level 5 only has meaning to the PCMNET's user program running in the PCM):

"mysite.isacinc.net/ECT_5_05202001100000_05202001170000.txt"

The above example would cause the PCM addressed, to activate its level 5 curtailment action beginning on 5/20/2001 at 10:00 am and end it on 5/20/2001 at 5:00 pm.

HTTP Index.html Monitor Page

To provide a simple means of seeing the general status of the PCMNet, a web page "index.html" is available for display. It displays a group of 16 Control Points and their values. You can display this page in the standard method from any browser. There is an authorization name/password required which is "main" and "page" respectively. The realm for this password is "user1". You may change the beginning point number to display by using the edit box at the bottom of the page and the Submit button. The response will be a confirmation response printed with a link back to index.htm to refresh the page.

HTTP Pmeter.html Monitor Page

To provide a simple means of seeing the general status of the PCMNet pulse inputs used for meter monitoring, a web page "pmeter.html" is available for display. It displays the defined digital inputs (configured as pulsing meter inputs) configuration including the defined pulse multipliers and sampling intervals.

Email Commands

The PCMNet has the ability to check for incoming Email messages on a programmed interval basis. When a Email message is found, the email is examined for proper format, and if not properly formatted the Email will be immediately deleted. If properly formatted as described below, then the Email message will be read and all the commands contained in it will be performed. The commands defined are designed to allow users to, manually or via automated software, override the values of designated Point values. Any number of commands may be contained within the same Email, making it possible to send complex temporary or permanent parameter changes to the PCMNet. The first illegal command found will terminate the Email scan and the Email will be deleted. Any overrides will be rejected unless the User has first defined a logon command that establishes that the user has a name/password with a permission level that is 0, 1 or 2. A password level of 3 or greater will prohibit the execution of any commands that would change anything.

Email Formatting Rules:

1. The subject line of the Email must contain the string "ISAC Command".
2. The Email must not contain any attachments. The Email may be formatted as "text/plain" or as "text/html" (MIME/HTML).
3. Each Email command must begin with the string "CMD:" (all caps important).
4. Each Email command must have commas between the elements.
5. The first command in the Email must be a "LOGN" command to establish a name and password.
6. The last command must be an empty command such as "CMD:" or the end command of "CMD:END" to let the PCMNet know when the list of commands has been completed and to ignore any duplicate content type sections of the Email.

Commands:

- "LOGN,{user name},{user password}". Example: "CMD:LOGN,boss,trinetboss".
-

- “PCG,{point#},{new value},{optional time in seconds}”. Example:
“CMD:PCG,100,1.0,300”. This example will override Point 100 to ON (“1.0”=ON, “0.0”=OFF, “xxxx.x”=analog value, “2/25/02”=date, or “13:15”=time), for 300 seconds (5 min). Example2: “CMD:PCG,100,A”. This example will cause Point 100 to go back to it’s Auto mode where the Trinet logic will determine the new value of the Point.
- The last command should be “CMD:END”.

(PCMNET_2_Commo_Summary.doc)
