4205/5205-TS-104S-PDPS

ProLinx Standalone

IEC-60870-5-104 to PDPS Communication Module with Time Stamp

User Manual

July 12, 2007

Please Read This Notice

Successful application of this module requires a reasonable working knowledge of the ProLinx Module, its connected devices, and the application in which the combination is to be used. For this reason, it is important that those responsible for implementation satisfy themselves that the combination will meet the needs of the application without exposing personnel or equipment to unsafe or inappropriate working conditions.

This manual is provided to assist the user. Every attempt has been made to assure that the information provided is accurate and a true reflection of the product's installation requirements. In order to assure a complete understanding of the operation of the product, the user should read all applicable documentation on the operation of the connected devices.

Under no conditions will ProSoft Technology be responsible or liable for indirect or consequential damages resulting from the use or application of the product.

Information in this manual is subject to change without notice and does not represent a commitment on the part of ProSoft Technology Improvements and/or changes in this manual or the product may be made at any time. These changes will be made periodically to correct technical inaccuracies or typographical errors.

Important Installation Instructions

Power, input and output wiring must be in accordance with Class I, Division 2 wiring methods – Article 501-4 (b) of the National Electrical Code, NFPA 70 and in accordance with the authority having jurisdiction. The following warnings must be heeded:

a WARNING – EXPLOSION HAZARD – SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIV. 2;

b WARNING – EXPLOSION HAZARD – WHEN IN HAZARDOUS LOCATIONS, TURN OFF POWER BEFORE REPLACING OR WIRING MODULES, and

c WARNING – EXPLOSION HAZARD – DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NONHAZARDOUS.

d "THIS DEVICE SHALL BE POWERED BY CLASS 2 OUTPUTS ONLY."

Your Feedback Please

We always want you to feel that you made the right decision to use our products. If you have suggestions, comments, compliments or complaints about the product, documentation or support, please write or call us.

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1 Customizing the Sample Configuration File

In This Chapter

1.1 Obtain the Sample Configuration Files

The ProSoft Solutions CD is organized in folders by module name. In the folder for the module you are using, you will find sample configuration files and other information.

1. Use Windows Explorer to locate the sample configuration files for your ProLinx module on the ProLinx CD.
2. When you have located the correct configuration files, use the Copy and Paste commands to move the files to a location on your PC's hard drive. We recommend C:\temp.
3. Files copied from a CD-ROM are read-only. The next step is to make the files writable. Navigate to the directory where you copied the files, then select the files and click the right mouse button to open a shortcut menu. On the shortcut menu, select Properties, and clear (uncheck) the Read Only check box.
4. The next step is to open the configuration files in a text editor such as Notepad, which comes with Windows. To start Notepad, click the Start button, and then choose **Programs** → **Accessories** → **Notepad**.
5. When Notepad starts, open the File menu, and then choose **Open**. Navigate to the folder where you copied the configuration file on your PC and select the file. Click **Open**. The configuration file will open in Notepad, ready for editing.

Note: We do not recommend opening the configuration file in a word processor such as Microsoft Word, because the file may be saved in a format that cannot be read by the module.

1.1.1 PDPS Protocol Specific Configuration

The following is excerpted from a configuration file showing typical examples of the PROFIBUS Slave Port of a CFG file for a PDPS port. Shipped with each unit is a default configuration file that can easily form the basis for a working solution. This file can either be downloaded from the ProSoft web site at http://www.prosoft-technology.com, or transferred from the module.

```
# Example configuration file for the 4105-xxxx-PDPS communication module.
#
# COMPANY : ProLinx Communication Gateways, Inc.
# DATE    :
#

# This information sets up the database.
[Module]
Module Name: 5105-xxxx-PDPS

# This is the data area for setting the PROFIBUS Slave parameters
[PROFIBUS Slave]
Slave Address           :     6 #PROFIBUS node address for slave (0-125)
Swap Input Bytes        :    No #Swap bytes in input image (Yes or No)
Swap Output Bytes       :    No #Swap bytes in output image (Yes or No)
Comm Failure Mode       :     1 #0=x-fer on comm fail, 1=no x-fer on fail
Comm Timeout Multiplier :     1 #(1 to 10) * 125 mSec communication timeout
```

1.1.2 [PROFIBUS SLAVE] Section

The PROFIBUS Slave section contains the data that applies to the PROFIBUS Slave parameters.

```
[PROFIBUS Slave]
Slave Address           : 6     #PROFIBUS node address for slave (0-125)
Swap Input Bytes        : No    #Swap bytes in input image (Yes or No)
Swap Output Bytes       : No    #Swap bytes in output image (Yes or No)
Comm Failure Mode       : 1     #0=x-fer on comm fail, 1=no x-fer on fail
Comm Timeout Multiplier : 10    #(1 to 10) * 125 mSec communication timeout
```

Slave Address

0 to 125

The parameter specifies the node address on the PROFIBUS network for the slave emulated in the module. Each node on the network must have a unique address.

Note: Although valid PROFIBUS Node addresses range from 0 to 125, Node 0 is not a valid node number for a Slave module and that Nodes 0, 1, and 2 are usually reserved for PROFIBUS Masters. Users are advised to use Node numbers 3-125

Swap Input Bytes

Yes or No

This parameter specifies if the data in the input data area of the module is to be byte swapped. If the order of the bytes in the words stored in the database is not correct, use this option. A value of Yes causes the module's program to swap the bytes in each word. A value of No indicates no byte swapping will occur.

Swap Output Bytes

Yes or No

This parameter specifies if the data in the output data area of the module is to be byte swapped. If the order of the bytes in the words stored in the database is not correct, use this option. A value of Yes causes the module's program to swap the bytes in each word. A value of No indicates no byte swapping will occur.

Comm Failure Mode

0 or 1

This parameter sets the data transfer mode of the module's PROFIBUS output image to the internal database when a communication failure on the PROFIBUS interface is detected. If the parameter is set to 0, the output image will continue to be transferred. If the parameter is set to 1, the output image will not be transferred and the last values will be retained.

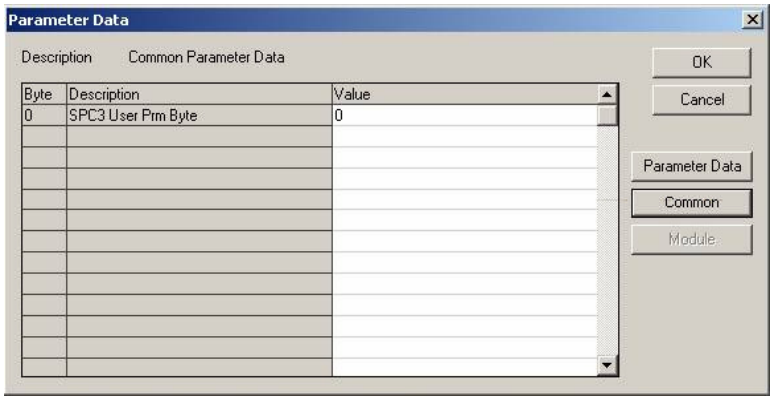
Comm Timeout Multiplier

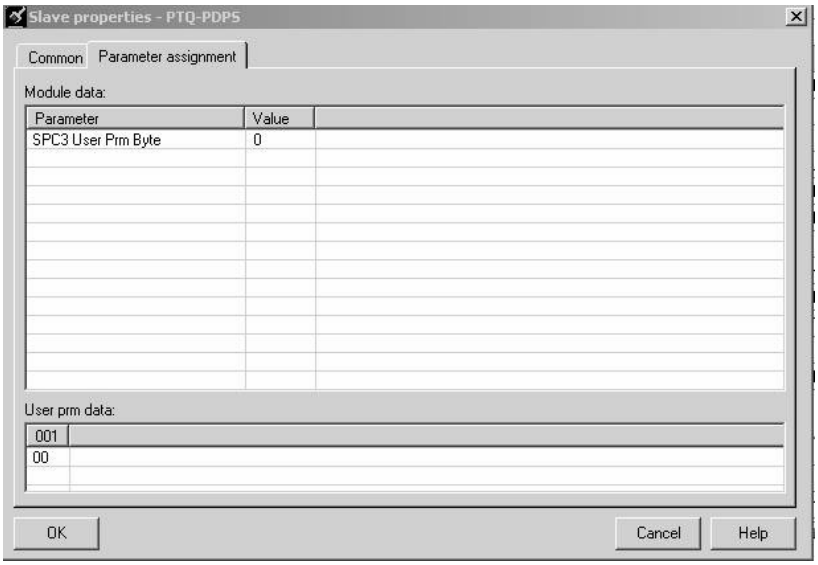
1 to 10

This parameter sets the communication timeout value for the module. The value entered is multiplied by 125 milliseconds to determine the actual timeout value. For example, a value of 1 specifies a communication timeout of 125 milliseconds.

Set Param (SAP61)

ProSoft PROFIBUS Slave (PDPS) devices have a configurable parameter for SPC3 User Prm Byte. The following illustrations show the value of this parameter in Sycon, the configuration tool for ProLinx PROFIBUS Master devices, and in ProSoft Configuration Builder for PROFIBUS, the configuration tool for ProSoft PROFIBUS Master devices.





Parameter Data Structure

SPC3 evaluates the first seven data bytes (without user prm data), or the first eight data bytes (with user prm data). The first seven bytes are specified according to the standard. The eighth byte is used for SPC3-specific communications. The additional bytes are available to the application.

Byte	Bit Position								Designation
	7	6	5	4	3	2	1	0	
0	Lock Reg	Unio Req	Sync Req	Free Req	WD on	Res	Res	Res	Station status
1									WD_Fact_1
2									WD_Fact_2
3									MinTSDR
4									Ident_Number_High
5									Ident_Number_Low
6									Group_Ident
7									Spec_User_Prm_Byte
8 to 243									User_Prm_Data

Byte 7	Spec_User_Prm_Byte		
Bit	Name	Significance	Default State
0	Dis_Startbit	The start bit monitoring in the receiver is switched off with this bit	Dis_Startbit = 1, That is, start bit monitoring is switched off.
1	Dis_Stopbit	Stop bit monitoring in the receiver is switched off with this bit	Dis_Stopbit = 0 That is, stop bit monitoring is not switched off.
2	WD_Base	This bit specifies the time base used to clock the watchdog. WD_Base = 0: time base 10 ms WD_Base = 1: time base 1 ms	WD_Base = 0 That is, the time base is 10 ms.
3 to 4	Res	To be parameterized with 0	0
5	Publisher_Enable	DXB-publisher-functionality of the SPC3 is activated with this bit	Publisher_Enable = 0, DXB-request-telegrams are ignored; Publisher_Enable = 1, DXB-request-telegramme are processed
6 to 7	Res	To be parameterized with 0	0

1.1.3 IEC 60870-5-104 Server section

The following is excerpted from a configuration file showing typical examples used for configuration of the 104S driver. A default configuration file for each module application that includes the 101S interface card is available for download from the ProSoft web site. This default configuration can easily form the basis for a working solution. This file can either be downloaded from the ProSoft web site at http:/www.prosoft-technology.com, or transferred from the module.

1.1.4 [Window Parameters]

This section is used to define the control window to send events and time data from the MNET interface to and from the 104S interface. If either or both of these parameters are invalid or -1, then this feature is disabled.

If the database registers for the two areas (non-overlapping -- not checked by application) are valid, this feature is utilized. Each window requires 100 words of the database. The input window is read by the module and the output window is written by the module.

```
[Window Parameters]
DB Input Window Start  :  3000 #Start register for input window (-1=not used)
DB Output Window Start :  3100 #Start register for output window (-1=not used)
```

DB Input Window Start

The DB Input Window Start parameter defines the Prolinx database starting register where the command block request should be transferred to (from the remote node to the Prolinx module). A value of –1 disables this functionality.

DB Output Window Start

The DB Output Window Start parameter defines the Prolinx database starting register where the command block response should be transferred to (from the Prolinx module to the remote node). So some command blocks will require a response from the module (for example the command block to retrieve the current time from the module). A value of –1 disables this functionality.

1.1.5 [SNTP CLIENT]

The [SNTP CLIENT] section of the **CFG** file is used to specify the parameters for the Simple Network Time Protocol (SNTP) client provided with the protocol driver. This client is required in order to keep the driver's internal clock set correctly. This version of the driver supports SNTP Revision 3 and stratum between 1 and 14.

SNTP is used for time synchronization of produced and consumed commands. When an exchange occurs the driver compares time stamps from the previous exchange. When the new exchange time is less than the previous exchange, the exchange is ignored. This can occur when the Ethernet packets are routed and delayed. Time synchronization provides for data integrity.

The SNTP driver will compute a new clock value every 5 minutes using the average value of 10 samples each collected over an approximate 6-second period. This new value will be used to adjust the clock maintained by the SNTP driver and used by the application. If a valid database register is specified, the driver will place the time value into the module's database. The first two registers will contain the number of seconds and the next two registers will contain the number of microseconds since January 1, 1970.

A list of some of the common NTP servers can be obtained at http://www.ntp.org/, http://www.eecis.udel.edu/~mills/ntp/servers.html, along with the appropriate IP address. Other server lists can be found on the Internet by searching on "NTP Servers" with your browser.

NTP Server IP Address

Enter in dotted notation

This parameter sets the IP address of the NTP server to utilize for time acquisition. Select an NTP server with the greatest accuracy that can be accessed all the time from your network. Setting this IP address to 0.0.0.0 disables SNTP server requests.

Time Zone

–11 to 11

This parameter sets the time zone offset from UTC. If UTC time is to be utilized in the module, set this value to zero. Positive values are for time zones west of UTC, and negative values are for time zones east of UTC.

Use Daylight Savings Time

Yes or No

This parameter specifies if daylight savings time will be used in the time computation.

Database Register

–1 or 0 to 3992 as an even value

This parameter specifies if the NTP time computed by the driver is to be placed into the module's database. If a value of –1 is specified, the time will not be placed into the database. If the value is between 0 and 3992, the time will be placed in the database. The first 4 bytes will represent the seconds since 1/1/1970, and the second 4 bytes will represent the number of microseconds. An even value should be used for the register value in order for the data to be stored correctly.

1.1.6 [IEC-870-5-104]

This section provides information required to configure a server application with the module. Most entries contained within this section are self explanatory An item of concern is the maximum size of the total database, although it is possible to configure a database of considerable size, this would not work, as the maximum Class 0 request may not exceed 2048 bytes in size.

The following example shows a sample [IEC-870-5-104] section:

```
# Network configuration
Use IP List               :     N #Use IP list to validate connection (Y/N)
Override StartDT          :     Y #Used to ignore STARTDT/STOPDT state (Y/N)
Clear queue on close      :     Y #Clear the queue when connection closed (Y/N)
t1 timeout set value      :    15 #timeout of send or test ASDU
t2 timeout set value      :    10 #timeout of ack when no data (t2<t1)
t3 timeout set value      :    30 #timeout for test frame on idle state
k (maximum queue)         :    12 #maximum number of message to hold in queue
                                  #(1-20)
w (latest ack threshold)  :     8 #threshold value when to send ack (1-20)
Time DB Offset            :  1020 #DB location of IEC time
Command Delay Timer       :  6000 #mSec to add to cmd w\ time-tag to check for
                                  #validity
# General protocol settings
Common Address of ASDU    :     1 #Range 0 to 65535
Cyclic data transmission  :     0 #Numb of milliseconds between cyclic updates
Select/Operate Timeout    :  2000 #Milliseconds before select timeout
Use ACTTERM with setpoint :     Y #ACTCON is last response to cmd (Yes or No)
Use ACTTERM with step     :     Y #ACTCON is last response to cmd (Yes or No)

Maximum ASDU Resp Len     :   248 #maximum ASDU response message length (25-255)

# These two parameters are utilized if the Mode A operation is to be used for the
# counter freeze operation.  If they are not used, the the module will operate in
# Mode D.
Freeze Start Type         :      N #D=Day, H=Hour, M=Minute, N=Not used
Interval For Freeze       :     30 #Number of seconds after start type
                                  #(0 to 65535)

# This section is used to define priority queues for the module.  The data types
# that can return events can be assigned priorities so that events of data types
# will be returned before other data types.  This may cause events to be lost as
# the event buffers for low priority queues may overflow.  If this feature is
# utilized, each data type must be assigned a unique index from 0 to 6.  The
# lower the index the higher the priority (0=highest priority).
Set Priority Queues       :     1 #Set user defined priority queues 1=Yes, 0=No
M_SP_NA Priority          :     1 #Unique index for this data type in queue
                                  #(0-5)
M_DP_NA Priority          :     0 #Unique index for this data type in queue
                                  #(0-5)
M_ST_NA Priority          :     5 #Unique index for this data type in queue
                                  #(0-5)
M_ME_NA Priority          :     4 #Unique index for this data type in queue
                                  #(0-5)
M_ME_NB Priority          :     3 #Unique index for this data type in queue
                                  #(0-5)
```

```
M_ME_NC Priority          :     2 #Unique index for this data type in queue
                                  #(0-5)
M_IT_NA Priority          :     6 #Unique index for this data type in queue
                                  #(0-5)
# This section is used to define the parameters utilized for the Invalid Bit
# Monitoring. If this feature is not used, set the parameters to zero.  If used,
# the Cyclic Set IV Time must be at least 3 times larger than the IV Check Delay
# Time.  If the IV Fail Count parameter is zero, the feature will be disabled.
Cyclic Set IV Time        :    60 #Number of sec intervals between IV sets
IV Check Delay Time       :    15 #Number of sec intervals between investigation
IV Fail Count             :     3 #Number of IV failures recognized before
                                  #reporting
# Event configuration
Event Scan delay     :      1 #MSec between event scanning (0-65535) 0=Disable

M_SP_NA Scan Events  :      1 #0=No scanning, 1=scan for events
M_SP_NA Time Type    :      2 #0=None, 2=CP56 time

M_DP_NA Scan Events  :      1 #0=No scanning, 1=scan for events
M_DP_NA Time Type    :      2 #0=None, 2=CP56 time

M_ST_NA Scan Events  :      1 #0=No scanning, 1=scan for events
M_ST_NA Time Type    :      2 #0=None, 2=CP56 time

M_ME_NA Scan Events  :      1 #0=No scanning, 1=scan for events
M_ME_NA Time Type    :      2 #0=None, 2=CP56 time

M_ME_NB Scan Events  :      1 #0=No scanning, 1=scan for events
M_ME_NB Time Type    :      2 #0=None, 2=CP56 time

M_ME_NC Scan Events  :      0 #0=No scanning, 1=scan for events
M_ME_NC Time Type    :      2 #0=None, 2=CP56 time

M_IT_NA Time Type    :      2 #0=None, 2=CP56 time
```

Modify each parameter based on the needs of your application.

Use IP List

```
Use IP List               :     0 #Use IP list to validate connection
                                  #(0=No, 1=Yes)
```

This parameter specifies if the IP address of the host connected to the system will be validated. If the parameter is set to 0, any host may connect to the unit. If the parameter is set to 1, only hosts in the IP list will be permitted to connect to the unit.

Override StartDT

```
Override StartDT          :     1 #Used to ignore STARTDT/STOPDT state
                                  #(0=No, 1=Yes)
```

This parameter is used when testing the unit with a simulator or with a client unit that does not meet the IEC 60870-5-104 specification. After the host connects to the system, it will send a STARTDT.ACT U-format message to the unit to permit the unit to start sending data. If the client does not support this requirement, set the parameter to a value of 1. Set the parameter to 0 if the unit sends the STARTDT.ACT message.

Clear Queue on Close

```
Clear queue on close      :     0 #Clear the queue when connection
                                  #closed (0=No, 1=Yes)
```

Use this command to define if the module will store the unacknowledged buffers in the unit after the connection is closed. If the specification is to be followed, set this parameter to 0 and the packets will be resent after a connection is made. If you want to flush the packets after the connection is closed, set this parameter to 1 (this is not according to the specification).

t1 Timeout Set Value

```
t1 timeout set value      :    60 #timeout of send or test ASDU
```

This is the timeout of send or test ASDU's and is in units of seconds. After a packet is sent from the unit, the client must acknowledge the packet within this time interval or else the unit will close the connection.

t2 Timeout Set Value

```
t2 timeout set value      :    10 #timeout of ack when no data (t2<t1)
```

This is a timeout of when to send an S-format message to the host to acknowledge outstanding messages received. This parameter is in units of seconds and must be less than the value set for t1.

t3 Timeout Set Value

```
t3 timeout set value      :    30 #timeout for test frame on idle state
```

This is the timeout to wait on an idle line before the unit will send a TestFr.Act message. This value is in units of seconds.

k (maximum queue)

```
k (maximum queue)         :    12 #maximum number of message to hold in
                                  #queue (1-20)
```

This parameter specifies the number of unacknowledged messages the unit will buffer. This parameter must match that in the host. If the set number of buffers are filled in the unit, no other messages will be sent until the host unit acknowledges some or all the messages.

w (latest ack threshold)

```
w (latest ack threshold)  :     8 #threshold value when to send ack (1-20)
```

This parameter must match that of the host unit and specifies the number of messages the module will receive before sending an S-format sequence acknowledge message when no I-format data is ready to send. It is recommended to set this value to 2/3 the value of k.

Common Address of ASDU

```
Common Address of ASDU    :     1 #Range 0 to 65535
```

This parameter specifies the common address of the ASDU (section address) for access to data in the module. There is only one value entered for access to all data in the module.

Cyclic Data Transmission

```
Cyclic data transmission  : 20000 #Numb of milliseconds between cyclic
                                  #updates
```

This parameter defines the number of milliseconds between cyclic updates. The range of values for this parameter permit update times of 1 millisecond to 5 minutes. If the parameter is set to 0, cyclic data reporting will be disabled.

Select/Operate Timeout

```
Select/Operate Timeout    : 10000 #Milliseconds before select timeout
```

This parameter sets the number of milliseconds after a select command is received in which to wait for a valid execute command. The range of values for this parameter permit times of 1 millisecond to 30 seconds. If the parameter is set to 0, the feature will be disabled.

Use ACTTERM with Setpoint

```
Use ACTTERM with setpoint :     0 #1=Yes, 0=No ACTCON is last response
                                  #to cmd
```

This parameter determines if an ACTTERM will be sent. If the parameter is set to Y, then setpoint commands will issue an ACTTERM when the command is complete. If the parameter is set to N, ACTCON is the last response to a setpoint command.

Use ACTTERM with Step

```
Use ACTTERM with step     :     1 #1=Yes, 0=No ACTCON is last response
                                  #to cmd
```

This parameter determines if an ACTTERM will be sent. If the parameter is set to Y, then step commands will issue an ACTTERM when the command is complete. If the parameter is set to N, ACTCON is the last response to a step command.

Time DB Offset

```
Time DB Offset            :  3000 #DB location of IEC time
```

This parameter sets the location in the database where the module's current date and time will be copied to.

Note: The following tables lists the 12 byte, data area placed in the database if the Time DB Offset parameter is set to a value other than –1:

Byte	Length	Range	Description
0 to 1	2	0 to 59,999	Seconds and milliseconds
2	1	0 to 59	Minutes
3	1	0 to 23	Hour
4	1		Reserved
5	1	1 to 31	Day of the Month
6	1	1 to 12	Month
7 to 8	2	0 to 65,535	Year (four digit format, for example 2005)
9	1		Reserved
10	1	0 or 1	Invalid Flag (0 = Valid, 1 = Invalid
11	1		Reserved

Command Delay Timer

0 to 65535

This value is used for time-tag validity verification for the ASDUs listed below. The received commands will only be accepted if [timestamp + Command Delay Timer] is greater than the module own time.

Maximum ASDU Resp Len

```
Maximum ASDU Resp Len     :   246 #Max ASDU response message length may
                                  #have value from 25 to 246 (usually 246).
```

This parameter limits the maximum size of the ASDU portion of a response message. Most applications will use a value of 246.

Freeze Start Type

D=Day, H=Hour, M=Minute, N=Not used

The Freeze Start Type parameter defines when the module starts sending the M_IT messages.

Interval for Freeze

These two parameters are utilized if the Mode A operation is to be used for the counter freeze operation. If they are not used, the module will operate in Mode D.

```
Freeze Start Type         :      N #D=Day, H=Hour, M=Minute, N=Not used
Interval For Freeze       :     30 #Number of seconds after start type (0 to
65535)
```

Set Priority Queues

```
Set Priority Queues       :     1 #Set user defined priority queues
                                  #1=Yes, 0=No
```

This section defines priority queues for the module. The data types that can return events can be assigned priorities so that events of data types will be

returned before other data types. This may cause events to be lost as the event buffers for low priority queues may overflow. If this feature is utilized, each data type must be assigned a unique index from 0 to 6. The lower the index, the higher the priority (0=highest priority).

```
M_SP_NA Priority          :     1 #Unique index for this data type in queue
                                  #(0-5)
M_DP_NA Priority          :     0 #Unique index for this data type in queue
                                  #(0-5)
M_ST_NA Priority          :     5 #Unique index for this data type in queue
                                  #(0-5)
M_ME_NA Priority          :     4 #Unique index for this data type in queue
                                  #(0-5)
M_ME_NB Priority          :     3 #Unique index for this data type in queue
                                  #(0-5)
M_ME_NC Priority          :     2 #Unique index for this data type in queue
                                  #(0-5)
M_IT_NA Priority          :     6 #Unique index for this data type in queue
                                  #(0-5)
```

Each of the ASDUs affected by this feature must be assigned a unique priority index from 0 to 6. Events of the ASDU with a priority of 0 will always be reported before any others when they are present.

For more information, refer to ***Event Priority*** (page 58).

Cyclic Set IV Time

```
Cyclic Set IV Time        :     0 #Number of sec intervals between IV sets
```

The Cyclic Set IV Time parameter must be set to determine how frequently the IV Checks will be performed. If the IV bit is ON for a number of times given by the IV Fail Count parameter the module will consider the point as invalid.

This section defines the parameters utilized for the Invalid Bit Monitoring. If this feature is not used, set the parameters to zero. If used, the Cyclic Set IV Time must be at least 3 times larger than the IV Check Delay Time. If the IV Fail Count parameter is zero, the feature will be disabled.

For more information on using this feature, refer to ***Using Monitor Points*** (page 38).

IV Check Delay Time

```
IV Check Delay Time       :    10 #Number of sec intervals between
                                  #investigation
```

This feature allows the application to set the invalid (IV) quality bit of the protocol for all the monitored ASDU types supported. The Cyclic Set IV Time parameter must be at least 3 times larger than the IV Check Delay Time.

IV Fail Count

```
IV Fail Count             :     2 #Number of IV failures recognized before
                                  #reporting
```

This feature allows the application to set the invalid (IV) quality bit of the protocol for all the monitored ASDU types supported. If you enable this feature, the

processor can determine the individual IV quality bit status of each point you configured.

To disable this feature, set the IV Fail Count parameter to 0. If used, the Cyclic Set IV Time parameter must be at least 3 times larger than the IV Check Delay Time.

Event Scan Delay

```
Event Scan delay    :      1 #MSec between event scanning (0-65535)
                              #0=Disable
```

If set to 0, the feature will be disabled and the module will not generate any events. If set from 1 to 65535, the parameter represents the number of milliseconds between event scanning. This parameter defines how often the program will scan for new events in the databases.

M_SP_NA Scan Events

```
M_SP_NA Scan Events :      1 #0=No scanning, 1=scan for events
```

Determines if events of this point type will be generated by the module. If 0, then events will not be generated. If 1, events will be scanned and generated on change.

M_SP_NA Time Type

```
M_SP_NA Time Type   :      2 #0=None, 2=CP56 time
```

This parameters defines the time format used with data events. 0=None and 2=CP56 time formats.

M_DP_NA Scan Events

```
M_DP_NA Scan Events :      1 #0=No scanning, 1=scan for events
```

Determines if events of this point type will be generated by the module. If 0, then events will not be generated. If 1, events will be scanned and generated on change.

M_DP_NA Time Type

```
M_DP_NA Time Type   :      2 #0=None, 2=CP56 time
```

This parameters defines the time format used with data events. 0=None and 2=CP56 time formats.

M_ST_NA Scan Events

```
M_ST_NA Scan Events :      1 #0=No scanning, 1=scan for events
```

Determines if events of this point type will be generated by the module. If 0, then events will not be generated. If 1, events will be scanned and generated on change.

M_ST_NA Time Type

```
M_ST_NA Time Type   :      2 #0=None, 2=CP56 time
```

This parameters defines the time format used with data events. 0=None and 2=CP56 time formats.

M_ME_NA Scan Events

```
M_ME_NA Scan Events :      1 #0=No scanning, 1=scan for events
```

Determines if events of this point type will be generated by the module. If 0, then events will not be generated. If 1, events will be scanned and generated on change.

M_ME_NA Time Type

```
M_ME_NA Time Type   :      2 #0=None, 2=CP56 time
```

This parameter defines the time format used with data events. 0=None and 2=CP56 time formats.

M_ME_NB Scan Events

```
M_ME_NB Scan Events :      1 #0=No scanning, 1=scan for events
```

Determines if events of this point type will be generated by the module. If 0, then events will not be generated. If 1, events will be scanned and generated on change.

M_ME_NB Time Type

```
M_ME_NB Time Type   :      2 #0=None, 2=CP56 time
```

This parameters defines the time format used with data events. 0=None and 2=CP56 time formats.

M_ME_NC Scan Events

```
M_ME_NC Scan Events :      1 #0=No scanning, 1=scan for events
```

Determines if events of this point type will be generated by the module. If 0, then events will not be generated. If 1, events will be scanned and generated on change.

M_ME_NC Time Type

```
M_ME_NC Time Type   :      2 #0=None, 1=CP24, 2=CP56 time
```

This parameters defines the time format used with data events. 0=None and 2=CP56 time formats.

M_IT_NA Time Type

```
M_IT_NA Time Type   :      2 #0=None, 2=CP56 time
```

This parameters defines the time format used with data events. 0=None and 2=CP56 time formats.

1.1.7 [IEC-870-5-104 IP Addresses]

This section enters the IP addresses for the hosts to connect to this unit. The unit will only accept connections from hosts listed here. This list may contain up to 10 entries between the START and END labels. The address must start in column 1, and must be entered in standard dot notation.

The following is an example of the [IEC-870-5-104 IP Addresses] section:

```
[IEC-870-5-104 IP ADDRESSES]
START
192.168.0.207
192.168.0.203
192.168.0.61
END
```

1.1.8 [IEC-870-5-104 Database]

This section describes the [IEC-870-5-104 Database] section.

Each parameter is described below. Edit the configuration file according to the needs of your application.

Short Pulse Time

```
Short Pulse Time    :   2000 #MSec for short pulse command
```

This parameter defines the number of milliseconds to be associated with a short pulse command. The valid range of numbers for this parameter are 0 to 2,147,483,647. Range is 0 to 2^31-1.

Long Pulse Time

```
Long Pulse Time     :  10000 #MSec for long pulse command
```

This parameter defines the number of milliseconds to be associated with a long pulse command. The valid range of numbers for this parameter are 0 to 2,147,483,647. Range is 0 to 2^31–1

M_SP_NA Point Count

```
M_SP_NA point count :     10 #Number of monitored single-points
```

This parameter specifies the number of point values assigned in monitored single-point database. Range is 0 to 1000.

M_DP_NA Point Count

```
M_DP_NA point count :     10 #Number of monitored dual-points
```

This parameter specifies the number of point values assigned in monitored dual-point database. Rang is 0 to 1000.

M_ST_NA Point Count

```
M_ST_NA point count :     10 #Number of monitored step-points
```

This parameter specifies the number of point values assigned in monitored step-point database. Range is 0 to 1000.

M_ME_NA Point Count

```
M_ME_NA point count :     10 #Number of monitored normalized-points
```

This parameter specifies the number of point values assigned in monitored normalized-point database. Range is 0 to 1000.

M_ME_NB Point Count

```
M_ME_NB point count :     10 #Number of monitored scaled-points
```

This parameter specifies the number of point values assigned in monitored scaled-point database. Range is 0 to 1000.

M_ME_NC Point Count

```
M_ME_NC point count :     10 #Number of monitored scaled-points
```

This parameter specifies the number of point values assigned in monitored scaled short-float point database. Range is 0 to 50.

M_IT_NA Point Count

```
M_IT_NA point count :     10 #Number of monitored counter-points
```

This parameter specifies the number of point values assigned in monitored counter-point database. Range is 0 to 1000.

C_SC_NA Point Count

```
C_SC_NA point count :     10 #Number of command single-points
```

This parameter specifies the number of point values assigned in command single-point database. Range is 0 to 1000.

C_DC_NA Point Count

```
C_DC_NA point count :     10 #Number of command dual-points
```

This parameter specifies the number of point values assigned in command dual-point database. Range is 0 to 1000.

C_RC_NA Point Count

```
C_RC_NA point count :     10 #Number of command step-points
```

This parameter specifies the number of point values assigned in command step-point database. Range is 0 to 1000.

C_SE_NA Point Count

```
C_SE_NA point count :     10 #Number of command normalized-points
```

This parameter specifies the number of point values assigned in command normalized-point database. Range is 0 to 1000.

C_SE_NB Point Count

```
C_SE_NB point count :     10 #Number of command scaled-points
```

This parameter specifies the number of point values assigned in command scaled-point database. Range is 0 to 1000.

C_SE_NC Point Count

```
C_SE_NC point count :     10 #Number of command float points
```

This parameter specifies the number of point values assigned in command float point database. Range is 0 to 1000.

Sequence

```
M_SP_NA Sequence    : N  #Y=ASDU in sequence with SQ=1, N=report separate (SQ=0)
M_DP_NA Sequence    : N  #Y=ASDU in sequence with SQ=1, N=report separate (SQ=0)
M_ME_NA Sequence    : N  #Y=ASDU in sequence with SQ=1, N=report separate (SQ=0)
M_ME_NB Sequence    : N  #Y=ASDU in sequence with SQ=1, N=report separate (SQ=0)
M_ME_NC Sequence    : N  #Y=ASDU in sequence with SQ=1, N=report separate (SQ=0)
M_IT_NA Sequence    : N  #Y=ASDU in sequence with SQ=1, N=report separate (SQ=0)
```

M_ME_NA Parameter Offset

```
M_ME_NA Parameter Offset :  2000 #M_ME_NA IOA offset for parameter data
```

This parameter specifies the IOA offset to the parameter data for the normalized parameter data. The value entered is added to the Information Object Address for the associated point to compute the parameter IOA address. When the M_ME_NA or M_ME_NB points are polled (e.g, with a group interrogation request), the module will also include parameter points in the response.

For each monitored point, there will be three parameter points:

Point	Value
Threshold	Determined by the deadband set in the configuration file or altered by the write command.
Low	Last reported event value - threshold.
High	Last reported event value + threshold.

M_ME_NB Parameter Offset

```
M_ME_NB Parameter Offset  :  2000 #M_ME_NB IOA offset for parameter data
```

This parameter specifies the IOA offset to the parameter data for the scaled parameter data. The value entered is added to the Information Object Address for the associated point to compute the parameter IOA address.

For each monitored point, there will be three parameter points:

Point	Value
Threshold	Determined by the deadband set in the configuration file or altered by the write command.
Low	Last reported event value - threshold.
High	Last reported event value + threshold.

For example, for a M_ME_NA point with an Information Object Address of 503, the associated parameter point would have an IOA of 2503 (for a configured parameter offset of 2000).

M_ME_NC Parameter Offset

```
M_ME_NC Parameter Offset  :  2000 #M_ME_NC IOA offset for parameter data
```

This parameter specifies the IOA offset to the parameter data for the scaled parameter data. The value entered is added to the Information Object Address for the associated point to compute the parameter IOA address.

For each monitored point, there will be three parameter points:

Point	Value
Threshold	Determined by the deadband set in the configuration file or altered by the write command.
Low	Last reported event value - threshold.
High	Last reported event value + threshold.

For example, for a M_ME_NC point with an Information Object Address of 503, the associated parameter point would have an IOA of 2503 (for a configured parameter offset of 2000).

1.1.9 [M_SP_NA_1 104] Section

This section defines the monitored single-point database for the server device emulated. This information is sourced from the database and is transferred to the remote client unit. Each point in the database occupies 1 bit. (1 = On, 0 = Off state).

This section takes the following parameters:

- Point #
- DB Address
- Group(s)
- IV DB Bit

Each point is one bit and the DB address value corresponds to the bit offset in the database.

1.1.10 [M_DP_NA_1 104] Section

This section defines the monitored dual-point database for the server device emulated. This information is sourced from the database and is transferred to the remote client unit. Each point in the database occupies two bits. (00 = intermediate, 01 = off, 10 = on and 11 = intermediate).

This section takes the following parameters:

- Point #:
- DB Address:
- Group(s):
- IV DB Bit

Each point is two bits and the DB address value corresponds to the bit offset in the database.

1.1.11 [M_ST_NA_1 104] Section

This section defines the monitored step database for the server device emulated. This information is sourced from the database and is transferred to the remote client unit. Each point in the database occupies one byte.

This section takes the following parameters:

- Point #:
- DB Address:
- Group(s):
- IV DB Bit

Each point is one byte and the DB Address value corresponds to the byte offset in the database.

1.1.12 [M_ME_NA_1 104] Section

This section defines the monitored measured value, normalized database for the server device emulated. This information is sourced from the database and is transferred to the remote client unit. Each point occupies a word position in the database. The IOA for the parameters are for each object and are determined by adding the Point # below to the value of the M_ME_NA parameter offset parameter set in the previous section.

This section takes the following parameters:

- Point #:
- DB Address:
- Group(s):
- Default Deadband:
- IV DB Bit

Each point is one word and the DB Address value corresponds to the word offset in the database.

1.1.13 [M_ME_NB_1 104] Section

This section defines the monitored measured value, scaled database for the server device emulated. This information is sourced from the database and is transferred to the remote client unit. Each point occupies a word position in the database. The IOA for the parameters for each object are determined by adding the Point # below to the value of the M_ME_NB parameter offset parameter set in the previous section.

This section takes the following parameters:

- Point #:
- DB Address:
- Group(s):
- Default Deadband:
- IV DB Bit

Each point is one word and the DB Address value corresponds to the word offset in the database.

1.1.14 [M_ME_NC_1 104] Section

This section defines the monitored short-float point database for the slave device emulated. This information is sourced from the database and is transferred to the remote client unit. Each point occupies 4-byte positions in the database. The IOA for the parameters for each object are determined by adding the Point # below to the value of the M_ME_NC Parameter Offset parameter set above.

This section takes the following parameters:

- Point #
- DB Address
- Groups
- Default Deadband
- IV DB Bit

Each point is one word and the DB Address value corresponds to the word offset in the database.

The Database Address value should be located in a database area that is constantly being moved from the processor to the 4205/5205-TS-104S-PDPS module. Therefore, this value should be configured in an area that is used on a Backplane Command Function 1.

Refer to the Group Codes section for a listing of Group Codes.

1.1.15 [M_IT_NA_1 104] Section

This section defines the monitored integrated totals (counter) database for the server emulated. This information is sourced from the database and is transferred to the remote client unit. Each point occupies two words in the database (4 bytes).

This section takes the following parameters:

- Point #:
- DB Address:
- Group(s):
- IV DB Bit

Each point is two words and the DB Address value corresponds to the double-word offset in the database.

1.1.16 [C_SC_NA_1 104] Section

This section defines the single point command database for the server emulated. This information is sourced from the remote client and is transferred to the database. Each point occupies a single bit position in the database. You can associate a command with a monitored single-point database value to coordinate the command/monitor operation. You must enter the correct Monitor Point # and Monitor DB Address values in the table. If the Require Select parameter is not set to zero, a select command must be received before an execute command will be processed.

This section takes the following parameters:

- Point #:
- DB Address:
- Monitor Point #:
- Monitor DB Addr:
- Require Select:

Each point is one bit and the DB Address value corresponds to the bit offset in the database.

1.1.17 [C_DC_NA_1 104] Section

This section defines the double point command database for the server emulated. This information is sourced from the remote client and is transferred to the database. Each point occupies two bits in the database. You can associate a command with a monitored double point database value to coordinate the command/monitor operation. You must enter the correct Monitor Point # and Monitor DB Addr values in the table. If the Require Select parameter is not set to zero, a select command must be received before an execute command will be processed.

This section takes the following parameters:

- Point #:
- DB Address:
- Monitor Point #:
- Monitor DB Addr:
- Require Select:

Each point is two bits and the DB Address value corresponds to the bit offset in the database.

1.1.18 [C_RC_NA_1 104] Section

This section defines the step command database for the server emulated. This information is sourced from the remote client and is transferred to the database. Each point occupies a byte in the database. The control value can be associated with a monitored point as described in the previous example.

This section takes the following parameters:

- Point #:
- DB Address:
- Monitor Point #:
- Monitor DB Addr:

Each point is one byte and the DB Address value corresponds to the byte offset in the database.

1.1.19 [C_SE_NA_1 104] Section

This section defines the normalized setpoint database for the server emulated. This information is sourced from the remote client and is transferred to the database. Each point occupies a word position in the database. You can associate a command with a monitored normalized database value to coordinate the command/monitor operation. You must enter the correct Monitor Point # and Monitor DB Addr values in the table. If the Require Select parameter is not set to zero, a select command must be received before an execute command will be processed.

This section takes the following parameters:

- Point #:
- DB Address:
- Monitor Point #:
- Monitor DB Addr:
- Require Select:

Each point is one word and the DB Address value corresponds to the word offset in the database.

1.1.20 [C_SE_NB_1 104] Section

This section defines the scaled setpoint database for the server emulated. This information is sourced from the remote client and is transferred to the database. You can associate a command with a monitored scaled database value to coordinate the command/monitor operation. You must enter the correct Monitor Point # and Monitor DB Addr values in the table. If the Require Select parameter is not set to zero, a select command must be received before an execute command will be processed.

This section takes the following parameters:

- Point #:
- DB Address:
- Monitor Point #:
- Monitor DB Addr:
- Require Select:

Each point is one word and the DB Address value corresponds to the word offset in the database.

1.1.21 [C_SE_NC_1 104] Section

This section defines the short-float setpoint database for the server emulated. This information is sourced from the remote client and is transferred to the database. Each point occupies a double-word position in the database. If the Require Select parameter is not set to zero, a select command must be received before an execute command will be processed.

This section takes the following parameters:

- Point #:
- DB Address:
- Monitor Point #:
- Monitor DB Addr:
- Require Select:

Each point is two words and the DB Address value corresponds to the double-word offset in the database.

The database address should be located in a database area that is being constantly moved from the module to the processor. You should configure the DB Address parameter in an area that is on a Backplane Command Function 2.

1.1.22 Group Definition

One aspect of the point configuration database that leads to confusion is the group definition field. This assignment for each point assigns a point to one or more interrogation groups. Use of interrogation groups permits the controlling unit to interface with a specific set of data. Refer to the IEC 60870-5-104 standard for a full discussion of interrogation groups. A specific group, Periodic data group, reports data points on a set frequency. The frequency is set in the **Cyclic Data Transmission** parameter in the configuration file. Remember that a point can be assigned to more than one group:

Group Code	Description
0x00000001	Interrogated by general interrogation (station or global)
0x00000002	Interrogated by group 1 interrogation
0x00000004	Interrogated by group 2 interrogation
0x00000008	Interrogated by group 3 interrogation
0x00000010	Interrogated by group 4 interrogation
0x00000020	Interrogated by group 5 interrogation
0x00000040	Interrogated by group 6 interrogation
0x00000080	Interrogated by group 7 interrogation
0x00000100	Interrogated by group 8 interrogation
0x00000200	Interrogated by group 9 interrogation
0x00000400	Interrogated by group 10 interrogation
0x00000800	Interrogated by group 11 interrogation
0x00001000	Interrogated by group 12 interrogation
0x00002000	Interrogated by group 13 interrogation

Group Code	Description
0x00004000	Interrogated by group 14 interrogation
0x00008000	Interrogated by group 15 interrogation
0x00010000	Interrogated by group 16 interrogation
0x00020000	Interrogated by general counter request
0x00040000	Interrogated by group 1 counter request
0x00080000	Interrogated by group 2 counter request
0x00100000	Interrogated by group 3 counter request
0x00200000	Interrogated by group 4 counter request
0x40000000	Disable event scanning of this point
0x80000000	Periodic/cyclic data returned from unit

If the highest bit (bit 31) is set, data will be produced by the driver for the specified point at the rate set for periodic data generation. Bit 30 (0x40000000) enables scanning of this point for event generation. If the bit is clear and the data type is set for scanning, events will be generated for the point. If the bit is set, events will not be generated for the point. This feature can be used to select which points will generate events for the controlling station and can get rid of event data that is not important to the application.

1.1.23 [Data Map] Section

The [Data Map] section of the CFG file allows you to selectively copy data registers, one register up to 100 registers at a time, from one internal database area to another. Up to 200 entries can be made in the [Data Map] section, providing a wide and powerful range of functionality.

You can use the Data Map section of the configuration file to copy data from the device error or status table to the internal database register, or to copy data from one area to another. The bytes and/or words copied can be altered to preset the data (for example, floating-point data) in the correct format for a specific protocol.

You can also use the Data Map feature to build a specific block of data to be used by any of the protocol drivers. For example, you can use the data map to build the input and output data area for the PROFIBUS Slave driver.

```
[DATA MAP]
#   From        To    Register   Swap    Delay
#Address   Address       Count   Code   Preset
START
END

[DATA MAP]
#   From        To    Register   Swap   Delay
#Address   Address       Count   Code  Preset
START
    4000      3000           9      0    5000  #General Module Status
    4030      3010           6      0    2003  #sntp client status
    4020      3020          10      0    2003  #http Server Status
   10213      3100          10      0    2003
   10300      3030          13      0    1007  #HART Port 0 Status
END
```

Tip: Use the **[V]** command in the ***Configuration/Debug Menu*** (page 77) to view the status of the Program Scan Counter. Repeat the command to see the value change.

From Address

0 to highest Status Data address

This field specifies the internal database register to be copied from. This address can range from the Data area as well as the Status Data Area of the product

To Address

0 to 3999

The destination for the copy is always going to be the Register Data area.

Register Count

1 to 100

This parameter specifies the number of registers to be copied.

Swap Code

0,1,2,3

You may need to swap the order of the bytes in the registers during the copy process in order to change from alignment of bytes between dissimilar protocols. This parameter is helpful when dealing with floating-point or other multi-register values, as there is no standard method of storage of these data types in slave devices.

The following table defines the values and their associated operations:

Swap Code	Description
0	None - No Change is made in the byte ordering (1234 = 1234)
1	Words - The words are swapped (1234=3412)
2	Words & Bytes - The words are swapped then the bytes in each word are swapped (1234=4321)
3	Bytes - The bytes in each word are swapped (1234=2143)

Delay Preset

Copies one portion of the database or virtual database to a user specified location in the database. The Delay Preset represents the scan count of the program between each copy operation. The copy operations should not all happen at the same time, otherwise the process could delay the scan. For example, you should not set all values to a delay preset of 1001. Instead, use values such as 1000, 1001 and 1002, or you can use the preset values in the sample configuration file. This will keep the copies from happening concurrently.

Tip: Use the **[V]** command in the ***Configuration/Debug Menu*** (page 77) to view the status of the Program Scan Counter. Repeat the command to see the value change.

1.1.24 [E-MAIL] Section

The [E-MAIL] section of the CFG file defines the network and file parameters to be associated with each of the 20 potential e-mail messages that can be sent from the module. The format of the section is different than the other sections of the configuration file. Each e-mail definition is contained on a single line between the labels **START** and **END**. These labels inform the program where the list resides. The module's program will parse all data after the **START** label until it reaches the **END** label or until 20 e-mail messages are defined.

The format of each definition in the list is the same with the content dependent on the operation to perform. An example section from the CFG file is shown below:

```
[E-MAIL]
# DB Trigger Mail  TO
# Reg Value Server IP Name  E-Mail File Name
START
 4000  1 192.168.0.5 user@aol.com  stat
 4000  2 192.168.0.5 user@aol.com  commands
 4000  3 192.168.0.5 user@aol.com  errlist
 4000  4 192.168.0.5 user@aol.com  emailcfg
 4000  5 192.168.0.5 user@aol.com  example.rpt
END
```

Each parameter is discussed below:

DB Reg

0 to 9999
This parameter specifies the register in the virtual database in the module to be associated with the Trigger Value parameter. The register value can be controlled by Server devices based on data acquired using the command list or from commands issued on the network from a remote Client unit.

Trigger Value

This parameter specifies the value in the database to trigger the e-mail message. When the value entered for this parameter is first recognized in the virtual database at the register specified in the DB Reg parameter, the e-mail message will be generated. The value must change in order for the value to be re-used. Most applications will use a single register with different trigger values generating different messages. The example displayed above uses this technique.

Mail Server IP

This parameter specifies the IP address of the mail server to be reached with the e-mail message. Refer to your network administrator for this information.

To Name

This parameter must contain a valid user or e-mail account information for your network. Groups of people can be designated to receive an individual e-mail message by setting the appropriate name in this field. Refer to your network administrator for a list of accounts.

E-Mail File Name

This parameter contains the fully qualified file and path name to the file to be associated with the e-mail message. This file must reside on the module's Flash ROM in order to be sent. Several e-mail files are built into the module and need not be constructed by the user. The reserved file names and a description of their content is given below:

Stat: This file contains the module's communication status data for each network service and the Client port.
Emailcfg: This file contains a listing of the e-mail configuration data.
All other file names entered must exist on the module.

1.1.25 Creating Custom E-Mail Reports

The ProLinx module supports up to 20 user defined e-mail reports. The following insertion tags can be used with e-mail messages:

Note: A space character **must** exist before the **-->** string or else the insertion tag will be disregarded

<--DATE 0 --> insert the date in the format 02/07/2000.
<--DATE 1 --> insert the date in the format February 7, 2000.
<--TIME --> insert the time in the format 17:02:15.35
<--BTEXT 0,BIT_0_ON,BIT_0_OFF --> insert a text string based on the value of a bit in the database.
<--DATA 0,1,1,%04d --> insert one or more data values from the database in the specified format.
Refer to the Web Page Definition section of the documentation on formatting files with encapsulated data and insertion tags.

1.1.26 Example E-mail Report File

The following serves as an example of an e-mail report file. This file is available on the ProLinx unit, and can be accessed via the FTP port.

```
TO:    Production Engineers
FROM:  4201-WEB-DFM, ProSoft Technology, Inc. Module
SUBJECT:     Production Report for Shipping Pumps
       This is an example of the type of e-mail that can be sent from the module
to a remote site using the e-mail feature. The data contained in the report
displays several methods of displaying data in a report from the module's
database.
       Register 0 = <--DATA 0,1,1,%d --> (this is the report number flag value)
DATE 0 = <--DATE 0 -->
DATE 1 = <--DATE 1 -->
TIME = <--TIME -->
BTEXT = <--BTEXT 0,BIT_0_ON,BIT_0_OFF --> (state of bit 0)
DATA = <--DATA 0,1,1,%04d -->
PUMP DATA:
On Time Suction Discharge Temp
(Hours) (PSIG) (PSIG)  (F)
<--DATA 0,12,4,%12d -->
End of report.
```

2 Protocol Implementation

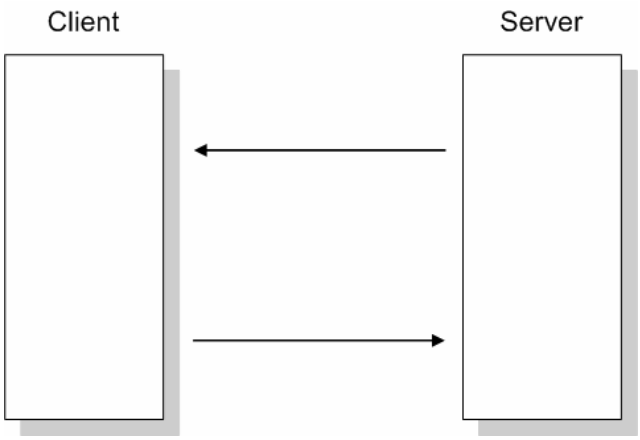
In This Chapter

2.1 IEC-60870-5-104 (104S) Protocol Implementation

The intent of this section is to provide a quick understanding of how the 104S module implements the IEC-60870-5-104 protocol, without going into complex details of the specification.

The IEC-60870-5-104 protocol applies to Telecontrol equipment and systems with data transmission for monitoring and controlling geographically widespread processes. This protocol consists essentially of the IEC-60870-5-101 protocol, with the addition of TCP/IP as the transport mechanism.

Any application with the IEC-60870-5-104 protocol consists of a client (Controlling Station) and one or more servers (Controlled Stations). The client constantly monitors and controls the data from each server in the TCP/IP network.



The 4205/5205-TS-104S-PDPS works as an IEC-60870-5-104 server; it can send monitor data, receive commands, or generate events to the client unit.

2.1.1 Module Address

The 4205/5205-TS-104S-PDPS module is identified at transport level (using the IP Address) and at application level (using the Common ASDU Address).

IP Address

The 4205/5205-TS-104S-PDPS module is identified by a unique IP address on the TCP/IP network. You must edit the WATTCP.CFG configuration file (or use the configuration tool) to enter a valid IP address. The following example lists the default contents of the WATTCP.CFG file:

```
# ProSoft Technology
# Default private class 3 address
my_ip=192.168.0.100
# Default class 3 network mask
netmask=255.255.255.0
# The gateway I wish to use
gateway=192.168.0.1
# some networks (class 2) require all three parameters
# gateway,network,subnetmask
# gateway 192.168.0.1,192.168.0.0,255.255.255.0
```

In this example, the 4205/5205-TS-104S-PDPS module is identified by IP address 192.168.0.100 in the IEC-60870-5-104 network, with a netmask (subnet mask) of 255.255.255.0 and a default gateway address of 192.168.0.1.

Because there could be several devices in the same TCP/IP network, some applications may require a connection control (from which IP addresses the module may receive valid messages).

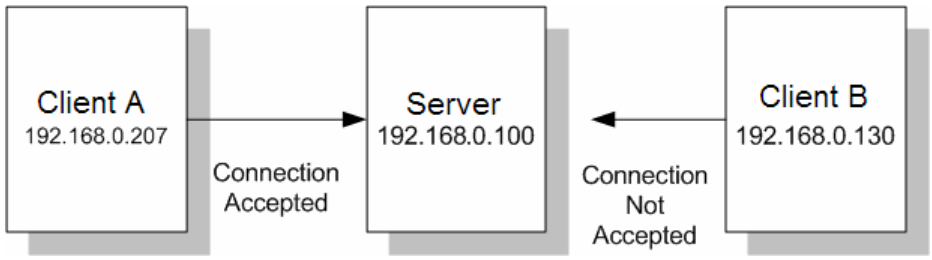
To restrict the units (IP addresses) from which the 4205/5205-TS-104S-PDPS module will accept connections, use the following parameter:

```
Use IP List               :     0 #Use IP list to validate connection
                                  #(0=No, 1=Yes)
```

If this parameter is set as 1 (Yes), the module will only accept a connection from a client unit that is listed in the IP address list, in the following format:

```
[IEC-870-5-104 IP ADDRESSES]
START
192.168.0.207
192.168.0.203
192.168.0.61
END
```

If the *Use IP List* parameter is set to 1 (Yes), the module will only accept a connection from one of the three IP addresses listed in the example above. The following illustration shows that the Server will accept a connection from Client A, whose address is on the list, but will reject a connection from Client B, whose address is not on the list.



Common ASDU Address

At the application level, the module is identified by the Common ASDU (Application Service Data Unit) Address. This address must match the CASDU sent by the client unit. An ASDU is a data unit that transfers information objects between the client and the server.

If the client sends a message to a different Common ASDU, the module ignores the command. To configure the Common ASDU Address for the 4205/5205-TS-104S-PDPS module, use the following parameter in the configuration file:

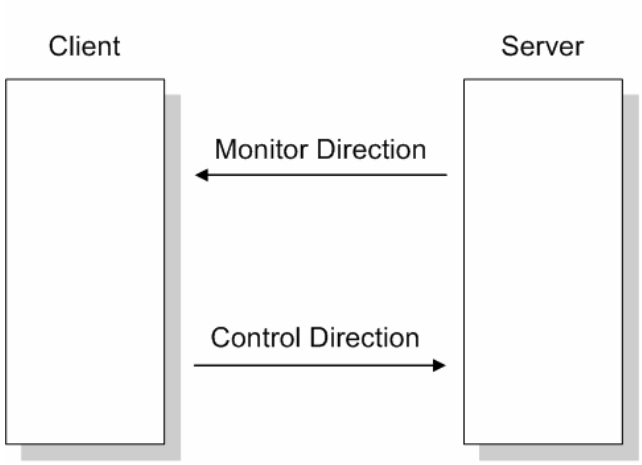
```
Common Address of ASDU    :     1 #Range 0 to 65535
```

2.1.2 Monitor Direction and Control Direction – Point Definition

The protocol specification defines two directions of data: monitor direction and control direction.

Monitor Direction: The direction of transmission from the server to the client

Control Direction: The direction of transmission from the client to the server



The points that are typically transferred from the server to the client are also known as **Monitor Points** (or Monitor Information Objects). The points that are typically transferred from the client to the server are also known as **Control Points** (or Command Information Objects).

The 4205/5205-TS-104S-PDPS module contains an internal database of 4000 words. You must associate the monitor and control points to database addresses in the 4205/5205-TS-104S-PDPS module. To configure the points for the 4205/5205-TS-104S-PDPS module, follow these steps:

1. Calculate the number of monitor and control points for the application.
2. Calculate the 4205/5205-TS-104S-PDPS module database regions that are required for the application, based on the number of monitor and control points. Define two separate regions. Remember that each data type stores a different quantity of data (for example, M_SP_NA uses one bit, M_ST_NA uses one byte, and so on).
3. Configure each point within its 4205/5205-TS-104S-PDPS module database region.

2.1.3 Using Monitor Points

The following monitor points are supported by the 4205/5205-TS-104S-PDPS module:

Symbol	Description	Data Size in Database	Addressing Type
M-SP-NA	Monitored Single-Points	1 bit	Bit
M-DP-NA	Monitored Dual-Points	2 bits	Bit
M-ST-NA	Monitored Step-Points	1 byte	Byte
M-ME-NA	Monitored Measured Normalized-Points	1 word	Word
M-ME-NB	Monitored Measured Scaled-Points	1 word	Word
M-ME-NC	Monitored Measured Short Floating Points	2 words	Double-Word
M-IT-NA	Monitored Counter-Points	2 words	Double-Word

Each monitor point is identified by its Information Object Address (it should be unique for each Common ASDU Address in the network). For each monitor point, configure the following parameters:

Point # – The information object address of the point. It identifies the point in the network.

DB Address – The database location in the 4205/5205-TS-104S-PDPS module associated with the point. You must associate each point to a database address in the 4205/5205-TS-104S-PDPS module. The interpretation of this parameter depends on the point type configured. For example, for an M_SP_NA point, this value represents the bit address. For a M_ME_NA point, this value represents the Word address.

Group(s) – This is the group definition for the point. It sets how the point will be polled by the master (cyclic or group interrogation). It can also be used to enable or disable the event generation for one specific point. The group parameter is discussed in the Data Communication section.

Deadband – Sets the deadband for each Measured point. If the value changes from more than the configured deadband , the module will generate an event for this point.

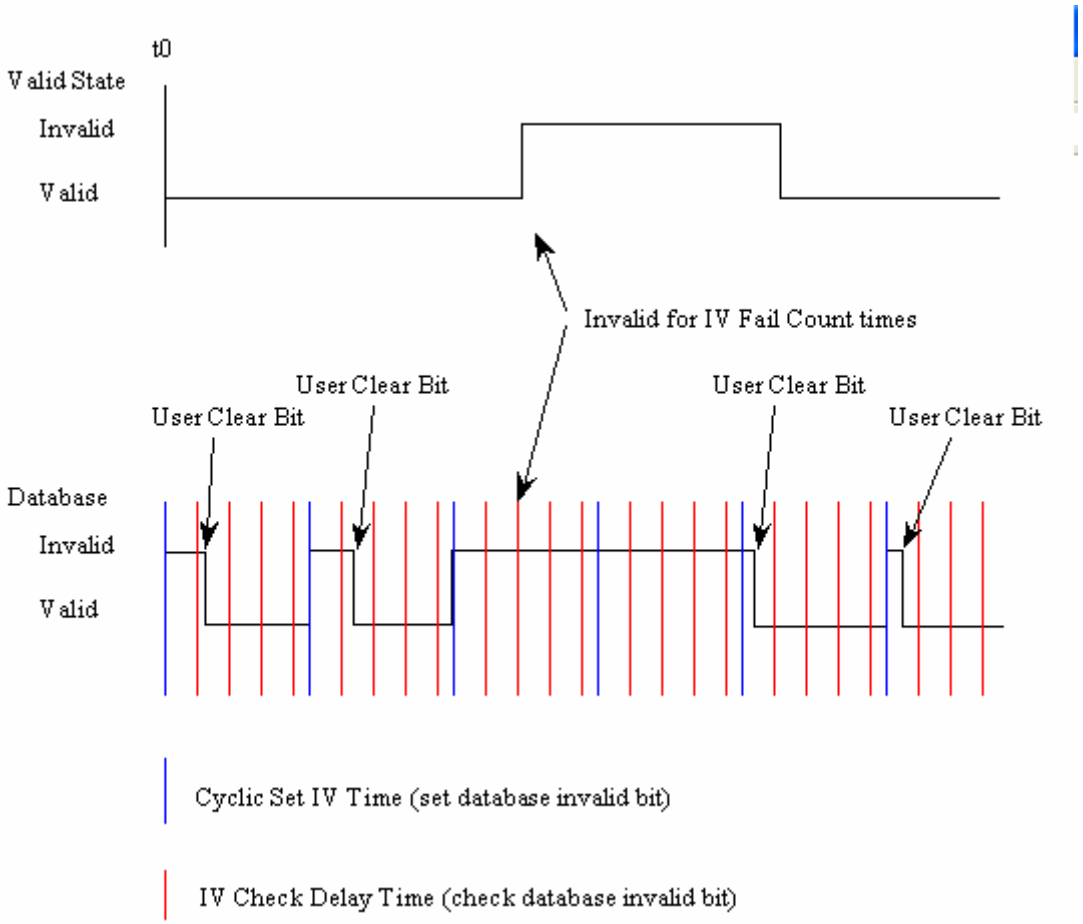
IV DB Bit – This feature allows the application to set the invalid (IV) quality bit of the protocol for all the monitored ASDU types supported. If you enable this feature, the processor can determine the individual IV quality bit status of each point you configured.

The following parameters must be configured in order to use this feature:

```
Cyclic Set IV Time    :    10 #Number of sec intervals
IV Check Delay Time   :     2 #Number of sec intervals between
                              #investigation
IV Fail Count         :     2 #Number of IV failures recognized
                              #before reporting
```

To disable this feature, set the IV Fail Count parameter to 0. If used, the Cyclic Set IV Time parameter must be at least 3 times larger than the IV Check Delay Time.

The Cyclic Set IV Time parameter must be set to determine how frequently the IV Checks will be performed. If the IV bit is ON for a number of times given by the IV Fail Count parameter the module will consider the point as invalid. The following illustration shows how these parameters are implemented:



If the IV bit field is absent or set to 0, the invalid quality state for the point will always be reported as valid.

If a database bit address (1 to 64000) is present, the application may consider the point with an invalid flag if the previous logic checks the iv bit as 1 during consecutive IV Check Delay scans. The iv bits would have to be reset to 0 to set the point to valid state.

The IV DB bit defined for each point can be unique or many points may share the same bit. The last case could be used when the points on an I/O module are to be considered as one set. In this case only a single bit is required. For a point that is the result of a computation, the valid quality state could be set for each point individually.

Monitor Data Transfer

Typically, you should properly configure the group code for each monitor point to define how the master will poll for the point. The group codes are defined as follows:

The Group parameter is defined as follows:

Group Code	Description
0x00000001	Interrogated by general interrogation (station or global)
0x00000002	Interrogated by group 1 interrogation
0x00000004	Interrogated by group 2 interrogation
0x00000008	Interrogated by group 3 interrogation
0x00000010	Interrogated by group 4 interrogation
0x00000020	Interrogated by group 5 interrogation
0x00000040	Interrogated by group 6 interrogation
0x00000080	Interrogated by group 7 interrogation
0x00000100	Interrogated by group 8 interrogation
0x00000200	Interrogated by group 9 interrogation
0x00000400	Interrogated by group 10 interrogation
0x00000800	Interrogated by group 11 interrogation
0x00001000	Interrogated by group 12 interrogation
0x00002000	Interrogated by group 13 interrogation
0x00004000	Interrogated by group 14 interrogation
0x00008000	Interrogated by group 15 interrogation
0x00010000	Interrogated by group 16 interrogation
0x00020000	Interrogated by general counter request
0x00040000	Interrogated by group 1 counter request
0x00080000	Interrogated by group 2 counter request
0x00100000	Interrogated by group 3 counter request
0x00200000	Interrogated by group 4 counter request
0x40000000	Disable event scanning of this point
0x80000000	Periodic/cyclic data returned from unit

The module will periodically send all points configured for periodic/cyclic poll (0x80000000) at every x milliseconds, where x is configured with the following parameter:

```
Cyclic data transmission: 20000 #Numb of milliseconds between cyclic
                                #updates
```

➢ *Example – Periodic Monitor Polling:*

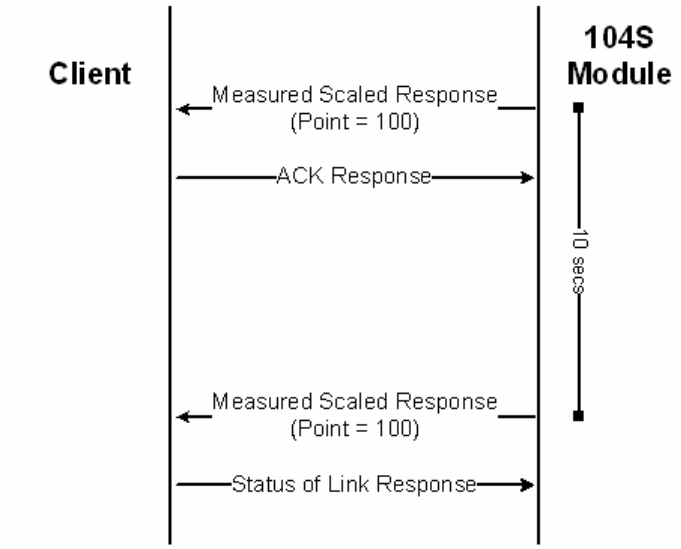
If the following point is configured for monitor polling:

```
[M_ME_NB_1]
#
# Each point is one word and the DB Address value corresponds to the
# word offset into the database.
#
#                                  Default
# Point #   DB Address   Group(s)  Deadband  IV DB Bit
# -------   ----------   --------  --------  ---------
START
      100            0   80000000         0          0
END
```

If you configure the periodic polling for 10 seconds (10000 milliseconds) as follows:

```
Cyclic data transmission  : 10000 #Numb of milliseconds between
                                  #cyclic updates
```

The following illustration shows the communication procedure:



Therefore, the point configured for a cyclic poll is periodically reported to the master.

You may also create groups of points allowing the master to poll certain points more frequently than other points. The master may send requests for different groups as follows:

- General Interrogation (station)
- General Interrogation for Group 1

- General Interrogation for Group 2
- …
- General Interrogation for Group 16

➢ *Example – General Interrogation*

If the following points are configured for General Interrogation:

If you configure the following data points:

```
[M_SP_NA_1]
# Point #   DB Address   Group(s)  IV DB Bit
# -------   ----------   --------  ---------
START
      100         1600   00000002          0 # Group 1 Interrogation
      101         1601   00000002          0 # Group 1 Interrogation
      102         1602   00000004          0 # Group 2 Interrogation
END
```

This feature allows you to separate the points into different groups according to the priority level that these should be reported to the master. In the example above, points 100 and 101 would be returned with a General Interrogation for Group 1 and point 102 would be returned with a General Interrogation for Group 2:

Counter Points

There are four modes of acquisition of integrated totals (M_IT_NA points) defined by the protocol specification. The actual values may be memorized (copied) periodically to frozen values by a freeze command received from the master or initiated locally within the module.

The module supports the following modes:

Mode A – Local freeze with spontaneous transmission

Mode D – Counter interrogation commands from the master initiate the freeze operation and the frozen values are reported spontaneously.

➢ *Example – Mode A*

To use Mode A, configure the following parameters:

```
Freeze Start Type      :   D #D=Day, H=Hour, M=Minute, N=Not used
Interval For Freeze    :  15 #Number of seconds after start type
                             #(0 to 65535)
```

Freeze Start Type

The Freeze Start Type parameter will define when the module starts sending the M_IT messages.

➢ *Example I – Freeze Start Type*

If the module powers up with the following date and time clock:

03/25/2004 18:07:42

If you configure the Interval For Freeze parameter as follows:

```
Interval For Freeze       :     15 #Number of seconds after start
                                    #type (0 to 65535)
```

The module would send the counter messages every 15 seconds. The module would start sending the messages depending on the Freeze Start Type parameter as follows:

Freeze Start Type	Time to Start Sending Messages
D	03/26/2004 00:00:00
H	03/25/2004 19:00:00
M	03/25/2004 18:08:00

➢ *Example II – Freeze Start Type*

If the module should send the counter points on the hourly turn around time and also 45 minutes later, the Mode A parameters should be configured as follows:

```
Freeze Start Type         :        H  #D=Day, H=Hour, M=Minute, N=Not
                                      #used
Interval For Freeze       :     2700  #Number of seconds after start
                                      #type (0 to 65535)
```

So the module would send events as follows (Hours:Minutes:Seconds):

```
17:00:00
17:45:00
18:00:00
18:45:00
19:00:00
19:45:00
…
```

Mode D

To select the Mode D. configure the Freeze Start Type parameter as "N". For this mode the master would periodically send Counter Interrogation Commands to perform the freeze operation. After the values are frozen the module will return the counter points as events. The counter points must be properly configured for counter interrogation groups for Mode D operation.

Monitor Points Addressing

As discussed before, the monitor points must be configured in a database area in the 4205/5205-TS-104S-PDPS module.

The monitor data types are described in the following table:

Data Type	Data Size	Addressing Type
M_SP_NA	1 bit	Bit
M_DP_NA	2 bits	Bit
M_ST_NA	1 byte	Byte
M_ME_NA	1 word	Word
M_ME_NB	1 word	Word
M_ME_NC	2 word	Double-Word
M_IT_NA	2 word	Double-Word

M_SP_NA and M_DP_NA

The monitored single-point (1 bit) and monitored double-point (2 bits) types both occupy bit-addressing. For example, if you configured the following points:

```
# Point #   DB Address   Group(s)   IV DB Bit
# -------   ----------   --------   -------------
START
      100         1600   80000000           0
      101         1601   00000200           0
      102         1602   00000400           0
END
```

These points would be used as follows:

Inf. Object Address	Module Database Address
100	Bit 0 of word 100
101	Bit 1 of word 100
102	Bit 2 of word 100

The monitored double-point uses two bits with bit-addressing. It typically represents the ON/OFF states where:

01 = OFF

10 = ON

M_ST_NA

The monitored step-point uses one byte with byte-addressing.

For example, if you configured the following points:

```
# Point #   DB Address   Group(s)     IV DB Bit
# -------   ----------   --------     -------------
START
      300           40   80000000             0
      301           60   00000200             0
      302           81   00000400             0
END
```

These points would be used as follows:

Inf. Object Address	Module Database Address
300	Low Byte of word 20
301	Low Byte of word 30
302	High Byte of word 40

M_ME_NA and M_ME_NB

The monitored measured normalized and measured scaled points occupy one word with word-addressing.

For example, if you configured the following points:

```
#                                    Default
# Point #   DB Address   Group(s)  Deadband  IV DB Bit
# -------   ----------   --------  --------  ---------
START
      400           10   80000000         0          0
      401           12   00000200         0          0
      402           18   00000400         0          0
END
```

These points would be used as follows:

Inf. Object Address	4205/5205-TS-104S-PDPS Module Database Address
400	Word 10
401	Word 12
402	Word 18

The monitored measured normalized points use a data representation defined by the protocol specification, where each bit represents a value as follows:

Bit	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Value	S	2^{-1}	2^{-2}	2^{-3}	2^{-4}	2^{-5}	2^{-6}	2^{-7}	2^{-8}	2^{-9}	2^{-10}	2^{-11}	2^{-12}	2^{-13}	2^{-14}	2^{-15}

Example: a value of 4000hex is interpreted as 0.5

M_ME_NC and M_IT_NA

The monitored measured short floating point and monitored integrated total points occupy two words with double-word addressing.

For example, if you configured the following points:

```
# Point #   DB Address   Group(s)  Deadband  IV DB Bit
# -------   ----------   --------  --------  ---------
START
      500           20   80000000         0          0
      501           32   00000200         0          0
      502           52   00000400         0          0
END
```

These points would be used as follows:

Inf. Object Address	Module Database Address
500	Words 40 and 41

Inf. Object Address	Module Database Address
501	Words 64 and 65
502	Word 104 and 105

2.1.4 Using Control (Command) Points

The following control points are supported by the 4205/5205-TS-104S-PDPS module:

Symbol	Description
C_SC_NA	Single-Point Command
C_DC_NA	Dual-Point Command
C_RC_NA	Step-Point Command
C_SE_NA	Measured Normalized Point Command
C_SE_NB	Measured Scaled-Point Command
C_SE_NC	Measured Short Floating-Point Command

Each control point is identified by its Information Object Address. For each control point, configure the following parameters:

Point # - This is the information object address of the point. It identifies the point in the network. This address must be unique for each Common ASDU Address in the network.

DB Address - This is the database location in the 4205/5205-TS-104S-PDPS module associated with the point.

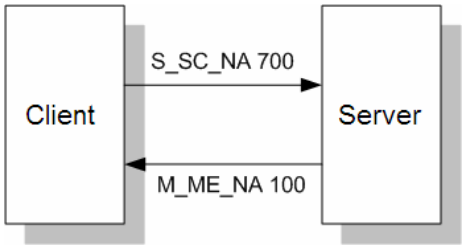
Monitor Point #-Monitor DB Address- The user might (optionally) configure a monitor point to be sent by the 4205/5205-TS-104S-PDPS module when it receives the command for that specific point.

- ***Example (C_SC_NA)***

```
#                         Monitor  Monitor  Require
# Point #   DB Address    Point #  DB Addr   Select
# -------   ----------    -------  -------  -------
START
      700          3200       100     1600        0
END
```

In the example above, each time the module receives a command for single-command point 700, it sends a response containing a monitored single-point (information object address 100 with the value at database bit-address 1600).

Require Select - This parameter configures the point to require a *Select* request before the *Operate* command.



Control Data Transfer

The control communication typically occurs when the client sends a command request to update the module's command points.

The data types addressing are described in the following table:

Data Type	Data Size	Addressing Type
C_SC_NA	1 bit	Bit
C_DC_NA	2 bits	Bit
C_RC_NA	1 byte	Byte
C_SE_NA	1 word	Word
C_SE_NB	1 word	Word
C_SE_NC	2 words	Word

Some of the command points may be configured to be selected before executed.

Refer to the following parameter to configure the select/operate timeout period. After the module receives the SELECT operation it will wait for this period of time for the EXECUTE operation. If the module does not receive an EXECUTE operation within this period of time it will require another SELECT operation before the EXECUTE operation.

```
Select/Operate Timeout    : 20000 #Milliseconds before select
                                    #timeout
```

Command Points Addressing

As discussed before, the command points must be configured in a database area that is updated at the module. You must associate each point to a database address in the 4205/5205-TS-104S-PDPS module. The interpretation of this parameter depends on the point type configured.

C_SC_NA and C_DC_NA

The single-point command and dual-point command points use one bit with bit-addressing. For example, if you configure the following points:

```
#                         Monitor  Monitor  Require
# Point #   DB Address    Point #  DB Addr   Select
# -------   ----------    -------  -------  -------
START
      100         1600          0        0        0
      101         1601          0        0        0
      102         1602          0        0        0
END
```

These points would be used as follows:

Inf. Object Address	Module Database Address
100	Bit 0 of word 100
101	Bit 1 of word 100
102	Bit 2 of word 100

The protocol specification defines a qualifier value that is set by the master to determine the duration of the pulse (short, long or persistent).

Configure the parameters below to set the duration of the short and long pulses:

```
Short Pulse Time    :   2000 #MSec for short pulse command
Long Pulse Time     :  10000 #MSec for long pulse command
```

C_RC_NA

The step-point command uses one byte with byte-addressing.

For example, if you configured the following points:

```
#                         Monitor  Monitor
# Point #   DB Address    Point #  DB Addr
# -------   ----------    -------  -------
START
      300           40         0        0
      301           60         0        0
      302           81         0        0
END
```

These points would be used as follows:

Inf. Object Address	Module Database Address
300	Low Byte of word 20
301	Low Byte of word 30
302	High Byte of word 40

C_SE_NA and C_SE_NB

The measured normalized point command uses one word with word-addressing. For example, if you configured the following points:

```
#                         Monitor  Monitor  Require
# Point #   DB Address    Point #  DB Addr   Select
# -------   ----------    -------  -------  -------
START
      400           10         0        0        0
      401           12         0        0        0
      402           18         0        0        0
END
```

These points would be used as follows:

Inf. Object Address	4205/5205-TS-104S-PDPS Module Database Address
400	Word 10
401	Word 12
402	Word 18

The measured normalized points use a data representation defined by the protocol specification, where each bit represents a value as follows:

Bit	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Value	S	2^{-1}	2^{-2}	2^{-3}	2^{-4}	2^{-5}	2^{-6}	2^{-7}	2^{-8}	2^{-9}	2^{-10}	2^{-11}	2^{-12}	2^{-13}	2^{-14}	2^{-15}

Ex: a value of 4000hex is interpreted as 0.5

C_SE_NC

The measured short floating point command uses two words with double word addressing.

For example, if you configured the following points:

```
#           DB Address   Monitor  Monitor  Require
# Point #   (word*2)     Point #  DB Addr   Select
# -------   ----------   -------  -------  -------
START
      400           10         0        0        0
      401           12         0        0        0
      402           18         0        0        0
END
```

These points would be used as follows:

Inf. Object Address	Module Database Address
400	Words 20 and 21
401	Words 22 and 23
402	Words 24 and 25

2.1.5 Data Communication

Group Communication

As previously discussed, the Group parameter in the module configuration file controls how each monitored point is transferred between the 4205/5205-TS-104S-PDPS module and the client unit. The Group parameter is described in detail in ***Group Definition*** (page 30)

The following example configures this point to be repeated either during cyclic polls, or when the module General Interrogation request for group 1 occurs.

```
# Point #   DB Address   Group(s)
# -------   ----------   --------
START
     100         1600   80000002    # P1-PSHH -- Discharge pressure SD
END
```

The module periodically sends all points configured for periodic/cyclic poll (0x80000000) at the interval in milliseconds configured with the following parameter:

```
Cyclic data transmission : 20000 #Numb of milliseconds between cyclic
                                  #updates
```

You can also divide the monitored points into different groups, allowing the client to periodically poll only certain points. This also allows some points to be polled more frequently than others.

Note: You should configure the counter points (M_IT_NA) for general counter interrogation or group counter interrogations.

➢ ***Example:***

In the following example, with the following data points for data type M_SP_NA configured:

```
[M_SP_NA_1 104]
# Point #  DB Address  Group(s)
# -------  ----------  --------
START
   100     1600        80000000 # Periodic Poll
   101     1601        00000002 # Group 1 Interrogation
   102     1602        00000002 # Group 1 Interrogation
   103     1603        00000004 # Group 2 Interrogation
END
```

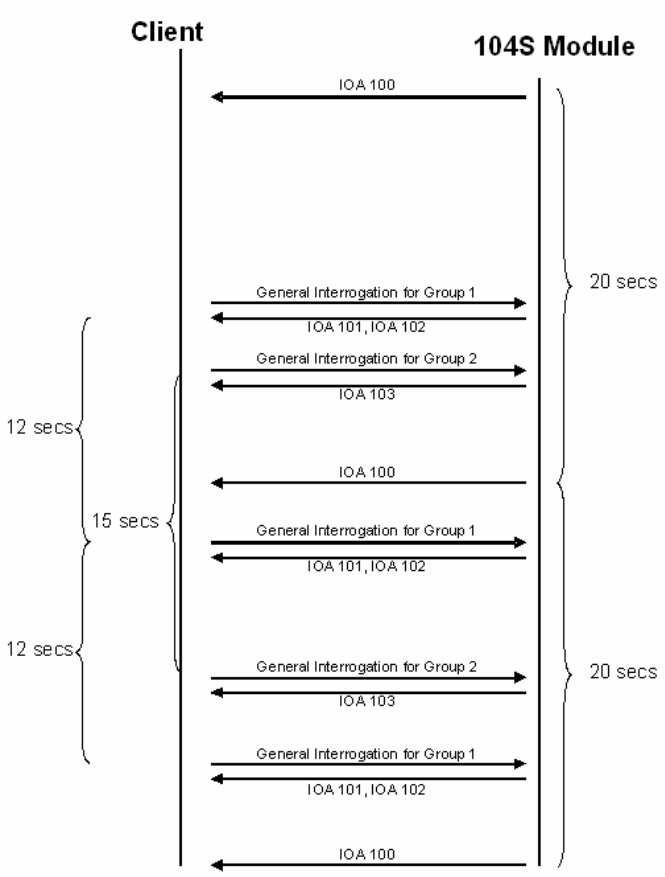
And the Cyclic data transmission parameter configured as follows:

```
Cyclic data transmission : 20000 #Numb of milliseconds between cyclic updates
```

The client unit sends the following requests:

- General Interrogation for Group 1 every 12 seconds
- General Interrogation for Group 2 every 15 seconds

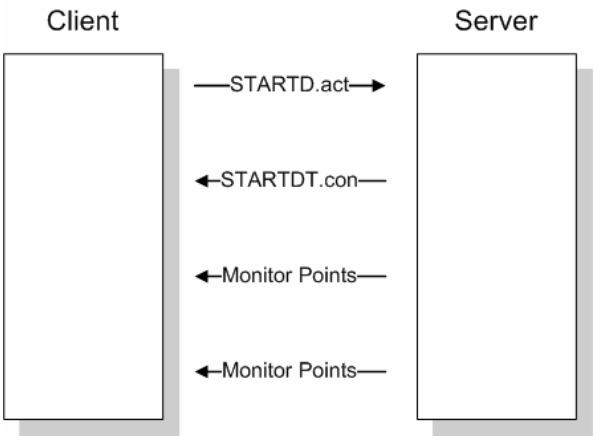
The following illustration shows how the communication would be performed between the client and the 104S module.



STARTDT & STOPDT

STARTDT (Start Data Transfer) and STOPDT (Stop Data Transfer) are used by the client to control the data transfer from the 4205/5205-TS-104S-PDPS module. When the connection is established, user data is not automatically enabled in the server until it receives a STARTDT act request from the client. The server should respond with a STARTDT con response to acknowledge the client request. Once this procedure is concluded, the server can send monitor data to the client.

The client can interrupt the monitor data flow at any time sending a STOPDT act command to the server.



In some circumstances the client unit may not support STARTDT and STOPDT messages. The module may also be tested with simulator software that does not support these features. During these situations, you may want to disable the STARTDT and STOPDT features using the following parameter:

```
Override StartDT :  1 #Used to ignore STARTDT/STOPDT state (0=No, 1=Yes)
```

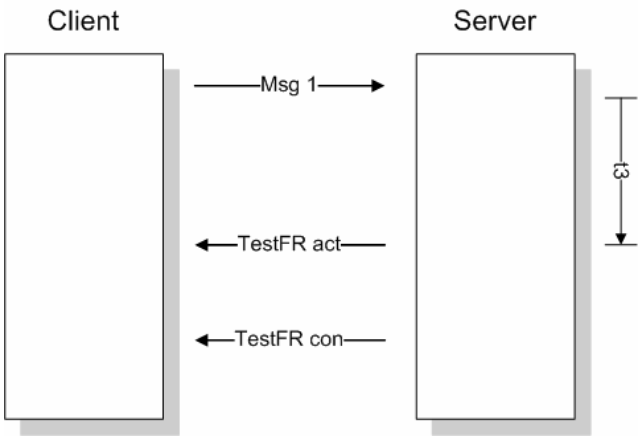
If this parameter is set to 1, the module will ignore the STARTDT and STOPDT requests by the client unit.

TESTFR Requests

Connections that are unused (but opened) may be periodically tested in both directions by sending test messages (TESTFR=act) which are confirmed by the receiving station sending TESTFR=con messages. The 4205/5205-TS-104S-PDPS module can be configured to periodically send this message using the following parameter:

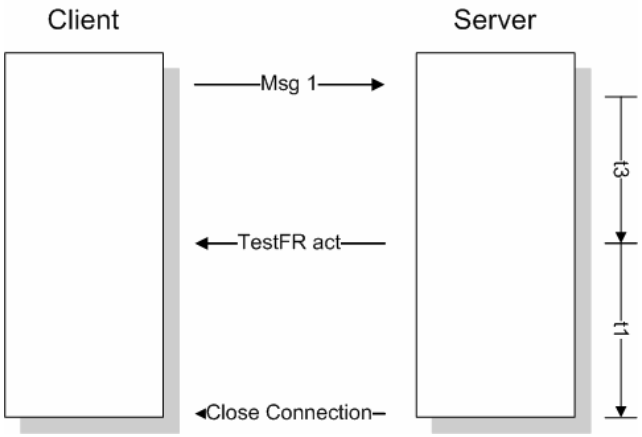
```
t3 timeout set value      :    30 #timeout for test frame on idle state
```

In the example above, the module would send a TESTFR.ACT message 30 seconds after receiving the last message:



If the module does not receive the TESTFR.con message within a certain amount of time, it will timeout and close the connection. You can configure the timeout period using the following parameter:

```
t1 timeout set value   :  15 #timeout of send or test ASDU
```



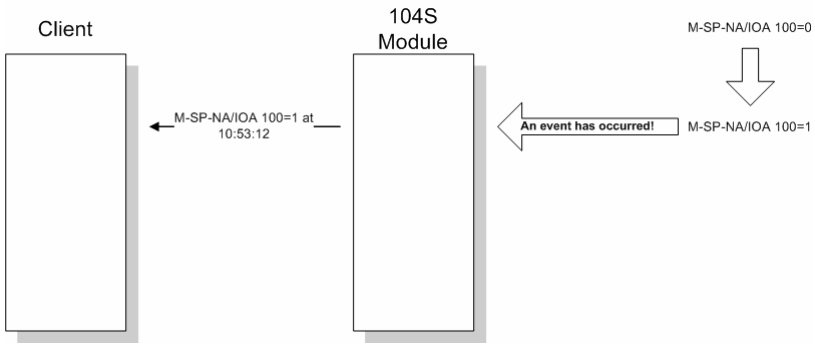
When closing the connection, the module can be configured to clear all the messages in its queue. The following parameter is used to implement this task:

```
Clear queue on close: 1 #Clear the queue when connection closed
                        #(0=No, 1=Yes)
```

The configuration above would cause to module to delete all pending messages/events while closing the connection to the client.

2.1.6 Events

In order to improve communication efficiency, most applications will require the client to periodically poll for data changes with a higher priority than polling for monitor data. Every time a data changes, the server sends this information, typically with the date and time information on when it has occurred.



Deadbands

The monitored measured points (M_ME_NA and M_ME_NB) will only generate events if the data changes from a value greater than the configured deadband value.

For example, with the following point configured:

```
[M_ME_NB_1 104]
#                                  Default
# Point #   DB Address   Group(s)  Deadband
# -------   ----------   --------  --------
START
      500          105   80000000       100
END
```

So, if the current value for this point is 130, it would only generate events if:

NEW VALUE is less or equal than 30

OR

NEW VALUE is greater or equal than 230.

You can set the deadband for each monitored measured point through the configuration file.

The client may also dynamically change the deadband for each monitored point. The client may send one of the following commands:

Type	Command
110	Parameter of Measured Normalized Data (M_ME_NA)
111	Parameter of Measured Scaled Data (M_ME_NB)
112	Parameter of Measured Short Floating Point (M_ME_NC)

The protocol specification explains that the qualifier value for these commands should be configured as:

Bits	Value	Description
1 to 6	0	Not Used
	1	**Threshold Value (Deadband)**
	2	Smoothing Factor (filter time constant) – Not Supported
	3	Low Limit Transmission of Measured Value
	4	High Limit Transmission of Measured Value
	5..31	Reserved
7	0	No Change
	1	Change
8	0	Operation
	1	Not in Operation

For the 4205/5205-TS-104S-PDPS module, the Low Limit and High Limit parameters cannot be changed by command, because these values are calculated as follows:

Low Limit = (LAST REPORTED VALUE) – Deadband

High Limit = (LAST REPORTED VALUE) + Deadband

These commands must be sent to a specific Information Object Address. The 4205/5205-TS-104S-PDPS module associates each monitor measured point with a parameter point through the following configuration parameters:

```
M_ME_NA Parameter Offset : 2000 #M_ME_NA IOA offset for parameter data
M_ME_NB Parameter Offset : 2000 #M_ME_NB IOA offset for parameter data
M_ME_NC Parameter Offset : 2000 #M_ME_NC IOA offset for parameter data
```

- ***Example:***

If the following monitored measured points are configured:

```
[M_ME_NA_1 104]
#
#                                   Default
# Point #   DB Address   Group(s)  Deadband  IV DB Bit
# -------   ----------   --------  --------  ---------
START
      400           10   00000002       100        # P1 suction pressure
      401           11   00000002       100        # P1 discharge pressure
      402           12   00000002       100        # P2 suction pressure
      403           13   00000002       100        # P2 discharge pressure
      404           14   00000002       100        # Station discharge pressure
      405           15   00000002       100        # VSD speed
      406           16   00000002       100        #
      407           17   00000002       100        #
      408           18   00000002       100        #
      409           19   00000002       100        #
END
```

```
[M_ME_NB_1 104]
#
#                                  Default
# Point #   DB Address   Group(s)  Deadband  IV DB Bit
# -------   ----------   --------  --------  ---------
START
      500           20   00000002       100       # P1 inboard bearing temp
      501           21   00000002       100       # P1 outboard bearing temp
      502           22   00000002       100       # P1 winding Temp
      503           23   00000002       100       # P1 current
      504           24   00000002       100       # P2 inboard bearing temp
      505           25   00000002       100       # P2 outboard bearing temp
      506           26   00000002       100       # P2 winding Temp
      507           27   00000002       100       # P2 current
      508           28   00000002       100       #
      509           29   00000002       100       #
END
[M_ME_NC_1 104]
#
#                                  Default
# Point #   DB Address   Group(s)  Deadband  IV DB Bit
# -------   ----------   --------  --------  ---------
START
      600           30   00000002       100            #
      601           32   00000002       100            #
      602           34   00000002       100            #
      603           36   00000002       100            #
      604           38   00000002       100            #
      605           40   00000002       100            #
      606           42   00000002       100            #
      607           44   00000002       100            #
      608           46   00000002       100            #
      609           48   00000002       100            #
END
```

And the parameter points are configured as follows:

```
M_ME_NA Parameter Offset : 2000 #M_ME_NA IOA offset for parameter data
M_ME_NB Parameter Offset : 2000 #M_ME_NB IOA offset for parameter data
M_ME_NC Parameter Offset : 2000 #M_ME_NC IOA offset for parameter data
```

It would imply that the parameter points would be configured as follows:

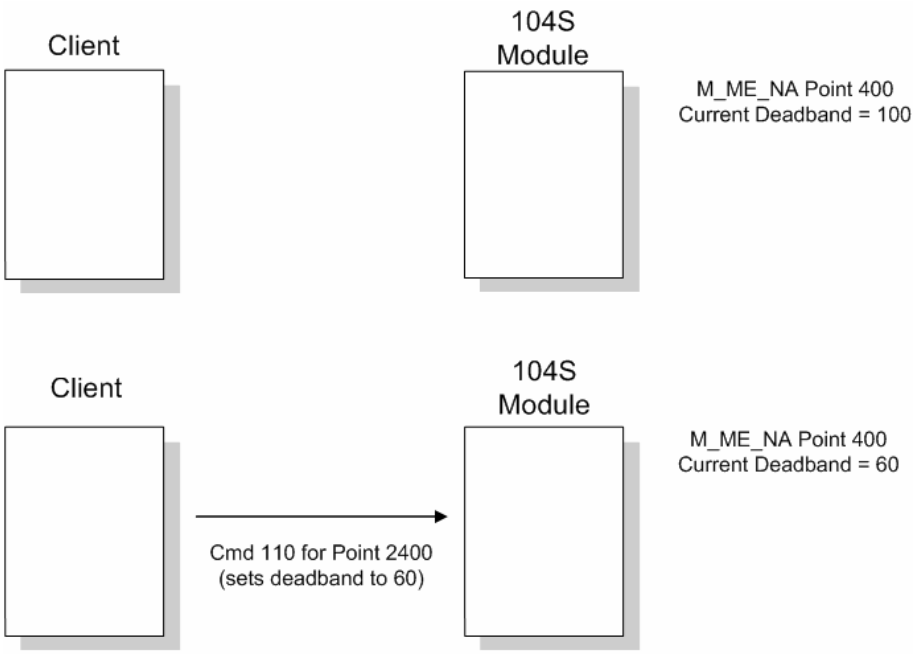
M_ME_NA

Monitored Measured Normalized Point	Associated Parameter Point
400	2400
401	2401
402	2402
403	2403
404	2404

M_ME_NB

Monitored Measured Normalized Point	Associated Parameter Point
500	2500
501	2501
502	2502
503	2503
504	2504

In order to send change the deadband for the M_ME_NA point 400, the client would send a command type 110 to point 2400:



M_ME_NC

Monitored Measured Normalized Point	Associated Parameter Point
600	2600
601	2601
602	2602
603	2603
604	2604

Controlling the Generation of Events

Some applications may require that only some points should generate events. The application would only poll the current value for these points, although there would be no special interest on when these points change the values. Other applications may require that all configured points should generate events.

The 4205/5205-TS-104S-PDPS module offers a lot of flexibility for event control. The user may control if events will be generated at 3 different levels:

1 General (All Points)
2 Data Type Level
3 Point Level

General (All Points)

The user may control how frequently the module will scan the database for events using the following configuration parameter:

```
Event Scan delay    :      1 #MSec between event scanning (0-65535)
                             #0=Disable
```

If this parameter is set to 0, the module will not generate events for any points. A non-zero value will configure how frequently the module will scan for events in the database.

Data Type Level

The user may configure if a data type should generate events or not. Each data type has a configuration parameter to control the generation of events:

```
M_SP_NA Scan Events :      1 #0=No scanning, 1=scan for events
M_DP_NA Scan Events :      0 #0=No scanning, 1=scan for events
M_ST_NA Scan Events :      0 #0=No scanning, 1=scan for events
M_ME_NA Scan Events :      0 #0=No scanning, 1=scan for events
M_ME_NB Scan Events :      0 #0=No scanning, 1=scan for events
M_ME_NC Scan Events :      0 #0=No scanning, 1=scan for events
```

In the example above, only the M_SP_NA points would generate events.

Point Level

You can configure if each point should generate events or not using the Group field for each point configuration. The user should set the value as 40000000 in order to disable the generation of events for that specific point.

```
[M_SP_NA_1 104]
#
# Point #   DB Address   Group(s)
# -------   ----------   --------
START
      100         1600   40000000    # P1-PSHH -- Discharge pressure SD
END
```

Time Information

Each event may also send the date and time when it has occurred. The 4205/5205-TS-104S-PDPS module supports the CP56 time format (as defined in the protocol specification). This format contains the milliseconds, seconds, minute, hour, day, month and year when the event has occurred.

The 4205/5205-TS-104S-PDPS module may also be configured not to send any time information with each event for certain data types.

The following parameters may be used to control the time information for each data type:

```
M_SP_NA Time Type   :      2 #0=None, 2=CP56 time
M_DP_NA Time Type   :      2 #0=None, 2=CP56 time
M_ST_NA Time Type   :      2 #0=None, 2=CP56 time
M_ME_NA Time Type   :      2 #0=None, 2=CP56 time
M_ME_NB Time Type   :      2 #0=None, 2=CP56 time
M_IT_NA Time Type   :      2 #0=None, 2=CP56 time
M_IT_NC Time Type   :      2 #0=None, 2=CP56 time
```

Note: The client should send a Time Synchronization command to the module in order to synchronize its date and time information, according to the protocol specifications. Depending on certain parameters, as well as hardware limitations, the module may present some time delay over time. The client should periodically send time synchronization requests to the 104S module.

Event Priority

Event Priority permits ASDUs that generate events to be placed in priority queues that are set by the user. The configuration file contains the following parameters to support this feature:

```
[IEC-870-5-PDPS Port 0]
Set Priority Queues   :    1 #Set user defined priority queues 1=Yes,
                             #0=No
M_SP_NA Priority      :    1 #Unique index for this data type in queue
                             #(0-5)
M_DP_NA Priority      :    0 #Unique index for this data type in queue
                             #(0-5)
M_ST_NA Priority      :    5 #Unique index for this data type in queue
                             #(0-5)
M_ME_NA Priority      :    4 #Unique index for this data type in queue
                             #(0-5)
M_ME_NB Priority      :    3 #Unique index for this data type in queue
                             #(0-5)
M_ME_NC Priority      :    2 #Unique index for this data type in queue
                             #(0-5)
M_IT_NA Priority      :    6 #Unique index for this data type in queue
                             #(0-5)
```

The Set Priority Queues parameter must be enabled for this feature to be used. Each of the ASDU's affected by this feature must be assigned a unique priority index from 0 to 6. Events of the ASDU with a priority of 0 will always be reported before any others when they are present.

➢ *Example – Event Priority*

If the module is configured with the example values above, and the event queue contains the events generated in the following order:

Event Order	ASDU
1	M_SP_NA
2	M_SP_NA
3	M_DP_NA
4	M_ST_NA
5	M_DP_NA
6	M_SP_NA

The module will respond to a class one data request from the controlling station by returning the data in the event queue in the order shown in the following table:

Packet Order	Content
1	M_DP_NA events 3 and 5
2	M_SP_NA events 1, 2 and 6
3	M_ST_NA event 4

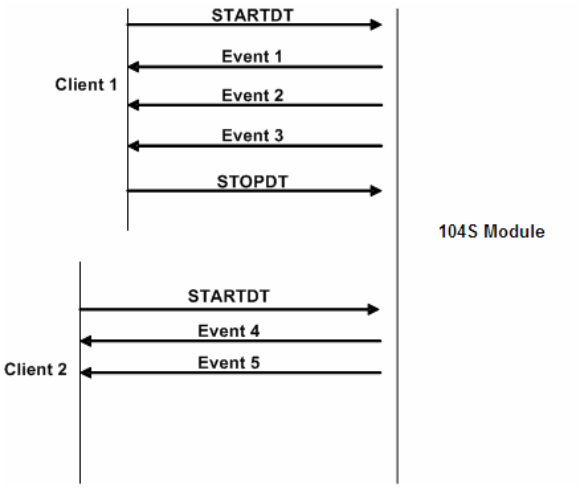
Note that the events are packed into messages in order to maximize the bandwidth on the network. The following warning must be considered when deciding to use this feature: Because events from the highest priority queues are always reported when present before lower priority queues, events in the lower queues may be lost due to buffer overflow.

If this feature is not utilized, each ASDU's events are stored in their own queue. The module will report each queue containing events in a round-robin fashion with all the data for each ASDU being packed. This methodology limits the possibility of a buffer overflowing and still maximizes the use of bandwidth on the communication channel.

2.2 Redundant Connections

The module supports redundancy by accepting two simultaneous client connections. Only one connection can send/receive user data at a time, so the module uses the STARTDT function to select to which client it will be exchanging data. The module will send events and accept commands only to the client connection that has sent the last STARTDT function.

The following diagram shows an example where the module sends five events to two different clients. The module initially receives a STARTDT request from Client 1 and therefore sends the following events to this client. After the third event the Client 1 sends a STOPDT request and then Client 2 sends a STARTDT request to the module. From that point on the module will send the next events to Client 2 only.

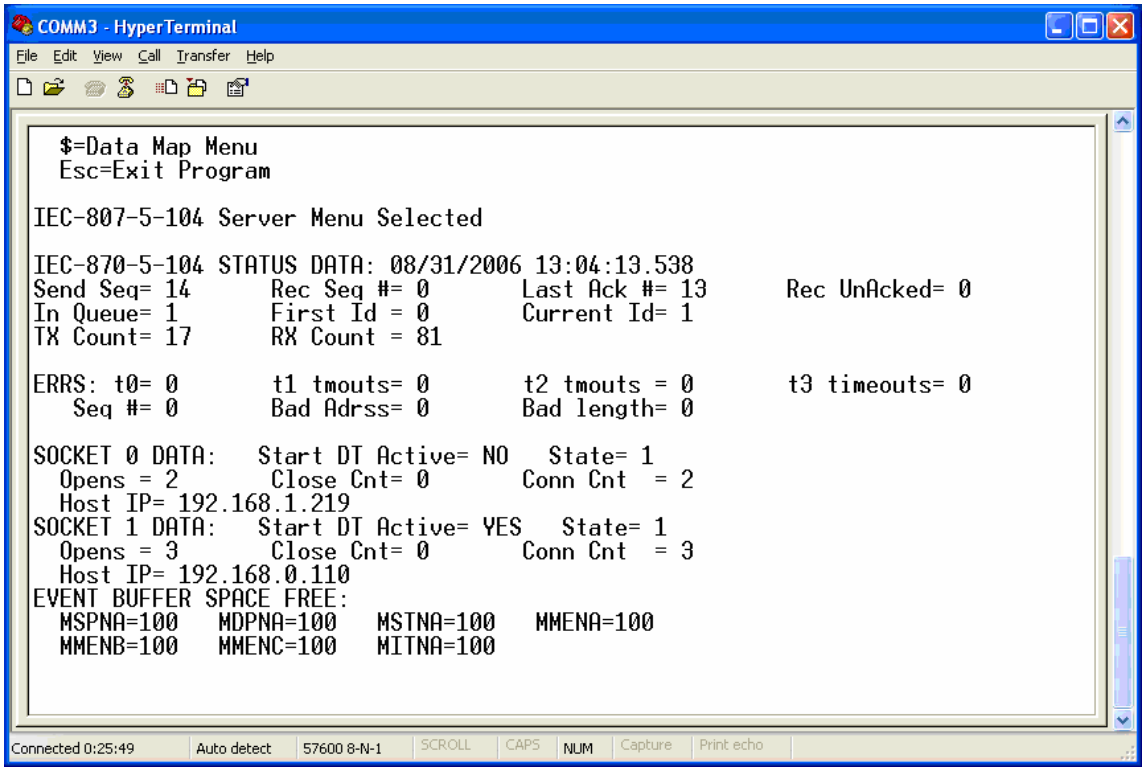


Please note the following:

1. The STARTDT triggers the switch of the connection. Therefore, the STOPDT request is not actually required from the current client to perform the switch (although the previous diagram indicates the recommended communication procedure)
2. The module will respond to any TESTFR requests received by both clients at any time.

By selecting the E key (Display Program Status) the user can monitor the status of both connections can be monitored. For the example below, the client connected through Socket 1 is actively exchanging data to the module. This can be confirmed since the START DT Active register has a value of YES (which means that the last START DT received was through Socket 1).

You can also monitor the number of connections opened and closed per each socket:



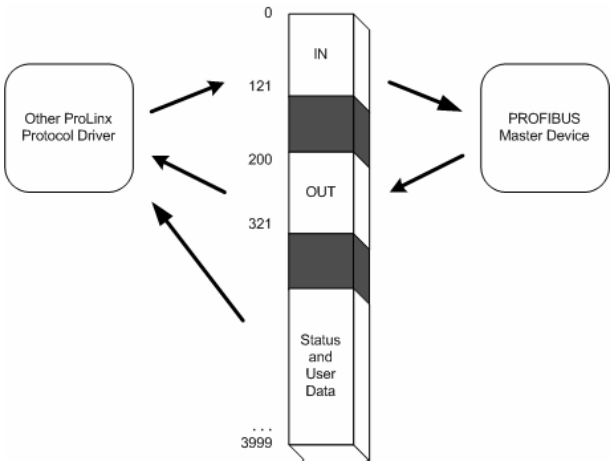
2.3 PDPS Protocol Implementation

2.3.1 Functional Overview

The PROFIBUS slave protocol driver may exist in a single port implementation. The driver can be configured as a slave interface with other PROFIBUS devices. The PROFIBUS slave port can be used to continuously interface with other PROFIBUS devices over a serial communication interface (RS-485).

Module Internal Database

Central to the functionality of the module is the internal database. This database is shared between all the ports on the module and is used as a conduit to pass information from one device on one network to one or more devices on another network. This permits data from devices on one communication port/network to be viewed and controlled by devices on another port/network. In addition to data from the slave port, status and error information generated by the module can also be mapped into the internal database.



PROFIBUS Slave Port Access to Database

The Slave driver uses the database in two ways:

1. A read command issued to a slave device by the slave driver will return the slave data into the internal database.
2. A write command issued to a slave device by the slave driver uses the data in the internal database to write to the slave device

Mailbox Commands

Start	Stop	Direction	Description
100	101	PLC to GW	Event Data
150	151	PLC to GW	Database write transfer
160	161	GW to PLC	Database read transfer
200	200	Both	Set Time
201	201	Both	Get Time
202	202	Both	Get Event Buffer Counts

PLC = PROFIBUS master interface in PLC

GW = ProLinx Gateway

NOTES:

The block number for each device must be changed to trigger an operation.

The I/O data area is owned exclusively by only the PLC or GW.

A timeout must be implemented in the PLC in case the GW is not present.

Mailbox Structure

Mailbox From PLC to GW

Start Byte	End Byte	Description
0	0	Block number of data in block
1	1	Block number of data requested
2	198	Data for block
199	199	Block number of data in block

Mailbox From GW to PLC

Start Byte	End Byte	Description
0	0	Block number of data in block
1	1	Block number last requested by PLC
2	198	Data for block
199	199	Block number of data in block

Example Raw Database Exchange

Start Byte	End Byte	Description
0	0	150 (Raw data write)
1	1	160 (Raw data read)
2	3	Start register in database for write
4	5	Number of registers to write (1 to 94)
6	7	Start register in database for read
8	9	Number of registers to read (1 to 96)
10	197	Words to write to the database
198	198	Reserved
199	199	150 (Raw data write)

Example Response Block From GW

Start Byte	End Byte	Description
0	0	160 (Raw data read)
1	1	150 (Raw data write)
2	3	Start register in database for read
4	5	Number of registers to read (1 to 96)
6	197	Words read from the database
198	198	Reserved
199	199	160 (Raw data read)

Example Event Data Block From PLC

Start Byte	End Byte	Description
0	0	100 (Event data)
1	1	201 (Get Time)
2	3	Event Count
4	195	Event Data
196	198	Reserved for future use
199	199	100 (Event data)

Example Response Block From GW

Start Byte	End Byte	Description
0	0	201 (Get Time)
1	1	100 (Event data)
2	3	Year
4	5	Month
6	7	Day
8	9	Hour
10	11	Minutes
12	13	Seconds & milliseconds
14	198	Reserved for future use
199	199	201 (Get Time)

Example Set Time Data Block From PLC

Start Byte	End Byte	Description
0	0	200 (Set Time)
1	1	201 (Get Time)
2	3	Year
4	5	Month
6	7	Day
8	9	Hour
10	11	Minutes
12	13	Seconds & milliseconds
14	198	Reserved for future use
199	199	200 (Set Time)

Example Response Block From GW

Start Byte	End Byte	Description
0	0	201 (Get Time)
1	1	200 (Set Time)
2	3	Year
4	5	Month
6	7	Day
8	9	Hour
10	11	Minutes
12	13	Seconds & milliseconds
14	198	Reserved for future use
199	199	201 (Get Time)

Example Get Event Buffer Count Block From PLC

Start Byte	End Byte	Description
0	0	100 (Event data)
1	1	202 (Get Event Buffer Count)
2	3	Event Count
4	195	Event Data
196	198	Reserved for future use
199	199	100 (Event data)

Example Response Block From GW

Start Byte	End Byte	Description
0	0	202 (Get Event Buffer Count)
1	1	100 (Event data)
2	3	Single point event buffer space
4	5	Double point event buffer space
6	7	Step point event buffer space
8	9	Normalized event buffer space
10	11	Scaled event buffer space
12	13	Short-float event buffer space
14	15	Integrated totals event buffer space
16	198	Reserved
199	199	202 (Get Event Buffer Count)

Block 100 to 101 identification codes send event messages from the PROFIBUS interface to the IEC-60870-5-104S driver.

Event Data Block Format

Start Byte	End Byte	Data Field(s)	Description
0	0	Block ID	This field contains the value of 100 to 101 identifying the block type to the module.
1	1	Data block being requested	This field contains the block ID being requested for the response block.
2	3	Event Count	Number of events present in the block. This field can have a value from 1 to 12.
4	19	Event #1	Event data to add to event message queue.

Start Byte	End Byte	Data Field(s)	Description
20	35	Event #2	Event data to add to event message queue.
36	51	Event #3	Event data to add to event message queue.
52	67	Event #4	Event data to add to event message queue.
68	83	Event #5	Event data to add to event message queue.
84	99	Event #6	Event data to add to event message queue.
100	115	Event #7	Event data to add to event message queue.
116	131	Event #8	Event data to add to event message queue.
132	147	Event #9	Event data to add to event message queue.
148	163	Event #10	Event data to add to event message queue.
164	179	Event #11	Event data to add to event message queue.
180	195	Event #12	Event data to add to event message queue.
196	198	Reserved	Reserved for future use
199	199	Block ID	Copy of byte 0 in the block.

The structure of each event record in the block is shown below:

Start Byte	End Byte	Data Field(s)	Description
0	1	DB Index	This is the index for the point in the module's database. This corresponds to the order of point definition for the module data types. This is not the point address for the event.
2	2	ASDU	This is the ASDU data type for the event message. Valid entries for this field are as follows: 1=single point, 3=double-point, 5=step, 9=normalized, 11=scaled, 13=short-float and 15=integrated total.
3	3	Qualifier	This is the qualifier code to be used with the event message. Refer to the IEC protocol specification for a full listing of valid qualifier codes for each ASDU type.
4	5	Year	This field contains the four-digit year to be used with the event.
6	6	Month	This field contains the month value for the event. Valid entry for this field is in the range of 1 to 12.
7	7	Day	This field contains the day value for the event. Valid entry for this field is in the range of 1 to 31.
8	8	Hour	This field contains the hour value for the event. Valid entry for this field is in the range of 0 to 23.
9	9	Minute	This field contains the minute value for the event. Valid entry for this field is in the range of 0 to 59.
10	11	Seconds & Milliseconds	This field contains the seconds and milliseconds value for the event. Valid entry for this field is in the range of 0 to 59,999.
12	15	Data	These bytes contain the data to be used with the event. For single- and double-point, step events, the first byte is used. For measured value events, the first two bytes are used. For integrated total and short-float events, all four bytes are used.

PROFIBUS Slave Error and Status Data

The PROFIBUS Slave Error and Status Data area is discussed in this section.

The data area is initialized with zeros whenever the module is initialized. This occurs during a cold-start (power-on), reset (reset push-button pressed) or a warm-boot operation (commanded or loading of new configuration). Counter values are also initialized to 0 at power up.

Example Internal Database Address	Word Offset	Description
10300	0	Diagnostic reporting state 0=normal 1=extended 2=static diagnostics 3=extended/static diagnostics
10301	1	Reserved
10302	2	Reserved
10303	3	Reserved
10304	4	Product Codes Bytes 0 and 1
10305	5	Product Codes Bytes 2 and 3
10306	6	Product Codes Bytes 4 and 5
10307	7	Product Codes Bytes 6 and 7
10308	8	Product Codes Bytes 8 and 9
10309	9	PROFIBUS Status Register
10310	10	Module state and last global command received by slave from a master
10311	11	Input counter (number of times the input region of the database is transferred to the input image)
10312	12	Output counter (number of times the output image is transferred to the database)
10313	13	No valid data
…		
…		
…		
10399		

Refer to the following topics to interpret the status/error codes present in the data area.

Diagnostic state – Word 10300

- 0 = Normal Operation or not in data exchange with Status Register [0] Bit 0x20 set.
- 1 = Not in data exchange state with the Status Register [0] bit 0x20 not set or normal operation with the Status Register [0] bit 0x20 not set.
- 3 = Not in a defined state or in module state 1, 2 or 3.
- 4 = Normal operation with Status Register [0] bit 0x20 set

PROFIBUS Reserved Words - Word 10301 to Word 10303

Reserved for future use.

Words 10304 - 10308

Example Internal Database Address	Word Offset	Description
10304	4	Product Codes Bytes 0 and 1
10305	5	Product Codes Bytes 2 and 3
10306	6	Product Codes Bytes 4 and 5
10307	7	Product Codes Bytes 6 and 7
10308	8	Product Codes Bytes 8 and 9

PROFIBUS Status Register – Word 10309

SPC3 ASIC slave status information provided to the master

Bit 0	Offline/Passive-Idle
	Offline-/Passive-Idle state
	0 = SPC3 is in offline 1 = SPC3 in passive idle
Bit 1	FDL_IND_ST (Fieldbus Data link Layer)
	FDL indication is temporarily buffered.
	0 = No FDL indication is temporarily buffered. 1 = FDL indication is temporarily buffered.
Bit 2	Diag_Flag
	Status diagnostics buffer
	0 = The DP master fetches the diagnostics buffer. 1 = The DP master has not yet fetched the diagnostics buffer.
Bit 3	RAM Access Violation
	Memory access > 1.5kByte
	0 = No address violation 1 = For addresses > 1536 bytes, 1024 is subtracted from the current address, and there is access to this new address.
Bits 4,5	DP-State
	DP-State Machine state
	00 = 'Wait_Prm' state 01 = 'Wait_Cfg' state 10 = 'DATA_EX' state 11 = Not possible
Bits 6,7	WD-State
	Watchdog-State-Machine state
	00 = 'Baud_Search' state 01 = 'Baud_Control' state 10 = 'DP_Control' state 11 = Not possible

Bits 8 - 11	Baud rate:
	The baud rates SPC3 found
	0000 = 12 Mbaud 0001 = 6 Mbaud 0010 = 3 Mbaud 0011 = 1.5 Mbaud 0100 = 500 kBaud 0101 = 187.5 kBaud 0110 = 93.75 kBaud 0111 = 45.45 kBaud 1000 = 19.2 kBaud 1001 = 9.6 kBaud Rest = Not possible
Bits 12 - 15	SPC3-Release:
	Release no. for SPC3
	0000 = Release 0 Rest = Not possible

Further explanation of Status Register [0] – Word 10309 Bit states

Bit 0

Offline/Passive-idle

- 0 = SPC3 exits offline and goes to passive-idle. The idle timer and Wd timer go offline.
- 1= SPC3 exits offline and goes to passive-idle. The idle timer and Wd timer are started.

Bit 4, 5

- 10 = Data Exchange State is Normal. The SPC3 has a correct configuration.

Module State – Word 10310 Byte 0

Indicates the current state of the module.

- 0 = Normal Operation
- 1 = Shutdown
- 2 = File Transfer
- 3 = SPC3 ASIC problem
- 4 = Not in data exchange

Last Global Command – Word 10310 Byte 1

The value of the last global command code received from the master.

Bit	Designation	Significance
0	Reserved	
1	Clear_Data	With this command the ASCI output data is deleted in data transfer buffer and is changed to next transfer data buffer contents.
2	Unfreeze	With 'Unfreeze' - freezing input data is cancelled.
3	Freeze	The ASCI input data is fetched from next transfer buffer to data transfer buffer and frozen. New input data is not fetched again until the master sends the next 'Freeze' command.

Bit	Designation	Significance
4	Unsync	The 'Unsync' command cancels the 'Sync' command.
5	Sync	The ASCI output data transferred with a WRITE_READ_DATA telegram is changed from data transfer buffer next state buffer. The following transferred output data is kept in data transfer buffer until the next 'Sync' command is given.
6,7	Reserved	The Reserved designation specifies that these bits are reserved for future function expansions.

PROFIBUS Input Counter – 10311

Input counter is incremented each time the input data is updated.

PROFIBUS Output Counter – Word 10312

Output counter is incremented each time the output data is updated.

Words 10313 - 10399

No valid data

3 Diagnostics and Troubleshooting

In This Chapter

The module provides information on diagnostics and troubleshooting in the following forms:

- Status data values are transferred from the module to the processor.
- Data contained in the module can be viewed through the Configuration/Debug port attached to a terminal emulator.
- LED status indicators on the front of the module provide information on the module's status.

3.1 Definition of Module's Extended Diagnostics Data

The Extended Diagnostic Data is reported during startup and initialization sequence when the master requests diagnostic data from the module. The Extended Diagnostics is "Device Related" type providing status data (the extended diagnostic bit 3 in standard diagnostic byte 1 is set = 0). The data length is normally 14 (0E) bytes displayed in the following format:

Byte(s)	Description (HEX)
0	Extended Diagnostics length (normally 14 bytes (0E))
1 to 6	ASCII data for Product Version
7 to 10	ASCII data for Product Name
11	Value of Status Register [0] (see Section 2)
12	Value of Status Register [1] (see Section 2)
13	Module State (see Section 2)

Bytes 7 through 10 Data – Specific Product Code Value

Each ProLinx application has its own, unique product code. You can determine the product code from the Version screen in the Configuration/Debug menu.

The following table lists the product codes for some ProLinx modules that support the PDPS protocol.

Example Product	Example Product Code
5105-ASCII-PDPS	ASPS
5105-DFCM-PDPS	DFPS
5105-DH485-PDPS	D4PS
5105-DNPM-PDPS	DMPS
5105-DNPS-PDPS	D3PS
5105-I101S-PDPS	ISPS
5105-I103M-PDPS	PSI3
5105-MCM-PDPS	PDSM

Sample Diagnostics reported to master.

```
extended diagnostic data:

0E 56 30 31 2E 30 35 50
44 53 34 41 03 04

device related diagnostic data:

0E 56 30 31 2E 30 35 50
44 53 34 41 03 04
```

Translated as follows:

Extended diagnostics length 0E= 14 bytes, **Product Version** 56 = "V", 30 = "0", 31 = "1", 2E = ".", 30 = "0", 35 = "5", **Product Name** 50 = ""P", 44 = ""D", 53 = "S", 34 = "4" (MVI46),

Status Register [0] 41 = SPC3 in passive idle and WD-State is in DP_Control State, **Status Register [1]** 03 = 1.5 Baud rate, **Module State** 04 = not in data exchange

3.1.1 The Configuration/Debug Menu

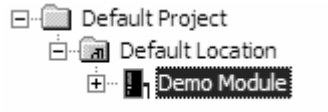
The Configuration and Debug menu for this module is arranged as a tree structure, with the Main Menu at the top of the tree, and one or more sub-menus for each menu command. The first menu you see when you connect to the module is the Main menu.

Because this is a text-based menu system, you enter commands by typing the command letter from your computer keyboard in the diagnostic window in ProSoft Configuration Builder (PCB). The module does not respond to mouse movements or clicks. The command executes as soon as you press the command letter — you do not need to press **[Enter]**. When you type a command letter, a new screen will be displayed in your terminal application.

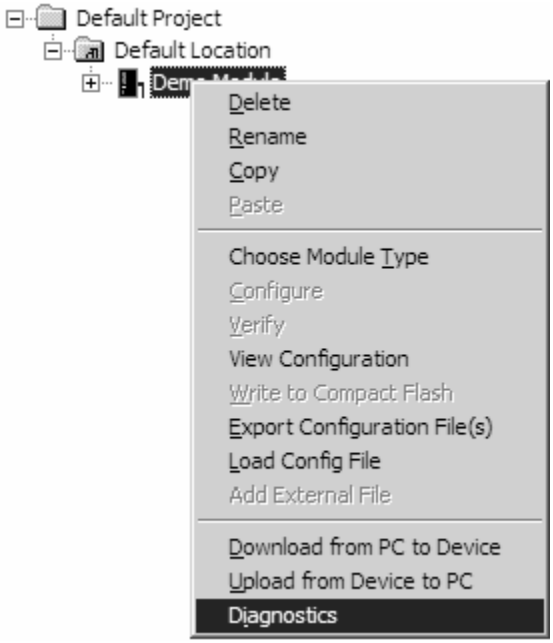
Using the Diagnostic Window in ProSoft Configuration Builder

To connect to the module's Configuration/Debug serial port:

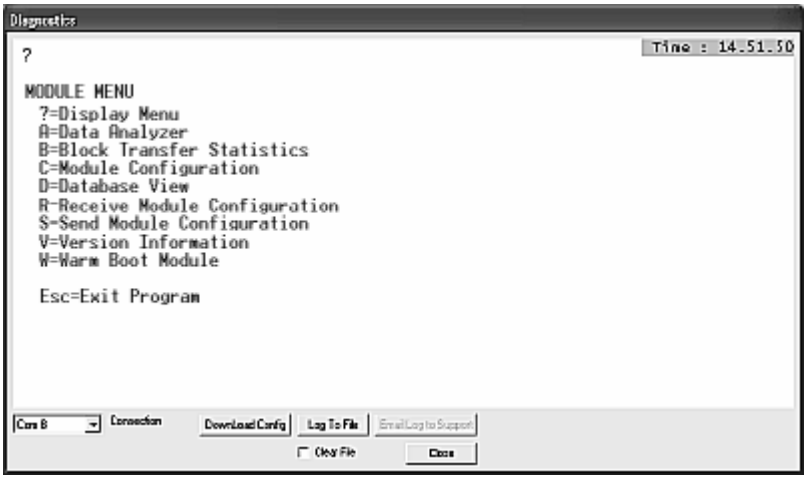
1 Start PCB program with the application file to be tested. Right click over the module icon.



2 On the shortcut menu, choose Diagnostics.



3 This action opens the following dialog box. Press "?" to display the Main Menu.



If there is no response from the module, follow these steps:

1 Verify that the cable is connected properly between your computer's serial or Ethernet port and the module. A regular serial cable will not work.

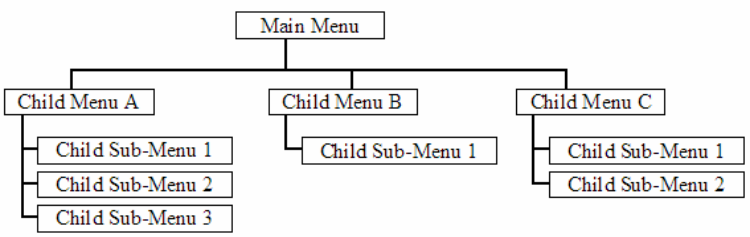
2 On computers with more than one serial port, verify that your communication program is connected to the same port that is connected to the module.

If you are still not able to establish a connection, you can contact ProSoft Technical Services for assistance.

Navigation

All of the sub-menus for this module contain commands to redisplay the menu or return to the previous menu. You can always return from a sub-menu to the next higher menu by pressing **[M]** on your keyboard.

The organization of the menu structure is represented in simplified form in the following illustration:



The remainder of this section shows you the menus available for this module, and briefly discusses the commands available to you.

Keystrokes

The keyboard commands on these menus are almost always non-case sensitive. You can enter most commands in lower case or capital letters.

The menus use a few special characters (**[?]**, **[-]**, **[+]**, **[@]**) that must be entered exactly as shown. Some of these characters will require you to use the **[Shift]**, **[Ctrl]** or **[Alt]** keys to enter them correctly. For example, on US English keyboards, enter the **[?]** command as **[Shift][/]**.

Also, take care to distinguish capital letter **[I]** from lower case letter **[l]** (L) and number **[1]**; likewise for capital letter **[O]** and number **[0]**. Although these characters look nearly the same on the screen, they perform different actions on the module.

3.1.2 Required Hardware

You can connect directly from your computer's serial port to the serial port on the module to view configuration information, perform maintenance, and send (upload) or receive (download) configuration files.

ProSoft Technology recommends the following minimum hardware to connect your computer to the module:

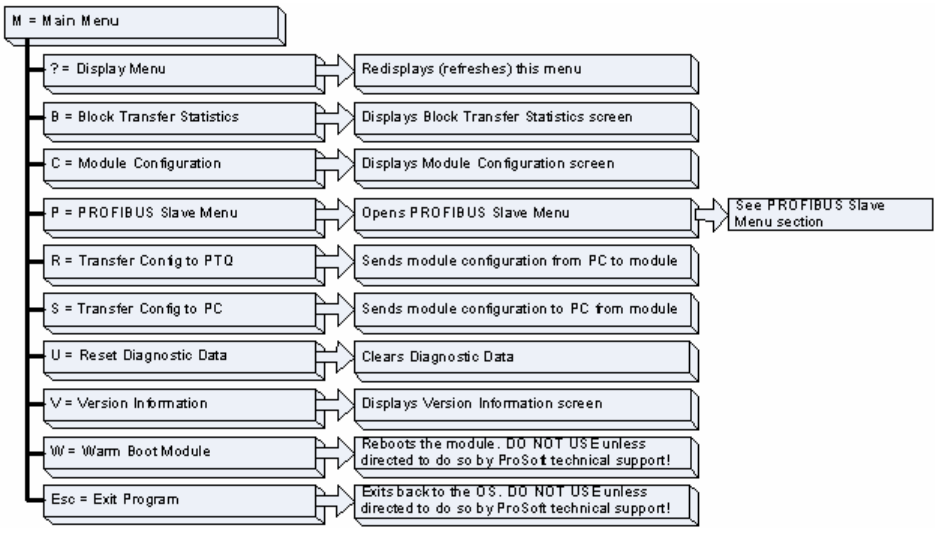
- 80486 based processor (Pentium preferred)
- 1 megabyte of memory
- At least one UART hardware-based serial communications port available. USB-based virtual UART systems (USB to serial port adapters) often do not function reliably, especially during binary file transfers, such as when uploading/downloading configuration files or module firmware upgrades.
- A null modem serial cable.

3.1.3 Main Menu

When you first connect to the module from your computer, your terminal screen will be blank. To activate the main menu, press the [?] key on your computer's keyboard. If the module is connected properly, the following menu will appear on your terminal screen:

```
PTQ-PDPS COMMUNICATION MODULE MENU
  ?=Display Menu
  B=Block Transfer Statistics
  C=Module Configuration
  P=Profibus Slave Menu
  R=Transfer Configuration from PC to Module
  S=Transfer Configuration from Module to PC
  U=Reset diagnostic data
  V=Version Information
  W=Warm Boot Module
  Esc=Exit Program
```

Caution: Some of the commands available to you from this menu are designed for advanced debugging and system testing only, and can cause the module to stop communicating with the processor or with other devices, resulting in potential data loss or other failures. Only use these commands if you are specifically directed to do so by ProSoft Technology Technical Support staff. Some of these command keys are not listed on the menu, but are active nevertheless. Please be careful when pressing keys so that you do not accidentally execute an unwanted command.



Redisplaying the Menu

Press **[?]** to display the current menu. Use this command when you are looking at a screen of data, and want to view the menu choices available to you.

Viewing Block Transfer Statistics

Press **[B]** from the Main Menu to view the Block Transfer Statistics screen.

Use this command to display the configuration and statistics of the backplane data transfer operations between the module and the processor. The information on this screen can help determine if there are communication problems between the processor and the module.

Tip: To determine the number of blocks transferred each second, mark the numbers displayed at a specific time. Then some seconds later activate the command again. Subtract the previous numbers from the current numbers and divide by the quantity of seconds passed between the two readings.

Viewing Module Configuration

Press **[C]** to view the Module Configuration screen.

Use this command to display the current configuration and statistics for the module.

Opening the Database Menu

Press **[D]** to open the Database View menu. Use this menu command to view the current contents of the module's database.

Opening the IEC-870-5-104 Server Menu

Press **[I]** to open the IEC-870-5-104 Server Menu. Use this command to view all data associated with the IEC 60870-5-104 server driver.

Viewing SNTP Status

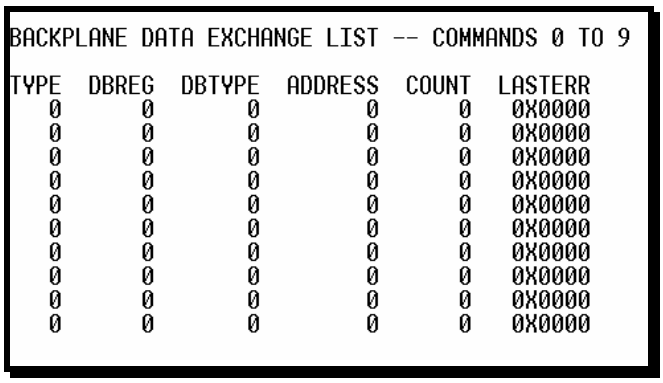
Press **[N]** to view configuration information about the SNTP client.

```
SNTP CLIENT CONFIGURATION:
  NTP SERVER IP : 0.0.0.0
  DB REGISTER   : -1
  TIME ZONE     : 0         USE DST       : No
  TIME VALID    : No
  REQUESTS      : 0         RESPONSES     : 0
  COMPUTATIONS  : 0         TIME SET CNT  : 0
  TIMEOUT ERRS  : 0
```

Refer to SNTP Support for more information on configuring and using this function.

Viewing the Backplane Command List

Press **[P]** from the Main Menu to view the Backplane Data Exchange List. Use this command to display the configuration and statistics of the backplane data transfer operations.



Tip: Repeat this command at one-second intervals to determine the number of blocks transferred each second.

Opening the Session Configuration Menu

Press **[P]** from the Main Menu Menu to open the PROFIBUS Slave menu. Use this command to view PROFIBUS Slave configuration information.

The *PROFIBUS Slave Menu* section has more information about the commands on this menu.

Receiving the Configuration File

Press **[R]** to download (receive) the current configuration file from the module. For more information on receiving and sending configuration files, please see Uploading and Downloading the Configuration File.

Sending the Configuration File

Press **[S]** to upload (send) an updated configuration file to the module. For more information on receiving and sending configuration files, please see Uploading and Downloading the Configuration File.

Viewing Version Information

Press **[V]** to view Version information for the module.

Use this command to view the current version of the software for the module, as well as other important values. You may be asked to provide this information when calling for technical support on the product.

Values at the bottom of the display are important in determining module operation. The Program Scan Counter value is incremented each time a module's program cycle is complete.

Tip: Repeat this command at one-second intervals to determine the frequency of program execution.

Resetting diagnostic data

Press **[U]** to reset the status counters for the client and/or servers in the module.

Warm Booting the Module

Caution: Some of the commands available to you from this menu are designed for advanced debugging and system testing only, and can cause the module to stop communicating with the processor or with other devices, resulting in potential data loss or other failures. Only use these commands if you are specifically directed to do so by ProSoft Technology Technical Support staff. Some of these command keys are not listed on the menu, but are active nevertheless. Please be careful when pressing keys so that you do not accidentally execute an unwanted command.

Press **[W]** from the Main Menu to warm boot (restart) the module. This command will cause the program to exit and reload, refreshing configuration parameters that must be set on program initialization. Only use this command if you must force the module to re-boot.

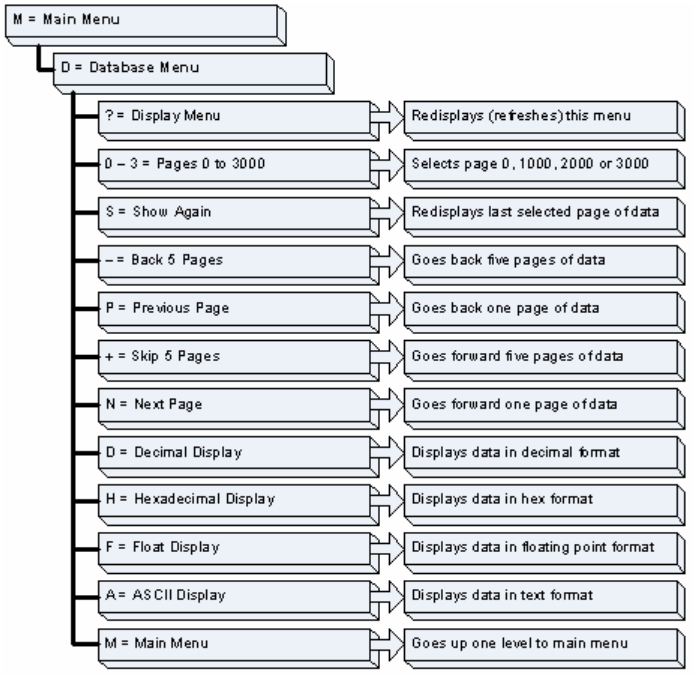
Exiting the Program

Caution: Some of the commands available to you from this menu are designed for advanced debugging and system testing only, and can cause the module to stop communicating with the processor or with other devices, resulting in potential data loss or other failures. Only use these commands if you are specifically directed to do so by ProSoft Technology Technical Support staff. Some of these command keys are not listed on the menu, but are active nevertheless. Please be careful when pressing keys so that you do not accidentally execute an unwanted command.

Press **[Esc]** to restart the module and force all drivers to be loaded. The module will use the configuration stored in the module's Flash ROM to configure the module.

3.1.4 Database View Menu

Press **[D]** from the Main Menu to open the Database View menu. Use this menu command to view the current contents of the module's database. Press **[?]** to view a list of commands available on this menu.



Viewing Register Pages

To view sets of register pages, use the keys described below:

Command	Description
[0]	Display registers 0 to 99
[1]	Display registers 1000 to 1099
[2]	Display registers 2000 to 2099

And so on. The total number of register pages available to view depends on your module's configuration.

Displaying the Current Page of Registers Again

```
DATABASE DISPLAY 0 TO 99 (DECIMAL)
   100   101   102     4     5     6     7     8     9    10
    11    12    13    14    15    16     0     0     0     0
     0     0     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0     0     0
```

This screen displays the current page of 100 registers in the database.

Moving Back Through 5 Pages of Registers

Press **[-]** from the Database View menu to skip back to the previous 500 registers of data.

Viewing the Previous 100 Registers of Data

Press **[P]** from the Database View menu to display the previous 100 registers of data.

Skipping 500 Registers of Data

Hold down **[Shift]** and press **[=]** to skip forward to the next 500 registers of data.

Viewing the Next 100 Registers of Data

Press **[N]** from the Database View menu to select and display the next 100 registers of data.

Viewing Data in Decimal Format

Press **[D]** to display the data on the current page in decimal format.

Viewing Data in Hexadecimal Format

Press **[H]** to display the data on the current page in hexadecimal format.

Viewing Data in Floating Point Format

Press **[F]** from the Database View menu. Use this command to display the data on the current page in floating point format. The program assumes that the values are aligned on even register boundaries. If floating-point values are not aligned as such, they are not displayed properly.

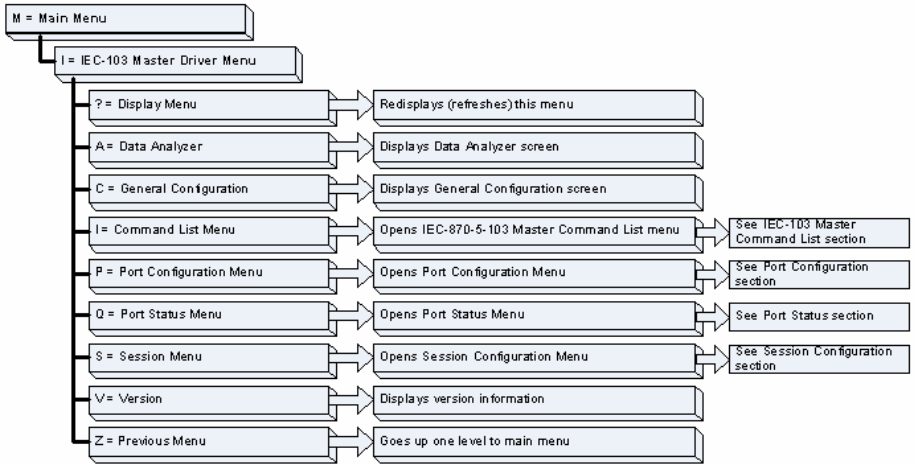
Viewing Data in ASCII (Text) Format

Press **[A]** to display the data on the current page in ASCII format. This is useful for regions of the database that contain ASCII data.

Returning to the Main Menu

Press **[M]** to return to the Main Menu.

3.1.5 IEC-870-5-104 Server Menu



Press **[I]** from the main menu to display the IEC-870-5-104 Server Menu.

```
IEC-870-5-104 Menu Selected

IEC-870-5-104 SERVER MENU
  ?=Display Menu
  C=Configuration
  E=Display Program Status
  I=List of valid hosts
  M=Return to Main Menu
  1 = M_SP_NA Setup       2 = M_DP_NA Setup
  3 = M_ST_NA Setup       4 = M_ME_NA Setup
  5 = M_ME_NB Setup       6 = M_IT_NA Setup
  7 = C_SC_NA Setup       8 = C_DC_NA Setup
  9 = C_RC_NA Setup       0 = C_SE_NA Setup
  ! = C_SE_NB Setup       @ = IEC-870 Database Cfg
```

IEC-870-5-104 Configuration Menu

From the IEC-870-5-104 Server Menu, press **[C]** to display the IEC-870-5-104 Configuration Menu. This menu shows the module parameters configured by the user through the configuration file:

```
IEC-870-5-104 CONFIGURATION:
 StartDT Use: OVERRD  Queue Cls  : NORMAL
 k APDUs    : 12      w APDUs    : 8
 t1 Timeout : 60      t2 Timeout : 10      t3 Timeout : 30
 Comm ASDU  : 1       C ASDU Ln  : 2       IOA Len    : 3
 Cyc Updat  : 20000   Sel/Op Tm  : 10000   ActTrm Sp  : 0
 ActTerm St : 1       Evt Scan   : 1
 MSPNA TM   : CP56    MDPNA TM   : CP56    MSTNA TM   : CP56
 MMENA TM   : CP56    MMENB TM   : CP56    MITNA TM   : CP56
 MSPNA REC  : 0       MDPNA REC  : 0       MSTNA REC  : 0
 MMENA REC  : 0       MMENB REC  : 0
 Short Pulse Time : 2000        Long Pulse Time : 10000
 Error Offset     : -1            Time DB Offset   : 2000
```

IEC-870-5-104 Status Data

From the IEC-870-5-104 Server Menu press **[E]** to display the IEC-870-5-104 Status Data screen. Refer to the Status section for more information about these values.

```
IEC-870-5-104 STATUS DATA: 08/03/1980 02:59:53.504
Send Seq= 0       Rec Seq #= 0       Last Ack #= 0       Rec UnAcked= 0
In Queue= 0       First Id = 0       Current Id= 0
TX Count= 0       RX Count = 0

ERRS: t0= 0       t1 tmouts= 0       t2 tmouts = 0       t3 timeouts= 0
   Seq #= 0       Bad Adrss= 0       Bad length= 0

SOCKET DATA:   Start DT Active= NO   State= 0
  Opens = 1       Close Cnt= 0       Conn Cnt  = 0
 Host IP=
```

Lists of Valid Hosts

From the IEC-870-5-104 Server Menu press **[I]** to display the List of Valid Hosts screen. These values are configured by the user and the IP addresses will be displayed only if the "Use IP List" parameter is set to YES.

```
IEC-870-5-104 Menu Selected

LIST OF VALID IP ADDRESSES FOR HOSTS
TOTAL NUMBER OF VALID IP ADDRESSES = 4
IP LIST BEING USED IN SYSTEM       = YES

IP ADDRESS VALUE      (VALUE)
192.168.0.207         (C0A800CF)
192.168.0.203         (C0A800CB)
192.168.0.61          (C0A8003D)
192.168.0.69          (C0A80045)
```

Point Setup

From the IEC-870-5-104 Server Menu press keys 1 to 9, 0 or ! to display the point configuration for each data type. The information includes point address, group and its current value.

```
M_SP_NA Setup Menu Selected

M_SP_NA Setup (0 to 3)
Index  Point#  DB Addr  Group(s)  Value
    0     100     1600  00000001      0
    1     101     1602  00000002      0
    2     102     1604  00000004      0
```

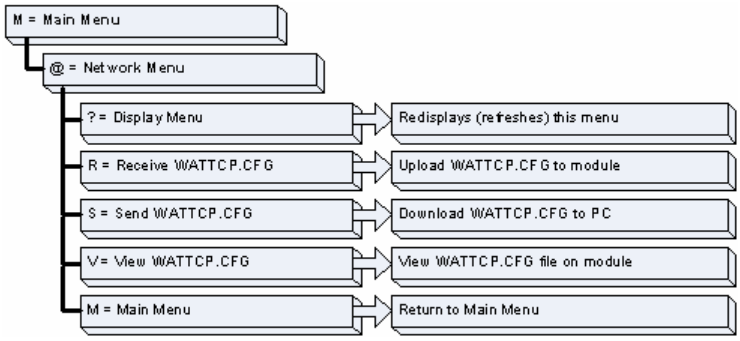
Database Configuration

From the IEC-870-5-104 Server Menu press **[@]** to display the Database Configuration screen. It displays the number of configured points and the event configuration for each data type:

```
IEC-870-5-104 DATABASE CONFIGURATION:
 PMENA Offs: 2000    PMENB Off: 2000
 M_SP_NA point count = 10       Event Scanning Enabled : Yes
 M_DP_NA point count = 10       Event Scanning Enabled : Yes
 M_ST_NA point count = 10       Event Scanning Enabled : Yes
 M_ME_NA point count = 10       Event Scanning Enabled : Yes
 M_ME_NB point count = 10       Event Scanning Enabled : Yes
 M_ME_NC point count = 10       Event Scanning Enabled : Yes
 M_IT_NA point count = 10
 C_SC_NA point count = 10
 C_DC_NA point count = 10
 C_RC_NA point count = 10
 C_SE_NA point count = 10
 C_SE_NB point count = 10
 C_SE_NC point count = 10
```

3.1.6 Network Menu

The network menu allows you to send, receive and view the WATTCP.CFG file that contains the IP and gateway addresses, and other network specification information.



Transferring WATTCP.CFG to the module

Press **[R]** to transfer a new WATTCP.CFG file from the PC to the module. Use this command to change the network configuration for the module (for example, the module's IP address).

Press **[Y]** to confirm the file transfer, and then follow the instructions on the terminal screen to complete the file transfer process.

Transferring WATTCP.CFG to the PC

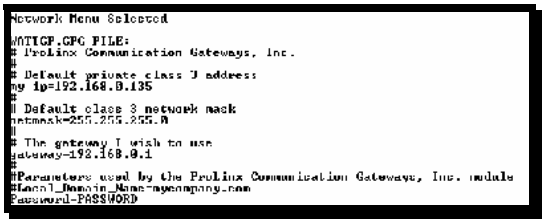
Press **[S]** to transfer the WATTCP.CFG file from the module to your PC.

Press **[Y]** to confirm the file transfer, and then follow the instructions on the terminal screen to complete the file transfer process.

After the file has been successfully transferred, you can open and edit the file to change the module's network configuration.

Viewing the WATTCP.CFG file on the module

Press **[V]** to view the module's WATTCP.CFG file. Use this command to confirm the module's current network settings.



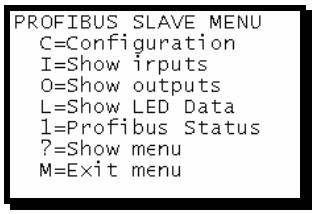
Returning to the Main Menu

Press **[M]** to return to the Main Menu.

3.1.7 PROFIBUS Slave Menu

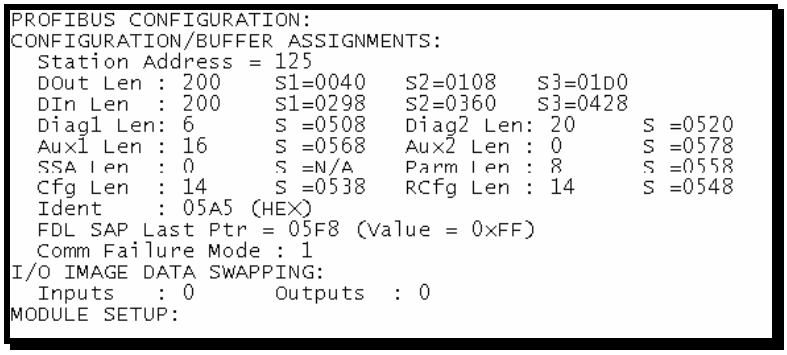
The PROFIBUS Slave menu provides slave (module) status information and error data.

Press [P] to open the PROFIBUS Slave menu.



Viewing PROFIBUS Slave Configuration

The Configuration Screen displays many specific SPC3 ASIC diagnostic data useful to ProSoft Technology Technical Support and advanced PROFIBUS users. Additional information can be found in the SPC3 specification.



Station Address = The configured station address set by the user

DOut Len is the total number of output bytes with the S1, S2 and S3 values being pointers to the 3 output buffers in the SPC3 chip.

DIn Len is the total number of input bytes with the S1, S2 and S3 values being pointers to the 3 input buffers in the SPC3 chip.

Diag1Len should always be 6 to represent the minimal number of diagnostic bytes and S= pointer in SPC3 chip to this data.

Diag2Len is the extended diagnostic buffer length and S is a pointer to this data in the SPC3 chip.

Aux1 Len: (see SPC3 specification) and S is a pointer to this data in the SPC3 chip.

Aux2 Len: (see SPC3 specification) and S is a pointer to this data in the SPC3 chip.

SSA Len is not used and should be 0 and its pointer S is N/A.

Param Len = is the length of the parameter data for the slave with S as the pointer in the SPC3 chip to the data.

Cfg Len is the configuration length for the slave with S as the pointer.

RCfg len is that received from the master with S as the pointer.

Ident is the PROFIBUS identification number for the module.

FDL SAP last PTR is the end of all the PDPS data in the SPC3 chip. This value must be less than 0xFF or there is a memory overflow problem!

Comm Failure mode is that from the configuration file as is the swapping of input and output data.

Viewing PROFIBUS Status

```
Profibus Slave Menu Selected

PROFIBUS SLAVE STATUS DATA
  Enable Status Flag    : 1
  Module State          : 4
  Product               : V01.06PDSQ
  Status Data (Hex)     : [0]=05 [1]=08
  Diagnostic State (Hex): 01
  Input Counter         : 16182
  Output Counter        : 39311
  Last Global Cmd (Hex) : 00
```

Enable State

Indicates the initialized state of the 4205/5205-TS-104S-PDPS module.

- 0 = Module is not initialized
- 1 = Module is initialized

Module State

Indicates the current state of the 4205/5205-TS-104S-PDPS module.

- 0 = Normal Operation
- 1 = Shutdown
- 2 = File Transfer
- 3 = SPC3 ASIC problem
- 4 = Not in data exchange

Status Register [0]

SPC3 ASIC slave status information provided to the master.

Bit 0	Offline/Passive-Idle
	Offline-/Passive-Idle state
	0 = SPC3 is in offline 1 = SPC3 in passive idle
Bit 1	FDL_IND_ST (Fieldbus Data link Layer)
	FDL indication is temporarily buffered.
	0 = No FDL indication is temporarily buffered. 1 = FDL indication is temporarily buffered.
Bit 2	Diag_Flag
	Status diagnostics buffer
	0 = The DP master fetches the diagnostics buffer. 1 = The DP master has not yet fetched the diagnostics buffer.
Bit 3	RAM Access Violation
	Memory access > 1.5kByte
	0 = No address violation 1 = For addresses > 1536 bytes, 1024 is subtracted from the current address, and there is access to this new address.

Bits 4,5	DP-State
	DP-State Machine state
	00 = 'Wait_Prm' state
	01 = 'Wait_Cfg' state
	10 = 'DATA_EX' state
	11 = Not possible
Bits 6,7	WD-State
	Watchdog-State-Machine state
	00 = 'Baud_Search' state
	01 = 'Baud_Control' state
	10 = 'DP_Control' state
	11 = Not possible

Bit 0

Offline/Passive-idle

- 0 = SPC3 exits offline and goes to passive-idle. The idle timer and Wd timer go offline.
- 1= SPC3 exits offline and goes to passive-idle. The idle timer and Wd timer are started.

Bit 4, 5

- 10 = Data Exchange State is Normal. The SPC3 has a correct configuration.

Bits 6, 7

- Watchdog Timer
- Automatic Baud Rate Identification

The SPC3 is able to identify the baud rate automatically. The "baud search" state is located after each RESET and also after the watchdog (WD) timer has run out in the "Baud_Control_state." As a rule, SPC3 begins the search for the set rate with the highest baud rate. If no SD1 telegram, SD2 telegram, or SD3 telegram was received completely and without errors during the monitoring time, the search continues with the next lowest baud rate.

After identifying the correct baud rate, SPC3 switches to the "Baud_Control" state and monitors the baud rate. The monitoring time can be parameterized (WD_Baud_Control_Val). The watchdog works with a clock of 100 Hz (10 milliseconds). The watchdog resets each telegram received with no errors to its own station address. If the timer runs out, SPC3 again switches to the baud search state.

Further explanation of Status Register [0] – Word 9 Bit states

Bit 0

Offline/Passive-idle

- 0 = SPC3 exits offline and goes to passive-idle. The idle timer and Wd timer go offline.
- 1= SPC3 exits offline and goes to passive-idle. The idle timer and Wd timer are started.

Bit 4, 5

- 10 = Data Exchange State is Normal. The SPC3 has a correct configuration.

Bits 6, 7

- Watchdog Timer
- Automatic Baud Rate Identification

The SPC3 is able to identify the baud rate automatically. The "baud search" state is located after each RESET and also after the watchdog (WD) timer has run out in the "Baud_Control_state." As a rule, SPC3 begins the search for the set rate with the highest baud rate. If no SD1 telegram, SD2 telegram, or SD3 telegram was received completely and without errors during the monitoring time, the search continues with the next lowest baud rate.

After identifying the correct baud rate, SPC3 switches to the "Baud_Control" state and monitors the baud rate. The monitoring time can be parameterized (WD_Baud_Control_Val). The watchdog works with a clock of 100 Hz (10 milliseconds). The watchdog resets each telegram received with no errors to its own station address. If the timer runs out, SPC3 again switches to the baud search state.

Baud Rate Monitoring

The located baud rate is constantly monitored in 'Baud_Control.' The watchdog is reset for each error-free telegram to its own station address. The monitoring time results from multiplying both 'WD_Baud_Control_Val' (user sets the parameters) by the time base (10 ms). If the monitoring time runs out, WD_SM again goes to 'Baud_Search'. If the user carries out the DP protocol (DP_Mode = 1, see Mode register 0) with SPC3, the watchdog is used for the "DP_Control' state, after a 'Set_Param telegram' was received with an enabled response time monitoring 'WD_On = 1.' The watchdog timer remains in the baud rate monitoring state when there is a switched off 'WD_On = 0' master monitoring. The PROFIBUS DP state machine is also not reset when the timer runs out. That is, the slave remains in the DATA_Exchange state, for example.

Response Time Monitoring

The 'DP_Control' state serves response time monitoring of the DP master (Master_Add). The set monitoring times results from multiplying both watchdog factors and multiplying the result with the momentarily valid time base (1 ms or 10 ms):

- TWD = (1 ms or 10 ms) * WD_Fact_1 * WD_Fact_2 (See byte 7 of the parameter setting telegram.)

The user can load the two watchdog factors (WD_Fact_1, and WD_Fact_2) and the time base that represents a measurement for the monitoring time via the 'Set_Param telegram' with any value between 1 and 255.

EXCEPTION: The WD_Fact_1=WD_Fact_2=1 setting is not permissible. The circuit does not check this setting.

Monitoring times between 2 ms and 650 s - independent of the baud rate - can be implemented with the permissible watchdog factors. If the monitoring time runs out, the SPC3 goes again to 'Baud_Control,' and the SPC3 generates the

'WD_DP_Control_Timeout-Interrupt'. In addition, the DP_State machine is reset, that is, generates the reset states of the buffer management.

If another master accepts SPC3, then there is either a switch to 'Baud_Control" (WD_On = 0), or there is a delay in 'DP_Control' (WD_On = 1), depending on the enabled response time monitoring (WD_On = 0).

Status Register [1]

SPC3 ASIC slave status information provided to the master.

Bits	Baud rate:
0 - 3	The baud rates SPC3 found
	0000 = 12 MBaud
	0001 = 6 MBaud
	0010 = 3 MBaud
	0011 = 1.5 MBaud
	0100 = 500 kBaud
	0101 = 187.5 kBaud
	0110 = 93.75 kBaud
	0111 = 45.45 kBaud
	1000 = 19.2 kBaud
	1001 = 9.6 kBaud
	Rest = Not possible
Bits	SPC3-Release:
4 - 7	Release no. for SPC3
	0000 = Release 0
	Rest = Not possible

Diagnostic State

- 0 = Normal Operation or not in data exchange with Status Register [0] Bit 0x20 set.
- 1 = Not in data exchange state with the Status Register [0] bit 0x20 not set or normal operation with the Status Register [0] bit 0x20 not set.
- 3 = Not in a defined state or in module state 1, 2 or 3.
- 4 = Normal operation with Status Register [0] bit 0x20 set

PROFIBUS Input Counter

Input counter is incremented each time the input data is updated.

PROFIBUS Output Counter

Output counter is incremented each time the output data is updated.

Last Global Command

The value of the last global command code received from the master.

Bit	Designation	Significance
0	Reserved	
1	Clear_Data	With this command the ASCI output data is deleted in data transfer buffer and is changed to next transfer data buffer contents.
2	Unfreeze	With 'Unfreeze' - freezing input data is cancelled.
3	Freeze	The ASCI input data is fetched from next transfer buffer to data transfer buffer and frozen. New input data is not fetched again until the master sends the next 'Freeze' command.
4	Unsync	The 'Unsync' command cancels the 'Sync' command.
5	Sync	The ASCI output data transferred with a WRITE_READ_DATA telegram is changed from data transfer buffer next state buffer. The following transferred output data is kept in data transfer buffer until the next 'Sync' command is given.
6,7	Reserved	The Reserved designation specifies that these bits are reserved for future function expansions.

4 Reference

In This Chapter

4.1 Product Specifications

4.1.1 General Specifications

The ProLinx Communication Modules provide connectivity for two or more dissimilar network types. The modules, encased in sturdy extruded aluminum, are stand-alone DIN-rail mounted protocol gateways, providing communication between many of the most widely used protocols in industrial automation today.

4.1.2 Internal Database

The ProLinx module contains an internal database that consists of areas for application data, status information, and configuration information.

The internal database is shared between all ports on the module and is used as a conduit to pass information from a device on one network to one or more devices on another network.

Application Data Area

The data area stores and retrieve data by the protocol drivers and for data exchange between protocols. The database is used as a source for write commands to remote devices and holds data collected from the remote devices. Commands defined in the configuration file (stored in the configuration data area) control how the data is to be handled in the database.

Status Data Area

This area stores error codes, counters, and port status information for each port.

Configuration File

This file contains module configuration information such as port configuration, network information, and command configuration. This configuration file is transferred to or from the module.

Optional Web Server for Ethernet Solutions

An HTML server is available for Ethernet ProLinx modules. With this option, HTML text pages can be enabled to:

- Display module internal register and status values
- Accept user data input values via POST commands for setpoint, on/off control, etc.
- Provide limited graphic file support

Type	Specifications
HTML Server (See note below)	Key features of the HTML server include: Max HTML page size: 1MB Max File Storage: 32MB Supported context types: jpeg, bmp, css Supported data types: bit, ASCII, integer, float Sockets: Up to five connections. Note that this limits the number of simultaneous graphic file and frame references per HTML page
FTP Server	Permits remote HTML file transfer between the module and remote host. Capabilities of the FTP Server include: Single socket connection Non-passive transfers only WS_FTP or Command Line FTP recommended CuteFTP, Internet Explorer, Netscape, or NCFTP all support multiple socket connections and therefore are not supported by the ProLinx module
Email Client	E-mail message generation based on database trigger values. Messages can contain dynamic data from the module

Important Note: The Web Server is not designed to act like, or replace, the powerful web servers available in the marketplace today. Please check application specifics with Technical Support if you are unsure if your application will work with the ProLinx Web Server.

4.1.3 Hardware Specifications

Specification	Description
Power Supply	24 VDC nominal 18 to 32 VDC allowed Positive, Negative, GND Terminals 2.5 mm screwdriver blade
Current Load	500 mA max@ 32 VDC max
Operating Temperature	–20 to 50°C (–4 to 122°F)
Storage Temperature	–40 to 85°C (–40 to 185°F)
Relative Humidity	5% to 95% (non-condensing)

Specification	Description
Dimensions	Standard: 5.20H x 2.07W x 4.52D in. (13.2cmH x 5.25cmW x 11.48cmD) Extended: 5.20H x 2.73W x 4.52D in. (13.2cmH x 6.934cmW x 11.48cmD)
LED Indicators	Power and Module Status Application Status Serial Port Activity LED Serial Activity and Error LED Status
Configuration Serial Port	DB-9M RS-232 only No hardware handshaking
Ethernet Port (Ethernet modules only)	RJ45 Connector Link and Activity LED indicators
Application Serial Ports	RS-232/422/485 RS-232 handshaking configurable RS-422/485 screw termination included
Serial Port Isolation	2500V RMS port signal isolation per UL 1577 3000V DC min. port to ground and port to logic power isolation
Shipped with Each Unit	Mini-DIN to DB-9M serial cables 4 ft RS-232 configuration cable 2.5mm screwdriver CD (docs and Configuration utility) RS-422/485 DB-9 to Screw Terminal Adaptor (1 or 4, depending on ports)

4.1.4 Port Physical and Protocol Specifications

104 Slave Port Specifications

The 104S module acts as a gateway between the IEC-870-5-104, other protocols and networks, as well as several proprietary interfaces. A 4000-word register space in the module exchanges data between the two protocols.

General specifications include:

- Support for the storage and transfer of up to 4000 registers between protocols
- User-definable module memory usage
- Storage of IEC time used in module is available in the database
- Configuration via a user-generated text file (downloadable to the module)
- Protocol implementation conforms to the IEC-870-5-104 specification with fully configurable parameters
- Priority Queues
- Invalid Bit Monitoring
- Supports Redundant Connection

Driver Protocol Specifications

General Parameters

Internal Database	4000 registers (words) available
Communication parameters	Port 0: Baud Rate = 110 to 38.4K baud Port 1,2,3: Baud Rate = 110 to 115K baud Stop Bits: 1 or 2 Data Size: 5 or 8 bits Parity: None, Even, Odd RTS Timing Delays: 0 to 65535 milliseconds

IEC 60870-5-104 Slave

Configurable Parameters	
Status Data	Status data is returned in a block of counter values allowing communications to be effectively debugged.
Conformance Specifications	See *IEC 60870-5-104 Server Interoperability Document* (page 107)

Slave Functional Specifications

The 104S module accepts commands from an attached master unit on the network and generates unsolicited messages. These last sets of messages are either spontaneous or cyclic. Data transferred to the host is derived from the module's internal database. The remote master device can control data in the database and hence the devices connected using the other protocol in the module using standard control messages supported in the protocol. The remote master device uses the fully-configured databases in the module to control outputs and monitor inputs.

PROFIBUS Slave Port Specifications

Type	Specifications
General Parameters	
Internal Database	Up to 4000 registers (words) available.
GSD File	Downloadable from ProSoft-Technology.com web site
PROFIBUS Slave	
Communication parameters	Baud Rate: 9.6 kbps to 12 Mbps
Supported I/O length	122 words Input data 122 words Output data 200 words max
Supported PROFIBUS DP features	Freeze Mode Sync Mode Auto Baud Setting
Configurable Parameters	a) PROFIBUS Node Address: 0 to 125 b) Data byte swapping c) Action on loss of PROFIBUS connection d) Comm Fail Timeout Multiplier e) Status Data location in Internal Database
Status Data	Error codes available on an individual command basis. In addition, a slave status list is maintained per active PROFIBUS Slave port.
Physical Connection	
PROFIBUS Connector	Standard PROFIBUS DB-9F communication connector. Cable connection matches PROFIBUS pin out specification.

Important Note: The slave node address is set to 126 by default in the module configuration file (See Section 3 of this manual). The default node address must be changed to a valid address between 0 to 125 by the user for the slave to function on the PROFIBUS network.

Serial Port Specifications

Type	Specifications
Serial Ports	
Serial Port Cables (DB-9M Connector)	One DIN to DB-9M cable included per configurable serial port
Config Port	DB-9M connector
Serial Port Isolation	2500V RMS port-to-port isolation per UL 1577. 3000V DC min. port to ground and port to logic power isolation.
Serial Port Protection	RS-485/422 port interface lines TVS diode protected at +/- 27V standoff voltage. RS-232 port interface lines fault protected to +/- 36V power on, +/- 40V power off.

Note: On single serial port ProLinx modules, the serial port data is not buffered. Packets go directly to and from the serial chip set to the processor. This has the potential to cause the serial communications to start becoming erratic above baud rates of 38,400 baud.

ProLinx modules with 4 serial ports have a separate serial interface board for the additional 3 serial ports. These serial ports are buffered, and can handle communications up to 115,200 baud.

4.1.5 SNTP Support

SNTP is used for time synchronization of produced and consumed commands. When an exchange occurs the driver compares time stamps from the previous exchange. When the new exchange time is less than the previous exchange, the exchange is ignored. This can occur when the Ethernet packets are routed and delayed. Time synchronization provides for data integrity. The following table lists the parameters defined in this section:

The SNTP driver will compute a new clock value every 5 minutes using the average value of 10 samples each collected over an approximate 6-second period. This new value will be used to adjust the clock maintained by the SNTP driver and used by the application. If a valid database register is specified, the driver will place the time value into the module's database. The first two registers will contain the number of seconds and the next two registers will contain the number of microseconds since January 1, 1970.

A list of some of the common NTP servers can be obtained at http://www.ntp.org/, http://www.eecis.udel.edu/~mills/ntp/servers.html, along with the appropriate IP address. Other server lists can be found on the Internet by searching on "NTP Servers" with your browser.

SNTP Status Data

The status data for the SNTP driver is located at the virtual database addresses shown in the following table, The data area is initialized with zeros whenever the module is initialized. This occurs during a cold-start (power-on), reset (reset push-button pressed) or warm-boot operation (commanded or loading of new configuration).

SNTP Client Status	
4030	Time is valid
4031	Request count
4032	Response count
4033	Computation count
4034	Clock set count
4035	Timeout error count

The module's data mapping feature can be utilized to move this data into the module's database area. This way the data can be made available to all drivers on the module for use on any of the connected networks. If it is not mapped into the module's database, the data will only be available through the Configuration/Debug Port.

The Time is valid status register will be set to 1 if the SNTP time is valid. If the time is not valid, the register will be set to 0. All the other registers are counters used to determine the functionality of the driver. This version of the driver supports SNTP Revision 3 and stratum between 1 and 14.

4.2 GSD File: prlx05a5.gsd

```
;============================================================
; Profibus Device Database of:
;   ProLinx Communication Gateways, Inc.
;   Model: ProLinx Profibus Slave
;   Description: Profibus DP Slave
;   Language: English
;   Date:  01.16.2006
;   Author: ProLinx Communication Gateways, Inc.
;   Rev  Date      Description
;    A   01/16/06  Max_Output_Len and Max_Input_Len increased to 244
;============================================================
#Profibus_DP
GSD_Revision  = 2
;These are text strings associated with each parameter
;This application only uses one parameter byte required
;by the SPC3 ASIC.
ExtUserPrmData=0 "SPC3 User Prm Byte"           ;
Unsigned8 0 0-7
EndExtUserPrmData

; Device identification
Vendor_Name="ProLinx Comm Gateways Inc."
Model_Name       = "ProLinx Profibus Slave"
Revision         = "Version 1.00"
Ident_Number     = 0x05A5
Protocol_Ident   = 0          ; DP protocol
Station_Type     = 0          ; Slave device
FMS_supp         = 0          ; FMS not supported
Hardware_Release = "Rev. 1.00"
Software_Release = "Rev. 1.00"

; Supported baudrates
```

```
9.6_supp = 1
19.2_supp = 1
45.45_supp = 1
93.75_supp = 1
187.5_supp = 1
500_supp = 1
1.5M_supp = 1
3M_supp=1
6M_supp=1
12M_supp=1

; Maximum responder time for supported baudrates
MaxTsdr_9.6 = 60
MaxTsdr_19.2 = 60
MaxTsdr_45.45 = 250
MaxTsdr_93.75 = 60
MaxTsdr_187.5 = 60
MaxTsdr_500 = 100
MaxTsdr_1.5M = 150
MaxTsdr_3M = 250
MaxTsdr_6M = 450
MaxTsdr_12M = 800

; Supported hardware features
Redundancy        = 0         ; not supported
Repeater_Ctrl_Sig = 2         ; TTL
24V_Pins          = 0         ; not connected
Implementation_Type = "SPC3"
; Supported DP features
Freeze_Mode_supp   = 1          ; supported
Sync_Mode_supp     = 1          ; supported
Auto_Baud_supp     = 1        ; supported
Set_Slave_Add_supp = 0          ; not supported

;
;--Slave specific data-----
Bitmap_Device = "ProLnx_R"
Bitmap_Diag   = "ProLnx_D"
Bitmap_SF     = "ProLnx_S"

; Default Length of User Parameter
User_Prm_Data_Len = 1

; Default User Parameter string:
User_Prm_Data     = 0x00
Ext_User_Prm_Data_Const(0)= 0x00
Ext_User_Prm_Data_Ref(0)=0

; Maximum polling frequency
Min_Slave_Intervall = 1      ;100 µs

; Maximum supported sizes
Modular_Station = 1      ; modular
Max_Module      = 14    ; logical modules emulated on the card
Max_Input_Len   = 244
Max_Output_Len  = 244
Max_Data_Len    = 400
```

```
Modul_Offset=0

Slave_Family=9
Max_Diag_Data_Len = 20

;Refer to the ProSoft Profibus Slave documentation for a complete discussion of
;the extended diagnostic data.

;
; Module byte-organised send data
;
Module = "Empty Slot" 0x00
EndModule
;
; Module word size send data
;
Module = "1 Word Input" 0x50
EndModule
Module = "2 Words Input" 0x51
EndModule
Module = "3 Words Input" 0x52
EndModule
Module = "4 Words Input" 0x53
EndModule
Module = "5 Words Input" 0x54
EndModule
Module = "6 Words Input" 0x55
EndModule
Module = "7 Words Input" 0x56
EndModule
Module = "8 Words Input" 0x57
EndModule
Module = "9 Words Input" 0x58
EndModule
Module = "10 Words Input" 0x59
EndModule
Module = "11 Words Input" 0x5A
EndModule
Module = "12 Words Input" 0x5B
EndModule
Module = "13 Words Input" 0x5C
EndModule
Module = "14 Words Input" 0x5D
EndModule
Module = "15 Words Input" 0x5E
EndModule
Module = "16 Words Input" 0x5F
EndModule

;
; Module word size receive data
;
Module = "1 Word Output" 0x60
EndModule
Module = "2 Words Output" 0x61
EndModule
Module = "3 Words Output" 0x62
```

```
EndModule
Module = "4 Words Output" 0x63
EndModule
Module = "5 Words Output" 0x64
EndModule
Module = "6 Words Output" 0x65
EndModule
Module = "7 Words Output" 0x66
EndModule
Module = "8 Words Output" 0x67
EndModule
Module = "9 Words Output" 0x68
EndModule
Module = "10 Words Output" 0x69
EndModule
Module = "11 Words Output" 0x6A
EndModule
Module = "12 Words Output" 0x6B
EndModule
Module = "13 Words Output" 0x6C
EndModule
Module = "14 Words Output" 0x6D
EndModule
Module = "15 Words Output" 0x6E
EndModule
Module = "16 Words Output" 0x6F
EndModule
```

4.3 Slave Error and Status Data

The 104S Driver Error and Status Data areas are discussed in this section. This data represents a collection of status, diagnostic and troubleshooting registers which may prove helpful in troubleshooting the 104S network and port operation. The data map functionality of the module must be utilized in order to map this data into the normal module database region (0 to 3999). All or any portion of the data can be moved using this facility.

The data area is initialized with zeros whenever the module is initialized. This occurs during a cold-start (power-on), reset (reset push-button pressed) or a warm-boot operation (commanded or loading of new configuration).

4.3.1 General Communication Status and Client 0 Status

Status Register	Name	Description
10200	t0 Timeout Count	This word contains the number of t0 errors recognized by the module.
10201	t1 Timeout Count	This word contains the number of t1 errors recognized by the module.
10202	t2 Timeout Count	This word contains the number of t2 errors recognized by the module.
10203	t3 Timeout Count	This word contains the number of t3 errors recognized by the module.

Status Register	Name	Description
10204	Sequence Error Count	This word contains the number of sequence errors recognized by the module. When the send sequence number received by the module does not match the expected sequence number, the connection is closed and this counter is incremented.
10205	Bad Address Error Count	This word contains the number of messages received from the remote host that do not contain a valid common ASDU address in the packet.
10206	Length Error Count	This word contains the number of messages received from the remote host that do not have a valid length field.
10207	Receive Frame Count	This word contains the number of message frames (not packets) received from the host. A packet may contain more than one message.
10208	Transmit Frame Count	This word contains the number of message frames sent to the host from the unit.
10209	Socket State Value (socket 0)	This word contains the current socket state as follows: -1 = Open Socket 0 = Wait for connection 1 = Transmit message if ready 2 = Receive packet and process message 3 = Process multiple messages in packet 50 = Send TestFr Act 51 = Wait for TestFr Con 60 = Send sequence (S-Format) message 1000 = Close Socket 1001 = Wait for socket to close
10210	Socket Open Count (socket 0)	This word contains the number of times the socket listen function executed.
10211	Socket Close Count (socket 0)	This word contains the number of times an active close function executed.
10212	Socket Connect Count (socket 0)	This word contains the number of times a connection was established with the remote host unit.
10213	Host IP Address (socket 0)	IP address of the client connected to the server.
…		
10222		

4.3.2 Client 1 Status

Status Register	Name	Description
10250	Socket State Value (socket 1)	This word contains the current socket state as follows: -1 = Open Socket 0 = Wait for connection 1 = Transmit message if ready 2 = Receive packet and process message 3 = Process multiple messages in packet 50 = Send TestFr Act 51 = Wait for TestFr Con 60 = Send sequence (S-Format) message 1000 = Close Socket 1001 = Wait for socket to close
10251	Socket Open Count (socket 1)	This word contains the number of times the socket listen function executed.
10252	Socket Close Count (socket 1)	This word contains the number of times an active close function executed.
10253	Socket Connect Count (socket 1)	This word contains the number of times a connection was established with the remote host unit.
10254 … 10263	Host IP Address (socket 1)	IP address of the client connected to the server.
10264	StartDT active (socket 1)	This word contains the current StartDT state as follows: 0 = The module has not received the most recent STARTDT request through this socket or there has been no communication with the remote host unit. 1 = The module has received the most recent STARTDT request through this socket (therefore will be reporting data to the remote client connected through this socket).

4.4 LED Indicators

Troubleshooting the operation of the IEC Slave port can be performed using several methods.

The first and quickest is to scan the LEDs on the module to determine the existence and possibly the cause of a problem. This section provides insight into the operation of the Serial Port status LEDs. Information on the module's other LEDs can be found in the ProLinx Reference Guide.

LEDs for Port 0 Serial Port

Some ProLinx modules will include an extra three serial ports. Each of these serial ports has two LEDs indicating status.

LED	Color	Description
Port 0 – ACT	Off	No activity on the port.
	Green Flash	The port is either actively transmitting or receiving data
Port 0 – ERR	Off	Normal state. When off and Port Active led is indicating activity, there are no communication errors
	Red On or Flashing	Activity on this led indicates some communication error was detected, either during transmit or receive

4.5 Command Qualifiers

Qualifier Code	Description
0	No additional definitions (Module will use Long duration pulse for this qualifier selection).
1	Short pulse duration (circuit breaker), determined by user-set parameter in module. This is supported in the module for single and dual point commands.
2	Long duration pulse (control relay), duration determined by user-set parameter in module. This is supported in the module for single and dual point commands.
3	Persistent output of control. This is supported in the module for all output data types.
4 to 8	Reserved for standard definitions of standard – NOT SUPPORTED
9 to 15	Reserved for the selection of other predefined functions – NOT SUPPORTED
16 to 31	Reserved for special use (private range) – NOT SUPPORTED

4.6 Parameter Qualifiers

Type of Parameter	Description
0	Not used.
1	Threshold value (deadband). This parameter is used as the value of variation from the last reported event value to generate events. Each measured value has a user-assigned deadband value. The low and high limit parameter values are computed using the value entered for each measure data point. This parameter can be set and read by the controlling device (client).
2	Smoothing factor (filtered time constant) – NOT SUPPORTED
3	Low limit for transmission of metered values. This value is used as the lower limit for event generation. The value of this parameter is determined based on the value of the last reported event and the deadband set for the specific point. This parameter can be read by the controlling device (client).
4	High limit for transmission of measured values. This value is used as the upper limit for event generation. The value of this parameter is set based on the value of the last reported event and the deadband for the specific point. This parameter can be read by the controlling device (client).
5 to 31	Reserved for standard definitions of standard – NOT SUPPORTED
32 to 63	Reserved for special use – NOT SUPPORTED.

4.7 Design Forms

Form for use with the data types M_SP_NA_1, M_DP_NA_1, M_ST_NA_1 and M_IT_NA_1

Point Number	Database Address	Group Assignment

Form to be used with data types M_ME_NA_1 and M_ME_NB_1

Point Number	Database Address	Group Assignment	Default Deadband

Forms to be used with all command data types except C_RC_NA_1

Point Number	Database Address	Monitor Point #	Monitor Database Address	Require Select

Form to be used with C_RC_NA_1 data type

Point Number	Database Address	Monitor Point #	Monitor Database Address

4.8 IEC 60870-5-104 Server Interoperability Document

This companion standard presents sets of parameters and alternatives from which subsets have to be selected to implement particular telecontrol systems. Certain parameter values, such as the number of octets in the COMMON ADDRESS of ASDUs represent mutually exclusive alternatives. This means that only one value of the defined parameters is admitted per system. Other parameters, such as the listed set of different process information in command and in monitor direction allow the specification of the complete set or subsets, as appropriate for given applications. This clause summarizes the parameters of the previous clauses to facilitate a suitable selection for a specific application. If a system is composed of equipment stemming from different manufacturers it is necessary that all partners agree on the selected parameters.

NOTE: In addition, the full specification of a system may require individual selection of certain parameters for certain parts of the system, such as the individual selection of scaling factors for individually addressable measured values.

The selected parameters should be marked in the white boxes as follows:

☐ Function or ASDU is not used

☒ Function or ASDU is used as standardized (default)

R Function or ASDU is used in reverse mode

B Function or ASDU is used in standard and reverse mode

The possible selection (blank, X, R, B) is specified for each specific clause or parameter.

A black check box indicates that the option cannot be selected in this companion standard.

4.8.1 System or device

☐ System definition

☐ Controlling station definition (Master)

☒ Controlled station definition (Slave)

4.8.2 Application Layer

Transmission mode for application data

Mode 1 (Least significant octet first), as defined in clause 4.10 of IEC 60870-5-4, is used exclusively in this companion standard.

Common address of ASDU

(System-specific parameter)

☐ One octet ☒ Two octets

Information object address

(System-specific parameter)

☐ One octet ☐ Structured

☐ Two octets ☐ Unstructured

☒ Three octets

Cause of transmission

(System-specific parameter)

☐ One octet ☒ Two octets (with originator address)

Length of APDU

(System-specific parameter, specify the maximum length of the APDU per system)

The Maximum length of the APDU is 246 (default). The maximum length may be reduced by the system.

246 Maximum length of APDU per system

4.8.3 Selection of standard ASDUs

Process information in monitor direction

(Station-specific parameter, mark each Type ID '**X**' if it is only used in the standard direction, '**R**' if only used in the reverse direction, and '**B**' if used in both directions)

☒ <1> := Single-point information M_SP_NA_1

☒ <3> := Double-point information M_DP_NA_1

☒ <5> := Step position information M_ST_NA_1

☐ <7> := Bitstring of 32 bit M_BO_NA_1

☒ <9> := Measured value, normalized value M_ME_NA_1

☒ <11> := Measured value, scaled value M_ME_NB_1

☒ <13> := Measured value, short floating point value M_ME_NC_I

☒ <15> := Integrated totals M_IT_NA_1

☐ <20> := Packed single-point information with status change detection M_PS_NA_1

☐ <21> := Measured value, normalized value without quality descriptor M_ME_ND_1

☒ <30> := Single-point information with time tag CP56Time2a M_SP_TB_1

☒ <31> := Double-point information with time tag CP56Time2A M_DP_TB_1

☒ <32> := Step position information with time tag CP56Time2A M_ST_TB_1

☐ <33> := Bitstring of 32 bit with time tag CP56Time2A M_BO_TB_1

☒ <34> := Measured value, normalized value with time tag CP56Time2A M_ME_TD_1

☒ <35> := Measured value, scaled value with time tag CP56Time2A M_ME_TE_1

☒ <36> := Measured value, short floating point value with time tag CP56Time2A M_ME_TF_1

☒ <37> := Integrated totals with time tag CP56Time2A M_IT_TB_1

☐ <38> := Event of protection equipment with time tag CP56Time2A M_EP_TD_1

☐ <39> := Packed start events of protection equipment with time tag CP56time2A M_EP_TE_1

☐ <40> := Packed output circuit information of protection equipment with time tag CP56Time2a M_EP_TF_1

Process information in control direction

(Station-specific parameter, mark each Type ID '**X**' if it is only used in the standard direction, '**R**' if only used in the reverse direction, and '**B**' if used in both directions)

☒ <45> := Single command C_SC_NA_1

☒ <46> := Double command C_DC_NA_1

☒ <47> := Regulating step command C_RC_NA_1

☒ <48> := Set point command, normalized value C_SE_NA_1

☒ <49> := Set point command, scaled value C_SE_NB_1

☒ <50> := Set point command, short floating point value C_SE_NC_1

☐ <51> := Bitstring of 32 bit C_BO_NA_1

☒ <58> := Single command with time tag CP56Time2a C_SC_TA_1

☒ <59> := Double command with time tag CP56Time2A C_DC_TA_1

☒ <60> := Regulating step command with time tag CP56Time2A C_RC_TA_1

☒ <61> := Set point command, normalized value with time tag CP56Time2A C_SE_TA_1

☒ <62> := Set point command, scaled value with time tag CP56Time2A C_SE_TB_1

☒ <63> := Set point command, short float value with time tag CP56Time2A C_SE_TC_1

☐ <64> := Bitstring of 32 bit with time tag CP56Time2A C_BO_TA_1

Either the ASDUs of the set <45>-<51> or of the set <58>-<64> are used.

System information in monitor direction

(Station-specific parameter, mark '**X**' if used)

☒ <70> := End of initialization M_EI_NA_1

System information in control direction

(Station-specific parameter, mark each Type ID '**X**' if it is only used in the standard direction, '**R**' if only used in the reverse direction, and '**B**' if used in both directions)

☒ <100> := Interrogation command C_IC_NA_1

☒ <101> := Counter interrogation command C_CI_NA_1

☒ <102> := Read command C_RD_NA_1

☒ <103> := Clock synchronization command C_CS_NA_1

☒ <105> := Reset process command C_RP_NC_1

☒ <107> := Test command with time tag CP56Time2a C_TS_TA_1

Parameter in control direction

(Station-specific parameter, mark each Type ID '**X**' if it is only used in the standard direction, '**R**' if only used in the reverse direction, and '**B**' if used in both directions)

☒ <110> := Parameter of measured value, normalized value P_ME_NA_1

☒ <111> := Parameter of measured value, scaled value P_ME_NB_1

☒ <112> := Parameter of measured value, short floating point value P_ME_NC_1

☐ <113> := Parameter activation P_AC_NA_1

File transfer

(Station-specific parameter, mark each Type ID '**X**' if it is only used in the standard direction, '**R**' if only used in the reverse direction, and '**B**' if used in both directions)

☐ <120> := File ready F_FR_NA_1

☐ <121> := Section ready F_SR_NA_1

☐ <122> := Call directory, select file, call file, call section F_SC_NA_1

☐ <123> := Last section, last segment F_LS_NA_1

☐ <124> := Ack file, ack section F_AF_NA_1

☐ <125> := Segment F_SG_NA_1

☐ <126> := Directory F_DR_TA_1

4.8.4 Type identifier and cause of transmission assignments

(Station-specific parameters)
Shaded boxes: option not required
Black boxes: option not permitted in this companion standard
Blank boxes: functions or ASDU not used
Mark Type Identification/Cause of Transmission combinations: '**X**' if only used in standard direction, '**R**' if only used in reverse direction, and '**B**' if used in both directions

Type Identification		Cause of transmission																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	20 to 36	37 to 41	44	45	46	47
<1>	M_SP_NA_1	X		X		X						X			X					
<3>	M_DP_NA_1	X		X		X						X			X					
<5>	M_ST_NA_1	X		X		X						X			X					
<7>	M_BO_NA_1																			
<9>	M_ME_NA_1	X		X		X									X					
<11>	M_ME_NB_1	X		X		X									X					
<13>	M_ME_NC_1	X		X		X									X					
<15>	M_IT_NA_1	X		X		X										X				
<20>	M_PS_NA_1																			
<21>	M_ME_ND_1																			
<30>	M_SP_TB_1			X		X									X					
<31>	M_DP_TB_1			X		X									X					
<32>	M_ST_TB_1			X		X									X					
<33>	M_BO_TB_1																			
<34>	M_ME_TD_1			X		X									X					
<35>	M_ME_TE_1			X		X									X					
<36>	M_ME_TF_1																			
<37>	M_IT_TB_1			X		X										X				
<38>	M_EP_TD_1																			
<39>	M_EP_TE_1																			
<40>	M_EP_TF_1																			
<45>	C_SC_NA_1						X	X	X	X	X									
<46>	C_DC_NA_1						X	X	X	X	X									
<47>	C_RC_NA_1						X	X	X	X	X									
<48>	C_SE_NA_1						X	X	X	X	X									
<49>	C_SE_NB_1						X	X	X	X	X									
<50>	C_SE_NC_1						X	X	X	X	X									
<51>	C_BO_NA_1						X	X	X	X	X									
<58>	C_SC_TA_1						X	X	X	X	X									
<59>	C_DC_TA_1						X	X	X	X	X									
<60>	C_RC_TA_1						X	X	X	X	X									
<61>	C_SE_TA_1						X	X	X	X	X									
<62>	C_SE_TB_1						X	X	X	X	X									
<63>	C_SE_TC_1						X	X	X	X	X									
<64>	C_BO_TA_1																			
<70>	M_EI_NA_1				X															
<100>	C_IC_NA_1						X	X	X	X	X									
<101>	C_CI_NA_1						X	X			X									
<102>	C_RD_NA_1					X														
<103>	C_CS_NA_1						X	X												
<105>	C_RP_NA_1						X	X												
<107>	C_TS_TA_1						X	X												
<110>	P_ME_NA_1						X	X												
<111>	P_ME_NB_1						X	X												
<112>	P_ME_NC_1						X	X												
<113>	P_AC_NA_1																			
<120>	F_FR_NA_1																			
<121>	F_SR_NA_1																			
<122>	F_SC_NA_1																			
<123>	F_LS_NA_1																			
<1124>	F_AF_NA_1																			
<125>	F_SG_NA_1																			
<126>	F_DR_TA_1																			

4.8.5 Basic Application Functions

Station initialization

(Station-specific parameter, mark '**X**' if function is used)

☒ Remote initialization

Cyclic data transmission

(Station-specific parameter, mark '**X**' if function is only used in the standard direction, '**R**' if only used in the reverse direction, and '**B**' if used in both directions)

☒ Cyclic data transmission

Read procedure

(Station-specific parameter, mark '**X**' if function is only used in the standard direction, '**R**' if only used in the reverse direction, and '**B**' if used in both directions)

☒ Read procedure

Spontaneous transmission

(Station-specific parameter, mark '**X**' if function is only used in the standard direction, '**R**' if only used in the reverse direction, and '**B**' if used in both directions)

☒ Spontaneous transmission

Double transmission of information objects with cause of transmission spontaneous

(Station-specific parameter, mark each information type '**X**' where both a Type ID without time and corresponding Type ID with time are issued in response to a single spontaneous change of a monitored object)

The following type identifications may be transmitted in succession caused by a single status change of an information object. The particular information object addresses for which double transmission is enabled are defined in a project-specific list.

☐ Single-point information M_SP_NA_1, M_SP_TA_1, M_SP_TB_1 and M_PS_NA_1
☐ Double-point information M_DP_NA_1, MDP_TA_1 and M_DP_TB_1

☐ Step position information M_ST_NA_1, M_ST_TA_1 and M_ST_TB_1

☐ Bitstring of 32 bit M_BO_NA_1, M_BO_TA_1 and M_BO_TB_1

☐ Measured value, normalized value M_ME_NA_1, M_ME_TA_1, M_ME_ND_1 and M_ME_TD_1

☐ Measured value, scaled value M_ME_NB_1, M_ME_TB_1 and M_ME_TE_1

☐ Measured value, short floating point number M_ME_NC_1, M_ME_TC_1 and M_ME_TF_1

Station Interrogation

(Station-specific parameter, mark '**X**' if function is only used in the standard direction, '**R**' if only used in the reverse direction, and '**B**' if used in both directions)

☒ global

☒ group 1	☒ group 7	☒ group 13
☒ group 2	☒ group 8	☒ group l4
☒ group 3	☒ group 9	☒ group 15
☒ group 4	☒ group 10	☒ group 16
☒ group 5	☒ group 11	
☒ group 6	☒ group 12	Addresses per group have to be defined

Clock synchronization

(Station-specific parameter, mark '**X**' if function is only used in the standard direction, '**R**' if only used in the reverse direction, and '**B**' if used in both directions)

☒ Clock synchronization

Optional

Command transmission

(Object-specific parameter, mark '**X**' if function is only used in the standard direction, '**R**' if only used in the reverse direction, and '**B**' if used in both directions)

☒ Direct command transmission

☒ Direct set point command transmission

☒ Select and execute command

☒ Select and execute set point command

☒ C_SE_ACTTERM used note 2

☒ No additional definition

☒ Short pulse duration (duration determined by a system parameter in the outstation)

☒ Long pulse duration (duration determined by a system parameter in the outstation)

☒ Persistent output

☐ Supervision of maximum delay in command direction of commands and set point commands

Maximum allowable delay of commands and set point commands

Transmission of Integrated totals

(Station- or object-specific parameter, mark '**X**' if function is only used in the standard direction, '**R**' if only used in the reverse direction, and '**B**' if used in both directions)

☒ Mode A: Local freeze with spontaneous transmission

☐ Mode B: Local freeze with counter interrogation

☐ Mode C: Freeze and transmit by counter-interrogation commands

☒ Mode D: Freeze by counter-interrogation command, frozen values reported spontaneously

☒ Counter read

☒ Counter freeze without reset

☐ Counter freeze with reset

☐ Counter reset

☒ General request counter

☒ Request counter group 1

☒ Request counter group 2

☒ Request counter group 3

☒ Request counter group 4

Parameter loading

(Object-specific parameter, mark '**X**' if function is only used in the standard direction, '**R**' if only used in the reverse direction, and '**B**' if used in both directions)

☒ Threshold value

☐ Smoothing factor

☒ Low limit for transmission of measured value

☒ High limit for transmission of measured value

Parameter activation

(Object-specific parameter, mark '**X**' if function is only used in the standard direction, '**R**' if only used in the reverse direction, and '**B**' if used in both directions)

☐ Act/deact of persistent cyclic or periodic transmission of the addressed object

Test procedure

(Station-specific parameter, mark '**X**' if function is only used in the standard direction, '**R**' if only used in the reverse direction, and '**B**' if used in both directions)

☐ Test procedure

File transfer

(Station-specific parameter, mark '**X**' if function is used)

File transfer in monitor direction

☐ Transparent file

☐ Transmission of disturbance data of protection equipment

☐ Transmission of sequence of events

☐ Transmission of sequence of recorded analogue values

File transfer in control direction

☐ Transparent file

Background scan

(Station-specific parameter, mark '**X**' if function is only used in the standard direction, '**R**' if only used in the reverse direction, and '**B**' if used in both directions)

☐ Background scan

Definition of time outs

Parameter	Default Value	Remarks	Selected Value
t_0	60 seconds	Time-out of connection establishment	60 seconds
t_1	15 seconds	Time-out of send or test APDUs	
t_2	10 seconds	Time-out for acknowledges in case of no data messages ($t_2 < t_1$)	
t_3	20 seconds	Time-out for sending test frames in case of a long idle time	

Maximum range of values for all time-outs: 1 to 255 seconds, accuracy 1 second.

Maximum number of outstanding I format APDUs k and latest acknowledge APDUs (w)

Parameter	Default Value	Remarks	Selected Value
k	12 APDUs	Maximum difference receive sequence number to send state variable (Maximum value is 19)	
w	8 APDUs	Latest acknowledge after receiving *w* I format APDUs	

Maximum range of values *k*: 1 to 32767 (2^{15}–1) APDUs, accuracy 1 APDU
Maximum range of values *w*: 1 to 32767 (2^{15}–1) APDUs, accuracy 1 APDU
(Recommendation: *w* should not exceed two-thirds of *k*).

Port number

Parameter	Value	Remarks
Port number	2404	In all cases

RFC 2200 suite

RFC 2200 is an official Internet Standard which describes the state of standardization of protocols used in the Internet as determined by the Internet Architecture Board (IAB). It offers a broad spectrum of actual standards used in the Internet. The suitable selection of documents from RFC 2200 defined in this standard for given projects has to be chosen by the user of this standard.

☒ Ethernet 802.3

☐ Serial X.21 interface

☐ Other selection from RFC 2200:

5 Support, Service & Extended Warranty

In This Chapter

Be sure and read the full Warranty that can be found on our web site at www.prosoft-technology.com for *details and other terms and conditions. The content in this summary is subject to change without notice. The content is current at date of publication.*

ProSoft Technology, Inc. strives to provide meaningful support to its customers. Should any questions or problems arise, please feel free to contact us at:

Internet	Web Site: http://www.prosoft-technology.com/support
	E-mail address: support@prosoft-technology.com

Those of us at ProSoft Technology, Inc. want to provide the best and quickest support possible, so before calling please have the following information available. You may wish to fax this information to us prior to calling.

1. Product Version Number
2. System architecture
3. Network details

In the case of hardware, we will also need the following information:

1. Module configuration and contents of file
2. Module Operation
3. Configuration/Debug status information
4. LED patterns
5. Information about the processor and user data files as viewed through the development software and LED patterns on the processor
6. Details about the networked devices interfaced, if any

For technical support calls within the United States, an after-hours answering system allows pager access to one of our qualified technical and/or application support engineers at any time to answer your questions.

5.1 How to Contact Us: Sales and Support

All ProSoft Technology Products are backed with full technical support. Contact our worldwide Technical Support team and Customer Service representatives directly by phone or email:

USA / Latin America (excluding Brasil) (Office in California)

+1(661) 716-5100
+1(661) 716-5101 (Fax)
1675 Chester Avenue, 4th Floor
Bakersfield, California 93301
U.S.A.
+1.661.716.5100, support@prosoft-technology.com
Languages spoken include: English, Spanish

Asia Pacific (office in Malaysia)

+603.7724.2080
+603.7724.2090 (Fax)
C210, Damansara Intan,
1 Jalan SS20/27, 47400 Petaling Jaya
Selangor, Malaysia
+603.7724.2080, asiapc@prosoft-technology.com
Languages spoken include: Chinese, Japanese, English

China Pacific (office in China)

+86.21.64518356 x 8011
+86.21.64756957 (Fax)
4/F, No. 16 Hongcao Road
Shanghai, China 200233
China
+86.21.64518356 x 8011, zhang@prosoft-technology.com
Languages spoken include: Chinese, English

Europe / Middle East / Africa (office in Toulouse, France)

+33 (0) 5.34.36.87.20
+33 (0) 5.61.78.40.52 (Fax)
Zone d'activité de Font Grasse
17, rue des Briquetiers
F-31700 Blagnac
France
+33 (0) 5.34.36.87.20. support. EMEA@prosoft-technology.com
Languages spoken include: French, English

Brasil (office in Sao Paulo)

+55-11-5084-5178
+55-11-5083-3776 (Fax)
Rua Vergueiro, 2949 - sala 182 - Edifício Vergueiro Work Center
Vila Mariana - São Paulo
Cep: 04101-300 – Brasil
+55-11-5084-5178, eduardo@prosoft-technology.com
Languages spoken include: Portuguese, English

5.2 Return Material Authorization (RMA) Policies and Conditions

The following RMA Policies and Conditions apply to any returned product. These RMA Policies are subject to change by ProSoft without notice. For warranty information, see Section C below entitled "Limited Warranty". In the event of any inconsistency between the RMA Policies and the Warranty, the Warranty shall govern.

5.2.1 All Product Returns

1 In order to return a Product for repair, exchange or otherwise, the Customer must obtain a Returned Material Authorization (RMA) number from ProSoft and comply with ProSoft shipping instructions.

2 In the event that the Customer experiences a problem with the Product for any reason, Customer should contact ProSoft Technical Support at one of the telephone numbers listed above in Section A. A Technical Support Engineer will request several tests in an attempt to isolate the problem. If after these tests are completed, the Product is found to be the source of the problem, ProSoft will issue an RMA.

3 All returned Products must be shipped freight prepaid, in the original shipping container or equivalent, to the location specified by ProSoft, and be accompanied by proof of purchase. The RMA number is to be prominently marked on the outside of the shipping box. Customer agrees to insure the Product or assume the risk of loss or damage in transit. Products shipped to ProSoft without an RMA number will be returned to the Customer, freight collect. Contact ProSoft Technical Support for further information.

4 Out of warranty returns are not allowed on RadioLinx accessories such as antennas, cables, and brackets.

The following policy applies for Non-Warranty Credit Returns:

a 10% Restocking Fee if Factory Seal is *not* broken

b 20% Restocking Fee if Factory Seal is broken

ProSoft retains the right, in its absolute and sole discretion, to reject any non-warranty returns for credit if the return is not requested within three (3) months after shipment of the Product to Customer, if the Customer fails to comply with ProSoft's shipping instructions, or if the Customer fails to return the Product to ProSoft within six (6) months after Product was originally shipped.

5.3 Procedures for Return of Units Under Warranty:

1 A Technical Support Engineer must pre-approve all product returns.

2 Module is repaired or replaced after a Return Material Authorization Number is entered and a replacement order is generated.

3 Credit for the warranted item is issued within 10 business days after receipt of product and evaluation of the defect has been performed by ProSoft. The credit will only be issued provided the product is returned with a valid Return Material Authorization Number and in accordance with ProSoft's shipping instructions.

a) If no defect is found, a credit is issued.

b) If a defect is found and is determined to be customer generated or if the defect is otherwise not covered by ProSoft's Warranty, or if the module is not repairable, a credit is not issued and payment of the replacement module is due.

5.4 Procedures for Return of Units Out of Warranty:

1. Customer sends unit in for evaluation.
2. If no defect is found, Customer will be charged the equivalent of US $100 plus shipping, duties and taxes that may apply. A new Purchase Order will be required for this evaluation fee.
   If the unit is repaired the charge to the Customer will be 30%* of the list price plus any shipping, duties and taxes that may apply. A new Purchase Order will be required for a product repair.
3. For an immediate exchange, a new module may be purchased and sent to Customer while repair work is being performed. Credit for purchase of the new module will be issued when the new module is returned in accordance with ProSoft's shipping instructions and subject to ProSoft's policy on non-warranty returns. This is in addition to charges for repair of the old module and any associated charges to Customer.
4. If, upon contacting ProSoft Customer Service, the Customer is informed that unit is believed to be unrepairable, the Customer may choose to send unit in for evaluation to determine if the repair can be made. Customer will pay shipping, duties and taxes that may apply. If unit cannot be repaired, the Customer may purchase a new unit.

5.4.1 Un-repairable Units

- 3150-All
- 3750
- 3600-All
- 3700
- 3170-All
- 3250
- 1560 can be repaired, if defect is the power supply
- 1550 can be repaired, if defect is the power supply
- 3350
- 3300
- 1500-All

*** 30% of list price is an estimated repair cost only. The actual cost of repairs will be determined when the module is received by ProSoft and evaluated for needed repairs.**

Purchasing Warranty Extension:

As detailed below in ProSoft's Warranty, the standard Warranty Period is one year (or in the case of RadioLinx modules, three years) from the date of delivery. The Warranty Period may be extended for an additional charge, as follows:

- Additional 1 year = 10% of list price
- Additional 2 years = 20% of list price
- Additional 3 years = 30% of list price

5.5 LIMITED WARRANTY

This Limited Warranty ("Warranty") governs all sales of hardware, software and other products (collectively, "Product") manufactured and/or offered for sale by ProSoft, and all related services provided by ProSoft, including maintenance, repair, warranty exchange, and service programs (collectively, "Services"). By purchasing or using the Product or Services, the individual or entity purchasing or using the Product or Services ("Customer") agrees to all of the terms and provisions (collectively, the "Terms") of this Limited Warranty. All sales of software or other intellectual property are, in addition, subject to any license agreement accompanying such software or other intellectual property.

5.5.1 What Is Covered By This Warranty

a *Warranty On New Products*: ProSoft warrants, to the original purchaser only, that the Product that is the subject of the sale will (1) conform to and perform in accordance with published specifications prepared, approved, and issued by ProSoft, and (2) will be free from defects in material or workmanship; provided these warranties only cover Product that is sold as new. This Warranty expires one year (or in the case of RadioLinx modules, three years) from the date of shipment (the "Warranty Period"). If the Customer discovers within the Warranty Period a failure of the Product to conform to specifications, or a defect in material or workmanship of the Product, the Customer must promptly notify ProSoft by fax, email or telephone. In no event may that notification be received by ProSoft later than 15 months (or in the case of RadioLinx modules, 39 months) from the date of delivery. Within a reasonable time after notification, ProSoft will correct any failure of the Product to conform to specifications or any defect in material or workmanship of the Product, with either new or used replacement parts. Such repair, including both parts and labor, will be performed at ProSoft's expense. All warranty service will be performed at service centers designated by ProSoft. If ProSoft is unable to repair the Product to conform to this Warranty after a reasonable number of attempts, ProSoft will provide, at its option, one of the following: a replacement product, a full refund of the purchase price or a credit in the amount of the purchase price. All replaced product and parts become the property of ProSoft. These remedies are the Customer's only remedies for breach of warranty.

b *Warranty On Services*: Material and labor used by ProSoft to repair a verified malfunction or defect are warranted on the terms specified above for new Product, provided said warranty will be for the period remaining on the original new equipment warranty or, if the original warranty is no longer in effect, for a period of 90 days from the date of repair.

c The Warranty Period for RadioLinx accessories (such as antennas, cables, brackets, etc.) are the same as for RadioLinx modules, that is, three years from the date of shipment.

5.5.2 What Is Not Covered By This Warranty

a ProSoft makes no representation or warranty, expressed or implied, that the operation of software purchased from ProSoft will be uninterrupted or error free or that the functions contained in the software will meet or satisfy the purchaser's intended use or requirements; the Customer assumes complete responsibility for decisions made or actions taken based on information obtained using ProSoft software.

b With the exception of RadioLinx accessories referenced in paragraph 1(c) this Warranty does not cover any product, components, or parts not manufactured by ProSoft.

c This Warranty also does not cover the failure of the Product to perform specified functions, or any other non-conformance, defects, losses or damages caused by or attributable to any of the following: (i) shipping; (ii) improper installation or other failure of Customer to adhere to ProSoft's specifications or instructions; (iii) unauthorized repair or maintenance; (iv) attachments, equipment, options, parts, software, or user-created programming (including, but not limited to, programs developed with any IEC 61131-3 programming languages, or "C") not furnished by ProSoft; (v) use of the Product for purposes other than those for which it was designed; (vi) any other abuse, misapplication, neglect or misuse by the Customer; (vii) accident, improper testing or causes external to the Product such as, but not limited to, exposure to extremes of temperature or humidity, power failure or power surges outside of the limits indicated on the product specifications; or (viii) disasters such as fire, flood, earthquake, wind or lightning.

d The information in this Agreement is subject to change without notice. ProSoft shall not be liable for technical or editorial errors or omissions made herein; nor for incidental or consequential damages resulting from the furnishing, performance or use of this material. The user guides included with your original product purchased by you from ProSoft, contains information protected by copyright. No part of the guide may be duplicated or reproduced in any form without prior written consent from ProSoft.

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5.5.4 DISCLAIMER OF ALL OTHER WARRANTIES

THE WARRANTIES SET FORTH IN PARAGRAPH 1 ABOVE ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

5.5.5 LIMITATION OF REMEDIES**

IN NO EVENT WILL PROSOFT (OR ITS DEALER) BE LIABLE FOR ANY SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES BASED ON BREACH OF WARRANTY, BREACH OF CONTRACT, NEGLIGENCE, STRICT TORT, OR ANY OTHER LEGAL THEORY. DAMAGES THAT PROSOFT AND ITS DEALER WILL NOT BE RESPONSIBLE FOR INCLUDE, BUT ARE NOT LIMITED TO: LOSS OF PROFITS; LOSS OF SAVINGS OR REVENUE; LOSS OF USE OF THE PRODUCT OR ANY ASSOCIATED EQUIPMENT; LOSS OF DATA; COST OF CAPITAL; COST OF ANY SUBSTITUTE EQUIPMENT, FACILITIES, OR SERVICES; DOWNTIME; THE CLAIMS OF THIRD PARTIES, INCLUDING CUSTOMERS OF THE PURCHASER; AND INJURY TO PROPERTY.

** Some areas do not allow time limitations on an implied warranty, or allow the exclusion or limitation of incidental or consequential damages. In such areas the above limitations may not apply. This Warranty gives you specific legal rights, and you may also have other rights which vary from place to place.

5.5.6 Time Limit for Bringing Suit

Any action for breach of warranty must be commenced within 15 months (or in the case of RadioLinx modules, 39 months) following shipment of the Product.

5.5.7 No Other Warranties

Unless modified in writing and signed by both parties, this Warranty is understood to be the complete and exclusive agreement between the parties, suspending all oral or written prior agreements and all other communications between the parties relating to the subject matter of this Warranty, including statements made by salesperson. No employee of ProSoft or any other party is authorized to make any warranty in addition to those made in this Warranty. The Customer is warned, therefore, to check this Warranty carefully to see that it correctly reflects those terms that are important to the Customer.

5.5.8 Intellectual Property

a Any documentation included with Product purchased from ProSoft is protected by copyright and may not be photocopied or reproduced in any form without prior written consent from ProSoft.

b ProSoft's technical specifications and documentation that are included with the Product are subject to editing and modification without notice.

c Transfer of title shall not operate to convey to Customer any right to make, or have made, any Product supplied by ProSoft.

d Customer is granted no right or license to use any software or other intellectual property in any manner or for any purpose not expressly permitted by any license agreement accompanying such software or other intellectual property.

e Customer agrees that it shall not, and shall not authorize others to, copy software provided by ProSoft (except as expressly permitted in any license agreement accompanying such software); transfer software to a third party separately from the Product; modify, alter, translate, decode, decompile, disassemble, reverse-engineer or otherwise attempt to derive the source code of the software or create derivative works based on the software; export the software or underlying technology in contravention of applicable US and international export laws and regulations; or use the software other than as authorized in connection with use of Product.

5.5.9 Additional Restrictions Relating To Software And Other Intellectual Property

In addition to complying with the Terms of this Warranty, Customers purchasing software or other intellectual property shall comply with any license agreement accompanying such software or other intellectual property. Failure to do so may void this Warranty with respect to such software and/or other intellectual property.

5.5.10 Allocation of risks

This Warranty allocates the risk of product failure between ProSoft and the Customer. This allocation is recognized by both parties and is reflected in the price of the goods. The Customer acknowledges that it has read this Warranty, understands it, and is bound by its Terms.

5.5.11 Controlling Law and Severability

This Warranty shall be governed by and construed in accordance with the laws of the United States and the domestic laws of the State of California, without reference to its conflicts of law provisions. If for any reason a court of competent jurisdiction finds any provisions of this Warranty, or a portion thereof, to be unenforceable, that provision shall be enforced to the maximum extent permissible and the remainder of this Warranty shall remain in full force and effect. Any cause of action with respect to the Product or Services must be instituted in a court of competent jurisdiction in the State of California.

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