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inRAX[®]

MVI46-104S

SLC Platform

IEC 60870-5-104 Slave Interface Module

September 04, 2008

USER MANUAL

Please Read This Notice

Successful application of this module requires a reasonable working knowledge of the Rockwell Automation SLC hardware, the MVI46-104S Module 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 ensure that the information provided is accurate and a true reflection of the product's installation requirements. In order to ensure a complete understanding of the operation of the product, the user should read all applicable Rockwell Automation documentation on the operation of the Rockwell Automation hardware.

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Battery Life Advisory

All modules in the MVI series use a rechargeable Lithium Vanadium Pentoxide battery to backup the 512K SRAM memory, real-time clock, and CMOS. The battery should last for the life of the module.

The module must be powered for approximately twenty hours before it becomes fully charged. After it is fully charged, the battery provides backup power for the CMOS setup and configuration data, the real-time clock, and the 512K SRAM memory for approximately 21 days.

Before you remove a module from its power source, ensure that the battery within the module is fully charged. A fully charged battery will hold the BIOS settings (after being removed from its power source) for a limited number of days. When the battery is fully discharged, the module will revert to the default BIOS settings.

Note: The battery is not user replaceable.

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.

ProSoft Technology

1675 Chester Avenue, Fourth Floor
Bakersfield, CA 93301
+1 (661) 716-5100
+1 (661) 716-5101 (Fax)
<http://www.prosoft-technology.com>

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MVI46-104S User Manual
September 04, 2008

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ProSoft® Product Documentation

In an effort to conserve paper, ProSoft Technology no longer includes printed manuals with our product shipments. User Manuals, Datasheets, Sample Ladder Files, and Configuration Files are provided on the enclosed CD and are available at no charge from our web site: <http://www.prosoft-technology.com>

Printed documentation is available for purchase. Contact ProSoft Technology for pricing and availability.

Asia Pacific: +603.7724.2080

Europe, Middle East, Africa: +33.5.34.36.87.20

Latin America: +1.281.298.9109

North America: +1.661.716.5100

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Guide to the MVI46-104S User Manual

Function		Section to Read	Details
Introduction (Must Do)	→	Start Here (page 9)	This Section introduces the customer to the module. Included are: package contents, system requirements, hardware installation, and basic configuration.
Verify Communication, Diagnostic and Troubleshooting	→	Verifying Communication (page 53) Diagnostics and Troubleshooting (page 43)	This section describes how to verify communications with the network. Diagnostic and Troubleshooting procedures.
Reference Product Specifications Functional Overview Glossary	→	Reference (page 57) Functional Overview (page 60) Product Specifications	These sections contain general references associated with this product, Specifications, and the Functional Overview.
Support, Service, and Warranty Index	→	Support, Service and Warranty (page 83)	This section contains Support, Service and Warranty information. Index of chapters.

1 Start Here

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Installing the MVI46-104S module requires a reasonable working knowledge of the Rockwell Automation hardware, the MVI46-104S Module and the application in which they will be used.



Caution: It is important that those responsible for implementation can complete the application without exposing personnel, or equipment, to unsafe or inappropriate working conditions. Safety, quality and experience are key factors in a successful installation.

1.1 System Requirements

The MVI46-104S module requires the following minimum hardware and software components:

- Rockwell Automation SLC 5/02 M0/M1 capable processors (or newer), with compatible power supply and one free slot in the rack, for the MVI46-104S module. The module requires 800mA of available power.
- Rockwell Automation RSLogix 500 programming software.
- Rockwell Automation RSLinx communication software
- Pentium® II 500 MHz minimum. Pentium III 733 MHz (or better) recommended
- Supported operating systems:
 - Microsoft® Windows 98
 - Windows NT® (version 4 with SP4 or higher)
 - Windows 2000
 - Windows XP
- 32 Mbytes of RAM minimum, 64 Mbytes of RAM recommended
- 50 Mbytes of free hard disk space (or more based on application requirements)

- 16-color VGA graphics adapter, 640 x 480 minimum resolution (256 Color 800 × 600 recommended)
- CD-ROM drive
- 3.5 inch floppy disk drive
- HyperTerminal or other terminal emulator program capable of file transfers using Zmodem protocol.

1.2 Package Contents

The following components are included with your MVI46-104S module, and are all required for installation and configuration.

Important: Before beginning the installation, please verify that all of the following items are present.

Qty.	Part Name	Part Number	Part Description
1	MVI46-104S Module	MVI46-104S	IEC 60870-5-104 Slave Interface Module
1	Cable	Cable #15, RS232 Null Modem	For RS232 Connection to the CFG Port
1	Cable	RJ45 to DB9 Male Adapter	For DB9 Connection to Module's Port
1	inRAX Solutions CD		Contains sample programs, utilities and documentation for the MVI46-104S module.

If any of these components are missing, please contact ProSoft Technology Support for replacement parts.

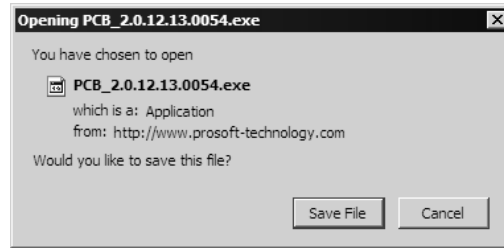
1.3 Install ProSoft Configuration Builder Software

You must install the ProSoft Configuration Builder (PCB) software in order to configure the MVI46-104S module. You can always get the newest version of ProSoft Configuration Builder from the ProSoft Technology web site.

To install ProSoft Configuration Builder from the ProSoft Web Site

- 1 Open your web browser and navigate to <http://www.prosoft-technology.com/pcb>
- 2 Click the **Download Here** link to download the latest version of ProSoft Configuration Builder.

- 3 Choose "Save" or "Save File" when prompted. The following illustrations show the file download prompt for two of the most common web browsers.



- 4 Make a note of the location where you saved the file, for example "Desktop", or "My Documents", so you can start the installation program.
- 5 When the download is complete, locate and open the file, and then follow the instructions on your screen to install the program.

If you do not have access to the Internet, you can install ProSoft Configuration Builder from the ProSoft Solutions CD-ROM, included in the package with your MVI46-104S module.

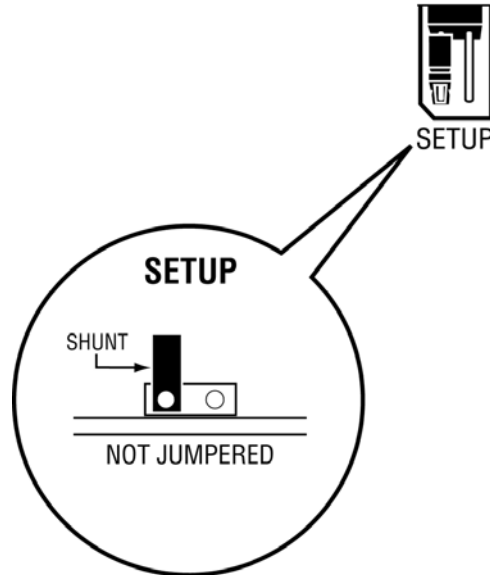
To install ProSoft Configuration Builder from the CD-ROM

- 1 Insert the ProSoft Solutions CD-ROM into the CD drive of your PC. Wait for the startup screen to appear.
- 2 On the startup screen, click *Product Documentation*. This action opens an explorer window.
- 3 Click to open the *Utilities* folder. This folder contains all of the applications and files you will need to set up and configure your module.
- 4 Double-click the *ProSoft Configuration Builder Setup* program and follow the instructions on your screen to install the software on your PC.

Note: Many of the configuration and maintenance procedures use files and other utilities on the CD-ROM. You may wish to copy the files from the Utilities folder on the CD-ROM to a convenient location on your hard drive.

1.4 Setting Jumpers

Note: The Setup Jumper acts as "write protection" for the module's flash memory. In "write protected" mode, the Setup pins are not connected, and the module's firmware cannot be overwritten. Do not jumper the Setup pins together unless you are directed to do so by ProSoft Technical Support.



1.5 Install the Module in the Rack

If you have not already installed and configured your SLC processor and power supply, please do so before installing the MVI46-104S module. Refer to your Rockwell Automation product documentation for installation instructions.

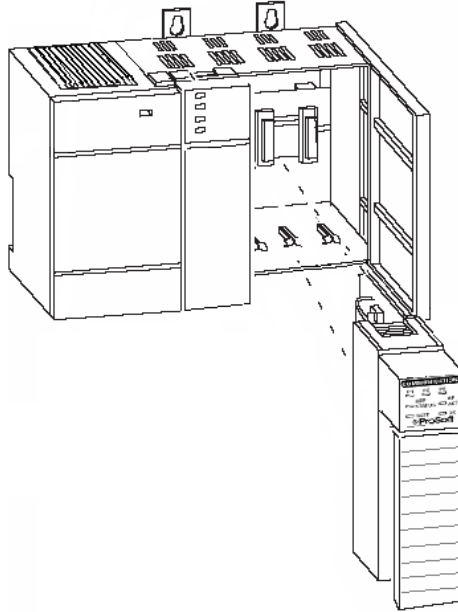
Warning: You must follow all safety instructions when installing this or any other electronic devices. Failure to follow safety procedures could result in damage to hardware or data, or even serious injury or death to personnel. Refer to the documentation for each device you plan to connect to verify that suitable safety procedures are in place before installing or servicing the device.

After you have checked the placement of the jumpers, insert MVI46-104S into the SLC™ chassis. Use the same technique recommended by Rockwell Automation to remove and install SLC™ modules.

Warning: This module is not hot-swappable! Always remove power from the rack before inserting or removing this module, or damage may result to the module, the processor, or other connected devices.

- 1 Turn power OFF.

- 2 Align the module with the top and bottom guides, and slide it into the rack until the module is firmly against the backplane connector.

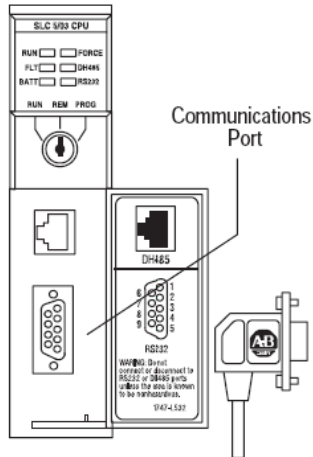


- 3 With a firm but steady push, snap the module into place.
- 4 Check that the holding clips on the top and bottom of the module are securely in the locking holes of the rack.
- 5 Make a note of the slot location. You will need to identify the slot in which the module is installed in order for the sample program to work correctly. Slot numbers are identified on the green circuit board (backplane) of the SLC rack.
- 6 Turn power ON.

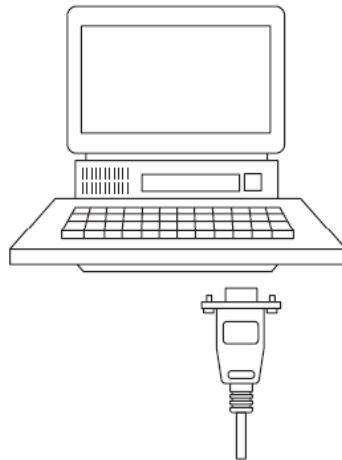
Note: If you insert the module improperly, the system may stop working, or may behave unpredictably.

1.6 Connect your PC to the Processor

- 1 Connect the right-angle connector end of the cable to your controller at the communications port.



- 2 Connect the straight connector end of the cable to the serial port on your computer.

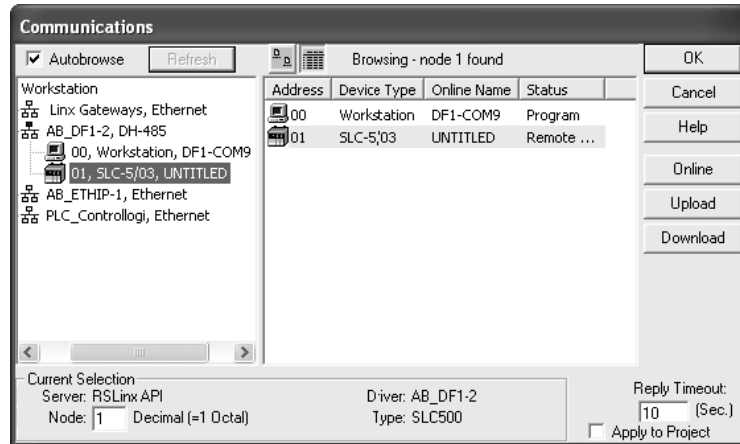


1.7 Download the Sample Program to the Processor

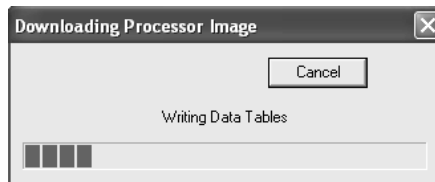
To download the sample program from RSLogix 500 to the SLC processor:

Note: The key switch on the front of the SLC processor must be in the REM position.

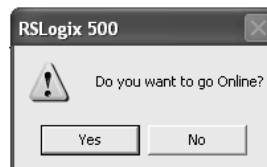
- 1 If you are not already online to the processor, open the Communications menu, and then choose Download. RSLogix will establish communication with the processor.



- 2 Click the Download button to transfer the sample program to the processor.
- 3 RSLogix will compile the program and transfer it to the processor. This process may take a few minutes.



- 4 When the download is complete, RSLogix will open another confirmation dialog box. Click Yes to switch the processor from Program mode to Run mode.

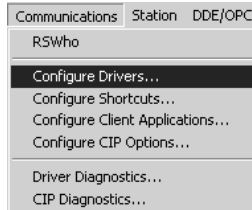


Note: If you receive an error message during these steps, refer to your RSLogix documentation to interpret and correct the error.

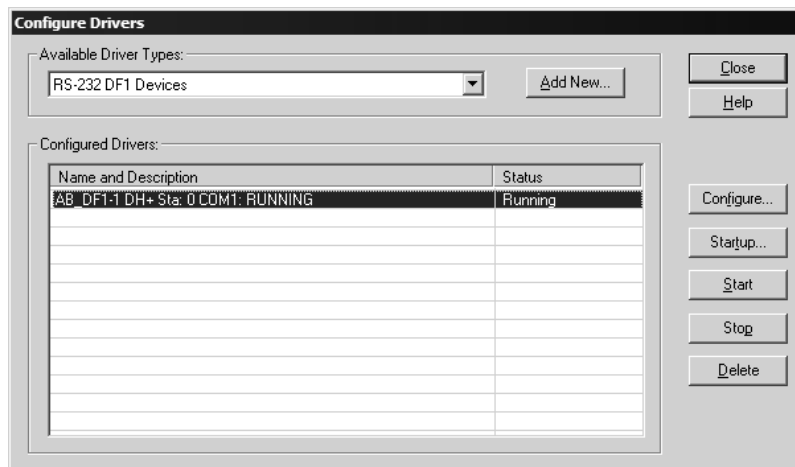
1.7.1 Configuring RSLinx

If RSLinx is unable to establish communication with the processor, follow these steps:

- 1 Open RSLinx.
- 2 Open the Communications menu, and choose Configure Drivers.



This action opens the Configure Drivers dialog box.



Note: If the list of configured drivers is blank, you must first choose and configure a driver from the Available Driver Types list. The recommended driver type to choose for serial communication with the processor is "RS-232 DF1 Devices".

- 3 Click to select the driver, and then click Configure. This action opens the Configure Allen-Bradley DF1 Communications Device dialog box.



- 4 Click the Auto-Configure button. RSLinx will attempt to configure your serial port to work with the selected driver.
- 5 When you see the message "Auto Configuration Successful", click the OK button to dismiss the dialog box.

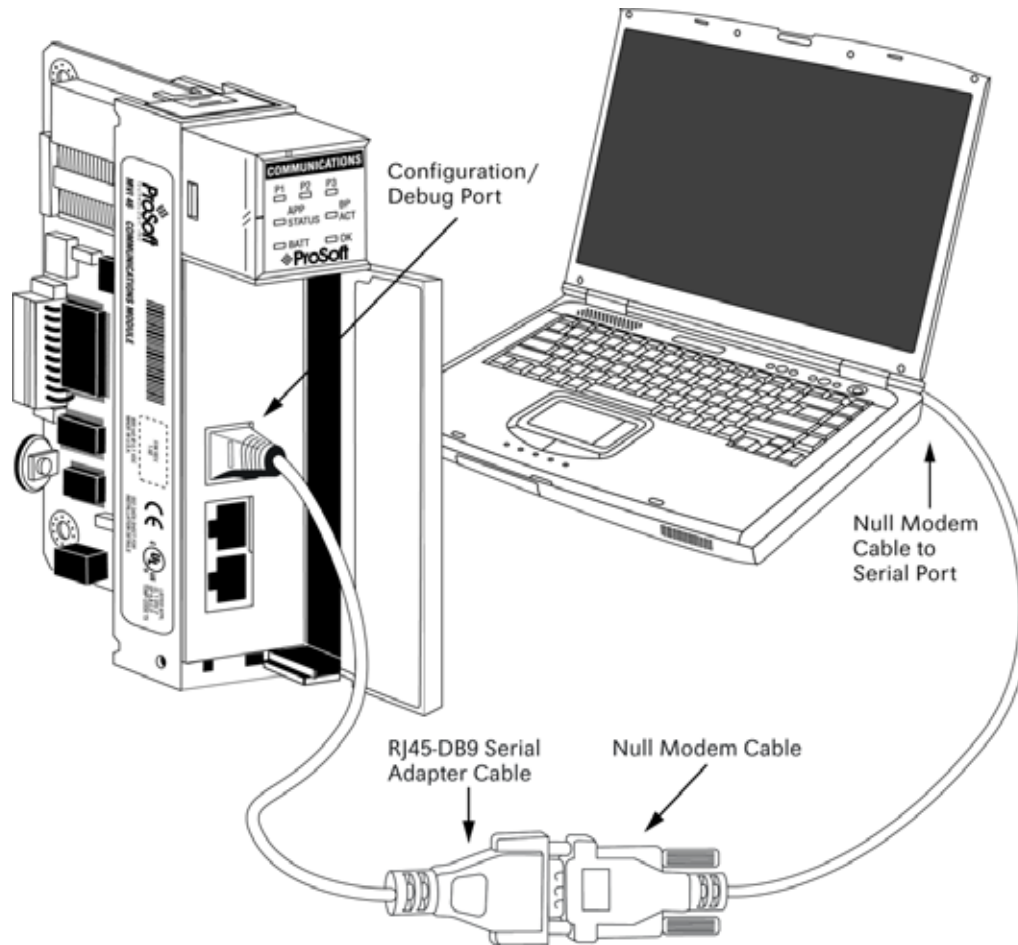
Note: If the auto-configuration procedure fails, verify that the cables are connected correctly between the processor and the serial port on your computer, and then try again. If you are still unable to auto-configure the port, refer to your RSLinx documentation for further troubleshooting steps.

1.8 Connect your PC to the Module

With the module securely mounted, connect your PC to the Configuration/Debug port using an RJ45-DB-9 Serial Adapter Cable and a Null Modem Cable.

- 1 Attach both cables as shown.
- 2 Insert the RJ45 cable connector into the Configuration/Debug port of the module.

- 3 Attach the other end to the serial port on your PC or laptop.



2 Module Configuration

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❖ [M_ME_NB_1 104]	36
❖ [M_IT_NA_1 104]	36
❖ [C_SC_NA_1 104]	36
❖ [C_DC_NA_1 104]	37
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This section contains the setup procedure, data and ladder logic requirements for successful application of the MVI46-104S module. Each step in the setup procedure is defined in order to simplify the use of the module. Go to the **Installing and Configuring the Module** section to begin installing and configuring the module. Additionally, this document contains a discussion on configuring the module using the IEC8704S.CFG file. All configuration information used by the module is stored in this file. Go to the **Configuration File** section to begin setting up this file.

The document also contains a discussion of the data areas defined for the module. These areas contain the read and write data from the module and status related to the module. It is important to understand each element of the data areas for proper application of the module. Go to the **Module Data** section for the presentation of the data areas.

The ladder logic requirement section defines the minimum ladder logic required to apply the module in a user application. The logic is simple to understand and implement. Go to the **Ladder Logic** section for a complete discussion of the ladder logic requirements.

2.1 Installing and Configuring the Module

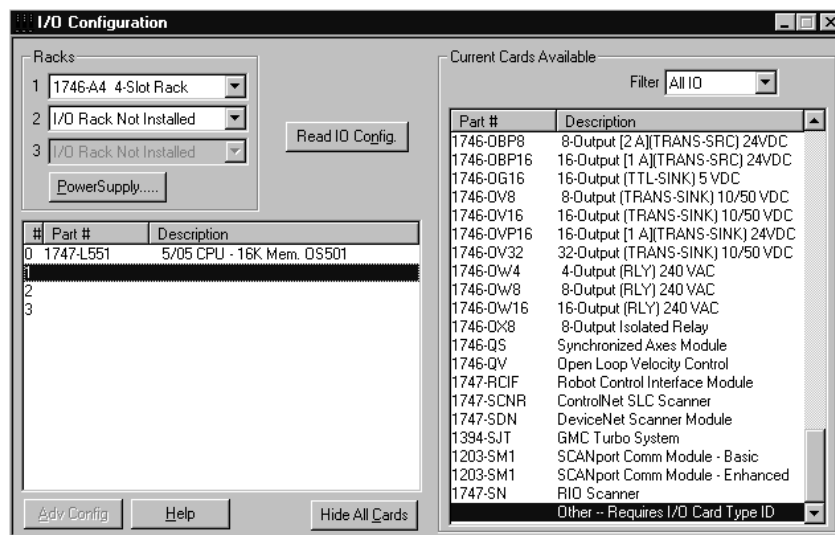
The configuration process consists of the following steps.

- 1 Download the sample program to the processor.

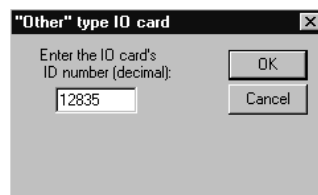
Note: For most applications, the sample program will work without modification. We strongly recommend setting up the module first with the sample program, before attempting to add the module to an existing application or create a custom application.

Modify the module's configuration files to meet the needs of your application, and copy the updated configuration to the module. Example configuration files are provided on the CD-ROM. Refer to Modifying the Configuration File (page 24) for more information on the configuration files.

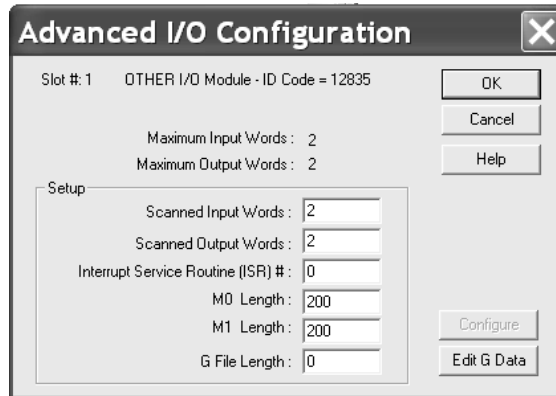
First, define the module to the system. Select the I/O Configuration option from the program screen. This displays the following dialog box:



Select the Other module from the list. This action opens the following dialog box.



Enter the module I/O card ID number as 12835, and then click OK. Double-click the mouse on the module just added to the rack. Fill in the dialog box presented as shown in the following example:



Click OK to apply these settings to the module. Then, close the I/O Configuration dialog box.

Next, define the user defined data areas to hold the status and read and write database areas. Edit the IEC8704S.CFG file now for the application to implement. Use any text editor to set the values in the file. You must retain the file name, IEC8704S.CFG.

The last step in the module setup is to add the ladder logic. If the example ladder logic is used, adjust the ladder to fit the application. When the ladder example is not used, copy the example ladder logic to your application and alter as necessary.

The module is now set up and ready to be used with your application. Insert the module in the rack and attach the serial communication cables. Download the IEC8704S.CFG file to the module. Download the new application to the controller and place the processor in run mode. If all the configuration parameters are set correctly and the module is attached to a network, the module's Application LED (APP LED) should remain off and the backplane activity LED (BP ACT) should blink very rapidly. Refer to the **Diagnostics and Troubleshooting** section of this manual you encounter errors. Attach a computer or terminal to Debug/Configuration port on the module and look at the status of the module using the Configuration/Debug Menu in the module.

2.2 Module Data

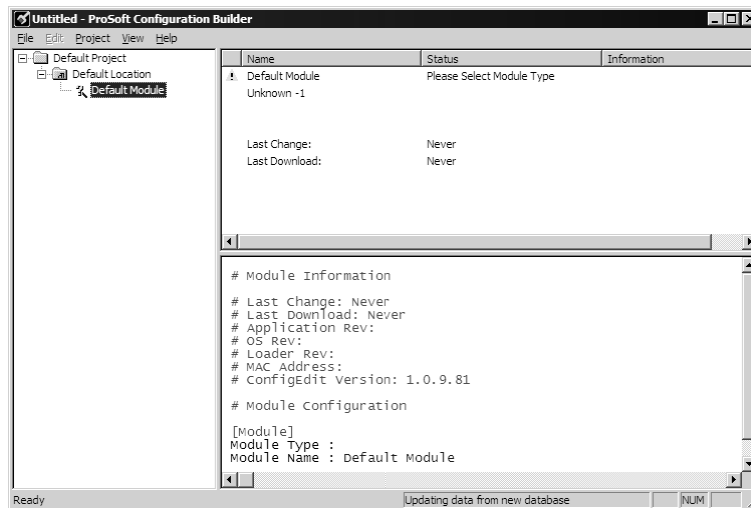
All data related to the MVI46-104S module is stored in a user defined data files and the module's M1 file. Files should be defined for each data type to be used with the module. Additionally, a file should be defined to hold the module status data. The status data should be copied from the M1 file and placed in the assigned status file. Input (monitor) data should be copied from the user file to the M1 file and output (command) data should be copied from the user files to the M1 file.

2.3 ProSoft Configuration Builder

ProSoft Configuration Builder (PCB) provides a quick and easy way to manage module configuration files customized to meet your application needs. PCB is not only a powerful solution for new configuration files, but also allows you to import information from previously installed (known working) configurations to new projects.

2.3.1 Set Up the Project

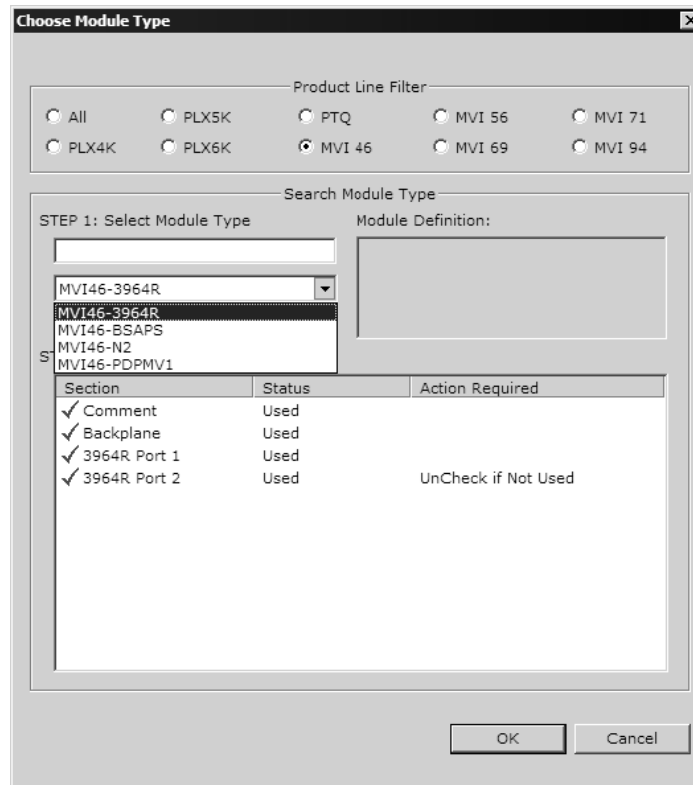
To begin, start ProSoft Configuration Builder. If you have used other Windows configuration tools before, you will find the screen layout familiar. ProSoft Configuration Builder's window consists of a tree view on the left, an information pane and a configuration pane on the right side of the window. When you first start ProSoft Configuration Builder, the tree view consists of folders for Default Project and Default Location, with a Default Module in the Default Location folder. The following illustration shows the ProSoft Configuration Builder window with a new project.



Your first task is to add the MVI46-104S module to the project.

- 1 Use the mouse to select "Default Module" in the tree view, and then click the right mouse button to open a shortcut menu.

- On the shortcut menu, choose "Choose Module Type". This action opens the Choose Module Type dialog box.



- In the Product Line Filter area of the dialog box, select MVI46. In the Select Module Type dropdown list, select MVI46-104S, and then click OK to save your settings and return to the ProSoft Configuration Builder window.

The next task is to set the module parameters.

Adding a Module

To add a module to your project:

- Double-click the Default Module icon to open the Choose Module Type dialog box.
- On the Choose Module Type dialog box, select the module type.

Or

- Open the Project menu and choose Location.
- On the Location menu, choose Add Module.

To add a module to a different location:

- 1 Right-click the Location folder and choose Add Module. A new module icon appears.

Or

- 1 Select the Location icon.
- 2 From the Project menu, select Location, then select Add Module.

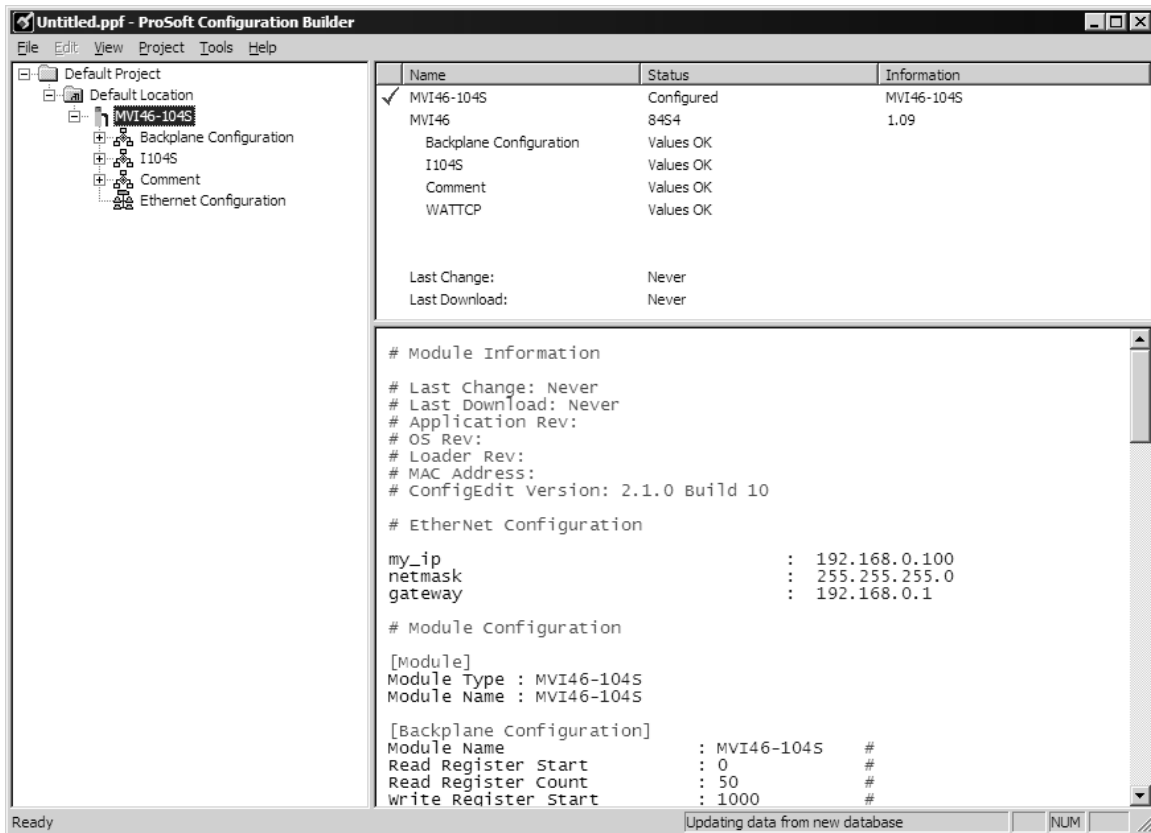
Adding a Project

To add a project to an existing project file:

- 1 Select the Default Project icon.
- 2 Choose Project from the Project menu, then choose Add Project. A new project folder appears.

2.3.2 Set Module Parameters

Notice that the contents of the information pane and the configuration pane changed when you added the MVI46-104S module to the project.





At this time, you may wish to rename the "Default Project" and "Default Location" folders in the tree view.



To rename an object:

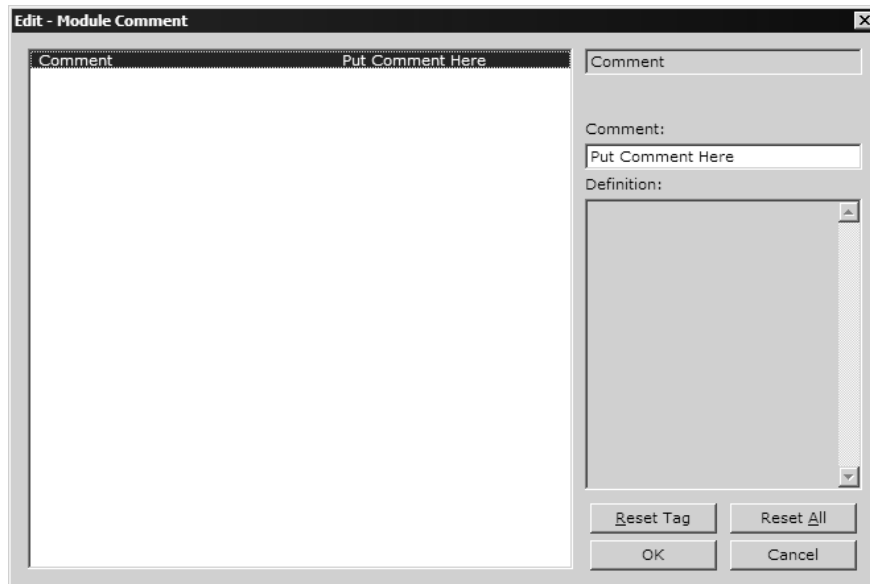
- 1 Select the object, and then click the right mouse button to open a shortcut menu. From the shortcut menu, choose Rename.
- 2 Type the name to assign to the object.
- 3 Click away from the object to save the new name.

Module EntriesTo configure module parameters

- 1 Click on the plus sign next to the icon  Comment to expand module information.
- 2 Double-click the  Module Comment icon to open the Edit dialog box.
- 3 To edit a parameter, select the parameter in the left pane and make your changes in the right pane.
- 4 Click OK to save your changes.

Comment EntriesTo add comments to your configuration file:

- 1 Click the plus sign to the left of the  Comment icon to expand the Module Comments.
- 2 Double-click the  Module Comment icon. The Edit - Module Comment dialog appears.



- 3 Enter your comment and click OK to save your changes.

Printing a Configuration File

To print a configuration file:

- 1 Select the Module icon, and then click the right mouse button to open a shortcut menu.
- 2 On the shortcut menu, choose View Configuration. This action opens the View Configuration window.
- 3 On the View Configuration window, open the File menu, and choose Print. This action opens the Print dialog box.
- 4 On the Print dialog box, choose the printer to use from the dropdown list, select printing options, and then click OK.

2.4 [Backplane Configuration]

This section provides the module with a unique name, identifies the method of failure for the communications for the module if the processor is not in run, and describes how to initialize the module upon startup.

2.4.1 Module Name

0 to 80 characters

This parameter assigns a name to the module that can be viewed using the configuration/debug port. Use this parameter to identify the module and the configuration file.

2.4.2 Failure Flag Count

0 through 65535

This parameter specifies the number of successive transfer errors that must occur before the communication ports are shut down. If the parameter is set to 0, the communication ports will continue to operate under all conditions. If the value is set larger than 0 (1 to 65535), communications will cease if the specified number of failures occur.

2.4.3 Error Offset

0 to 3980, or -1 to disable

This parameter specifies the database location where to write status data.

2.4.4 Initialize Output Data

```
Initialize Output Data      :      0 #0=No, 1=Yes read output values from  
                             #controller
```

Determines whether the module should read output values from the controller. 0 = No, 1 = Yes.

2.5 [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.

2.5.1 *Use IP List*

0 or 1

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.

2.5.2 *Override StartDT*

0 or 1

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.

2.5.3 *Clear Queue on Close*

0 or 1

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).

2.5.4 *t1 Timeout Set Value*

1 to 255

This is the timeout of send or test ASDUs 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.

2.5.5 *t2 Timeout Set Value*

1 to 255

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.

2.5.6 *t3 Timeout Set Value*

1 to 255

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.

2.5.7 *k (maximum queue)*

1 to 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.

2.5.8 *w (latest ack threshold)*

1 to 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.

2.5.9 *Time DB Offset*

-1 or 0 to 3994

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

2.5.10 Error Offset

0 to 3980, or -1 to disable

This parameter specifies the database location where to write status data.

2.5.11 Common Address of ASDU

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.

2.5.12 Cyclic Data Transmission

0 to 2^{32}

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.

2.5.13 Select/Operate Timeout

0 to 2^{32}

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.

2.5.14 Use ACTTERM with Setpoint

1 or 0

This parameter determines if an ACTTERM will be sent. If the parameter is set to 1, then setpoint commands will issue an ACTTERM when the command is complete. If the parameter is set to 0, ACTCON is the last response to a setpoint command.

2.5.15 Use ACTTERM with Step

1 or 0

This parameter determines if an ACTTERM will be sent. If the parameter is set to 1, then step commands will issue an ACTTERM when the command is complete. If the parameter is set to 0, ACTCON is the last response to a step command.

2.5.16 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.

2.5.17 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.

2.5.18 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.

2.5.19 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.

2.5.20 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.

2.5.21 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.

2.5.22 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.

2.5.23 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.

2.5.24 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.

2.5.25 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.

2.5.26 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.

2.5.27 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.

2.6 [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
```

2.7 [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.

2.7.1 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 $2^{31}-1$.

2.7.2 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 $2^{31}-1$.

2.7.3 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.

2.7.4 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. Range is 0 to 1000.

2.7.5 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.

2.7.6 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.

2.7.7 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.

2.7.8 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.

2.7.9 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.

2.7.10 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.

2.7.11 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.

2.7.12 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.

2.7.13 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.

2.7.14 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.

2.7.15 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).

2.8 [M_SP_NA_1 104]

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)

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

2.9 [M_DP_NA_1 104]

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):

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

2.10 [M_ST_NA_1 104]

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):

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

2.11 [M_ME_NA_1 104]

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:

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

2.12 [M_ME_NB_1 104]

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:

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

2.13 [M_IT_NA_1 104]

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):

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

2.14 [C_SC_NA_1 104]

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.

2.15 [C_DC_NA_1 104]

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.

2.16 [C_RC_NA_1 104]

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.

2.17 [C_SE_NA_1 104]

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.

2.18 [C_SE_NB_1 104]

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.

2.19 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

Group Code	Description
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

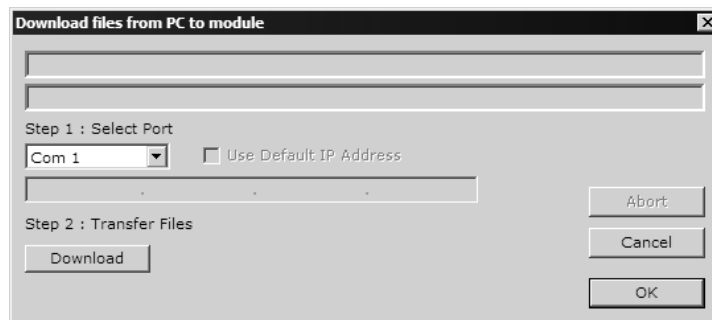
If the highest bit (bit 31) is set, data will be produced by the driver for the specified point at the rate set for periodic data generation. Bit 30 (0x40000000) enables scanning of this point for event generation. If the bit is clear and the data type is set for scanning, events will be generated for 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.

2.20 Download the Project to the Module

In order for the module to use the settings you configured, you must download (copy) the updated Project file from your PC to the module.

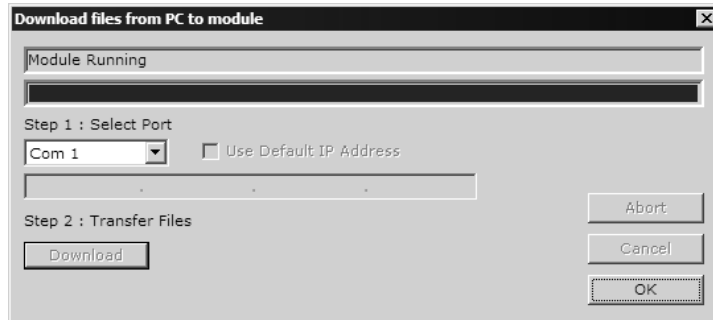
To Download the Project File

- 1 In the tree view in ProSoft Configuration Builder, click once to select the MVI46-104S module.
- 2 Open the **Project** menu, and then choose **Module / Download**. The program will scan your PC for a valid com port (this may take a few seconds). When PCB has found a valid com port, the following dialog box will open.



- 3 Choose the com port to use from the dropdown list, and then click the Download button.

The module will perform a platform check to read and load its new settings. When the platform check is complete, the status bar in ProSoft Configuration Builder will be updated with the message "Module Running".



3 Ladder Logic

Ladder logic is required for application of the MVI46-104S module. Tasks that must be handled by the ladder logic are module data transfer, special block handling and status data receipt. Additionally, a power-up handler may be needed to handle the initialization of the module's data and to clear any processor fault conditions.

The sample ladder logic, on the ProSoft Solutions CD-ROM, is extensively commented, to provide information on the purpose and function of each rung. For most applications, the sample ladder will work without modification.

4 Diagnostics and Troubleshooting

In This Chapter

- ❖ Reading Status Data from the Module 43
- ❖ LED Status Indicators..... 53

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.

4.1 Reading Status Data from the Module

The MVI46-104S module returns a 26-word Status Data block that can be used to determine the module's operating status. This data can be located in the module's database at registers at the location specified in the configuration. This data is transferred to the SLC processor M1 continuously. For a complete listing of the status data object, refer to the **Module Set Up Guide** section.

4.1.1 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.

4.1.2 The Configuration/Debug Menu

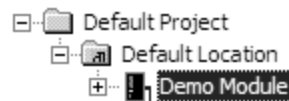
The Configuration and Debug menu for this module is arranged as a tree structure, with the Main Menu at the top of the tree, and one or more sub-menus for each menu command. The first menu you see when you connect to the module is the Main menu.

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.

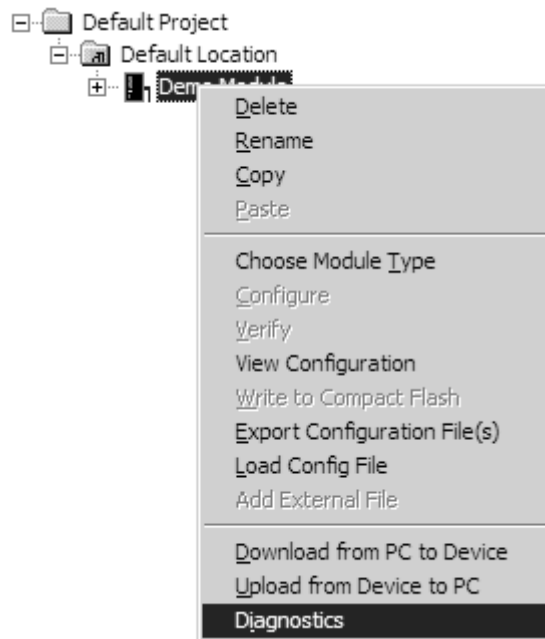
Using the Diagnostic Window in ProSoft Configuration Builder

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

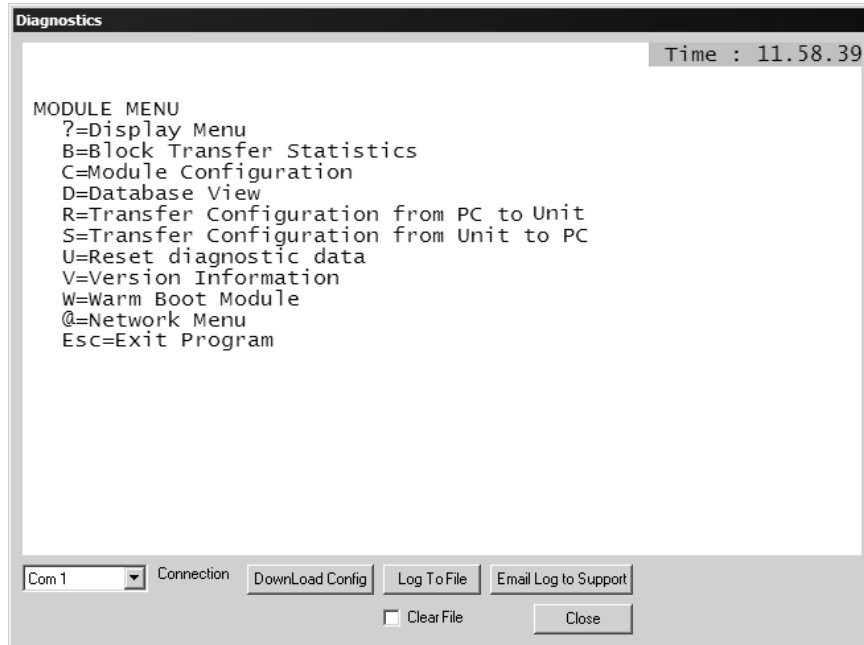
- 1 Start PCB program with the application file to be tested. Right click over the module icon.



- 2 On the shortcut menu, choose Diagnostics.



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



Important: The illustrations of configuration/debug menus in this section are intended as a general guide, and may not exactly match the configuration/debug menus in your own module.

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

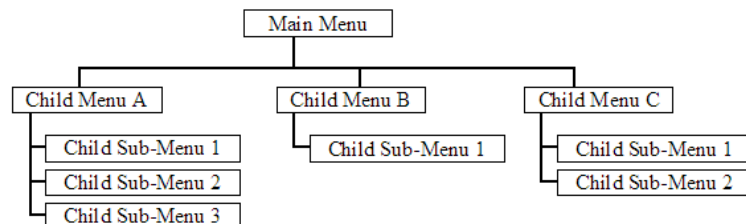
- 1 Verify that the null modem cable is connected properly between your computer's serial port and the module. A regular serial cable will not work.
- 2 On computers with more than one serial port, verify that your communication program is connected to the same port that is connected to the module.

If you are still not able to establish a connection, contact ProSoft Technology 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 [**i**] (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.

4.1.3 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:

```
IEC-870-5-104 SERVER COMMUNICATION MODULE (MVI46-104S) MENU
?=Display Menu
B=Block Transfer Statistics
C=Module Configuration
D=Database View
I=IEC-870-5-104 Menu
R=Receive Configuration File
S=Send Configuration File
T=Display e-mail setup
U=Version Information
W=Warn Boot Module
@=Network Menu
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.

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 60870-5-104 Menu

Press **[I]** to view all data associated with the IEC 60870-5-104 server driver.

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.

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.

Opening the Network Menu

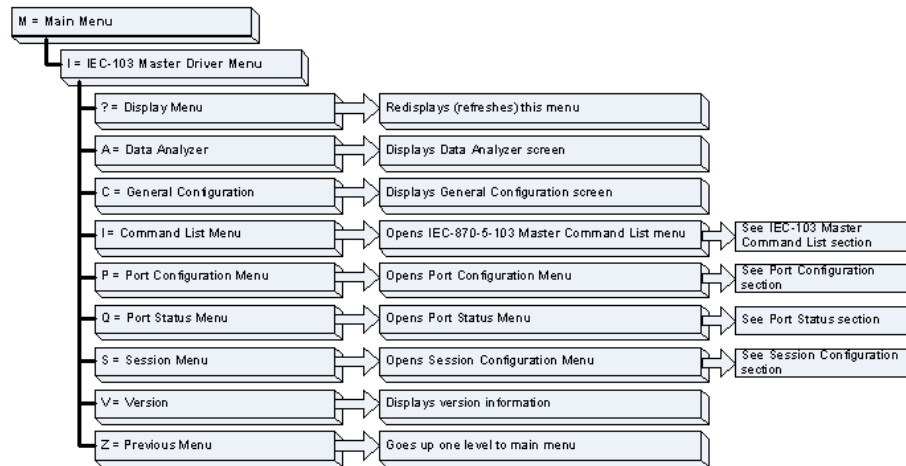
Press **[@]** to open the network menu. The network menu allows you to send, receive and view the WATTCP.CFG file that contains the IP, gateway and other network specification information. You can find more information about the commands on this menu in the Network Menu (page 52) section.

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.

4.1.4 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
  
```

Viewing Server Configuration

Press **[C]** to view configuration information for the server. Use this command to confirm that the module is correctly configured.

To change module configuration, edit and transfer the configuration file to the module.

Viewing Program Status

Press **[E]** to view the error/status data for the module.

Viewing a List of Valid Hosts

Press **[I]** the list of IP addresses the module will accept connections from. This list is only used if the module configuration parameter, Use IP List, is set to a value other than 0.

Returning to the Main Menu

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

Viewing Data Type Setup

To view setup information for each data type, press the matching key from the Menu.

Key	Data Type	Screen Example																								
1	M_SP_NA	<p>M_SP_NA Setup Menu Selected</p> <p>M_SP_NA Setup (0 to 2)</p> <table border="1"> <thead> <tr> <th>Index</th> <th>Point#</th> <th>DB</th> <th>Addr</th> <th>Group(s)</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>11</td> <td>0</td> <td></td> <td>80000001</td> <td>0</td> </tr> <tr> <td>1</td> <td>12</td> <td>1</td> <td></td> <td>80000001</td> <td>0</td> </tr> </tbody> </table>	Index	Point#	DB	Addr	Group(s)	Value	0	11	0		80000001	0	1	12	1		80000001	0						
Index	Point#	DB	Addr	Group(s)	Value																					
0	11	0		80000001	0																					
1	12	1		80000001	0																					
2	M_DP_NA	<p>M_DP_NA Setup Menu Selected</p> <p>M_DP_NA Setup (0 to 2)</p> <table border="1"> <thead> <tr> <th>Index</th> <th>Point#</th> <th>DB</th> <th>Addr</th> <th>Group(s)</th> <th>Bits</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>21</td> <td></td> <td>16</td> <td>00000002</td> <td>0 0</td> </tr> <tr> <td>1</td> <td>22</td> <td></td> <td>17</td> <td>00000002</td> <td>0 0</td> </tr> </tbody> </table>	Index	Point#	DB	Addr	Group(s)	Bits	0	21		16	00000002	0 0	1	22		17	00000002	0 0						
Index	Point#	DB	Addr	Group(s)	Bits																					
0	21		16	00000002	0 0																					
1	22		17	00000002	0 0																					
3	M_ST_NA	<p>M_ST_NA Setup Menu Selected</p> <p>M_ST_NA Setup (0 to 2)</p> <table border="1"> <thead> <tr> <th>Index</th> <th>Point#</th> <th>DB</th> <th>Addr</th> <th>Group(s)</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>31</td> <td></td> <td>6</td> <td>00000004</td> <td>0</td> </tr> <tr> <td>1</td> <td>32</td> <td></td> <td>7</td> <td>00000004</td> <td>0</td> </tr> </tbody> </table>	Index	Point#	DB	Addr	Group(s)	Value	0	31		6	00000004	0	1	32		7	00000004	0						
Index	Point#	DB	Addr	Group(s)	Value																					
0	31		6	00000004	0																					
1	32		7	00000004	0																					
4	M_ME_NA	<p>M_ME_NA Setup Menu Selected</p> <p>M_ME_NA Setup (0 to 2)</p> <table border="1"> <thead> <tr> <th>Index</th> <th>Point#</th> <th>DB</th> <th>Addr</th> <th>Group(s)</th> <th>Deadband</th> <th>Value</th> <th>Norm. Va</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>41</td> <td></td> <td>4</td> <td>00000008</td> <td>0</td> <td>0</td> <td>0.000000</td> </tr> <tr> <td>1</td> <td>42</td> <td></td> <td>5</td> <td>00000008</td> <td>0</td> <td>0</td> <td>0.000000</td> </tr> </tbody> </table>	Index	Point#	DB	Addr	Group(s)	Deadband	Value	Norm. Va	0	41		4	00000008	0	0	0.000000	1	42		5	00000008	0	0	0.000000
Index	Point#	DB	Addr	Group(s)	Deadband	Value	Norm. Va																			
0	41		4	00000008	0	0	0.000000																			
1	42		5	00000008	0	0	0.000000																			
5	M_ME_NB	<p>M_ME_NB Setup Menu Selected</p> <p>M_ME_NB Setup (0 to 2)</p> <table border="1"> <thead> <tr> <th>Index</th> <th>Point#</th> <th>DB</th> <th>Addr</th> <th>Group(s)</th> <th>Deadband</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>51</td> <td></td> <td>6</td> <td>00000010</td> <td>1</td> <td>0</td> </tr> <tr> <td>1</td> <td>52</td> <td></td> <td>7</td> <td>00000010</td> <td>1</td> <td>0</td> </tr> </tbody> </table>	Index	Point#	DB	Addr	Group(s)	Deadband	Value	0	51		6	00000010	1	0	1	52		7	00000010	1	0			
Index	Point#	DB	Addr	Group(s)	Deadband	Value																				
0	51		6	00000010	1	0																				
1	52		7	00000010	1	0																				
6	M_IT_NA	<p>M_IT_NA Setup Menu Selected</p> <p>M_IT_NA Setup (0 to 2)</p> <table border="1"> <thead> <tr> <th>Index</th> <th>Point#</th> <th>DB</th> <th>Addr</th> <th>Group(s)</th> <th>Value</th> <th>FROZEN</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>61</td> <td></td> <td>4</td> <td>00020000</td> <td>0</td> <td>0</td> </tr> <tr> <td>1</td> <td>62</td> <td></td> <td>5</td> <td>00040000</td> <td>0</td> <td>0</td> </tr> </tbody> </table>	Index	Point#	DB	Addr	Group(s)	Value	FROZEN	0	61		4	00020000	0	0	1	62		5	00040000	0	0			
Index	Point#	DB	Addr	Group(s)	Value	FROZEN																				
0	61		4	00020000	0	0																				
1	62		5	00040000	0	0																				
7	C_SC_NA	<p>C_SC_NA Setup Menu Selected</p> <p>C_SC_NA Setup (0 to 2)</p> <table border="1"> <thead> <tr> <th>Index</th> <th>Point#</th> <th>DB</th> <th>Addr</th> <th>MPnt#</th> <th>MPntDb</th> <th>ReqSel</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>700</td> <td></td> <td>1600</td> <td>2000</td> <td>3200</td> <td>0</td> <td>0</td> </tr> <tr> <td>1</td> <td>701</td> <td></td> <td>1601</td> <td>2010</td> <td>3201</td> <td>0</td> <td>0</td> </tr> </tbody> </table>	Index	Point#	DB	Addr	MPnt#	MPntDb	ReqSel	Value	0	700		1600	2000	3200	0	0	1	701		1601	2010	3201	0	0
Index	Point#	DB	Addr	MPnt#	MPntDb	ReqSel	Value																			
0	700		1600	2000	3200	0	0																			
1	701		1601	2010	3201	0	0																			
8	C_DC_NA	<p>C_DC_NA Setup Menu Selected</p> <p>C_DC_NA Setup (0 to 2)</p> <table border="1"> <thead> <tr> <th>Index</th> <th>Point#</th> <th>DB</th> <th>Addr</th> <th>MPnt#</th> <th>MPntDb</th> <th>ReqSel</th> <th>Bits</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>800</td> <td></td> <td>1616</td> <td>3000</td> <td>3216</td> <td>0</td> <td>0 0</td> </tr> <tr> <td>1</td> <td>801</td> <td></td> <td>1617</td> <td>3090</td> <td>3217</td> <td>0</td> <td>0 0</td> </tr> </tbody> </table>	Index	Point#	DB	Addr	MPnt#	MPntDb	ReqSel	Bits	0	800		1616	3000	3216	0	0 0	1	801		1617	3090	3217	0	0 0
Index	Point#	DB	Addr	MPnt#	MPntDb	ReqSel	Bits																			
0	800		1616	3000	3216	0	0 0																			
1	801		1617	3090	3217	0	0 0																			

Key	Data Type	Screen Example																								
9	C_RC_NA	C_RC_NA Setup Menu Selected C_RC_NA Setup (0 to 2) <table border="1"> <thead> <tr> <th>Index</th> <th>Point#</th> <th>DB Addr</th> <th>MPnt#</th> <th>MPntDb</th> <th>ReqSel</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>900</td> <td>51</td> <td>8000</td> <td>30</td> <td>0</td> <td>0</td> </tr> <tr> <td>1</td> <td>901</td> <td>52</td> <td>8888</td> <td>31</td> <td>0</td> <td>0</td> </tr> </tbody> </table>	Index	Point#	DB Addr	MPnt#	MPntDb	ReqSel	Value	0	900	51	8000	30	0	0	1	901	52	8888	31	0	0			
Index	Point#	DB Addr	MPnt#	MPntDb	ReqSel	Value																				
0	900	51	8000	30	0	0																				
1	901	52	8888	31	0	0																				
0	C_SE_NA	C_SE_NA Setup Menu Selected C_SE_NA Setup (0 to 2) <table border="1"> <thead> <tr> <th>Index</th> <th>Point#</th> <th>DB Addr</th> <th>MPnt#</th> <th>MPntDb</th> <th>ReqSel</th> <th>Value</th> <th>Norm</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>1000</td> <td>105</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0.0</td> </tr> <tr> <td>1</td> <td>1001</td> <td>106</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0.0</td> </tr> </tbody> </table>	Index	Point#	DB Addr	MPnt#	MPntDb	ReqSel	Value	Norm	0	1000	105	0	0	0	0	0.0	1	1001	106	0	0	0	0	0.0
Index	Point#	DB Addr	MPnt#	MPntDb	ReqSel	Value	Norm																			
0	1000	105	0	0	0	0	0.0																			
1	1001	106	0	0	0	0	0.0																			
Shift 1	C_SE_NB	C_SE_NB Setup Menu Selected C_SE_NB Setup (0 to 2) <table border="1"> <thead> <tr> <th>Index</th> <th>Point#</th> <th>DB Addr</th> <th>MPnt#</th> <th>MPntDb</th> <th>ReqSel</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>1100</td> <td>107</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>1</td> <td>1101</td> <td>108</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> </tbody> </table>	Index	Point#	DB Addr	MPnt#	MPntDb	ReqSel	Value	0	1100	107	0	0	0	0	1	1101	108	0	0	0	0			
Index	Point#	DB Addr	MPnt#	MPntDb	ReqSel	Value																				
0	1100	107	0	0	0	0																				
1	1101	108	0	0	0	0																				
Shift 4	C_SE_NC	C_SE_NC Setup Menu Selected C_SE_NC Setup (0 to 2) <table border="1"> <thead> <tr> <th>Index</th> <th>Point#</th> <th>DB Addr</th> <th>MPnt#</th> <th>MPntDb</th> <th>ReqSel</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>1200</td> <td>55</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>1</td> <td>1201</td> <td>56</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> </tbody> </table>	Index	Point#	DB Addr	MPnt#	MPntDb	ReqSel	Value	0	1200	55	0	0	0	0	1	1201	56	0	0	0	0			
Index	Point#	DB Addr	MPnt#	MPntDb	ReqSel	Value																				
0	1200	55	0	0	0	0																				
1	1201	56	0	0	0	0																				

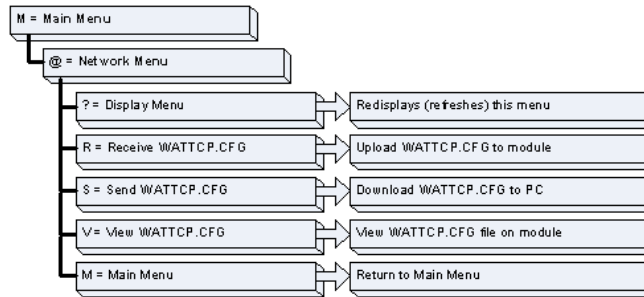
Viewing IEC 60870 Database Configuration

Press [@] to view the database size configuration information.

```
IEC-870-5-101 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_SI_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_IT_NA point count = 4
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
```

4.1.5 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.

```
Network Menu Selected
WATTCP.CFG FILE:
# ProLinx Communication Gateways, Inc.
#
# Default private class 3 address
my_ip=192.168.0.135
#
# Default class 3 network mask
netmask=255.255.255.0
#
# The gateway I wish to use
gateway=192.168.0.1
#Parameters used by the ProLinx Communication Gateways, Inc. module
#Local_Domain_Name=mycompany.com
#Password=PASSWORD
```

Returning to the Main Menu

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

4.2 LED Status Indicators

The LEDs indicate the module's operating status as follows:

ProSoft Module	Color	Status	Indication
CFG	Green	On	Data is being transferred between the module and a remote terminal using the Configuration/Debug port.
		Off	No data is being transferred on the Configuration/Debug port.
P1	Green	On	Not used in this application
		Off	Not used in this application
P2	Green	On	Not used in this application
		Off	Not used in this application
APP	Amber	Off	The MVI46-104S is working normally.
		On	The MVI46-104S module program has recognized a communication error on one of its ports.
BP ACT	Amber	On	The LED is on when the module is performing a write operation on the backplane.
		Off	The LED is off when the module is performing a read operation on the backplane. Under normal operation, the LED should blink rapidly on and off.
OK	Red/ Green	Off	The card is not receiving any power and is not securely plugged into the rack.
		Green	The module is operating normally.
		Red	The program has detected an error or is being configured. If the LED remains red for over 10 seconds, the program has probably halted.
BAT	Red	Off	The battery voltage is OK and functioning.
		On	The battery voltage is low or battery is not present. Allow battery to charge by keeping module plugged into rack for 24 hours. If BAT LED still does not go off, contact ProSoft Technology, as this is not a user serviceable item.

If the APP, BP ACT and OK LEDs blink at a rate of every one-second, this indicates a serious problem with the module. Call ProSoft Technology support to arrange for repairs.

In addition to these LEDs, the module contains two LEDs under the module's door. The LED on the left (green) displays the link status. If the module is connected properly to a Hub, this LED should be illuminated. The LED on the right (amber) is the data indication LED. Whenever the module is sending or receiving data on the Ethernet interface, this LED will be illuminated.

4.2.1 Ethernet LED Indicators

LED	State	Description
Data	Off	No activity on the port.
	Green Flash	The port is either actively transmitting or receiving data.
Link	Off	No connection to hub or network is detected.
	Green Solid	Connected to hub or network correctly. This is the normal operating state.

4.2.2 Clearing a Fault Condition

Typically, if the OK LED on the front of the module turns red for more than ten seconds, a hardware problem has been detected in the module, or the program has exited.

To clear the condition, follow these steps:

- 1 Turn off power to the rack
- 2 Remove the card from the rack
- 3 Verify that all jumpers are set correctly
- 4 If the module requires a Compact Flash card, verify that the card is installed correctly
- 5 Re-insert the card in the rack and turn the power back on
- 6 Verify the configuration data being transferred to the module from the SLC processor.

If the module's OK LED does not turn green, verify that the module is inserted completely into the rack. If this does not cure the problem, contact ProSoft Technology Support.

4.2.3 Troubleshooting

Use the following troubleshooting steps if you encounter problems when the module is powered up. If these steps do not resolve your problem, please contact ProSoft Technology Technical Support.

Processor Errors

Problem Description	Steps to take
Processor Fault	Verify that the module is plugged into the slot that has been configured for the module. Verify that the slot in the rack configuration has been set up correctly in the ladder logic.
Processor I/O LED flashes	This indicates a problem with backplane communications. Verify that all modules in the rack are configured in the ladder logic.

Module Errors

Problem Description	Steps to take
BP ACT LED remains off or blinks slowly	<p>This indicates that backplane transfer operations are failing. Connect to the module's Configuration/Debug port to check this.</p> <p>To establish backplane communications, verify the following items:</p> <ul style="list-style-type: none">▪ The processor is in Run mode.▪ The backplane driver is loaded in the module.▪ The module is configured for read and write block data transfer.▪ The ladder logic handles all read and write block situations.▪ The module is configured in the processor.
OK LED remains red	<p>The program has halted or a critical error has occurred. Connect to the Configuration/Debug port to see if the module is running. If the program has halted, turn off power to the rack, remove the card from the rack and re-insert the card in the rack, and then restore power to the rack.</p>

5 Reference

In This Chapter

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❖ MVI46-104S Status Data Definition	68
❖ MVI46-104S Database Design Forms	69
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5.1 Product Specifications

The MVI46-104S ("IEC 60870-5-104 Server Communication Module") allows Rockwell Automation SLC I/O compatible processors to interface easily with other IEC 60870-5-104 protocol compatible devices. The standards used in developing the product are listed in the following table:

PUBLICATION	TITLE
IEC 60870-5-101	Companion Standard for Basic Telecontrol Tasks
IEC 60870-5-101 Amendment 1	Companion Standard for Basic Telecontrol Tasks
IEC 60870-5-1	Transmission Frame Formats
IEC 60870-5-2	Link Transmission Procedures
IEC 60870-5-3	General Structure of Application Data
IEC 60870-5-4	Definition and Coding of Application Information Elements
IEC 60870-5-5	Basic Application Functions
IEC 60870-5-104	Network access for IEC 60870-5-101 using standard transport profiles
ITU-T Recommendation X.25	Interface between Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE) for terminals operating in the packet mode and connected to public data networks by dedicated circuit
IEEE 802.3	Information technology: Telecommunications and information exchange between systems - Local and metropolitan area networks
RFC 791	Internet Protocol
RFC 793	Transmission Control Protocol
RFC 894	Internet Protocol on Ethernet Networks
RFC 1700	Assigned Numbers
RFC 2200	Internet Official Protocol Standards

Refer to these standards for any questions on the protocol and data types supported.

5.1.1 Features and Benefits

The MVI46-104S module acts as an input/output module between the IEC-870-5-104 Ethernet network and the SLC backplane. Data transfer between the module and the processor is asynchronous from the actions on the network. Databases are defined by the user for the module to hold data as required by the protocol.

5.1.2 General Specifications

- Single Slot - 1746 backplane compatible (Local or extended I/O rack only. Remote rack not supported)
- The module is recognized as an Input/Output module and has access to processor memory for data transfer between processor and module using M0/M1 files
- Ladder Logic is used for data transfer between module and processor. Sample ladder file included
- Configuration data obtained from configuration text file downloaded to module. Sample configuration file included

5.1.3 Hardware Specifications

Specification	Description
Backplane Current Load	800 ma @ 5V (from backplane)
Operating Temperature	0 to 60°C (32 to 140°F)
Storage Temperature	-40 to 85°C (-40 to 185°F)
Relative Humidity	5% to 95% (non-condensing)
Shock	30g operational, 50g non-operational
Vibration	5 g from 10150 Hz
Processor	Compatible with Rockwell Automation SLC 5/02 M0/M1 capable processors or newer
LED indicators	Module status, Backplane transfer status, Application status, Serial activity (debug port), Ethernet link and activity, and error LED status
Debug/Configuration port (CFG)	
CFG Port (CFG)	RJ45 (DB-9M with supplied cable) RS-232 only No hardware handshaking
Configuration Connector	RJ45 RS-232 Connector (RJ45 to DB-9 cable shipped with unit)
Application Ports	
Ethernet Port (Ethernet Modules)	RJ45 Connector Link and activity LED indicators Electrical Isolation 1500 V rms at 50 Hz to 60 Hz for 60 s, applied as specified in section 5.3.2 of IEC 60950: 1991 Ethernet Broadcast Storm Resiliency = less than or equal to 5000 [ARP] frames-per-second and less than or equal to 5 minutes duration

5.1.4 Functional Specifications

The MVI46-104S module accepts data read/write commands from a master/client on the network. In addition, the module can be configured to generate unsolicited messages in either a spontaneous or cyclic fashion.

The module has 4000 words of user defined internal register space that are accessible to the protocol driver and to the SLC processor memory. Any of the supported database types can be individually located (within the total database size limit of 4000 words) and each database point is mapped within the module and can be assigned to one or more Groups. The supported database point types are:

Database Type	Description
M_SP_NA	Monitored single-point database
M_DP_NA	Monitored dual-point database
M_ST_NA	Monitored step-point database
M_ME_NA	Monitored normalized-point database
M_ME_NB	Monitored scaled-point database
M_ME_NC	Monitored short-float point database
M_IT_NA	Monitored integrated total database
C_SC_NA	Command single-point database
C_DC_NA	Command dual-point database
C_RC_NA	Command step-point database
C_SE_NA	Command normalized-point database
C_SE_NB	Command scaled-point database
C_SE_NC	Command short-float point database

IEC 60870-5-104 Server Specifications

Operating in the Server mode, the module accepts commands from a Client(s) to read/write data stored in the module's internal registers. This data is easily and continuously transferred between the MVI module and the SLC processor's data registers.

The IEC 60870-5-104 Server functionality supported by the module includes:

- The IEC 60870-5-104 communication driver is built in accordance to the approved IEC specification
- The module functions as a Server on the network supporting data read/write commands from an IEC 60870-5-104 client on the network
- One TCP server socket
- Supports unsolicited messages, either cyclic or spontaneous (cyclic rate is configurable)
- Supports clock synchronization commands from client or from the SLC
- Supports Group interrogation (Global, General 1 to 16, Global Counters, Counters 1 to 4)
- Event timestamping configurable by type (None, 24 bit, 56 bit)
- Event queue supports 99 points for each data type
- Optional user defined list of acceptable client host IP addresses

-
- Configurable Common ASDU address (sector) and Information Object Address
 - An IEC Interoperability Document for the MVI46 is available which fully documents data types supported by the module

5.2 Functional Overview

This section provides an overview of how the MVI46-104S module transfers data using the 104S protocol. You should understand the important concepts in this chapter before you begin installing and configuring the module.

5.2.1 General Concepts

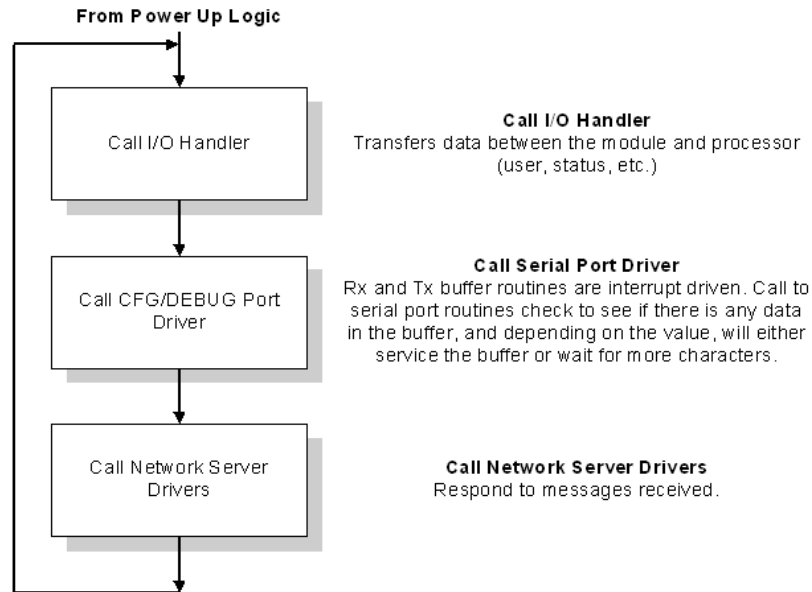
The following topics describe several concepts that are important for understanding the operation of the MVI46-104S module.

- 1 Initialize hardware components
- 2 Initialize SLC backplane driver
- 3 Test and Clear all RAM
- 4 Initialize the serial communication port
- 5 Initialize the Ethernet driver and TCP/IP stack
- 6 Reads configuration from Compact Flash Disk
- 7 Initialize Module Register space
- 8 Enable Server Driver for TCP/IP stack

After the module has received the Module Configuration, the module will begin communicating with other nodes on the network, depending on the configuration.

Main Logic Loop

Upon completing the power up configuration process, the module enters an infinite loop that performs the functions shown in the following diagram.

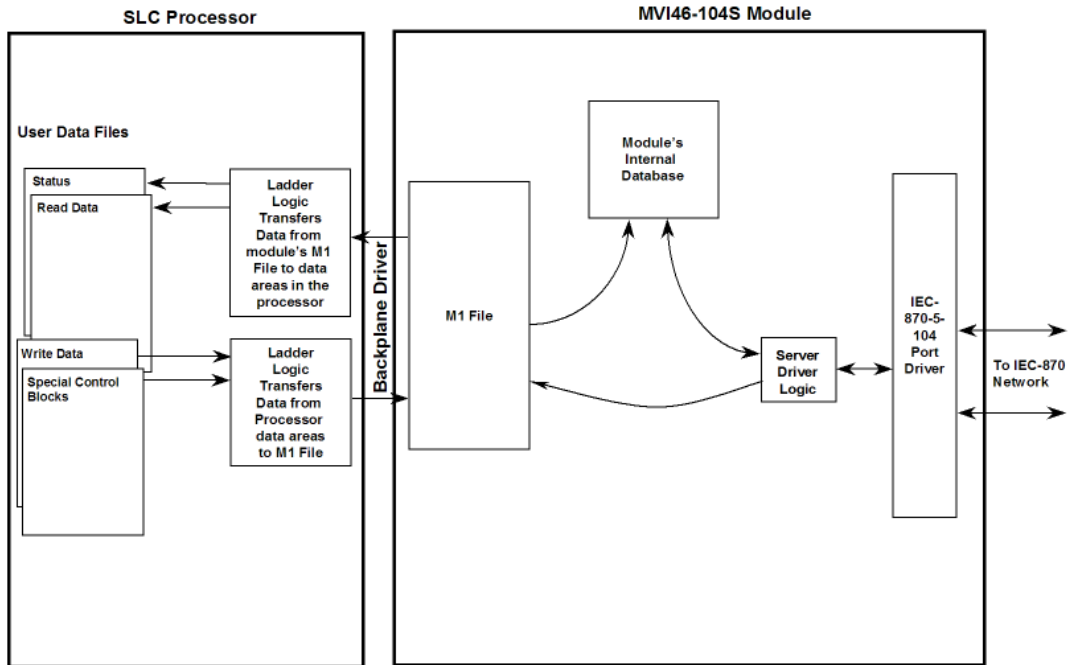
SLC Processor Not in Run

Whenever the module detects that the processor has gone out of the Run mode (that is, Fault or PGM), the protocol ports can be shut down as prescribed in the user configuration. When the processor is returned to a running state, the module will resume communications on the network.

Backplane Data Transfer

The MVI46-104S module communicates directly over the SLC backplane. All data for the module is contained in the module's M1 file. Data is moved between the module and the SLC processor across the backplane using the module's M1 file. The SLC scan rate and the communication load on the module determine the update frequency of the M1 file. The COP instruction can be used to move data between user data files and the module's M1 file.

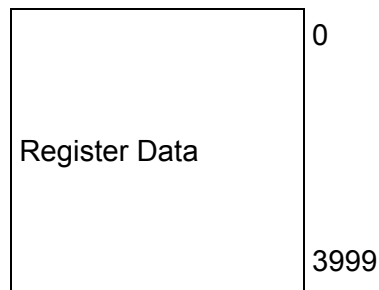
The following illustration shows the data transfer method used to move data between the SLC processor, the MVI46-104S module and the IEC 60870-5-104 network.



All data transferred between the module and the processor over the backplane is through the M1 file. Ladder logic must be written in the SLC processor to interface the M-file data with data defined in the user-defined data files in the SLC. All data used by the module is stored in its internal database. The following illustration shows the layout of the database:

Module's Internal Database Structure

4000 registers for user data



Data contained in this database is constantly updated with the M1 file data by the module and requires no SLC ladder logic to implement. A reserved word in the M1 and database, address 3999, is used as a control register for module control by the ladder logic and for control of the ladder logic by the module.

If the processor places a value of 9998 in this register, the module will perform a warm-boot operation. If the processor places a value of 9999 in this register, the module will perform a cold-boot operation. In this application module, both of these operations perform the same function. They exit the program and then restart the program. Many of the program parameters set in the user configuration must be set at program initialization and cannot be set while the program is running. Therefore, both functions operate the same.

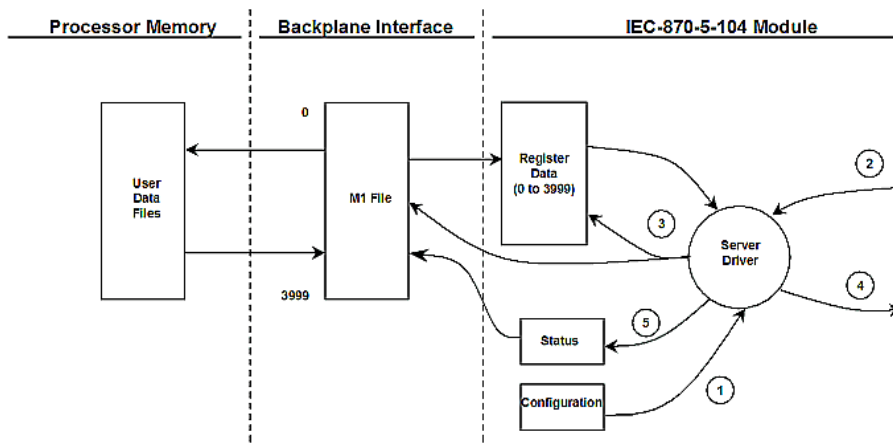
The module can be configured to have the output data in the module set to that stored in the SLC processor during program initialization. This feature requires ladder logic support. When the module performs a restart operation, it will set the output area of the M1 file to the current values stored in the processor. The module requests this action by placing a value of 1000 in the control register. After the ladder logic has completely built the M1 file image, it will set the control register to a value of 1001. This informs the module that the initialization is complete and the program can continue with the startup procedure.

5.2.2 Data Flow Between MVI46-104S Module and SLC Processor

The following topics describe the flow of data between the two pieces of hardware (SLC processor and MVI46-104S module) and the IEC 60870-5-104 master unit.

Server Driver

The Server Driver allows the MVI46-104S module to respond to data read and write commands issued by a master unit on the Ethernet network. The following flow chart and associated table describe the flow of data into and out of the module.



Step	Description
1	The server driver receives the configuration information from the Compact Flash Disk in the module. This information configures the driver and define the node characteristics.
2	A Host device issues a read or write command (I-format messages) to the module's node address. The driver qualifies the message before accepting it into the module. Additionally, the host can send S- and U-format messages to the module that will also be handled by the driver.
3	After the module accepts the message, the data is immediately transferred to or from the internal database in the module. If the command is a read command, the data is read out of the database and a response message is built. If the command is a write command, the data is written directly into the database and the M1 file and a response message is built. The module will also generate messages without being queried by the host. These messages include spontaneous and cyclic COT messages. Additionally, the driver may send S- and U-format messages as required by the user set timeout parameters.
4	After the data processing has been completed in Step 3, the response is issued to the originating master node.
5	Counters are available in the Status Block that permit the ladder logic program to determine the level of activity of the Driver.

Review the **Module Set Up** section for a complete list of the parameters that must be defined for a server. The IEC 60870-5-104 Interoperability Document for the MVI46-104S Server Module contains a listing of the protocol support supplied in the module.

5.2.3 Databases

This section discusses the databases utilized by the module to support the IEC 60870-5-104 protocol of the IEC-870-5-101 data types. The user is responsible for defining the databases for their specific application. In the module's configuration file, the size of each database and definition of each point is established. Refer to the **Module Set Up** section for a complete discussion of the configuration file. The following table summarizes the data types used in each of the 11 individual databases.

A key concept in interfacing the protocol with the SLC processor is the relationship between the databases and the data transfer operation between the module and the processor. The module does not transfer any of the database information to the M1 file. The M1 file is altered only through ladder logic operations or through command messages received on the serial port. When a command message is received by the module, both the M1 file and the internal database addresses are concurrently updated.

Data in the M1 file is constantly moved to the internal database for use by the module. Both the input (monitor) and output (command) data are stored in the M1 file and are transferred to the module's database. This does not require any ladder logic. Ladder logic is required to move the M1 file data areas associated with output data to user files in the SLC and to move input data from user files to the M1 file.

5.3 Cable Connections

The MVI46-104S module has the following communication connections on the module:

- One Ethernet port (RJ45 connector)
- One RS-232 Configuration/Debug port (RJ45 connector)

5.3.1 Ethernet Connection

The MVI46-104S module has an RJ45 port located on the front of the module labeled "Ethernet", for use with the TCP/IP network. The module is connected to the Ethernet network using an Ethernet cable between the module's Ethernet port and an Ethernet switch or hub.

Note: Depending on hardware configuration, you may see more than one RJ45 port on the module. The Ethernet port is labeled "Ethernet".

Warning: The MVI46-104S module is NOT compatible with Power Over Ethernet (IEEE802.3af / IEEE802.3at) networks. Do NOT connect the module to Ethernet devices, hubs, switches or networks that supply AC or DC power over the Ethernet cable. Failure to observe this precaution may result in damage to hardware, or injury to personnel.

Important: The module requires a static (fixed) IP address that is not shared with any other device on the Ethernet network. Obtain a list of suitable IP addresses from your network administrator BEFORE configuring the Ethernet port on this module.

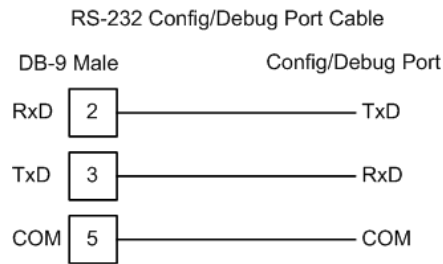
Ethernet Port Configuration - wattcp.cfg

The wattcp.cfg file must be set up properly in order to use a TCP/IP network connection. You can view the current network configuration using an ASCII terminal by selecting "@" (Network Menu) and "V" (View) options when connected to the Debug port.

```
# WATTCP.CFG FILE:
# ProSoft Technology.
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
```

5.3.2 RS-232 Configuration/Debug Port

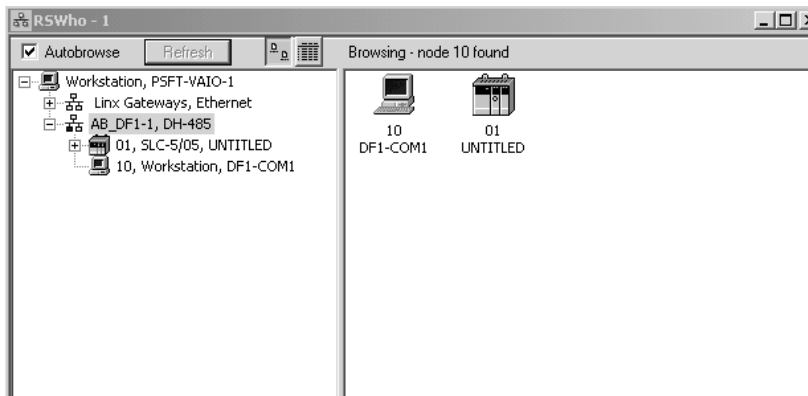
This port is physically an RJ45 connection. An RJ45 to DB-9 adapter cable is included with the module. This port permits a PC based terminal emulation program to view configuration and status data in the module and to control the module. The cable for communications on this port is shown in the following diagram:



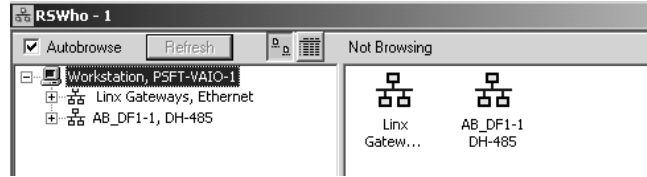
Disabling the RSLinx Driver for the Com Port on the PC



The communication port driver in RSLinx can occasionally prevent other applications from using the PC's COM port. If you are not able to connect to the module's configuration/debug port using ProSoft Configuration Builder (PCB), HyperTerminal or another terminal emulator, follow these steps to disable the RSLinx Driver.

- 1 Open RSLinx and go to Communications>RSWho
- 2 Make sure that you are not actively browsing using the driver that you wish to stop. The following shows an actively browsed network:



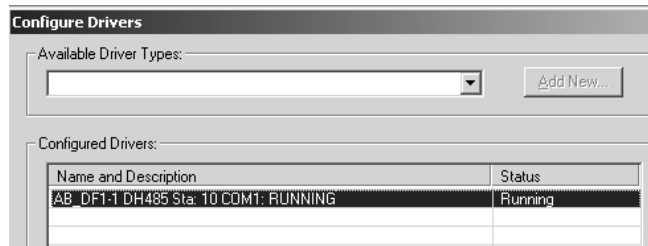
- 3 Notice how the DF1 driver is opened, and the driver is looking for a processor on node 1. If the network is being browsed, then you will not be able to stop this driver. To stop the driver your RSWho screen should look like this:



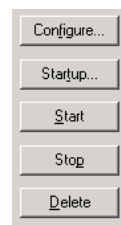
Branches are displayed or hidden by clicking on the  or the  icons.



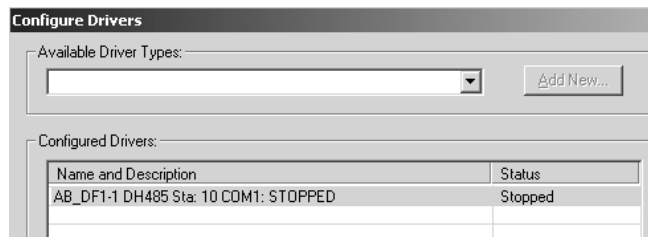
- 4 When you have verified that the driver is not being browsed, go to **Communications>Configure Drivers**
You may see something like this:



If you see the status as running, you will not be able to use this com port for anything other than communication to the processor. To stop the driver press the "Stop" on the side of the window:



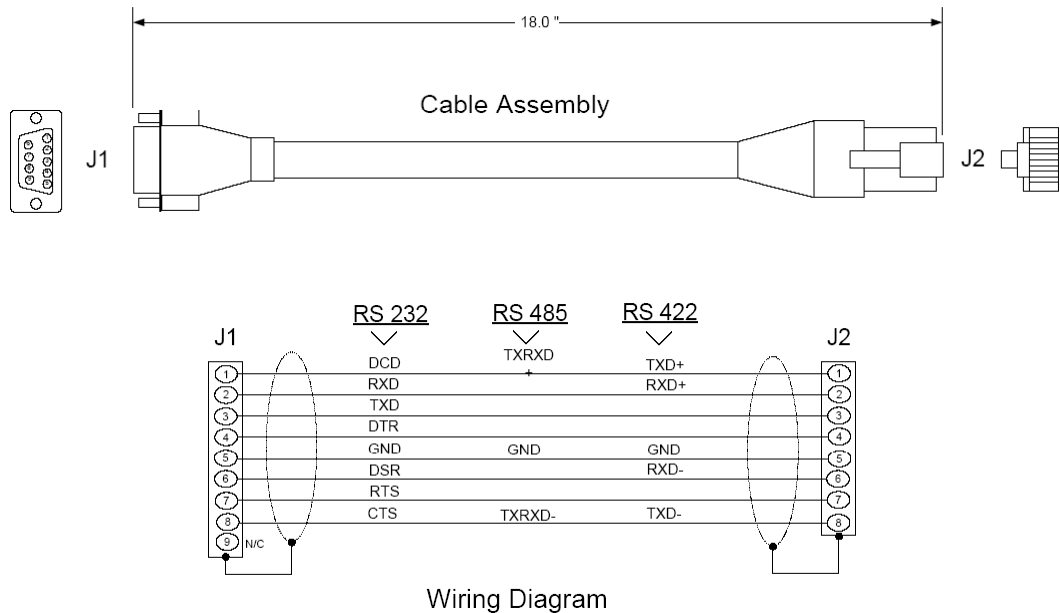
- 5 After you have stopped the driver you will see the following:



- Upon seeing this, you may now use that com port to connect to the debug port of the module.

Note: You may need to shut down and restart your PC before it will allow you to stop the driver (usually only on Windows NT machines). If you have followed all of the above steps, and it will not stop the driver, then make sure you do not have RSLogix open. If RSLogix is not open, and you still cannot stop the driver, then reboot your PC.

5.3.3 DB9 to RJ45 Adaptor (Cable 14)



5.4 MVI46-104S Status Data Definition

This section contains a description of the members present in the status data area stored in the M1 file.

Offset	Parameter	Description
0	Scan Count	This status value contains a counter incremented on each scan of the module's main loop.
1 to 2	Product Name	This two-word data area contains the text values representing the product name. These words contain the text '87S5' for the MVI56 platform.
3 to 4	Revision	This two-word data area contains the text values for the revision number.
5 to 6	Op Sys #	This two-word data area contains the text values for the operating system number.
7 to 8	Run Number	This two-word data area contains the text values for the run number.
9	Read Blk Cnt	This word contains the total number of block read operations successfully executed.
10	Write Blk Cnt	This word contains the total number of block write operations successfully executed.
11	Parse Blk Cnt	This word contains the total number of write blocks successfully parsed.
12	Error Blk Cnt	This word contains the total number of block transfer errors.

5.6 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.

5.6.1 System or device

- System definition
- Controlling station definition (Master)
- Controlled station definition (Slave)

5.6.2 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)

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)

- | | | | |
|---|--|--|--|
| <input checked="" type="checkbox"/> global | | | |
| <input checked="" type="checkbox"/> group 1 | <input checked="" type="checkbox"/> group 7 | <input checked="" type="checkbox"/> group 13 | |
| <input checked="" type="checkbox"/> group 2 | <input checked="" type="checkbox"/> group 8 | <input checked="" type="checkbox"/> group 14 | |
| <input checked="" type="checkbox"/> group 3 | <input checked="" type="checkbox"/> group 9 | <input checked="" type="checkbox"/> group 15 | |
| <input checked="" type="checkbox"/> group 4 | <input checked="" type="checkbox"/> group 10 | <input checked="" type="checkbox"/> group 16 | |
| <input checked="" type="checkbox"/> group 5 | <input checked="" type="checkbox"/> group 11 | | |
| <input checked="" type="checkbox"/> group 6 | <input checked="" type="checkbox"/> group 12 | | |
- Addresses per group have to be defined

Length of APDU

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

The Maximum length of the APDU is 253 (default). The maximum length may be reduced by the system.

253 Maximum length of APDU per system

5.6.3 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)

- | | | |
|--|---|-----------|
| <input checked="" type="checkbox"/> <1> | := Single-point information | M_SP_NA_1 |
| <input checked="" type="checkbox"/> <3> | := Double-point information | M_DP_NA_1 |
| <input checked="" type="checkbox"/> <5> | := Step position information | M_ST_NA_1 |
| <input type="checkbox"/> <7> | := Bitstring of 32 bit | M_BO_NA_1 |
| <input checked="" type="checkbox"/> <9> | := Measured value, normalized value | M_ME_NA_1 |
| <input checked="" type="checkbox"/> <11> | := Measured value, scaled value | M_ME_NB_1 |
| <input type="checkbox"/> <13> | := Measured value, short floating point value | M_ME_NC_I |
| <input checked="" type="checkbox"/> <15> | := Integrated totals | M_IT_NA_1 |
| <input type="checkbox"/> <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

5.6.4 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							
<3>	M DP NA 1	X		X		X								X							
<5>	M ST NA 1	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																				
<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																				
<51>	C BO NA 1																				
<58>	C SC TA 1																				
<59>	C DC TA 1																				
<60>	C RC TA 1																				
<61>	C SE TA 1																				
<62>	C SE TB 1																				
<63>	C SE TC 1																				
<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																				
<110>	P ME NA 1						X	X													
<111>	P ME NB 1						X	X													
<112>	P ME NC 1																				
<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																				

5.6.5 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

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:

6 Support, Service & Warranty

In This Chapter

- ❖ How to Contact Us: Technical Support..... 83
- ❖ Return Material Authorization (RMA) Policies and Conditions..... 84
- ❖ LIMITED WARRANTY..... 86

ProSoft Technology, Inc. (ProSoft) is committed to providing the most efficient and effective support possible. Before calling, please gather the following information to assist in expediting this process:

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

If the issue is hardware related, we will also need information regarding:

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

6.1 How to Contact Us: Technical Support

Internet

Web Site: <http://www.prosoft-technology.com/support>
(<http://www.prosoft-technology.com/support>)

E-mail address: support@prosoft-technology.com
(<mailto:support@prosoft-technology.com>)

Asia Pacific

+603.7724.2080, support.asia@prosoft-technology.com
(<mailto:support.asia@prosoft-technology.com>)

Languages spoken include: Chinese, English

Europe (location in Toulouse, France)

+33 (0) 5.34.36.87.20, support.EMEA@prosoft-technology.com
(<mailto:support.emea@prosoft-technology.com>)

Languages spoken include: French, English

North America/Latin America (excluding Brasil) (location in California)

+1.661.716.5100, support@prosoft-technology.com (mailto:support@prosoft-technology.com)

Languages spoken include: English, Spanish

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.

Brasil (location in Sao Paulo)

+55-11-5084-5178 , eduardo@prosoft-technology.com (mailto:eduardo@prosoft-technology.com)

Languages spoken include: Portuguese, English

6.2 Return Material Authorization (RMA) Policies and Conditions

The following RMA Policies and Conditions (collectively, "RMA Policies") apply to any returned Product. These RMA Policies are subject to change by ProSoft without notice. For warranty information, see "Limited Warranty". In the event of any inconsistency between the RMA Policies and the Warranty, the Warranty shall govern.

6.2.1 All Product Returns:

- a) 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.
- b) 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 (page 83). A Technical Support Engineer will request that you perform several tests in an attempt to isolate the problem. If after completing these tests, the Product is found to be the source of the problem, we will issue an RMA.
- c) 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 and receipt date. 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 using a shipment method other than that specified by ProSoft or shipped without an RMA number will be returned to the Customer, freight collect. Contact ProSoft Technical Support for further information.
- d) A 10% restocking fee applies to all warranty credit returns whereby a Customer has an application change, ordered too many, does not need, etc.

6.2.2 Procedures for Return of Units Under Warranty:

A Technical Support Engineer must approve the return of Product under ProSoft's Warranty:

- a) A replacement module will be shipped and invoiced. A purchase order will be required.
- b) Credit for a product under warranty will be issued upon receipt of authorized product by ProSoft at designated location referenced on the Return Material Authorization.

6.2.3 Procedures for Return of Units Out of Warranty:

- a) Customer sends unit in for evaluation
- b) If no defect is found, Customer will be charged the equivalent of \$100 USD, plus freight charges, duties and taxes as applicable. A new purchase order will be required.
- c) If unit is repaired, charge to Customer will be 30% of current list price (USD) plus freight charges, duties and taxes as applicable. A new purchase order will be required or authorization to use the purchase order submitted for evaluation fee.

The following is a list of non-repairable units:

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

6.2.4 Purchasing Warranty Extension:

- a) ProSoft's standard warranty period is three (3) years from the date of shipment as detailed in "Limited Warranty (page 86)". The Warranty Period may be extended at the time of equipment purchase 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

6.3 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.

6.3.1 *What Is Covered By This Warranty*

- a) *Warranty On New Products:* ProSoft warrants, to the original purchaser, 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 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 39 months. 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.
- b) *Warranty On Services:* Materials and labor performed by ProSoft to repair a verified malfunction or defect are warranted in 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.

6.3.2 *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) This Warranty 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, "C" or any variant of "C" programming languages) 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; or (viii) disasters such as fire, flood, earthquake, wind and lightning.
- c) 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 guide included with your original product purchase 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.

6.3.3 Disclaimer Regarding High Risk Activities

Product manufactured or supplied by ProSoft is not fault tolerant and is not designed, manufactured or intended for use in hazardous environments requiring fail-safe performance including and without limitation: the operation of nuclear facilities, aircraft navigation or communication systems, air traffic control, direct life support machines or weapons systems in which the failure of the product could lead directly or indirectly to death, personal injury or severe physical or environmental damage (collectively, "high risk activities"). ProSoft specifically disclaims any express or implied warranty of fitness for high risk activities.

6.3.4 Intellectual Property Indemnity

Buyer shall indemnify and hold harmless ProSoft and its employees from and against all liabilities, losses, claims, costs and expenses (including attorney's fees and expenses) related to any claim, investigation, litigation or proceeding (whether or not ProSoft is a party) which arises or is alleged to arise from Buyer's acts or omissions under these Terms or in any way with respect to the Products. Without limiting the foregoing, Buyer (at its own expense) shall indemnify and hold harmless ProSoft and defend or settle any action brought against such Companies to the extent based on a claim that any Product made to Buyer specifications infringed intellectual property rights of another party. ProSoft makes no warranty that the product is or will be delivered free of any person's claiming of patent, trademark, or similar infringement. The Buyer assumes all risks (including the risk of suit) that the product or any use of the product will infringe existing or subsequently issued patents, trademarks, or copyrights.

- a) Any documentation included with Product purchased from ProSoft is protected by copyright and may not be duplicated 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.
- f) **Additional Restrictions Relating To Software And Other Intellectual Property**

In addition to compliance 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.

6.3.5 Disclaimer of all Other Warranties

The Warranty set forth in What Is Covered By This Warranty (page 86) 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.

6.3.6 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 or its Dealer will not be responsible for included, 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.

6.3.7 Time Limit for Bringing Suit

Any action for breach of warranty must be commenced within 39 months following shipment of the Product.

6.3.8 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.

6.3.9 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.

6.3.10 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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