



*Allen-Bradley*

## **DH-485/RS-232C Interface Module**

**Catalog Number 1747-KE**

**User Manual**

**Rockwell  
Automation**

## Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls, publication SGI-1.1, available from your local Rockwell Automation sales office or online at <http://www.literature.rockwellautomation.com>, describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

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**WARNING**

Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.

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**IMPORTANT**

Identifies information that is critical for successful application and understanding of the product.

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**ATTENTION**

Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you:

- identify a hazard.
  - avoid a hazard.
  - recognize the consequences.
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**SHOCK HAZARD**

Labels may be located on or inside the equipment (for example, drive or motor) to alert people that dangerous voltage may be present.

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**BURN HAZARD**

Labels may be located on or inside the equipment (for example, drive or motor) to alert people that surfaces may be dangerous temperatures.

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## Summary of Changes

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The information below summarizes the changes to this manual since the last printing.

To help you find new and updated information in this release of the manual, we have included change bars as shown to the right of this paragraph.

<b>For</b>	<b>See page</b>
Updated method of ordering publications	P-2
Updated battery location on circuit board	1-2, C-2
Revised JW1 jumper illustration	1-2, 1-4
Revised JW2 jumper illustration	1-2, 1-4
Revised JW4 jumper illustration	1-2, 1-4
Replaced APS with RSLinx software	throughout
Updated information on configuring your SLC chassis	4-13
Updated information on configuring your DF1 driver with RSLinx software	4-14

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Read this preface to familiarize yourself with the rest of the manual. This preface covers the following topics.

- Who should use this manual
- The purpose of this manual
- Contents of this manual
- Terms and abbreviations
- Conventions used in this manual

### **Who Should Use This Manual**

Use this manual if you are responsible for designing, installing, programming, or troubleshooting control systems that use Allen-Bradley small logic controllers.

You should have a basic understanding of SLC 500 products, DF1 communications protocol, and DH-485 network communications. If you do not, contact your local Allen-Bradley representative for information on available training courses before using this product.

### **Purpose of This Manual**

This manual is a reference guide for the DH-485/RS-232C Interface Module. It describes the procedures you use to install and configure your interface module for application with PLC and SLC controllers.

## Related Documentation

The following documents contain additional information regarding Rockwell Automation products.

### Related Documentation

For	Read This Document	Document Number
A guide to understanding and selecting SLC 500 products	SLC 500 System Selection Guide	1747-SG001
A description on how to install and use your modular SLC 500 programmable controller	User Manual for Modular Hardware Style Programmable Controllers	1747-UM011
A reference manual that contains status file data, instruction set, and troubleshooting information	SLC 500 Instruction Set Reference Manual	1747-RM001
A glossary of industrial automation terms and abbreviations	Allen-Bradley Industrial Automation Glossary	AG-7.1

If you would like a manual, you can:

- download a free electronic version from the Internet at [www.literature.rockwellautomation.com](http://www.literature.rockwellautomation.com).
- purchase a printed manual by contacting your local distributor or Rockwell Automation representative.

## Terms and Abbreviations

The following terms and abbreviations are specific to this product. For a complete listing of Allen-Bradley terminology, refer to the Allen-Bradley Industrial Automation Glossary, publication AG-7.1.

**ASCII Terminal** - an industrial terminal, workstation, or personal computer with terminal mode software (such as PBASE or Windows HyperTerminal) that communicates in alphanumeric mode.

**Backplane** - a printed circuit board, at the back of a chassis, that provides electrical interconnection between the modules inserted into the chassis.

**DF1** - a serial communication protocol capable of delimiting-messages, controlling message flow, detecting and signalling errors, and retrying after errors are detected. See half- and full-duplex.

**DH-485 Link** - Data Highway-485 link. An Allen-Bradley token-passing baseband link for a local area network based on the RS-485 standard.

**Full-duplex** - a mode of operation for a point-to-point link with two physical circuits, in which messages or transmission blocks can be sent in both directions at the same time.

Half-duplex - a mode of operation for a point-to-point or multi-point baseband link with two physical circuits, in which messages or transmission blocks can be sent in one direction or the other, but not both at the same time.

Modem - Modulator/demodulator. Equipment that connects data terminal equipment to a communication line.

RAM - random access memory. The type of memory in which each storage location is by X/Y coordinates, as in core or semiconductor memory. (Tape or bubble memory cannot be random access.) Thus, the data access time is independent of the location of the data. Unless stated otherwise, RAM usually implies read/write and volatile.

RS-232-C - an EIA standard that specifies electrical, mechanical, and functional characteristics for serial-binary communication circuits in a point-to-point link.

RS-422 - an EIA standard that specifies electrical characteristics of balanced-voltage digital interface circuits in a point-to-point link.

RS-423 - an EIA standard that specifies electrical characteristics of unbalanced voltage digital interface circuits in a point-to-point link.

RS-485 - an EIA standard that specifies mechanical and functional characteristics for digital interface circuits. This standard is used in combination with either RS-422 or RS-423.

SLC 500 controller - the SLC 500 family of fixed and modular controllers.

## Conventions Used in This Manual

The following conventions are used throughout this manual.

- Bulleted lists such as this one provide information, not procedural steps.
- Numbered lists provide sequential steps or hierarchical information.
- **Bold** type is used for emphasis



## Overview

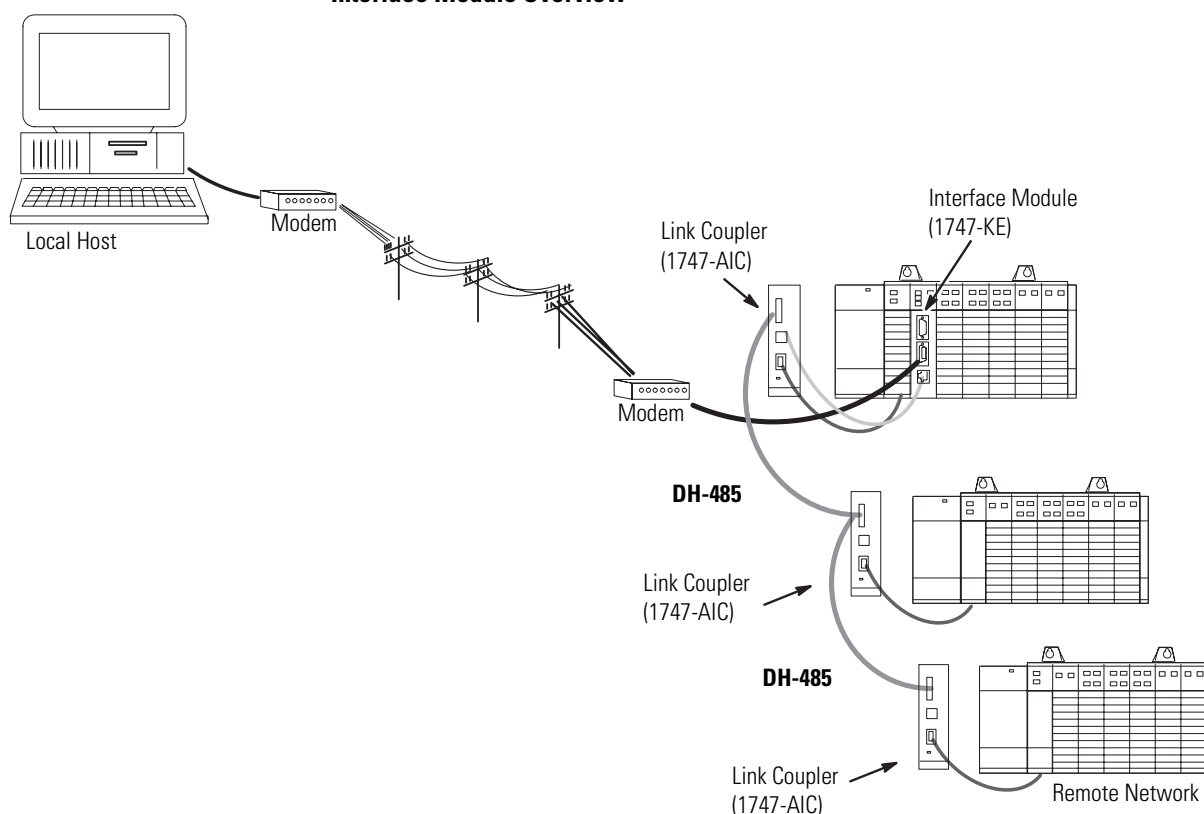
This chapter provides:

- an overview of the interface module.
- features (communication ports, LED indicators, and jumpers).
- guidelines outlining the type of modems you can use with the module.
- a brief discussion on using RSLinx software with your module.
- typical configurations.

### Interface Module Overview

The DH-485/RS-232C Interface Module, catalog number 1747-KE, is a communications interface module that acts as a bridge between DH-485 networks and devices requiring DF1 protocol. The DF1 port on the interface module can be configured for RS-232/423, RS-422, or RS-485 devices. Residing in an SLC 500 chassis, the module is ideally used as an interface module, linking remote DH-485 networks via a modem to a central host.

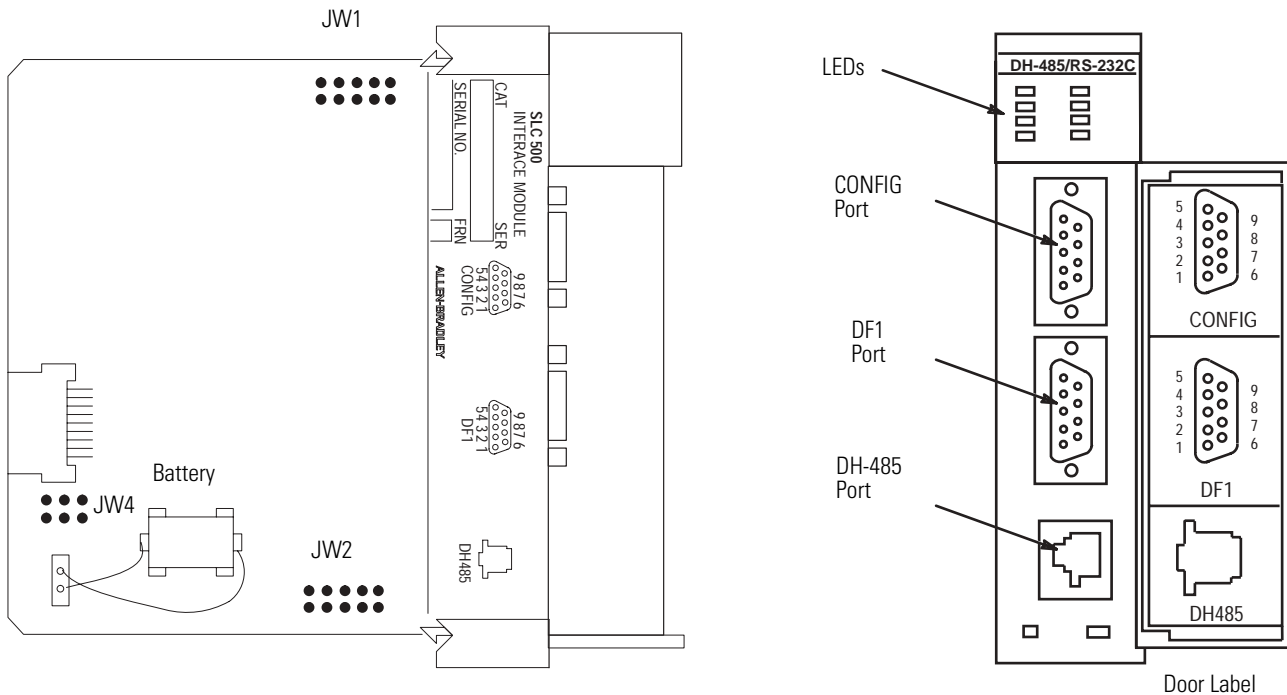
#### Interface Module Overview



## Features

The features of the module are shown below.

### 1747-KE Module Features



There are three communication ports on the front of the module. They are:

- **CONFIG** - used to configure the module with an ASCII terminal. This serial port accommodates RS-232/423, RS-422, and RS-485 communication interfaces. The CONFIG port is capable of operating at 300, 600, 1200, 2400, 4800, 9600, and 19200 Kbps. It is electrically isolated to 500V dc.
- **DF1** - used to interface the module to a modem or other user devices using DF1 protocol. This serial port accommodates RS-232/423, RS-422, and RS-485 communication interfaces. The DF1 port is capable of operating at 300, 600, 1200, 2400, 4800, 9600, and 19200 Kbps. It is electrically isolated to 500V dc.
- **DH485** - used to interface the module with the DH-485 network. This port is not isolated and cannot directly drive a multi-node DH-485 network. You must use a 1747-AIC link coupler to connect this port to a DH-485 network that includes multiple SLC 500 processors.

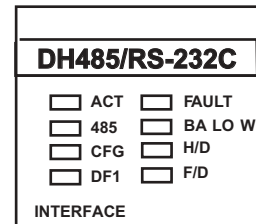
The 1747-C11 or 1747-C13 cables can connect the interface module's DH-485 port to a 1747-AIC link coupler. The 1747-C13 cable can also connect the module's DH-485 port directly to a single SLC processor.

See page 4-11 for cable connections.

## LED Indicators

There are eight LED indicators on the front of the module. These LED indicators are used for module diagnostics and operator interface. The LED indicators and their descriptions are provided below.

### LED Indicators



### LED Indicator Status

LED	Color	Status	Indication
ACT	Green	ON <sup>(1)</sup>	The module is receiving power from the backplane, is configured properly, and is placed in Run mode.
		Flashing	The module requires configuration or is being configured.
		OFF	The module is not receiving power from the backplane. A fault condition exists.
485	Green	ON	The DH485 port is active on the network.
		OFF	The DH485 port is not active on the network or the module is in Configuration mode.
CFG	Green	Flashing	The CONFIG port is transmitting or receiving signals.
		OFF	The CONFIG port is not transmitting or receiving signals.
DF1	Green	Flashing	The DF1 port is transmitting or receiving signals. (The flashing may occur so rapidly that the LED indicator appears to be on.)
		OFF	The DF1 port is not transmitting or receiving signals or the module is in Configuration mode.
FAULT	Red	ON	A system problem was detected during diagnostics. Cycle power to reset. If it remains on, contact your Allen-Bradley representative.
		OFF	No system problems are detected during diagnostics.
BA LOW	Red	ON	The voltage of the battery that backs up configuration RAM is low. A new battery is needed.
		OFF	The voltage of the battery that backs up configuration RAM is at an acceptable level.
H/D	Amber	ON	The module is configured for half-duplex DF1 protocol (local or remote).
		OFF	The module is not configured for half-duplex DF1 protocol.
F/D	Amber	ON	The module is configured for full-duplex DF1 protocol.
		OFF	The module is not configured for full-duplex DF1 protocol.

<sup>(1)</sup> Indicates normal operation after the module has been configured.





## Use a Modem with Your Interface Module

The module can be connected to most types of dial-up network or direct connect modems.

### IMPORTANT

Some modems are designed to respond to the DTR signal by answering the phone whether it is ringing or not. Since the module asserts DTR at all times (except during the hang-up sequence), the phone appears to be busy at all times. Do not use the interface module with any type of modem that answers the phone as soon as DTR is asserted.

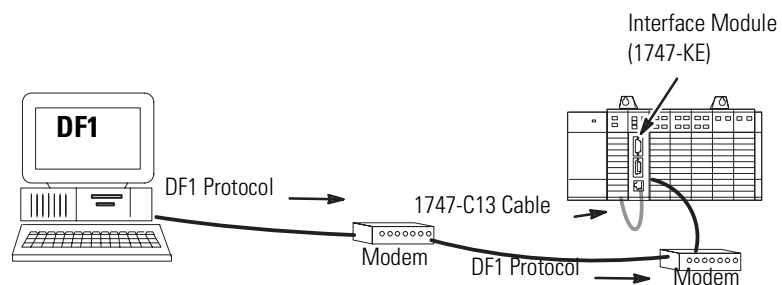
The type of modems you can use are:

- Manual - typically acoustically-coupled modems. A person on each end of the phone line establishes the connection. They then insert the handsets into an acoustic coupler to complete the connection.
- DTE controlled answer - these unattended modems are attached directly to the phone lines. The interface module acts as the Data Terminal Equipment (DTE), which controls the modem via the DTR, DSR, and DCD signals. The module incorporates timeouts and tests to properly operate these types of modems.
- Auto answer - these modems have self-contained timeouts and tests. They can answer and hang up the phone automatically. The module has no means of controlling an auto-dial modem, but it can be used in conjunction with a separate auto-dialer.
- Direct connect - these modems connect to a dedicated, leased phone line and remain active at all times.

## Use DF1 Protocol and Your Module

RSLinx software supports DF1 communications directly from your computer's serial communication port. Connecting a modem to this port lets you to call remote networks and control them as if you were connected locally.

### DF1 Protocol

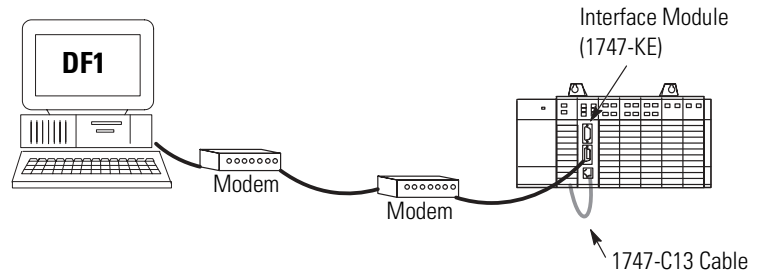


## Typical Configurations

The following configurations illustrate some of the possible uses for the module.

### Full-duplex (Point-to-point)

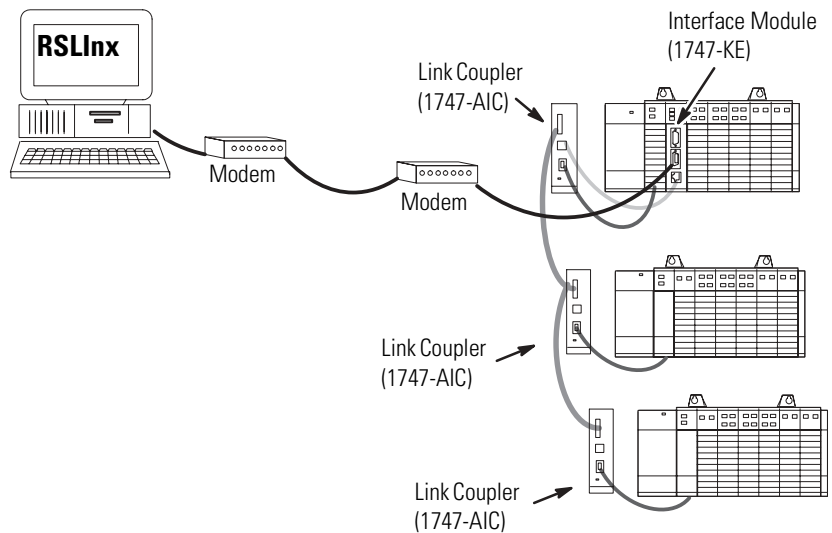
#### Full-duplex (Point-to-point)



This illustration shows a connection to a single remote SLC node. The 1747-C13 cable eliminates the need for a 1747-AIC link coupler.

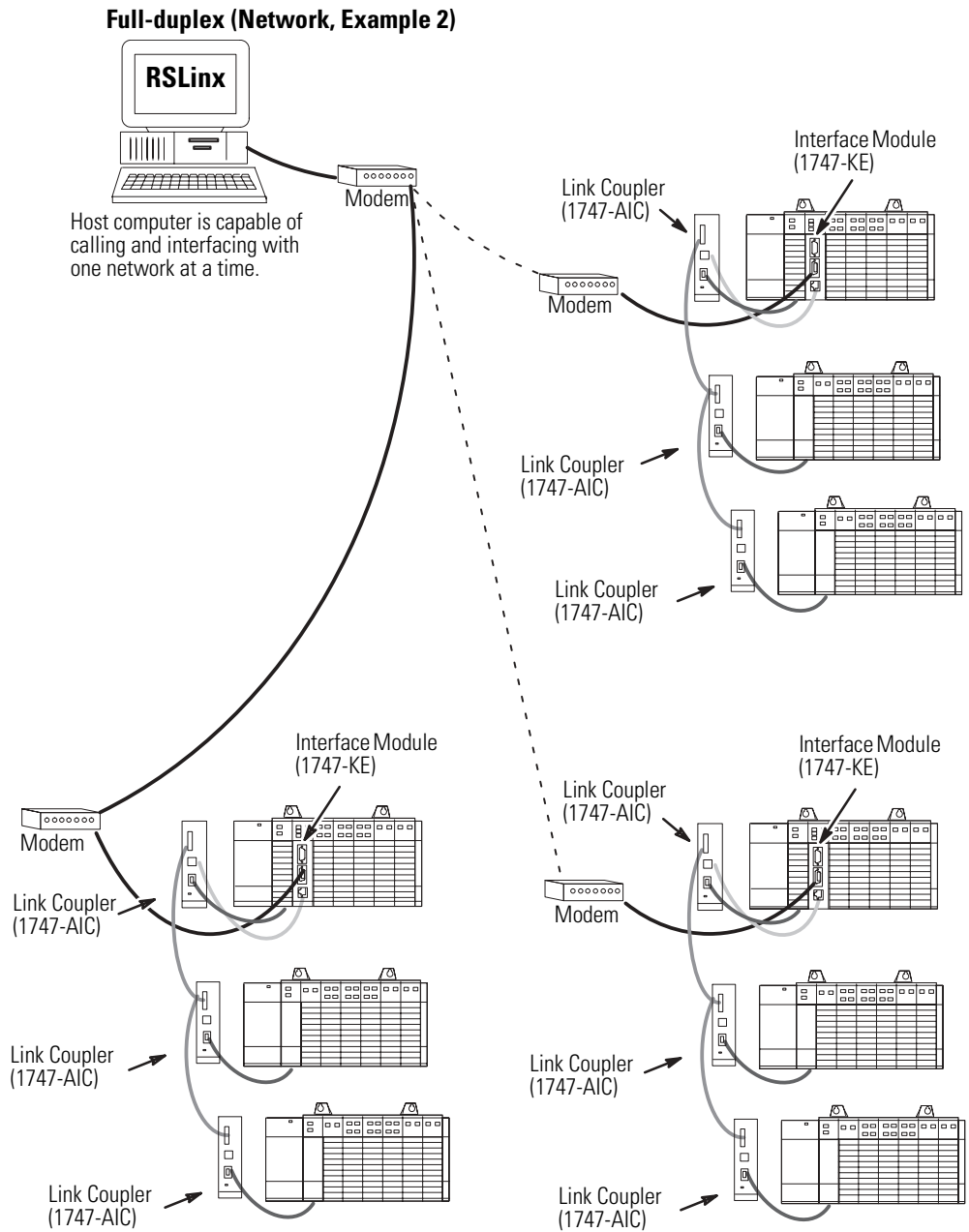
### Full-duplex (Network, Example 1)

#### Full-duplex (Network, Example 1)



This illustration shows a connection to a remote DH-485 network of up to 31 SLC nodes.

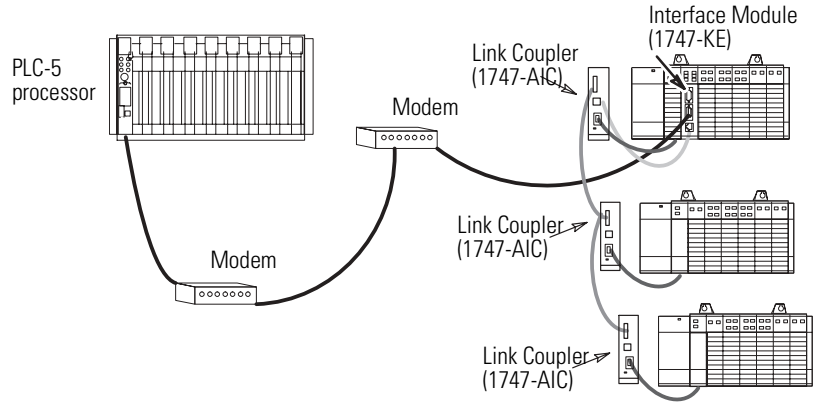
## Full-duplex (Network, Example 2)



This configuration allows the host to call more than one remote network (one network connected at a time). Each remote network can consist of up to 31 SLC nodes.

## Half-duplex (Local Mode)

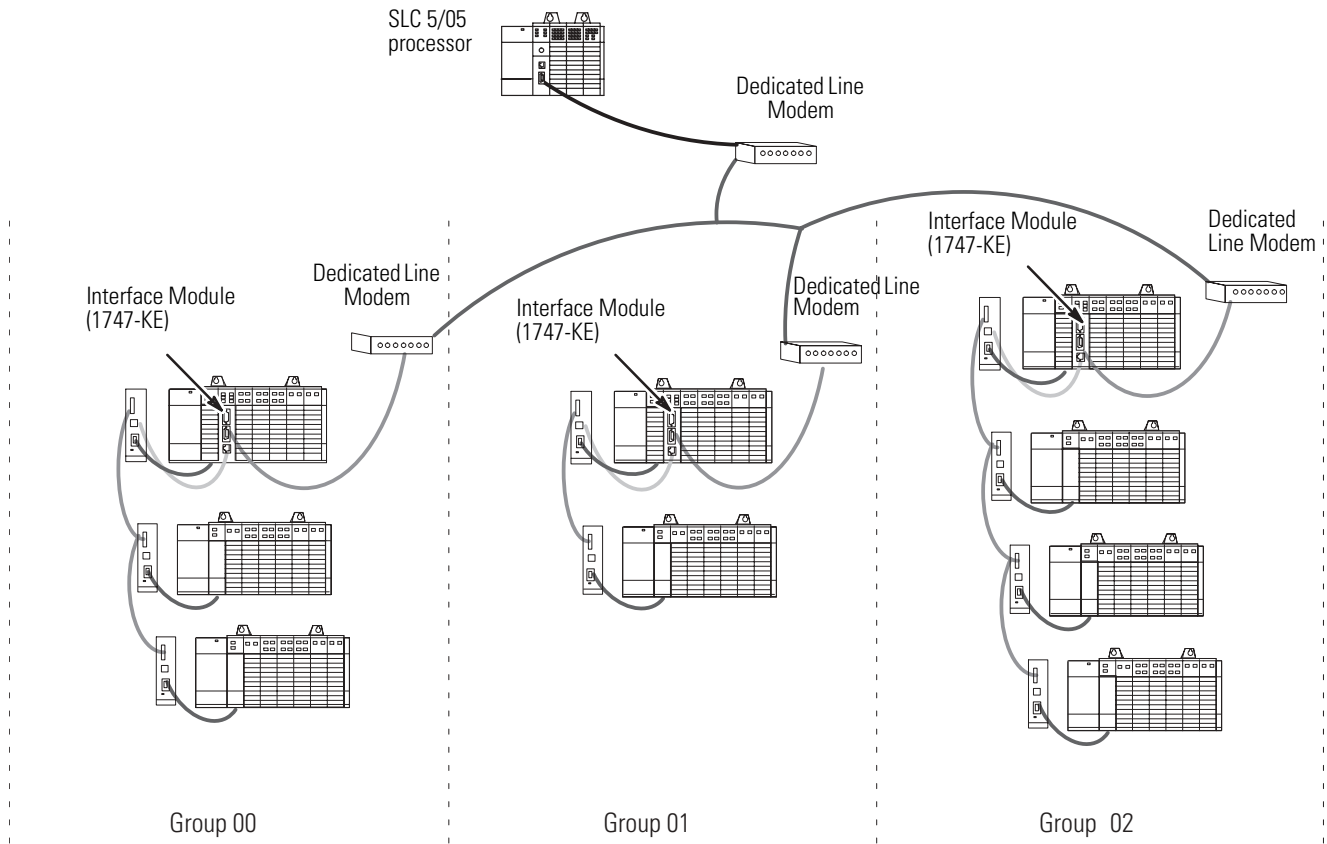
### Half-duplex (Local Mode) Master



This configuration allows the host controller to interface on a remote DH-485 network of up to 31 SLC nodes using the half-duplex protocol.

## Half-duplex (Remote Mode)

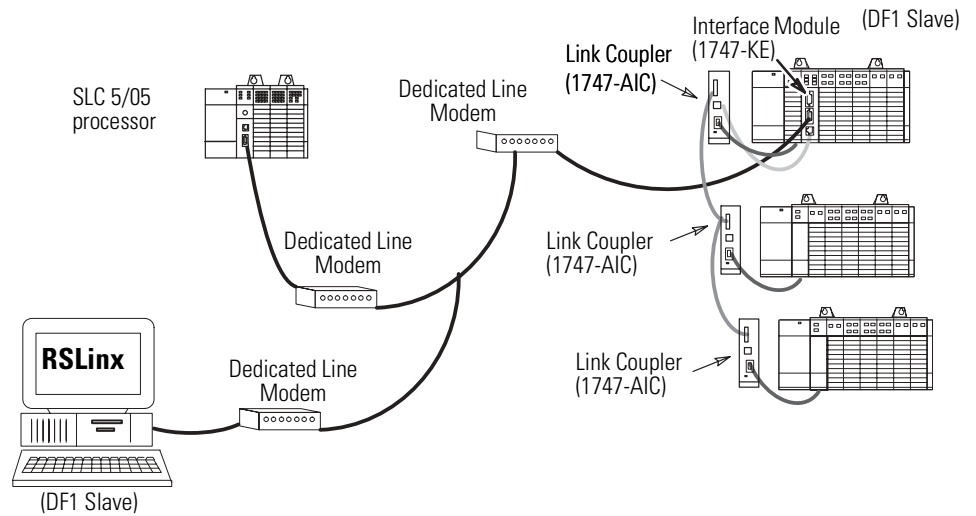
### Half-duplex (Remote Mode) Master



This illustration shows a host connect up to eight groups of DH-485 networks, connecting up to a total of 254 SLC nodes.

## Half-duplex (Slave-to-slave Communication)

### Half-duplex (Slave-to-slave Communication)



This configuration allows a DF1 slave device send a message to another DF1 slave device. In this example, RSLinx can communicate to an SLC slave.

## Quick Start

This chapter can help you to get started using the DH-485/RS-232C Interface Module (catalog number 1747-KE). The procedures included here assume that you have a basic understanding of SLC 500 products. You should understand electronic process control and be able to interpret the ladder logic instructions required to generate the electronic signals that control your application.

Because it is a start-up guide, this chapter does not contain detailed explanations about the procedures listed. It does, however, reference other chapters in this book where you can get more information about applying the procedures described in each step.

If you have any questions or are unfamiliar with the terms used or concepts presented in the procedural steps, always read the referenced chapters and other recommended documentation before trying to apply the information.

This chapter:

- tells you what tools and equipment you need.
- lists preliminary considerations.
- explains how to install the module.
- describes when to configure the module.
- discusses system start-up procedures.

## Required Tools and Equipment

Have the following tools and equipment ready.

- Medium blade screwdriver
- Programming equipment (RSLogix 500 software)

## Procedures

### Unpack the Module

Remove the items from the package making sure that the contents include:

- DH-485/RS-232C Interface Module (catalog number 1747-KE).
- cable (1747-C13).
- installation instructions, publication 1747-IN006.

If the contents are incomplete, call your local Rockwell Automation representative for assistance.

### Install the Module

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**ATTENTION**

Do not install or remove the 1747-KE module from the SLC chassis until all power dissipates from the SLC 500 power supply (approximately 10 seconds).

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Install the module and configure the SLC chassis. The following steps summarize these procedures.

1. Choose the module's functionality.
2. Select the configuration method you want to use and place your module in the corresponding mode using JW4.
3. Set your CONFIG and DF1 ports using JW1 and JW2.
4. Configure your SLC chassis using RSLogix 500 software.
5. Configure the module.
6. If your module is still in Configuration mode, place it in Run mode using the JW4 jumper.
7. Connect your DH-485 and DF1 cabling.
8. Turn on power and verify module status.

For more information refer to Chapter 4 (Installation and System Configuration).



## Configure the Module

Configure the module by either connecting to an ASCII terminal or communicating through the backplane.

For more information, see Chapter 5 (Module Configuration Using an ASCII Terminal) and Chapter 6 (Module Configuration Using the Backplane).

## Start-up the Module

Power up your system by performing standard start-up procedures as indicated in your processor manual. No special start-up procedures are required when using the module.

Before applying power to the module, make sure:

- the module is installed in the SLC chassis.
- all communication devices are connected.
- your SLC processor is configured to operate with the interface module.

Refer to Chapter 4 for more information.

- your interface module is configured properly.

Refer to Chapters 5 and 6 for more information.

When power is applied to the SLC system, the SLC processor and module run through a power cycle diagnostic sequence. After the diagnostics are successfully completed, the SLC processor enters Run mode and normal operation begins.

---

**ATTENTION**

This module is a device used for communications. Improper configuration or module failure may cause communications to stop. Be careful to avoid system designs that would cause potential safety concerns within the system in the event of a communications failure.

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## Communicate with the Interface Module

This chapter explains:

- full- and half-duplex DF1 communication.
- local and remote half-duplex operation.
- communicating with master and slave DH-485 devices.
- communicating with a modem.

### DF1 Communication

The module supports full-duplex DF1 protocol and half-duplex DF1 slave protocol on its RS-232 connection to the host computer (using the DF1 Port). The details of these protocols can be found in the DF1 Protocol and Command Set Reference Manual, publication 1770-RM516.

### Full-duplex DF1 Protocol

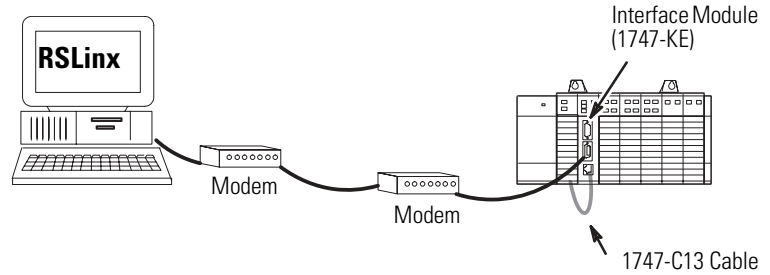
Full-duplex DF1 protocol is provided for applications where high performance peer-to-peer communication is needed.

In full-duplex mode, the module can send embedded responses. If the embedded response detect option is set to auto-detect embedded response, the module will not send embedded responses until it receives one from the host. The module makes an assumption that if a host computer sends embedded responses, it can also receive them.

In full-duplex mode, the destination address in a packet sent from the host computer to the module is the address of the DH-485 node for which the packet is intended. The source address in packets received by the host computer from the module is the node address of the sender.

*Full-duplex (Point-to-point)*

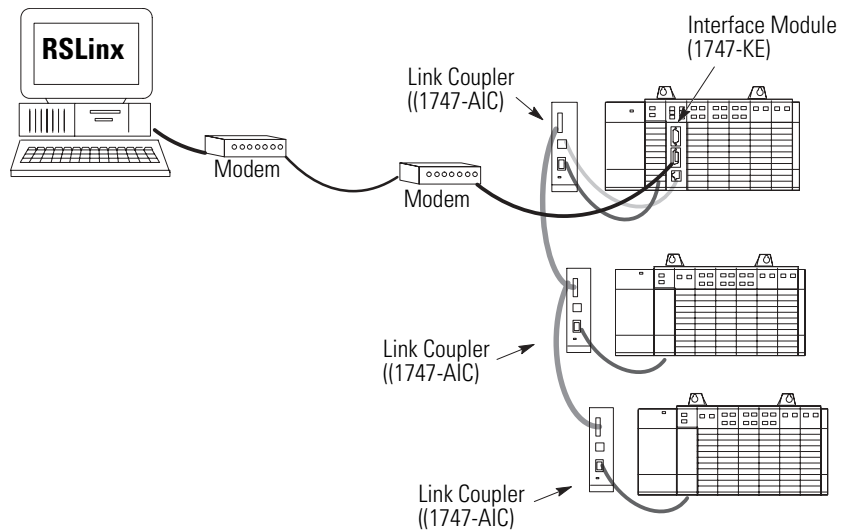
**Full-duplex (Point-to-point)**



This illustration shows a connection to a single remote SLC node. The 1747-C13 cable eliminates the need for a 1747-AIC link coupler for connections to one node.

*Full-duplex (Network Example)*

**Full-duplex (Network Example)**



This illustration shows a connection to a remote DH-485 network of up to 31 SLC nodes.

**Half-duplex DF1 Protocol**

The module provides two modes of half-duplex addressing: local and remote. Local mode is provided for compatibility with earlier DF1 products, such as the Data Highway/Data Highway Plus Asynchronous Interface Module (catalog number 1770-KF2) and when only one interface module is used in the system.

You may prefer local mode for use in applications where the RS-232C link is not networked, since it simplifies the polling algorithm.

Remote mode should be used when more than 31 SLC nodes are required on the DH-485 network. Because the interface module is transparent to the master device, existing drivers can be used without rewriting.

### *Local Mode*

Local mode requires an intelligent master device, capable of specifying both a station address and a destination address. Because the interface module acts as a slave on a half-duplex network, the half-duplex master's access to the DH-485 node is indirect. The destination address and the station address are generally different.

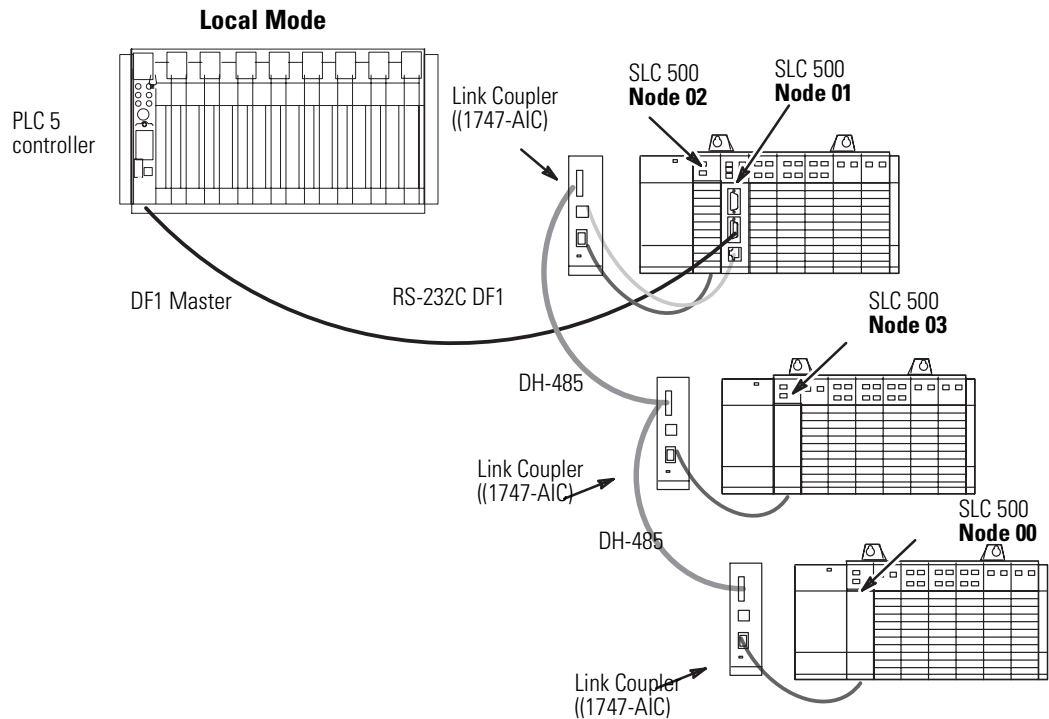
In local mode, the polling algorithm used by the half-duplex master is simplified so that the master only needs to poll the single interface module. The module will respond to messages from the half-duplex master only if the station address contained in these messages is the node address of the interface module. The module then forwards the packet to the appropriate DH-485 node, as defined by the destination address.

Responses from remote nodes on the DH-485 network contain a destination address equal to that of the interface module, and not that of the half-duplex master device. The module responds to poll packets from the half-duplex master by returning whatever data has been forwarded to it by the remote nodes under its jurisdiction.

In the Local Mode illustration on page 3-4, the half-duplex master only polls the interface module at station address 01.

Messages from the half-duplex master to the SLC 500 controllers are sent using a master message containing both the station address of the interface module (node 01) and the destination address of the SLC 500 controller (node 03 for example). Responses from the SLC 500 controllers to the half-duplex master contain the destination address of the interface module (node 01), which then returns all responses to the half-duplex master station upon being polled.

During configuration of the interface module, the module's destination address, or slave address, is selected if Local mode has been selected.



### *Remote Mode*

The valid range of slave addresses on a half-duplex network is 000 through 376 octal (000 through 254 decimal) accommodating a total of 255 devices. The valid range of addresses on a DH-485 network is 00 through 37 octal (00 through 31 decimal).

To let addressing of up to 255 DH-485 nodes, eight groups (group numbers 00 through 07) of DH-485 networks are established. Each group number defines a DH-485 network, which can consist of up to 32 nodes each (except for group 07 which is limited to 31 nodes).

Refer to the table on page 3-6.

During configuration of the interface module, the module's group number is selected if Remote mode has been selected.

In remote mode, the module appears transparent to the half-duplex master, so that remote SLC 500 controllers can be polled directly as individual slaves on the half-duplex network. The interface module responds to the half-duplex master if the station address specified corresponds to the node address of **any (token-passing) station** on the DH-485 network connected to that interface module.

Messages from the remote nodes on the DH-485 network (such as the SLC nodes) use the destination address of the module. Normally the module responds to a message from the DF1 master by swapping the source and destination addresses in the received message, assuring that the reply message is sent to the proper DF1 master station.

If a DH-485 node initiates a message to the DF1 master, the module overwrites the destination address with the master station value configured in the Remote mode submenu. The message received by the half-duplex master will contain a source address equal to the station address specified in the poll packet, and a destination address equal to the address of the half-duplex master device.

Remember that half-duplex DF1 (group) addresses are in octal and DH-485 node addresses are in decimal.

The table on page 3-6 provides the conversion using the group number.

**Half-duplex Remote Address Conversion Table**

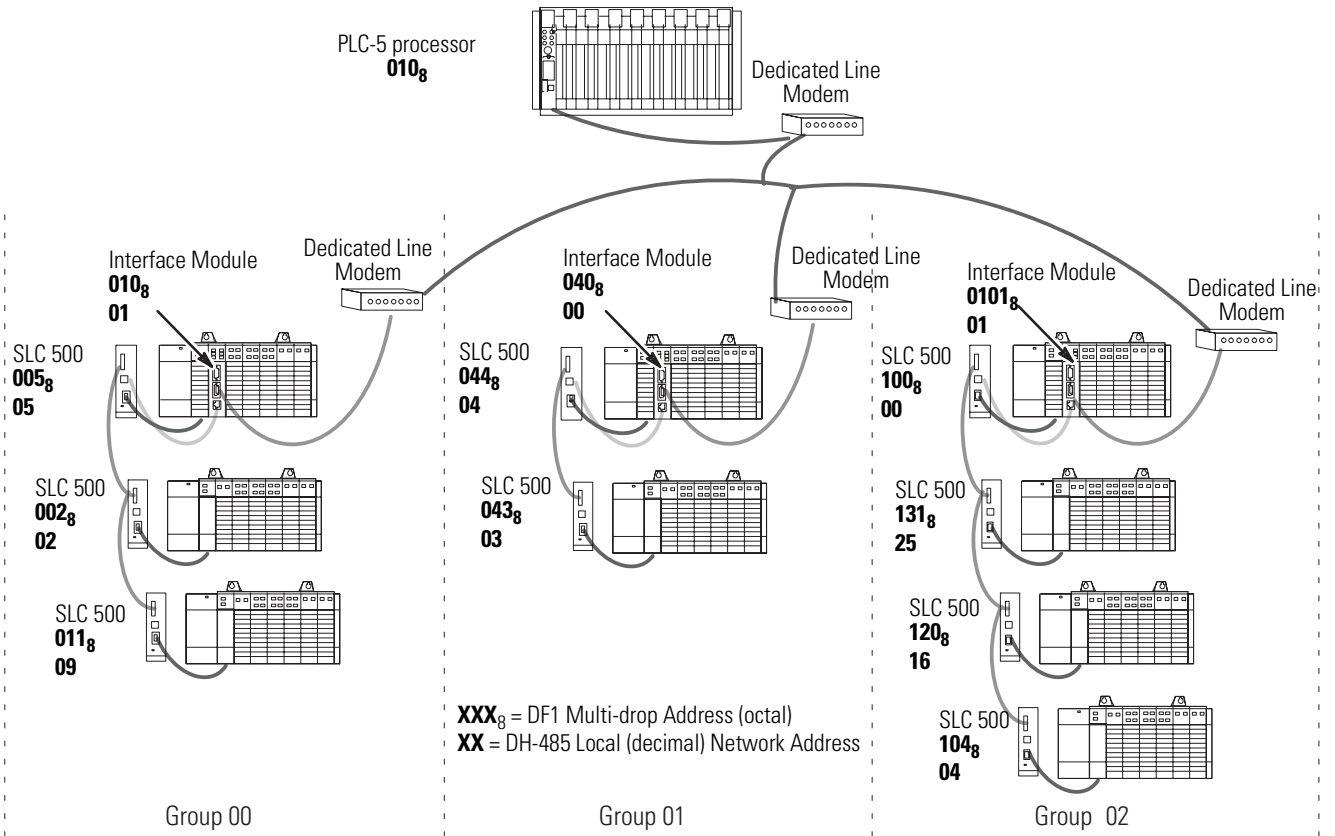
DH-485 Node Address (decimal)	Half-duplex DF1 Address (octal)							
	Group 00	Group 01	Group 02	Group 03	Group 04	Group 05	Group 06	Group 07
00	000	040	100	140	200	240	300	340
01	001	041	101	141	201	241	301	341
02	002	042	102	142	202	242	302	342
03	003	043	103	143	203	243	303	343
04	004	044	104	144	204	244	304	344
05	005	045	105	145	205	245	305	345
06	006	046	106	146	206	246	306	346
07	007	047	107	147	207	247	307	347
08	010	050	110	150	210	250	310	350
09	011	051	111	151	211	251	311	351
10	012	052	112	152	222	252	322	352
11	013	053	113	153	213	253	313	353
12	014	054	114	154	214	254	314	354
13	015	055	115	155	215	255	315	355
14	016	056	116	156	216	256	316	356
15	017	057	117	157	217	257	317	357
16	020	060	120	160	220	260	320	360
17	021	061	121	161	221	261	321	361
18	022	062	122	162	222	262	322	362
19	023	063	123	163	223	263	323	363
20	024	064	124	164	224	264	324	364
21	025	065	125	165	225	265	325	365
22	026	066	126	166	226	266	326	366
23	027	067	127	167	227	267	327	367
24	030	070	130	170	230	270	330	370
25	031	071	131	171	231	271	331	371
26	032	072	132	172	232	272	332	372
27	033	073	133	173	233	273	333	373
28	034	074	134	174	234	274	334	374
29	035	075	135	175	235	275	335	375
30	036	076	136	176	236	276	336	376
31	037	077	137	177	237	277	337	Illegal



### Remote Mode Addressing on a Multi-drop Network Example

This example shows a PLC-5 controller as the half-duplex master in a multi-drop configuration. Each interface module has been configured after Remote mode has been selected. The half-duplex master address of the PLC-5 controller has been set to 010 (octal).

#### Remote Mode Addressing on a Multi-drop Network



**IMPORTANT** Each interface module must be set up for a unique group number.

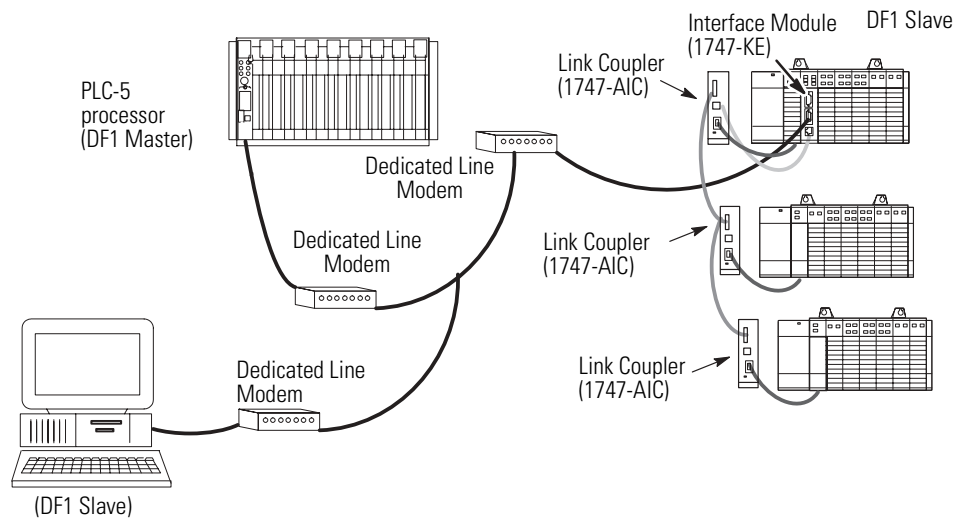


### Slave-to-slave Communication

The interface module lets communication from a DH-485 network device to a single DF1 slave device, regardless of which mode of half-duplex addressing is selected (local or remote). To achieve this, the interface module's Master Station Address must be configured as that DF1 slave address.

For example, if the RSLinx terminal in the illustration below is DF1 node 3, the interface module's Master Station Address must be configured as node 3.

### Slave-to-slave Communication



In this illustration, a packet from the RSLinx computer, intended for an SLC node, is first transferred to the PLC-5 controller (DF1 master). The PLC-5 controller then transfers the packet to the interface module, which converts it to a DH-485 packet and sends it to the specified SLC node. The SLC node's response goes through the interface module to the PLC-5 controller. The PLC-5 controller then transfers the response to the RSLinx computer.


The operation of slave-to-slave communication differs slightly depending on whether the interface module is in local or remote mode.

**Slave-to-slave communication**

<b>When the interface module is in</b>	<b>Slave-to-slave communication occurs</b>
Local mode	<p>Only if the module's DF1 node is the same as the DH-485 node for which the message is destined. In this mode the RSLinx computer can only communicate with one SLC node.</p> <p>For example, if you want a DF1 slave terminal in the illustration above to communicate with an SLC processor in node 2 of the DH-485 network, then the interface module's DF1 slave address must be set to 2.</p>
Remote mode	<p>Between the DF1 slave and any of the DH-485 devices connected to the interface module. The addresses for the DH-485 devices are determined by the group number in the interface module.</p> <p>Refer to the Half-duplex Remote Address Conversion Table in Chapter 3.</p> <p>For example, if the interface module in the illustration above is configured as group 03, and the DH-485 node to be accessed has a DH-485 address of 01, then the DF1 slave device will use address 141 (octal) when accessing this device.</p>

**Communicate with DH-485 Devices**

---

<b>ATTENTION</b>	Do not force outputs to a remote SLC system through the interface module. Phone line disturbances, interface module failure, or other system failure could disrupt remote communications and cause the outputs to remain active.
	

---

**DH-485 Token Passing Devices**

The interface module operates as a token passing master on the DH-485 network. It can communicate with other DH-485 master stations (such as an SLC 5/02 processor) and with DH-485 token passing slave devices (such as an SLC 5/01 processor).

The module communicates with other master stations using the Allen-Bradley programmable controller command set. For details, refer to the DF1 Protocol and Command Set Reference Manual, publication 1770-RM516.

## DH-485 Non-Token Passing Devices

The DH-485 network also supports non-token passing slave devices. The module communicates with these slaves using a special PLC command (CMD) byte.

Application programs communicate with non-token passing slaves via Send and Receive Data (SRD) messages on DH-485. The SRD message is a link layer service provided on DH-485. The Programmable Controller Communications Command Set (PCCC) has been extended to provide SRD messages by setting the PCCC CMD byte to 09. The SRD message cannot be used in slave-to-slave communication.

A detailed description of the packet is found in the DF1 Protocol and Command Set Reference Manual, publication 1770-RM516.

The format of the application layer data within the packet is completely dependent on how the destination device is implemented. Refer to the destination device's user manual for this information.

## Communicate with a Modem

The hardware handshaking option must be enabled for the module to properly control a modem.

The module continually asserts DTR while it is waiting for a call.

Under this condition, the modem answers a call and asserts DCD upon connection. When the module detects DCD, communications can start.

After detecting DCD, the module continues to monitor the DCD line. If DCD goes off, the module restarts the 10-second timeout. If DCD is not restored within 10 seconds, the module initiates the hang-up sequence. This feature lets the remote node to redial in case the connection was lost due to a fault in the phone system.

This handshaking is necessary to guarantee access to the phone line. If the handshaking protocol is defeated by improper selection of modem options or wiring of communication cables, the modem may still answer a call. But if the connection is lost, the modem will not hang up. It will then be impossible for the remote node to reestablish the connection because it will get a busy signal.

For successful modem communication be sure that:

- RSLinx software and the interface module agree on communication rate and error checking.
- both modems have the echo disabled.
- both modems have Carrier Detect set to normal (unforced).
- both modems have DTR Dialing disabled.
- the modem to receive the call has auto answer enabled.

---

## Installation and System Configuration

This chapter provides the following installation and system configuration information.

- European Union directives compliance
- Module functionality
- Mode selection
- Port configuration verification
- Module installation
- Cable connection
- SLC chassis, DF1 driver, and module configuration

---

**ATTENTION**

Do not install or remove the 1747-KE module from the SLC chassis until all power dissipates from the SLC 500 power supply (approximately 10 seconds).

---

### European Union Directives Compliance

If this product has the CE mark, it is approved for installation within the European Union and EEA regions. It has been designed and tested to meet the following directives.

#### EMC Directive

This product is tested to meet Council Directive 89/336/EEC Electromagnetic Compatibility (EMC) and the following standards, in whole or in part, documented in a technical construction file:

- EN 50081-2  
EMC - Generic Emission Standard, Part 2 - Industrial Environment
- EN 50082-2  
EMC - Generic Immunity Standard, Part 2 - Industrial Environment

This product is intended for use in an industrial environment.

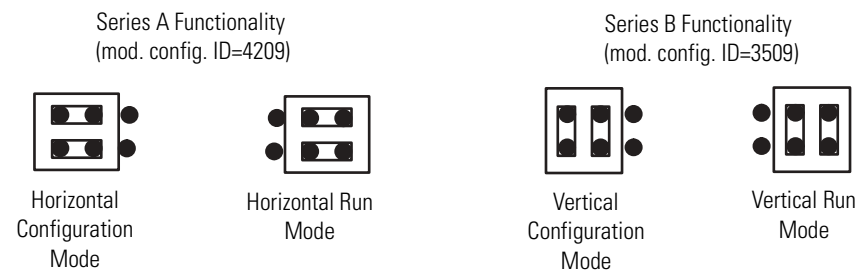
## Choose the Module's Functionality

Your series B interface module has the ability to function as a series A interface module. This feature may be important to you if you are replacing a series A module with a series B module.

Refer to page 4-2 for more information.

The module's functionality depends on the placement of the JW4 jumper. Horizontal placement of the jumper gives the module functionality equivalent to a series A interface module, while vertical placement of the jumper accesses the added functionality of a series B interface module.

### Module Functionality Settings



## Add an Interface Module to Your System

If you are not replacing a series A module, you will want to access the full functionality of the series B module. Therefore, as you work through the remainder of this manual, follow the instructions for series B functionality (vertical placement of the JW4 jumper).

Skip the next section and move on to Set the Module's Mode.

## Replace a Series A Interface Module in Your System

### IMPORTANT

Choosing series B functionality requires you to change the module configuration ID assigned in your processor.

### *Series A Functionality*

If you do not want to alter the existing configuration in your user program in any way, choose the series A functionality for your new module. The horizontal placement of JW4 gives the series B module a



module configuration ID equivalent to the module configuration ID of the series A module you are replacing (4209).

As you work through the remainder of this manual, follow the instructions for series A functionality (horizontal placement of the JW4 jumper).

---

**IMPORTANT**

The increased functionality of the series B interface module (for example, the Real Time Clock, backplane configuration, and SLC processor reset of the interface module) is not available with the series A functionality.

---

### *Series B Functionality*

The series B module functions identical to the series A module, but has these additional features.

- Real Time Clock (RTC)
- Backplane configuration
- SLC processor reset of the interface module

If you want to use the added features of the series B interface module, follow the directions given for series B functionality (vertical placement of the JW4 jumper) as you work through the remainder of this manual.

---

**IMPORTANT**

You will be required to change the module configuration ID assigned in your processor. The vertical placement of the JW4 jumper gives your module a configuration ID that differs from the configuration ID of your series A interface module.

The procedure for changing the module configuration ID is explained later in this chapter.

See page 4-13 for more information.

---

## Set the Module's Mode

Setting the module's mode depends on which method you want to use to configure the module. You can configure the module using:

- an ASCII terminal.
- backplane communications.

### IMPORTANT

You can only use backplane communications if you selected series B functionality for the module.

Decide which method you want to use and then place the JW4 jumper according to the directions given below.

## Configure with an ASCII Terminal

Configuration of the interface module with an ASCII terminal is allowed only when the JW4 jumper is in Configuration mode. Place the module in the Configuration mode that corresponds to the functionality you chose for the interface module.

### JW4 in Configuration Mode

Series A Functionality



Horizontal  
Configuration  
Mode

Series B Functionality



Vertical  
Configuration  
Mode

## Configure Through the Backplane

Reading and writing configuration data through the backplane is allowed only for series B interface modules, and then only when the JW4 jumper is in the vertical Run mode position. Place the module in vertical Run mode.

### JW4 in Vertical Run Mode



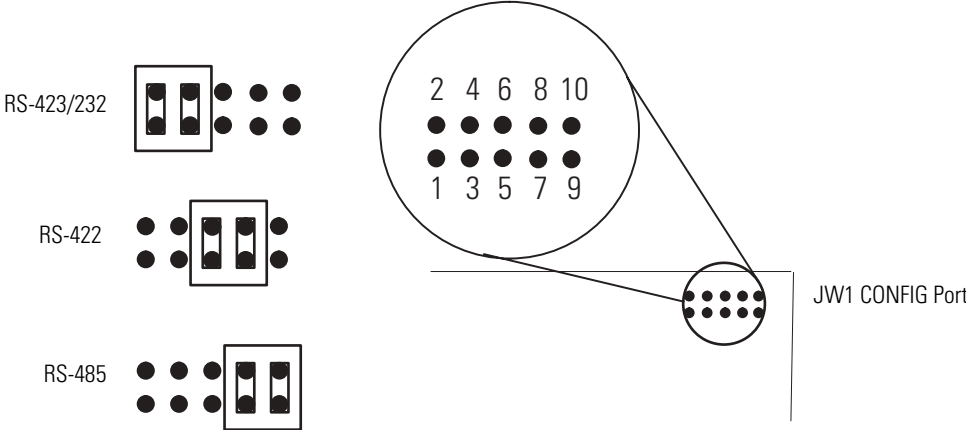
Vertical Run Mode

# Verify CONFIG Port Configuration

Jumper JW1, located at the top of the module, selects the following electrical interface for the CONFIG port.

- RS-423/232 (default)
- RS-422
- RS-485

## CONFIG Port Configuration



**ATTENTION**



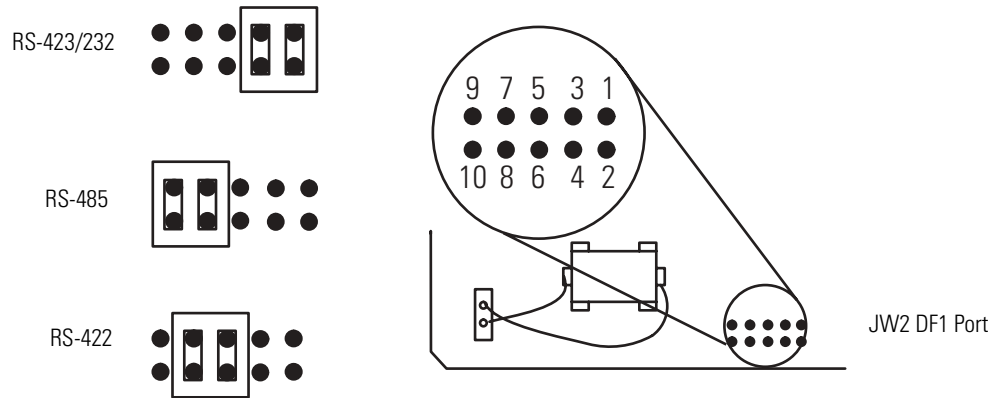
All other jumper settings are illegal and may cause damage to the module.

## Verify DF1 Port Configuration

Jumper JW2 selects the following electrical interface for the DF1 port.

- RS-423/232 (default)
- RS-422
- RS-485

### DF1 Port Configuration



### ATTENTION

All other jumper settings are illegal and may cause damage to the module.



## Install Your Module in an Open Slot

Installation procedures for this module are the same as any other digital I/O or specialty module.

---

**IMPORTANT**

Make sure you have JW1, JW2, and JW4 configured.

---

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**ATTENTION**

Do not install or remove the 1747-KE module from the SLC 500 chassis until all power dissipates from the SLC 500 power supply (approximately 10 seconds).

---

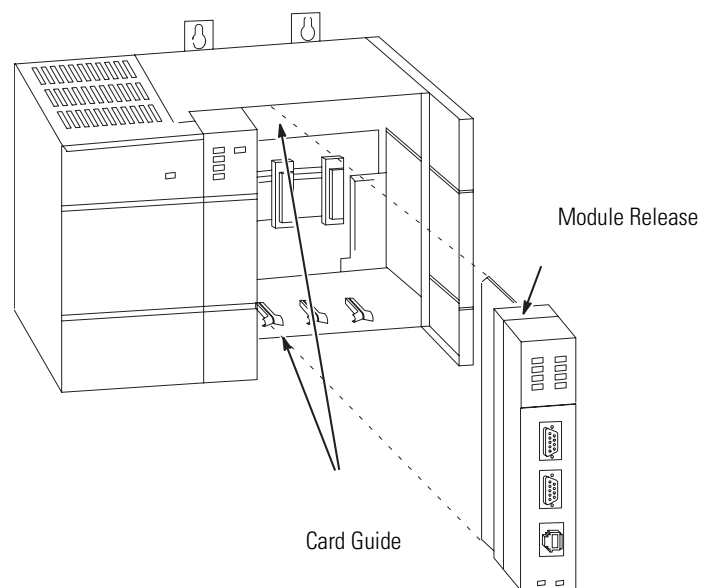
To install the module:

1. Align the full-size module circuit board with the chassis card guide.

The first slot (slot 0) of the first chassis is reserved for the CPU.

2. Slide the module into the chassis until the top and bottom latches are latched.

To remove the module, press the releases at the top and bottom of the module and slide it out.



## Connect Cable to CONFIG or DF1 Ports

The CONFIG and DF1 ports communicate to user devices through RS-423/232, RS-422, and RS-485 Communication modes.

The Communication mode is selected by setting jumpers JW1 and JW2 as described on pages 4-5 and 4-6.

### IMPORTANT

The following table and cable drawings assume the peripheral devices have conventional pin assignments. Check the documentation for your device to verify signals conform to those shown.

Use these pin assignments to construct communication cables for the CONFIG and DF1 ports. These connectors must be wired to correspond to the selected communication mode.

**Pin Assignments for CONFIG and DF1 Ports**

Pin for Interface Module	RS-423/232 Signal	RS-422 Signal	RS-485 Signal	IBM AT Standard RS-423/232		
				Signal	25-pin Pin	9-pin Pin
1	(1)	TXD-	TRXD-	DCD or CD	8	1
2	RXD	RXD-	(3)	RXD	3	2
3	TXD	(2)	(2)	TXD	2	3
4	DTR	(2)	(2)	DTR	20	4
5	COM	COM	COM	COM	7	5
6	DSR	RXD+	(3)	DSR	6	6
7	RTS	(2)	(2)	RTS	4	7
8	CTS	(2)	(2)	CTS	5	8
9	(1)	TXD+	TRXD+	RI	22	9

(1) In RS-423 mode, these pins are still connected to their RS-422 loads. Do not use these pins in RS-423 mode.

(2) In RS-422 and RS-485 modes these pins are connected to their RS-423 drivers and receivers. Do not use these pins in either RS-422 or RS-485 modes.

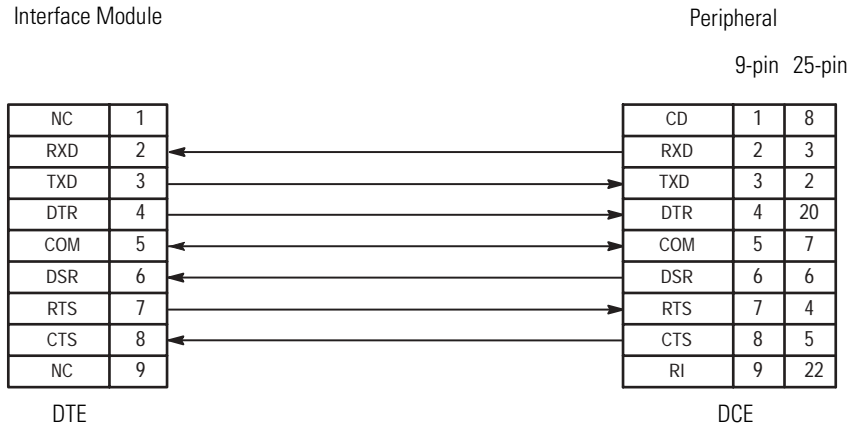
(3) In RS-485 mode, these pins are still connected to their RS-422 receivers. Do not use these pins in RS-485 mode.

### IMPORTANT

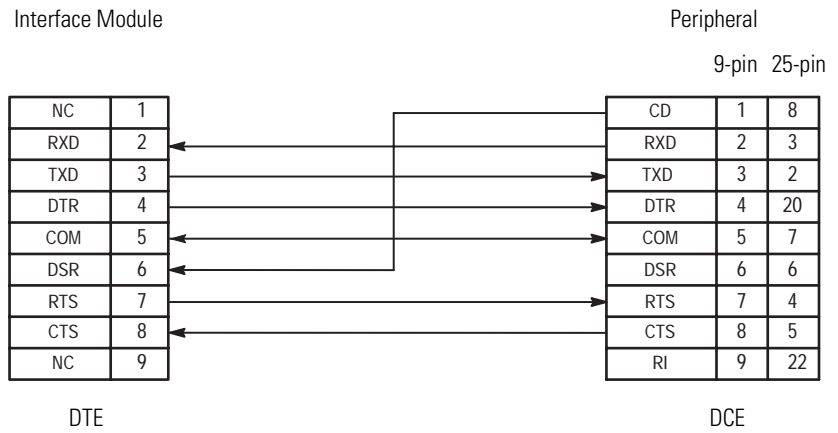
The signal names on a DCE device are viewed from a DTE perspective. For example, TXD is a DTE output and also a DCE input.

These illustrations show wiring diagrams for the RS-423/232, RS-422, and RS-485 communications.

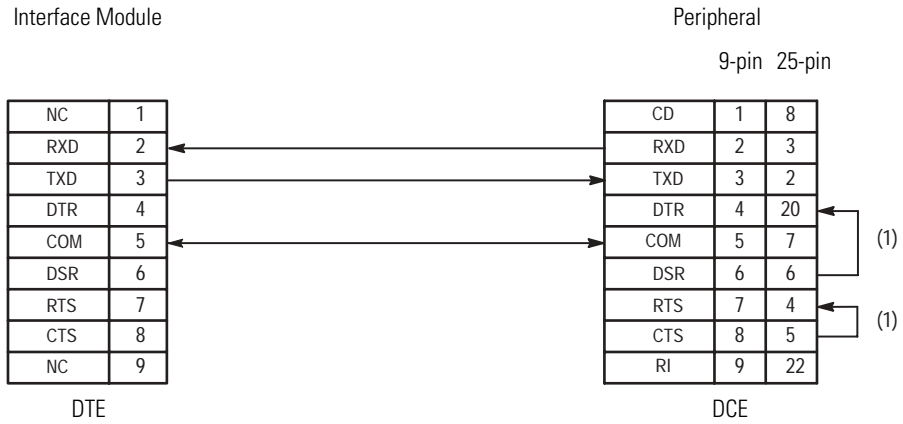
**RS-423/232 DTE to DCE (Non-modem Hardware Handshake to DCE)**



**RS-423/232 DTE to DCE (Modem Hardware Handshake to DCE)**

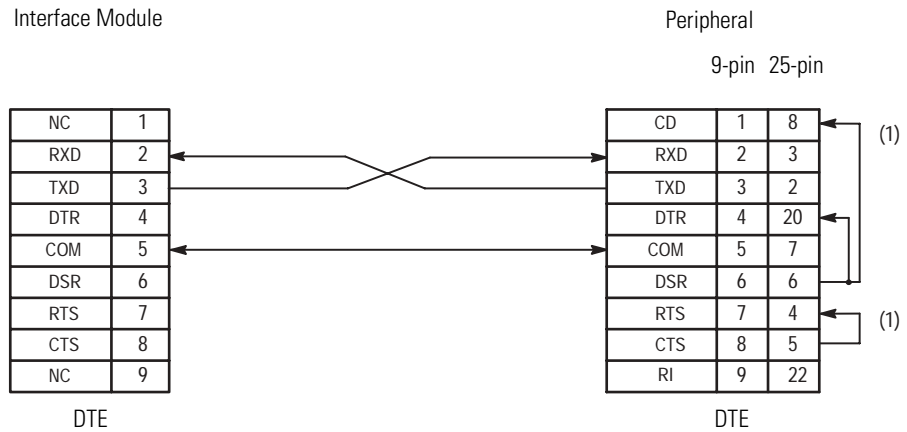


**RS-423/232 DTE to DCE (No Handshake to DCE)**



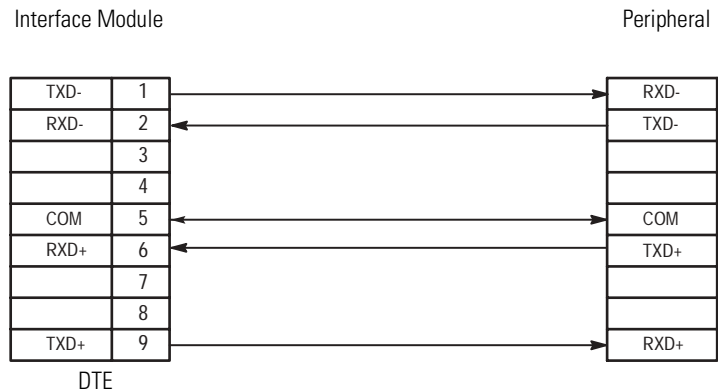
(1) Connect DSR to DTR and CTS to RTS when using devices that cannot disable their hardware handshaking.

**RS-423/232 DTE to DTE (Soft or No Handshake to DTE)**



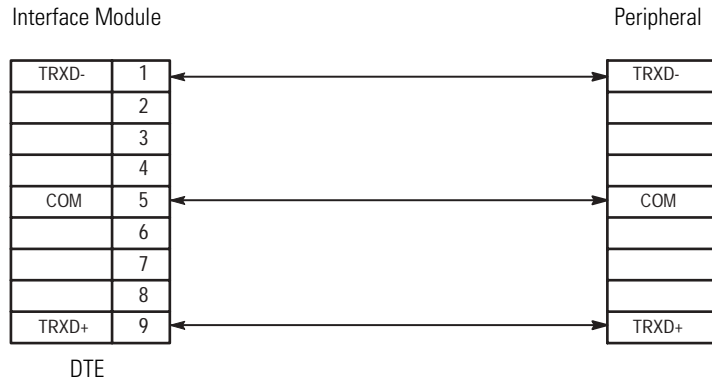
(1) Connect DSR to DTR and CD, and CTS to RTS when using devices that cannot disable their handshaking.

**RS-422**





**RS-485**



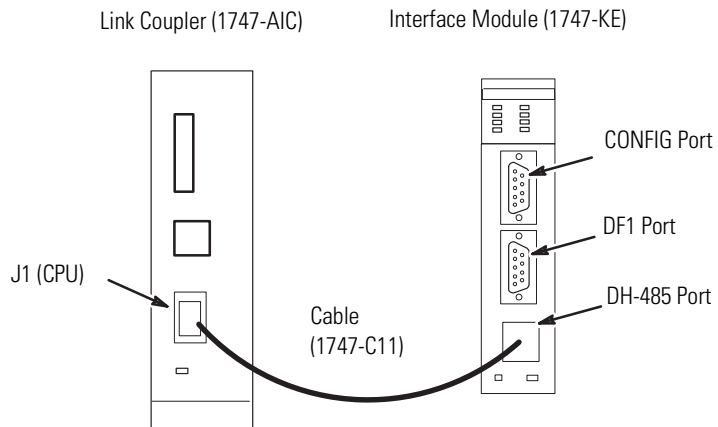
**Connect Cable to the DH-485 Port**

The DH485 port can communicate to user devices through the DH-485 Communication mode. Use a 1747-C11, 1747-C10, or 1747-C13 interface cable to connect the module to a link coupler interfaced with the DH-485 network.

If you use the 1747-C11 or 1747-C10 cable, it connects between the DH-485 port on the module and the J1 (CPU) connector on the link coupler. Power for the link coupler will come from the interface module.

Refer to page A-1 for more information.

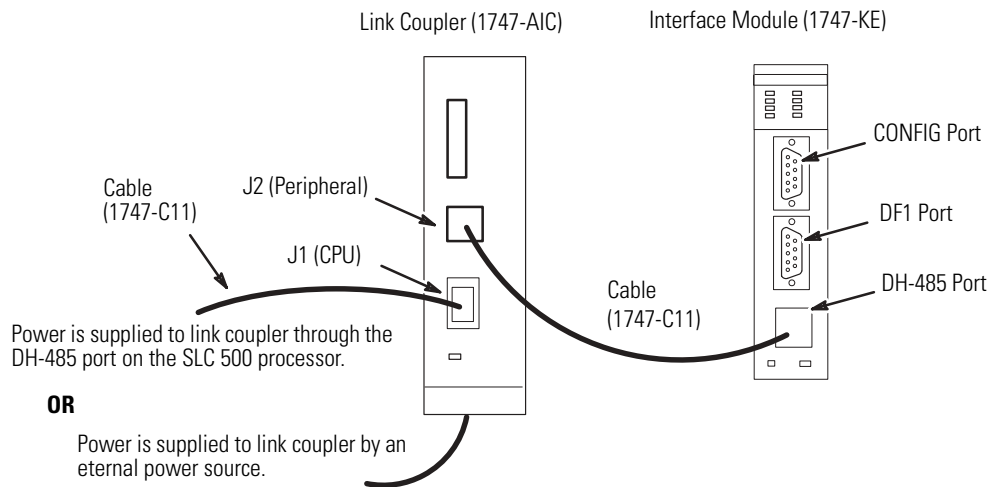
**Connect to the DH-485 Port via the 1747-C11 Cable**



If you use the 1747-C13 cable, it connects between the DH-485 port on the module and the J2 (Peripheral) connector on the link coupler. Power for the link coupler must be provided from some other source.

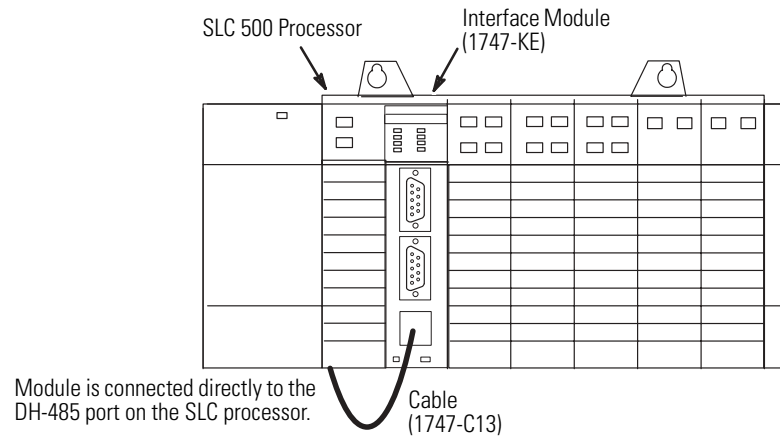
See page A-1 for more information.

**Connect to the DH-485 Port via the 1747-C11 Cable**



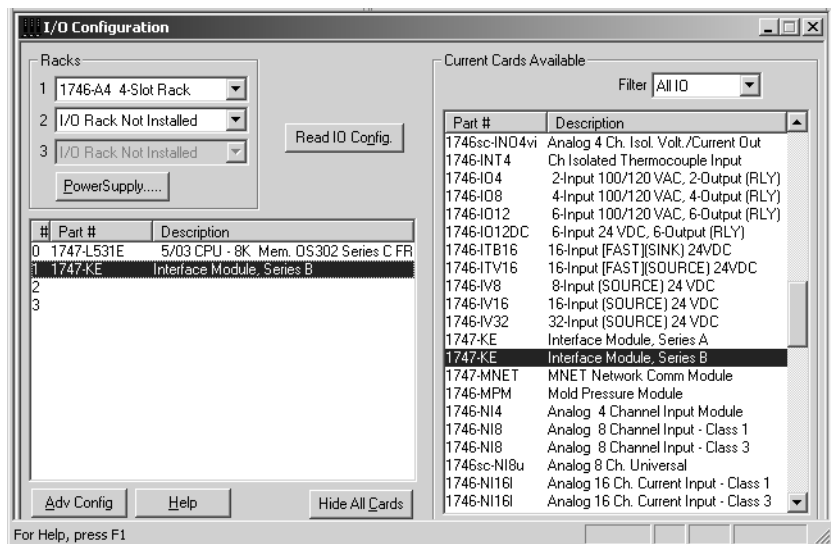
The 1747-C13 cable can also connect the module's DH-485 port directly to a single SLC processor. It connects between the DH-485 port on the module and the DH-485 port on the SLC 500 processor.

**Connect to the DH-485 Port via the 1747-C13 Cable**



## Configure Your SLC Chassis

The slot containing the interface module must be assigned within the SLC program. Using RSLogix 500 software, you can either manually insert the KE module into the chassis configuration in I/O Configuration or select Read I/O Config to read the current I/O configuration out of the processor and insert the module automatically. Enter the module ID code 4209. The ID code for interface modules with series A functionality is 4209, while the ID code for the interface modules with series B functionality is 3509. Entering the module ID code will automatically create the correct input and output words.



## Configure the DF1 Driver within RSLinx Software

To configure the DF1 driver within RSLinx software:

1. Open RSLinx Classic.
2. Select Configure Drivers.
3. Click Add New.
4. Click Auto-Configure.

If RSLinx software successfully communicates with the 1747-KE module, the following dialog appears.

The screenshot shows a dialog box titled "Configure RS-232 DF1 Devices". At the top, it displays "Device Name: AB\_DF1-1". Below this, there are two dropdown menus: "Comm Port:" set to "COM1" and "Device:" set to "1770-KF3/1747-KE". The main configuration area contains several fields: "Baud Rate:" set to "19200", "Station Number: (Decimal)" set to "00", "Parity:" set to "None", "Error Checking:" set to "CRC", "Stop Bits:" set to "1", and "Protocol:" set to "Full Duplex". There is an "Auto-Configure" button and a "Use Modem Dialer" checkbox which is unchecked. At the bottom, there are "OK", "Cancel", "Delete", and "Help" buttons.

## Configure Your Module

Configuration instructions are in Chapter 5, Module Configuration Using an ASCII Terminal, and Chapter 6, Module Configuration Using the Backplane.

Proceed to the chapter that corresponds to the configuration method you have chosen.

### ATTENTION



This module is a device used for communications. Improper configuration or module failure may cause communications to stop. Be careful to avoid system designs that would cause probable safety concerns within the system in the event of a communication failure.

## Complete the Installation of Your Module

Once your interface module has been configured, complete the module's installation.

### ATTENTION



Do not install or remove the 1747-KE module from the SLC 500 chassis until all power dissipates from the SLC 500 power supply (approximately 10 seconds).

1. If you configured your module using an ASCII terminal, place the module into Run mode.
  - a. Remove the module from the chassis.  
The removal is reverse of the installation directions found on page 4-7.
  - b. Place your module in Run mode using JW4

Series A Functionality  
(mod. config. ID=4209)



Horizontal Run  
Mode

Series B Functionality  
(mod. config. ID=3509)



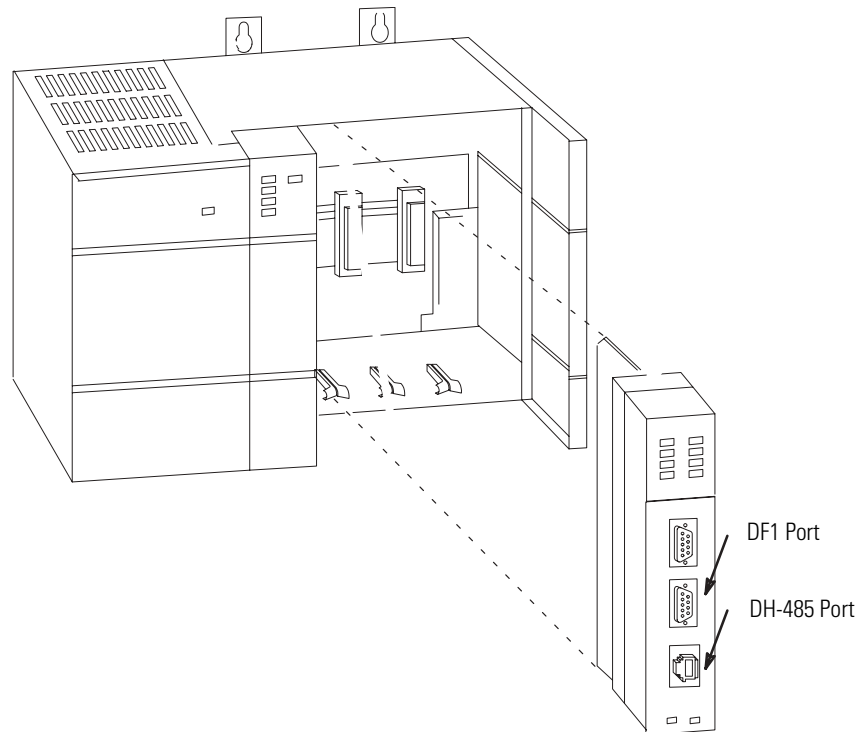
Vertical Run  
Mode

c. Re-insert the module into the chassis.

**IMPORTANT**

Make sure you have JW4 positioned for the Run mode that corresponds to the functionality you've chosen for your module.

2. Connect the DF1 cable to the DF1 port.
3. Connect the DH-485 cable to the DH-485 port.
4. Insert the cable tie in the slots and secure the cable.
5. Cover all unused slots with the Card Slot Filler (catalog number 1746-N2).



6. Apply power to the SLC 500 chassis.
7. Verify that the LED indicators on the module indicate normal operation per the LED indicator table on page 1-3.

## **Module Configuration Using an ASCII Terminal**

This chapter guides you through the configuration of your interface module using an ASCII terminal.

If you prefer to configure your module using backplane communication, proceed to Chapter 6.

Once you complete the configuration, return to page 4-15 for instructions on completing the installation of your module.

This chapter includes:

- configuration of the ASCII terminal.
- overview of module configuration with a terminal.
- top level setup menu.
- CONFIG port menu.
- DF1 port menu.
- DH-485 port menu.
- DF1 protocol menu.
- display parameters menu.

---

**IMPORTANT**

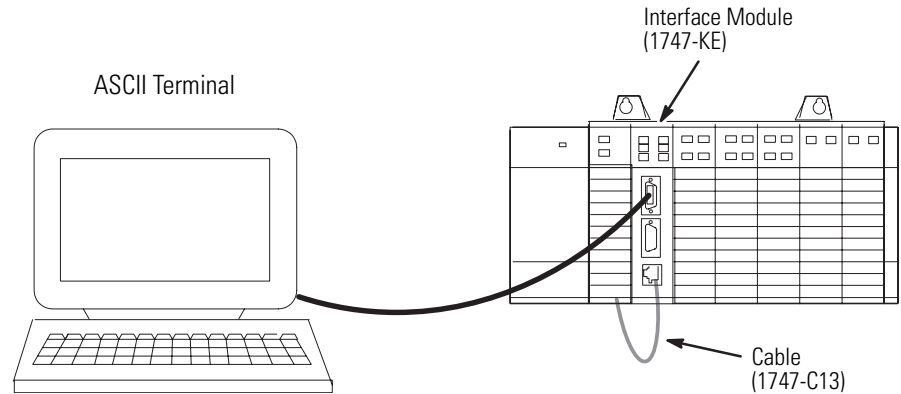
Configuration with an ASCII terminal is an alternate configuration method than that presented in Chapter 6, Module Configuration Using the Backplane.

---

## ASCII Terminal Configuration

To communicate with the interface module through an ASCII terminal, connect the terminal to the CONFIG port.

### ASCII Terminal Configuration



The ASCII terminal can be any industrial terminal, workstation, or personal computer with terminal mode software that communicates in alphanumeric mode.

Allen-Bradley has a development software package (catalog number 1747-PBASE) for the SLC 500 BASIC module that is capable of ASCII terminal emulation on an IBM compatible computer.

HyperTerminal is a terminal emulation program included with all versions of Microsoft Windows.

Configure the ASCII terminal's communication parameters for:

- 1200 Kbps.
- 8 bits per character.
- no parity.
- 1 stop bit.
- software handshaking enabled (XON/XOFF).



## Module Configuration with a Terminal Overview

Configuration of the module with an ASCII terminal requires:

- an ASCII terminal connected to the CONFIG port.
- jumper JW4 to be in the configuration position.

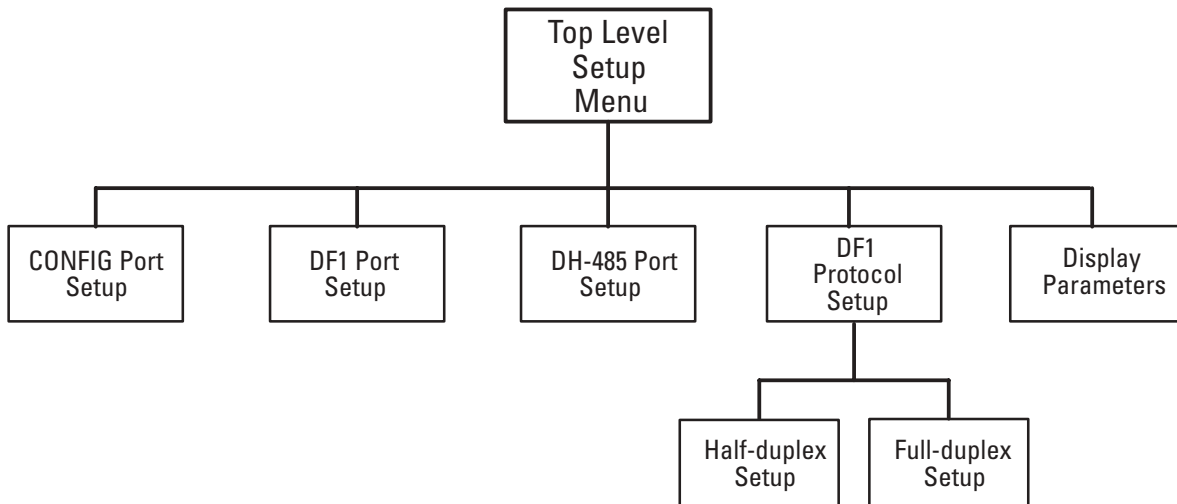
See page 4-4 for more information.

- knowledge of the communication parameters of the devices you will be connecting to each of the module ports.
- knowledge of what types of cables will be used to connect devices to the module ports.

Refer to the cable information beginning on page 4-8.

When you power up the module and your ASCII terminal, a Top Level Setup menu appears. The menu structure is three levels deep.

### Menu Structure



## Top Level Setup Menu

The Top Level Setup Menu provides six selections.

### Top Level Setup Menu

```

1747 KE Module, FRN #

Top Level Setup Menu.

      1. CONFIG PORT
      2. DF1 PORT
      3. DH 485 PORT
      4. DF1 PROTOCOL
      5. DISPLAY PARAMETERS
      X. SAVE AND EXIT

Enter Selection. . . . .

```

- To redisplay the above menu, press [ENTER] .
- To access the corresponding menus (described on the following pages), press [1] through [5].
- To save changes and exit, press [X]. This enables the DH-485 and DF1 ports.

#### **IMPORTANT**

After configuration is complete, place the module in Run mode as described on page 4-15.

If you operate the module in Configuration mode, cycling power will disable the DF1 and DH-485 ports, return to the configuration mode, and display the Top Level Setup Menu on your ASCII terminal.

## Change Parameters for Menus 1 through 4

To change any of the parameters in menus 1 through 4:

1. Select the parameter you wish to change. The current parameter setting and a prompt for entering a new value appear at the bottom of the screen.
2. Type in the new value and press [ENTER] .

If you enter an invalid value, the ASCII terminal beeps and the prompt remains. Refer to the tables on pages 5-5 through 5-12 for the valid parameter options.

When you enter a valid value the prompt line disappears, indicating that your change has been saved. You now have the option to select another parameter.

3. Once you finish changing parameters, press [X] to return to the Top Level Setup Menu.

## CONFIG Port Menu

The CONFIG PORT Setup Menu provides six selections.

### CONFIG Port Setup Menu

CONFIG PORT Setup Menu

1. Baudrate  
2. Bits per character  
3. Parity  
4. Stop bits  
5. Handshaking  
X. SAVE AND EXIT

Enter Selection. . . . .

## CONFIG PORT Setup Parameters

Whenever the module is powered up, the CONFIG port is set to the default parameters. If these parameters are changed and the setup is saved, they will remain changed only as long as module power remains on. Whenever power to the module is cycled off, the CONFIG port parameters return to their default values.

### CONFIG PORT Setup Parameters

Parameter	Default	Options	Description
Communication Rate	1200	300, 600, 1200, 2400, 4800, 9600, 19200	The speed in bits per second at which data is transferred. Must be set the same as the ASCII terminal.
Bits Per Character	8	7, 8	The size in number of bits of each character to be transferred. Must be set the same as the ASCII terminal.
Parity	None	Even, Odd, None	Used for checking data during the transfer. Must be set the same as the ASCII terminal.
Stop Bits	1	1, 2	Used for delineating data during the transfer. Must be set the same as the ASCII terminal.
Handshaking	Software	None, Software, Hardware, Both	Describes the communication protocol. If Hardware handshaking or Both is selected, you must use cables wired accordingly.

## DF1 Port Menu

The DF1 PORT Setup Menu provides five selections.

### DF1 PORT Setup Menu

DF1 PORT Setup Menu

1. Baudrate  
 2. Bits per character  
 3. Parity  
 4. Stop bits  
  
 X. SAVE AND EXIT

Enter Selection. . . . .

### DF1 Port Setup Parameters

When the module is powered up for the first time, the DF1 port will be set to the default parameters. If these parameters are changed and the setup is saved, then the module will always power up with the new settings, unless the battery fails and power to the module's RAM is lost.

#### DF1 Port Setup Parameters

Parameter	Default	Options	Description
Communication Rate	1200	300, 600, 1200, 2400, 4800, 9600, 19200	The speed in bits per second at which data is transferred. Must be set the same as the DF1 device.
Bits Per Character	8	7, 8	The size in number of bits of each character to be transferred. Must be set the same as the DF1 device.
Parity	None	Even, Odd, None	Used for checking data during the transfer. Must be set the same as the DF1 device.
Stop Bits	1	1, 2	Used for delineating data during the transfer. Must be set the same as the DF1 device.

## DH-485 Port Menu

The DH-485 PORT Setup Menu provides six selections.

### DH-485 Port Menu

```

DF1 PORT Setup Menu

      1. Baudrate
      2. Bits per character
      3. Parity
      4. Stop bits

      X. SAVE AND EXIT

Enter Selection. . . . .

```

## DH-485 Port Setup Parameters

When the module is powered up for the first time, the DH-485 port will be set to the default parameters. If these parameters are changed and the setup is saved, then the module will always power up with the new settings, unless the battery fails and power to the module's RAM is lost.

### DH-485 Port Setup Parameters

Parameter	Default	Options	Description
Node Address	2	0...31 (decimal)	The address of this node on the DH-485 network. Every device on the DH-485 network must be given a unique node address. For optimum performance, set devices to consecutive addresses starting at 0. This minimizes the solicitation of new stations.
Max. Node Address	31	1...31 (decimal)	The number of nodes that will be polled. For optimum performance this value should be set no larger than the value of the highest numbered node on the network.
Message Timeout	10,000 ms	100...12,750 ms	The time to wait for a response to a message sent on a DH-485 network.
Pass Through	Disabled	Enabled, Disabled	Determines whether diagnostic commands are executed by the module (Disabled) or passed through to the host (Enabled).
Communication Rate	19200	300, 600, 1200, 2400, 4800, 9600, 19200	The speed in bits per second at which data is transferred on the DH-485 link. Important: All stations on the DH-485 link must be set to the same communication rate.

## DF1 Protocol Menu

When you press [4] to select the DF1 Protocol Menu, you are first prompted at the bottom of the Top Level Setup Menu to select [H] or [F] for half- or full-duplex.

### IMPORTANT

Choose [F] for full-duplex when using RSLinx software.

### DF1 Protocol Menu

1. CONFIG PORT
2. DF1 PORT
3. DH 485 PORT
4. DF1 PROTOCOL
5. DISPLAY PARAMETERS
- X. SAVE AND EXIT

Enter Selection. . . . 4

DF1 Duplex = Full, New Value (H/F) =

## DF1 Full-duplex Setup Menu

Select full-duplex by pressing [F] when prompted at the bottom of the Top Level Setup Menu. The DF1 Full-duplex Setup Menu provides 12 selections.

### DF1 Full-duplex Setup Menu

DF1 Full Duplex Setup Menu

1. Duplicate Packet Detection
2. Checksum
3. Constant Carrier Detect
4. Modem Init String
5. Modem Init String Delay
6. Message Timeout
7. Hardware Handshaking
8. Embedded Response Detect
9. ACK Timeout
- A. ENquiry Retries
- B. NAK Received Retries

X. SAVE AND EXIT

Enter Selection. . . .

## DF1 Full-duplex Setup Parameters

When the module is powered up for the first time, the DF1 protocol will be set to the default parameters. If these parameters are changed and the setup is saved, then the module will always power up with the new settings, unless the battery fails and power to the module's RAM is lost.

### DF1 Full-duplex Setup Parameters

Parameter	Default	Options	Description
Duplicate Packet Detection	Disabled	Enabled, Disabled	Determines whether duplicate message detection is Disabled or Enabled. When enabled, duplicate messages will be acknowledged and discarded.
Checksum	BCC	BCC, CRC16	Determines the type of error detection that will be used on the DF1 link. It must be the same as that for any application programs that may be running.
Constant Carrier Detect	Disabled	Disabled, Enabled	If enabled, hardware handshaking is forced on. The module will monitor the carrier from the modem (DCD signal) and will not begin communication until it is detected.
Modem Init String	(blank)		Lets you configure your modem using Hayes commands upon every power cycle of the module. For example, entering ATDT here would get the modem's attention (AT) and set it to tone dialing (DT). Sending a (~) character will produce a 1 s wait on the modem. Refer to your modem user manual for details.
Modem Init String Delay	0 s	0...25 s	Determines the amount of time the module will wait before sending the Modem Init String to the modem.
Message Timeout	10,000 ms	100...12,750 ms	The time to wait for a response to a message sent on a DF1 network. This parameter is rounded down to the nearest 50 ms increment. For example, if you enter 199 ms, it is accepted as 150 ms.
Hardware Handshaking	Disabled	Disabled, Enabled	If enabled, the module will use the RTS and CTS signals for control of the modem.
Embedded Response Detect	Embedded Response	Embedded Response, Auto Detect Embedded Response	Selecting Embedded Response lets the module to send embedded responses within packets. Selecting Auto Detect Embedded Response causes the module to use embedded responses only if an embedded response from the host is received by the module.
ACK Timeout	200 x 5 ms	(0...65,535) x 5 ms	Determines the time the module will wait for an ACK to be received from the host DF1 device.
ENquiry Retries	2	0...254	Determines the number of enquiry retries that will be attempted before a packet transmission is considered to have failed.
NAK Received Retries	2	0...254	Determines the number of packet retries that will be attempted when NAK responses are received on previous transmissions of the packet.

## DF1 Half-duplex Setup Menu

When you press [4] on the Top Level Setup Menu, you are prompted at the bottom of the menu to select [H] or [F] for half- or full-duplex. Enter [H] to display the Half-Duplex Setup Menu.

---

**IMPORTANT**

Choose [F] for full-duplex when using RSLinx software.

---

### DF1 Half-duplex Setup Menu

```
DF1 Half Duplex Setup Menu
  1. Duplicate Packet Detection
  2. Checksum
  3. Constant Carrier Detect
  4. Modem Init String
  5. Modem Init String Delay
  6. Message Timeout
  7. Hardware Handshaking
  8. Poll Timeout
  9. Message Retries
  A. RTS On Delay
  B. RTS Off Delay
  C. Local/Remote Mode
  D. Slave Address/Group Number
  C. Master Station Address
  X. SAVE AND EXIT
```

```
Enter Selection. . . . .
```

## DF1 Half-duplex Setup Parameters

When the module is powered up for the first time, the DF1 protocol will be set to the default parameters. If these parameters are changed and the setup is saved, then the module will always power up with the new settings, unless the battery fails and power to the module's RAM is lost.



**DF1 Half-duplex Setup Parameters**

<b>Parameter</b>	<b>Default</b>	<b>Options</b>	<b>Description</b>
Duplicate Packet Detection	Disabled	Enabled, Disabled	Determines whether duplicate message detection is Disabled or Enabled. When enabled, duplicate messages will be acknowledged and discarded.
Checksum	BCC	BCC, CRC16	Determines the type of error detection that will be used on the DF1 link. It must be the same as that for the DF1 device.
Constant Carrier Detect	Disabled	Disabled, Enabled	If enabled, hardware handshaking is forced on. The module will monitor the carrier from the modem (DCD signal) and will not begin communication until it is detected.
Modem Init String	(blank)		Lets you configure your modem using Hayes commands upon every power cycle of the module. For example, entering ATDT here would get the modem's attention (AT) and set it to tone dialing (DT). Sending a (~) character will produce a one second wait on the modem. Refer to your modem user manual for details.
Modem Init String Delay	0 s	0...25 s	Determines the amount of time the module will wait before sending the Modem Init String to the modem.
Message Timeout	10,000 ms	100...12,750 ms	The time to wait for a response to a message sent on a DF1 network. This parameter is rounded down to the nearest 50 ms increment. For example, if you enter 199 ms, it is accepted as 150 ms.
Hardware Handshaking	Disabled	Disabled, Enabled	If enabled, the module will use the RTS and CTS signals for control of the modem.
Poll Timeout	200 x 5 ms	(0...65,535) x 5 ms	Determines the time to wait to be polled by the DF1 master before a transmission request is ignored.
Message Retries	2	0...254	Determines the number of allowable retries on the DF1 link before failure.
RTS On Delay	0 x 5 ms	(0...65,535) x 5 ms	Determines the delay between the RTS (Request to Send) signal and the start of transmission by the module. This parameter is only required when communicating with the type of radio modem that requires a delay after exerting the RTS signal. It only takes effect if hardware handshaking is enabled. Refer to your modem user manual.
RTS Off Delay	0 x 5 ms	(0...65,499) x 5 ms	Determines the delay between the end of the message and the module setting RTS (Request to Send) inactive. This parameter is only required when communicating with modems that require a delay between sending the last character and raising the RTS signal. It only takes effect if hardware handshaking is enabled. Refer to your modem user manual.
Local/Remote Mode	Local	Local, Remote	Refer to pages 3-3 and 3-4 for a description of these half-duplex modes.
Slave Address/ Group Number	0	Slave Add. = 0...254 Group No. = 0...7	Slave address is a half-duplex local mode parameter and is the address of the module on the DF1 link. Group Number is a half-duplex remote mode parameter and allows a means of addressing more than 32 DH-485 nodes.  This is explained in detail on page 3-4.
Master Station Address	8 (10 octal)	0...254 (decimal)	Determines the address of the half-duplex DF1 master device. For slave-to-slave communication, this is the address of the DF1 slave device. Refer to page 3-10.

## Display Parameters Menu

When you press [5] from the Top Level Setup Menu, you see a screen displaying all of the parameter settings of the CONFIG, DF1, and DH-485 ports. There are two Setup Summary screens, one for full-duplex and one for half-duplex. If you are in full-duplex mode when you select [5] you will see the full-duplex summary screen. Similarly, if you are in half-duplex mode when you select [5] you will see the half-duplex summary screen.

To exit the Display Parameters screen and return to the Top Level Setup Menu, press any key.

### Full-duplex Setup Summary

Setup Summary			
CONFIG POR T	DF1 POR T	DH-485 POR T	DF1 PR TCL (Full Dup)
Baud . . . . 1200	Baud . . . . 1200	Baud . . . . 19200	DPD . . . . . Off
Bits/char . . . . 8	Bits/char . . . . 8	Node . . . . . 2	Checksum . . . . . BCC
Parity . . . . None	Parity . . . . None	Max Node Add . 31	CCD . . . . . Off
Stop Bits . . . . 1	Stop Bits . . . . 1	Msg Time 10000ms	Modem Init Delay . . . . 0S
Hndshking . Soft		Pass Thru . . . . Off	Msg Time . . . . 10000mS
			RTS/CTS . . . . . Off
			Em Resp Detect . . . . ER
			ACK T ime . . . . 200x5mS
			ENQ Retries . . . . . 2
			NAK Retries . . . . . 2
Modem Init String =			
Hit any key to continue. . . . .			

### Half-duplex Setup Summary

Setup Summary			
CONFIG POR T	DF1 POR T	DH-485 POR T	DF1 PR TCL (Half Dup)
Baud . . . . 1200	Baud . . . . 1200	Baud . . . . 19200	DPD . . . . . Off
Bits/char . . . . 8	Bits/char . . . . 8	Node . . . . . 2	Checksum . . . . . BCC
Parity . . . . None	Parity . . . . None	Max Node Add . 31	CCD . . . . . Off
Stop Bits . . . . 1	Stop Bits . . . . 1	Msg Time 10000ms	Modem Init Delay . . . . 0S
Hndshking . Soft		Pass Thru . . . . Off	Msg Time . . . . 10000mS
			RTS/CTS . . . . . Off
			Poll Time . . . . . 200x5ms
			Msg Retries . . . . . 2
			RTS On Delay . . . . 0x5ms
			RTS Off Delay . . . . 0x5ms
			Loc/Rem . . . . . Local
			Group . . . . . 0
			Master . . . . . 8
Modem Init String =			
Hit any key to continue. . . . .			

---

## Module Configuration Using the Backplane

---

**IMPORTANT**

Configuration through the backplane is an alternate configuration method than that presented in Chapter 5. If you prefer to configure your module using an ASCII terminal, or have already done so, you do not need to go through this chapter. Instead, return to Chapter 5 for directions on configuration with a terminal or move on to Chapter 7.

---

The interface module can be configured through backplane communications using any SLC fixed, 5/01, 5/02, 5/03, 5/04, or 5/05 processor. This chapter guides you through the configuration of your interface module using backplane communications.

Once you complete the configuration, return to page 4-15 for instructions on completing the installation of your module.

Topics for this chapter include:

- configuring the interface module from the SLC processor.
- placing the module into software Run mode from the SLC processor.
- reading the module's configuration from the SLC processor.
- examining the SLC processor's status word.
- building the DF1, DH-485, and Modem Init String configuration packets.
- using the Real Time Clock.
- establishing a Data Echo between the interface module and the SLC processor.
- resetting the interface module from the SLC processor.

### Overview

In this method of configuration, the SLC processor uses the backplane to load the configuration data into the Output Image file for the interface module. By assigning a Data ID value in the Output Image file you designate which parameters to configure.

There are six valid Data ID values, one for each of the configuration packets you create to configure your interface module.

**Valid Data ID Values**

Data ID value	Lets you build a configuration packet for
01	Calendar/Clock Function
02	DF1 Set Up Parameters
03	DH-485 Set Up Parameters
04	Modem Init String (1...14 characters)
05	Modem Init String (15...28 characters)
06	Data Echo

---

**IMPORTANT**

Any of the configuration packets can be sent independently and do not need to be in a particular sequence, with the exception of the Modem Init String packets (Data ID 4 and 5). In this instance, packet ID 4 must be sent before packet ID 5.

---

## Configure the Interface Module from the SLC Processor

The steps for configuring the module from the SLC processor follow. Use these instructions to build the configuration packets described in the remainder of this chapter.

---

**IMPORTANT**

The terms software Configuration mode and software Run mode in this chapter refer to the SLC processor changing the interface module's mode across the backplane. The module's JW4 jumper must remain in the vertical Run mode (module configuration ID=3509) while using backplane communications.

---

**Configure the Module From the SLC Processor**

<b>With the SLC processor you</b>	<b>The interface module then</b>
1. Place the module into software Configuration mode, if it is not already. Do this setting the Module Mode Bit (O:e.0/15).	
2. Load the correct Data ID value for the parameters you will configure (O:e.0/0..3).	
3. Build the Output Image file with configuration data (O:e.1...7).	
4. Write the configuration data by resetting the Read or Write bit (O:e.0/13).	
5. Set the Data Handshake bit to indicate the data in the Output Image file is valid (O:e.0/14).	
	6. Gets the configuration data from the SLC Output file.
	7. Configures parameters on the Interface Module.
	8. Echoes the Data ID (I:e.0/0...3) and configuration data (I:e.1...7), and places the status of the configuration transaction in the SLC Input File (I:e.0/4...10).
	9. Sets the Data Handshake bit to indicate the image data is valid (I:e.0/14).
10. Reset the Data Handshake bit (O:e.0/14).	
	11. Resets the Data Handshake bit (I:e.0/14).
12. Save your configuration changes by putting the module in software Run mode.	

**IMPORTANT**

The configuration data that is loaded does not take effect until the interface module goes to software Run mode. Therefore, to save your configuration changes be sure to put the module in software Run mode.

## Place the Module into Software Run Mode from SLC Processor

When configuration is complete, place the module in software Run mode by following these steps.

### Place the Module in Run Mode

With the SLC processor you	The interface module then
1. Reset the Module Mode bit to software Run (O:e.0/15).	
2. Set the Data Handshake bit to indicate the data in the Output Image file is valid (O:e.0/14).	
	3. Resets the Module Mode bit to software Run in the SLC Input Image File (I:e.0/15).
	4. Sets the Data Handshake bit (I:e.0/14).
5. Reset the Data Handshake bit (O:e.0/14).	
	6. Resets the Data Handshake bit (I:e.0/14).

## Read the Module's Configuration from the SLC Processor

The interface module's current configuration can be read back to the SLC processor using the Input and Output Image files.

**IMPORTANT**

The interface module can be in software Run or software Configuration mode during the read operation.

### Read the Module's Configuration from the SLC Processor

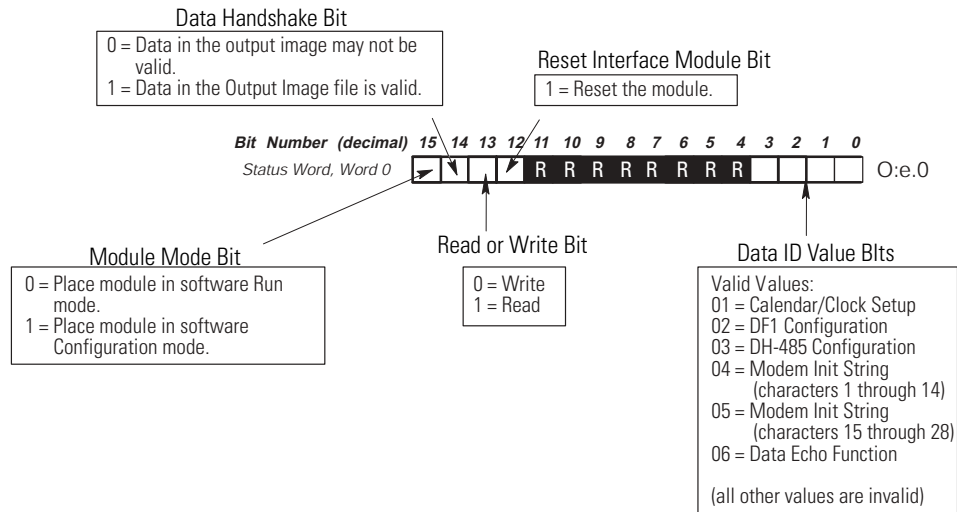
With the SLC processor you	The interface module then
1. Set the Read or Write bit to indicate a configuration read operation (O:e.0/13).	
2. Set the Data ID value for the configuration parameters to be read (O:e.0/0...3).	
3. Set the Data Handshake bit to indicate the data in the Output Image file is valid (O:e.0/14).	
	4. Interprets the Data ID value.
	5. Gets the configuration data from the Interface Module.
	6. Loads the data into the Input Image file (I:e.1...7).
	7. Sets the Data Handshake bit to indicate the image data is valid (I:e.0/14).
8. Read configuration data.	
9. 9. Reset the Data Handshake bit (O:e.0/14).	
	10. 10. Resets the Data Handshake bit (I:e.0/14).

## Examine the SLC Processor's Status Word

### SLC Output Status Word to the Interface Module

The output status word reserved for implementing backplane configuration and for resetting the interface module is shown below. Those status bits not defined here are reserved for future use.

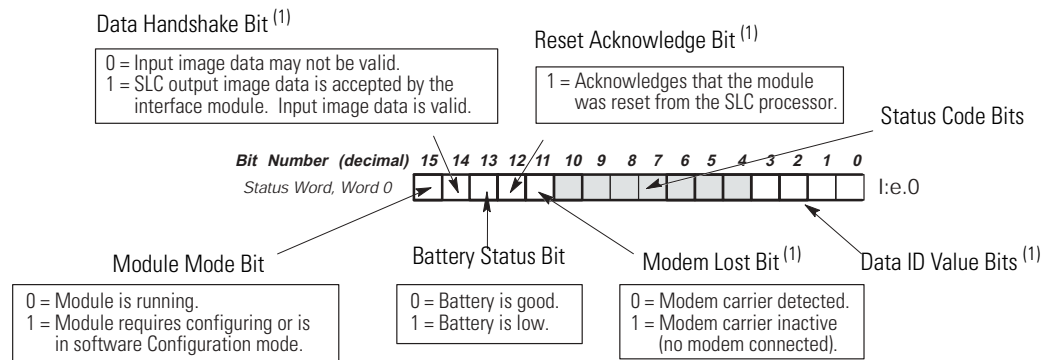
#### SLC Output Status Word Status Bits



### SLC Input Status Word from the Interface Module

This is the input status word reserved for implementing backplane configuration and for resetting the interface module. Those status bits not defined below are reserved for future use.

#### SLC Input Status Word Status Bits



<sup>(1)</sup> Applies to series B, or later interface modules only.



## Status Codes from the Module to the Processor

The module informs the SLC processor on the status of the configure or read transaction by placing a status value in the Input Image file word 0, bits 4 to 10. A value of 00 indicates that the status is okay.

### Status Codes from the Module to the SLC Processor

Value (hex)	Value (dec)	Indicates improper status for
01	01	Day
02	02	Month
03	03	Year
04	04	Day of the Week
05	05	Hour
06	06	Minute
07	07	Second
08	08	Data ID
09	09	(Not Used)
0A	10	(Not Used)
0B	11	DF1 Enq/Msg Retry
0C	12	Modem Init String Delay
0D	13	Master Station/NAK Rec Retry
0E	14	Slave Address/Group Number
0F	15	(Not Used)
10	16	DF1 Message Timeout
11	17	(Not Used)
12	18	RTS Off Delay
13	19	DH-485 Node Address
14	20	DH-485 Max Node Address
15	21	DH-485 Communication Rate
16	22	DH-485 Message Timeout
17	23	Modem Init String character
18	24	A write operation is attempted, but the configuration bit is not set (still in software Run mode).

## Build the DF1 Configuration Packet

Use the SLC processor to set up the DF1 port.

Build the configuration packet shown by following the configuration instructions found on page 6-2.

### SLC Output File to the Interface Module

Bit Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0 <sup>(1)</sup>	Module Mode Bit	Data Handshake Bit	Read or Write Bit	Reset Interface Module Bit	Reserved								Data ID=2			
1				Embedded Response Detect (Full) or Local/Remote Mode (Half)	Half or Full-duplex	Constant Carrier Detect <sup>(2)</sup>	Hardware Handshaking <sup>(2)</sup>	Checksum	Duplicate Packet Detection	Stop Bits	Parity	Bits per Character	DF1 Communication Rate			
2	Modem Init String Delay (0...25 s)								Enq/Msg Retries (0...254)							
3	Slave Address (Local) (0...254) Group Number (Remote) (0...7)								Master Station Address (Half Duplex) (0...254) NAK Rec Retries (Full Duplex) (0...254)							
4	ACK/POLL Timeout (0...65,535 x 5 ms)															
5	Message Timeout (100...12,750 ms)															
6	RTS ON Delay (0...65,535 x 5 ms) <sup>(3)</sup>															
7	RTS OFF Delay (0...65,499 x 5 ms) <sup>(3)</sup>															

<sup>(1)</sup> The output status word is defined on page 6-6. To configure the DF1 parameters the Read or Write Bit must be 0 and the Module Mode Bit must be 1. To read the DF1 parameters, the Read or Write Bit must be 1 and the Module Mode Bit can either be 0 or 1.

<sup>(2)</sup> If Constant Carrier Detect is enabled, Hardware Handshaking is forced on.

<sup>(3)</sup> The value is ignored if full-duplex is chosen.

## DF1 Port Setup Parameters

When the module is powered up for the first time, the DF1 port will be set to the default parameters shown in the table below. If these parameters are changed and the setup is saved (by changing to software Run mode), then the module will always power up with the new settings, unless the battery fails and power to the module's RAM is lost.

**DF1 Port Setup Parameters**

Parameter	Default	Options	Description
Communication Rate	1200	0=300, 1=600, 2=1200, 3=2400, 4=4800, 5=9600, 6 and 7=19200	The speed in bits per second at which data is transferred. Must be set the same as the DF1 device.
Bits Per Character	8 bits	0=7 bits, 1=8 bits	The size in number of bits of each character to be transferred. Must be set the same as the DF1 device.
Parity	None	0 and 3=None, 1=Even, 2=Odd	Used for checking data during the transfer. Must be set the same as the DF1 device.
Stop Bits	1 bit	0=1 bit, 1=2 bits	Used for delineating data during the transfer. Must be set the same as the DF1 device.

## DF1 Full-duplex Setup Parameters

Upon initial power up, the module defaults to full-duplex and the parameters shown in the table below. If these parameters are changed and the setup is saved (by changing to software Run mode), then the module will always power up with the new settings, unless the battery fails and power to the module's RAM is lost.

**DF1 Full-duplex Setup Parameters**

Parameter	Default	Options	Description
Duplicate Packet Detection	Disabled	Enabled, Disabled	Determines whether duplicate message detection is Disabled or Enabled. When enabled, duplicate messages will be acknowledged and discarded.
Checksum	BCC	BCC, CRC16	Determines the type of error detection that will be used on the DF1 link. It must be the same as that for any application programs that may be running.
Constant Carrier Detect	Disabled	Disabled, Enabled	If enabled, hardware handshaking is forced on. The module will monitor the carrier from the modem (DCD signal) and will not begin communication until it is detected.
Modem Init String	(blank)		Lets you configure your modem using Hayes commands upon every power cycle of the module. For example, entering ATDT here would get the modem's attention (AT) and set it to tone dialing (DT). Sending a (~) character will produce a one second wait on the modem. Refer to your modem user manual for details.
Modem Init String Delay	0 s	0...25 s	Determines the amount of time the module will wait before sending the Modem Init String to the modem.
Message Timeout	10,000 ms	100...12,750 ms	The time to wait for a response to a message sent on a DF1 network. This parameter is rounded down to the nearest 50 ms increment. For example, if you enter 199 ms, it is accepted as 150 ms.
Hardware Handshaking	Disabled	Disabled, Enabled	If enabled, the module will use the RTS and CTS signals for control of the modem.
Embedded Response Detect	Embedded Response	Embedded Response, Auto Detect Embedded Response	Selecting Embedded Response lets the module to send embedded responses within packets. Selecting Auto Detect Embedded Response causes the module to use embedded responses only if an embedded response from the host is received by the module.
ACK Timeout	200 x 5 ms	(0...65,535) x 5 ms	Determines the time the module will wait for an ACK to be received from the host DF1 device.
ENquiry Retries	2	0...254	Determines the number of enquiry retries that will be attempted before a packet transmission is considered to have failed.
NAK Received Retries	2	0...254	Determines the number of packet retries that will be attempted when NAK responses are received on previous transmissions of the packet.

## DF1 Half-duplex Setup Parameters

If you set Word 1, bit 11 to half-duplex (0), the default parameters are those shown in the table on the following page. If these parameters are changed and the setup is saved (by changing to software Run mode), then the module will always power up with the new settings, unless the battery fails and power to the module's RAM is lost.

### DF1 Half-duplex Setup Parameters

Parameter	Default	Options	Description
Duplicate Packet Detection	Disabled	Enabled, Disabled	Determines whether duplicate message detection is Disabled or Enabled. When enabled, duplicate messages will be acknowledged and discarded.
Checksum	BCC	BCC, CRC16	Determines the type of error detection that will be used on the DF1 link. It must be the same as that for the DF1 device.
Constant Carrier Detect	Disabled	Disabled, Enabled	If enabled, hardware handshaking is forced on. The module will monitor the carrier from the modem (DCD signal) and will not begin communication until it is detected.
Modem Init String	(blank)		Lets you configure your modem using Hayes commands upon every power cycle of the module. For example, entering ATDT here would get the modem's attention (AT) and set it to tone dialing (DT). Sending a (~) character will produce a one second wait on the modem. Refer to your modem user manual for details.
Modem Init String Delay	0 s	0...25 s	Determines the amount of time the module will wait before sending the Modem Init String to the modem.
Message Timeout	10,000 ms	100...12,750 ms	The time to wait for a response to a message sent on a DF1 network. This parameter is rounded down to the nearest 50 ms increment. For example, if you enter 199 ms, it is accepted as 150 ms.
Hardware Handshaking	Disabled	Disabled, Enabled	If enabled, the module will use the RTS and CTS signals for control of the modem.
Poll Timeout	200 x 5 ms	(0...65,535) x 5 ms	Determines the time to wait to be polled by the DF1 master before a transmission request is ignored.
Message Retries	2	0...254	Determines the number of allowable retries on the DF1 link before failure.
RTS On Delay	0 x 5 ms	(0...65,535) x 5 ms	Determines the delay between the RTS (Request to Send) signal and the start of transmission by the module. This parameter is only required when communicating with the type of radio modem that requires a delay after exerting the RTS signal. It only takes effect if hardware handshaking is enabled. Refer to your modem user manual.
RTS Off Delay	0 x 5 ms	(0...65,499) x 5 ms	Determines the delay between the end of the message and the module setting RTS (Request to Send) inactive. This parameter is only required when communicating with modems that require a delay between sending the last character and raising the RTS signal. It only takes effect if hardware handshaking is enabled. Refer to your modem user manual.

Parameter	Default	Options	Description
Local/Remote Mode	Local	Local, Remote	Refer to pages 3-3 and 3-4 for a description of these half-duplex modes.
Slave Address/ Group Number	0	Slave Add. = 0...254 Group No. = 0...7	Slave address is a half-duplex local mode parameter and is the address of the module on the DF1 link. Group Number is a half-duplex remote mode parameter and provides a means of addressing more than 32 DH-485 nodes. This is explained in detail on page 3-4
Master Station Address	8 (10 octal)	0...254 (decimal)	Determines the address of the half-duplex DF1 master device. For slave-to-slave communication, this is the address of the DF1 slave device. Refer to page 3-9.

## Build the DH-485 Configuration Packet

Use the SLC processor to set up the DH-485 port. Build the configuration packet shown below by following the configuration instructions found on page 6-2. Descriptions of each of the parameters follow.

### SLC Output File to the Interface Module

Bit Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	Module Mode Bit	Data Handshake Bit	Read or Write Bit	Reset Interface Module Bit	Reserved							Data ID=3				
1	DH-485 Max. Node Address (1-31)							DH-485 Node Address (0-31)								
2												Pass Thru	DH-485 Communication Rate			
3	Message Timeout (100...12,750 ms)															
4																
5																
6																
7																

## DH-485 Port Setup Parameters

When the module is powered up for the first time, the DH-485 port will be set to the default parameters. If these parameters are changed and the setup is saved (by changing to software Run mode), then the module will always power up with the new settings, unless the battery fails and power to the module's RAM is lost.

DH-485 Port Setup Parameters

Parameter	Default	Options	Description
Node Address	2	0...31 (decimal)	The address of this node on the DH-485 network. Every device on the DH-485 network must be given a unique node address. For optimum performance, set devices to consecutive addresses starting at 0. This minimizes the solicitation of new stations.
Max. Node Address	31	1...31 (decimal)	The number of nodes that will be polled. For optimum performance this value should be set no larger than the value of the highest numbered node on the network.
Message Timeout	10,000 ms	100...12,750 ms	The time to wait for a response to a message sent on a DH-485 network.
Pass Through	Disabled	0=Disabled, 1=Enabled	Determines whether diagnostic commands are executed by the module (Disabled) or passed through to the host (Enabled).
Communication Rate	19200	0=300, 1=600, 2=1200, 3=2400, 4=4800, 5=9600, 6 and 7=19200	The speed in bits per second at which data is transferred on the DH-485 link. Important: All stations on the DH-485 link must be set to the same communication rate.

## Build the Modem Init String Configuration Packets

When the module is powered up for the first time, the Modem Init String is empty. You can build the string using the two Data ID numbers reserved for the Modem Init String.

The packet with Data ID 4 will set up the first 14 characters of the Modem Init String. If you require less than 14 characters, place a NULL in the location immediately following the last valid character. The module ignores all characters beyond the NULL value. If you require exactly 14 characters, the module automatically places a NULL after the 14th character.

If you need more than 14 characters, you also need to send the packet with Data ID 5. Send this packet only **after** you send the packet with Data ID 4. Here again you need to place a NULL immediately following the last valid character. If you use all available characters of the string, a NULL is automatically placed after the 28th character.

## Modem Init String for Characters 1 Through 14

To set up string characters 1 to 14, build the configuration in the table shown below. Please note that sending a ~ character produces a one second wait on the modem.

Follow the configuration instructions found on page 6-2.

### SLC Output File to the Interface Module

Bit Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0 <sup>(1)</sup>	Module Mode Bit	Data Handshake Bit	Read or write Bit	Reset Interface Module Bit	Reserved								Data ID=4			
1	1st ASCII character								2nd ASCII character							
2	3rd ASCII character								4th ASCII character							
3	5th ASCII character								6th ASCII character							
4	7th ASCII character								8th ASCII character							
5	9th ASCII character								10th ASCII character							
6	11th ASCII character								12th ASCII character							
7	13th ASCII character								14th ASCII character							

<sup>(1)</sup> The output status word is defined on page 6-6. To configure the Modem Init String, the Read or Write Bit must be at 0 and the Module Mode Bit must be at 1. To read the Modem Init String, the Read or Write Bit must be 1 and the Module Mode Bit can be either 0 or 1.



## Modem Init String for Characters 15 Through 28

Build the configuration in the table shown below if you need to use characters 15 to 28 of the Modem Init String. Please note that sending a ~ character produces a one second wait on the modem.

### SLC Output File to the Interface Module

Bit Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0 <sup>(1)</sup>	Module Mode Bit	Data Handshake Bit	Read or Write Bit	Reset Interface Module Bit	Reserved								Data ID=5			
1	15th ASCII character								16th ASCII character							
2	17th ASCII character								18th ASCII character							
3	19th ASCII character								20th ASCII character							
4	21st ASCII character								22nd ASCII character							
5	23rd ASCII character								24th ASCII character							
6	25th ASCII character								26th ASCII character							
7	27th ASCII character								28th ASCII character							

<sup>(1)</sup> The output status word is defined on page 6-6. To configure the Modem Init String, the Read or Write Bit must be at 0 and the Module Mode Bit must be at 1. To read the Modem Init String, the Read or Write Bit must be 1 and the Module Mode Bit can be either 0 or 1.

## Use the Real Time Clock

You can use the interface module as a Real Time Clock in conjunction with normal module operation.

Set up the Calendar/Clock Function by using the configuration instructions found on page 6-2 and the configuration packet information shown below.

### SLC Output Status to the Interface Module

Bit Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0 <sup>(1)</sup>	Module Mode Bit	Data Handshake Bit	Read or Write Bit	Reset Interface Module Bit	Reserved							Data ID=1				
1	Day (1...31)															
2	Month (1...12)															
3	Year (00...99)															
4	Day of the Week (1...7, where Sunday=1 and Saturday=7)															
5	Hour (0...23 [only 24 hour clock is available])															
6	Minute (0...59)															
7	Second (0...59)															

<sup>(1)</sup> The output status word is defined on page 6-6. To set the Real Time Clock, the Read or Write Bit must be 1. To read the Real Time Clock, the Read or Write Bit must be 1 and the Module Mode Bit can either be at 0 or 1.

## Establish a Data Echo Between the Interface Module and the SLC Processor

Whether in software Run or software Configuration mode, the SLC processor can send data in the Output Image file to the interface module and have it echoed back by the module's Input Image file. This feature gives the SLC processor the ability to verify that the module is operating properly. If the data is not echoed back, the module is assumed to be operating incorrectly and is forced into a reset by the SLC processor.

See the section Resetting the Interface Module from the SLC processor.

### Establish a Data Echo

With the SLC processor you	The interface module then
1. Set the Data ID to 6 (O:e.0/0...3).	
2. Load known data into words 1...7 of the output file (O:e.1...7).	
3. Set the Data Handshaking bit (O:e.0/14).	
	4. Verifies that the DF1 and DH-485 ports are okay.
	5. Loads the data from the output file into the input file.
	6. Sets the Data Handshaking Bit (I:e.0/14).
7. Verify that the Input File words 1...7 (I:e.1...7) match the Output File (O:e.1...7).	
8. Reset the Data Handshaking Bit (O:e.0/14).	
	9. Resets the Data Handshaking Bit (I:e.0/14).

The SLC processor can set up the Data Echo configuration by building the configuration packet shown below.

### SLC Output File to the Interface Module

Bit Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0 <sup>(1)</sup>	Module Mode Bit	Data Handshake Bit	Read or Write Bit	Reset Interface Module Bit	Reserved							Data ID=6				
1	User-defined Data															
2	User-defined Data															
3	User-defined Data															
4	User-defined Data															
5	User-defined Data															
6	User-defined Data															
7	User-defined Data															

<sup>(1)</sup> The output status word is defined on page 6-6. To write the echo data packet, the Read or Write bit must be 0 and the Module Mode Bit can be either 0 or 1.

## Reset the Interface Module from the SLC Processor

The SLC processor can perform a soft reset of the interface module when the module is in either software Run or software Configuration mode. If the Reset bit is set, all other configuration information within that Output Image file will be ignored by the interface module. The reset is accomplished as listed below.

### Reset the Module from the SLC Processor

With the SLC processor you	The interface module then
1. Set the Reset Interface Module Bit (O:e.0/12).	
	2. Performs a reset.
	3. Sets the Reset Acknowledgement Bit (I:e.0/12) if the module detects the Reset bit is high. Otherwise, the module will assume a normal power cycle reset occurred and will not need to set the Reset Acknowledgement bit.
4. Reset the Reset Interface Module Bit (O:e.0/12).	
	5. Resets the Reset Acknowledgement Bit (I:e.0/12).

## Interpret the LED Indicators

This chapter contains the following information.

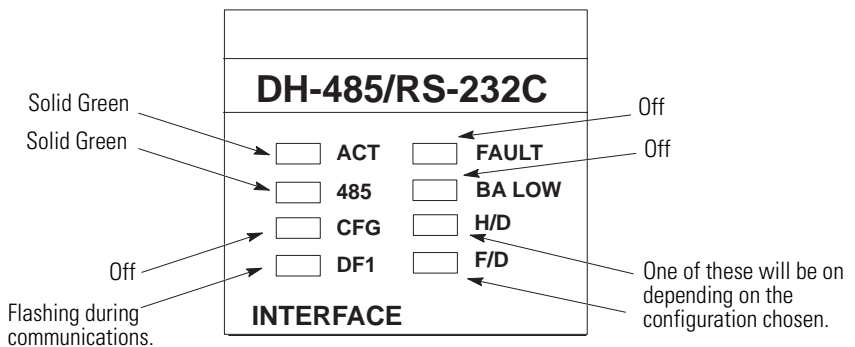
- Interface module status indicators
- Input image description
- SLC fault code

### Interface Module Status Indicators

For a full description of the eight LED indicators on the front of the module, see page 1-3.

During normal operation, the LED indicators are illuminated as shown below

#### LED Indicators



Shown below are possible error conditions represented by the LED indicators and their possible solutions.

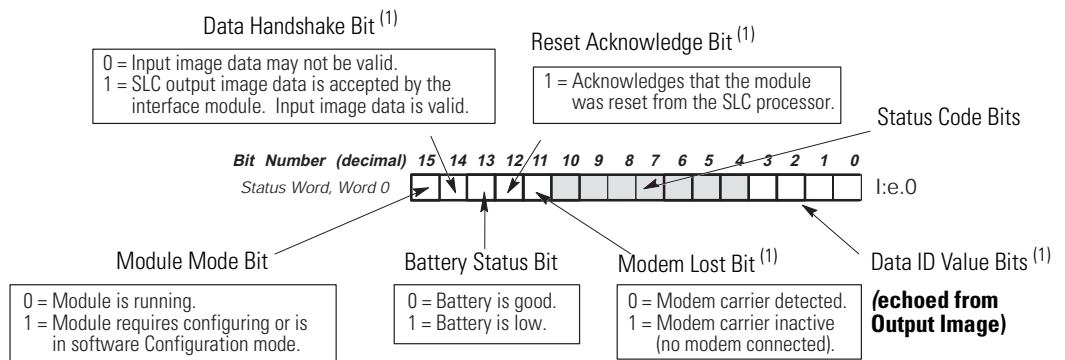
**LED Indicator Error Conditions**

LED	Color	Status	Condition	Solution
ACT	Green	Flashing	The module requires configuration.	The module requires configuration.
		OFF	The module is not receiving power from the backplane. A fault condition exists.	Check the SLC power supply. Make sure the interface module is properly installed in the rack.
485	Green	OFF	The DH485 port is not active for communication.	Check DH-485 cabling. Make sure the module's JW4 jumper is not in Configuration mode.
DF1	Green	OFF	DF1 host is transmitting data and LED indicator is not flashing.	Check DF1 cabling. Make sure the module's JW4 jumper is not in Configuration mode.
FAULT	Red	ON	A system problem was detected during background diagnostics.	Contact your Allen-Bradley representative.
BA LOW	Red	ON	The voltage of the battery that backs up configuration RAM is low.	Replace battery.
CFG	Green	OFF	The CONFIG port is transmitting data and LED indicator is not flashing.	Check ASCII terminal cabling. Make sure the module's JW4 jumper is in Configuration mode.

**Input Image Description**

Shown below is the input image that provides status to the SLC processor. Bit 13 indicates the battery status. The status information contained in bit 13 corresponds to the module's BA LOW LED indicator. Bit 15 indicates whether the module requires configuration or not.

**Input Image**



(1) Applies to series B, or later, interface modules only.

## Status Codes from the Module to the Processor

The module informs the SLC processor on the status of the configure or read transaction by placing a status value in the Input Image file word 0, bits 4 to 10. A value of 00 indicates that the status is okay.

### Status Codes from the Module to the SLC Processor

Value (hex)	Value (dec)	Indicates improper status for
01	01	Day
02	02	Month
03	03	Year
04	04	Day of the Week
05	05	Hour
06	06	Minute
07	07	Second
08	08	Data ID
09	09	(Not Used)
0A	10	(Not Used)
0B	11	DF1 Enq/Msg Retry
0C	12	Modem Init String Delay
0D	13	Master Station/NAK Rec Retry
0E	14	Slave Address/Group Number
0F	15	(Not Used)
10	16	DF1 Message Timeout
11	17	(Not Used)
12	18	RTS Off Delay
13	19	DH-485 Node Address
14	20	DH-485 Max Node Address
15	21	DH-485 Communication Rate
16	22	DH-485 Message Timeout
17	23	Modem Init String character
18	24	A write operation is attempted, but the configuration bit is not set (still in software Run mode).

## SLC Fault Code

If a fault has occurred in the SLC system and the SLC fault code indicates the slot the interface module is installed in, the fault might be associated with the module I/O configuration. Refer to the table below.

### SLC Fault Codes

SLC Fault Code (S:6)	Possible Reason
xx54 <sup>(1)</sup>	Wrong ID code was entered.
xx55 <sup>(1)</sup>	Wrong ID code was entered or wrong input and output size were entered.

<sup>(1)</sup> xx refers to the slot where the module is installed.





## Application Examples

This chapter contains the following application examples.

- Basic configuration example using the backplane
- Supplementary examples using the backplane
- RSLinx software to SLC network via modem example

### Basic Configuration Example Using the Backplane

This example demonstrates configuration of the interface module using the backplane.

#### **IMPORTANT**

Before you begin this application, insure that the JW4 jumper is in vertical Run mode (module configuration ID=3509).

### Parameter Locations

In this application, the configuration parameters are in the data file N10.

#### Parameter Locations

Address	0	1	2	3	4	5	6	7	8	9
N10:00	0	0	0	0	0	0	0	0	0	0
N10:10	DF1 port configuration parameters									
N10:20	DH485 port configuration parameters									
N10:30	Modem Init String characters 1...14									
N10:40	Modem Init String characters 15...28									

## Parameter Settings

For this example, configure the parameters to the settings provided below.

### DF1 Configuration (N10:11...17)

Parameter	Configuration	Word and Bits Used
Communication Rate	1200	N10:11/0...2
Bits Per Character	8	N10:11/3
Parity	None	N10:11/4...5
Stop Bits	1	N10:11/6
Duplicate Packet Detection	Disabled	N10:11/7
Checksum	BCC	N10:11/8
Hardware Handshaking	Disabled	N10:11/9
Constant Carrier Detect	Disabled	N10:11/10
Duplex Setting	Full	N10:11/11
Embedded Response Detect	ADER	N10:11/12
ENquiry Retries	2	N10:12/0...7
Modem Init String Delay	5 s	N10:12/8...15
NAK Received Retries	4	N10:13/0...7
DF1 Slave Address <sup>(1)</sup>	7	N10:13/8...15
ACK Timeout	37 x 5 ms	N10:14/0...15
Message Timeout	100 ms	N10:15/0...15
RTS On Delay <sup>(1)</sup>	5 x 5 ms	N10:16/0...15
RTS Off Delay <sup>(1)</sup>	7 x 5 ms	N10:17/0...15

<sup>(1)</sup> Not applicable for full-duplex.

### DH-485 Configuration (N10:21...27)

Parameter	Configuration	Word and Bits Used
Node Address	5	N10:21/0...7
Max Node Address	31	N10:21/8...15
Communication Rate	19,200	N10:22/0...3
Pass Through	Enabled	N10:22/4
Message Timeout	12000 ms	N10:23/0...15

*Modem Init String Characters 1-14 (N10:31-37)*

c d e f g h i j k l m n o p

*Modem Init String Characters 15-28 (N10:41-47)*

A B C (null)

## Configuration Results

Configuration occurs upon power up or when entering Run mode. The configuration is successful only if data file N10:0=4. If your configuration is unsuccessful, check the table below for the failed configuration block.

### Failed Configuration Block

If N10:0=	Then failure occurred in the
0	DF1 port
1	DH485 port
2	Modem Init String (characters 1...14)
3	Modem Init String (characters 15...28)

If you need to reconfigure the module, set N10:0 equal to 0 and change the incorrect parameters in N10:10-47.

## Backplane Configuration User Program

The following steps summarize the user program.

1. N10:0 is initialized.
2. The DF1 port config block is copied to the interface module.
3. The results of the DF1 config are checked.
4. The DH-485 port config block is copied to the interface module.
5. The results of the DH-485 config are checked.
6. The Modem Init String (1 to 14) config block is copied to the Module.
7. The results of the Modem Init String (1 to 14) config are checked.
8. The Modem Init String (15 to 28) config block is copied to the Module.
9. The results of the Modem Init String (15 to 28) config are checked.
10. The interface module is placed in Run mode.

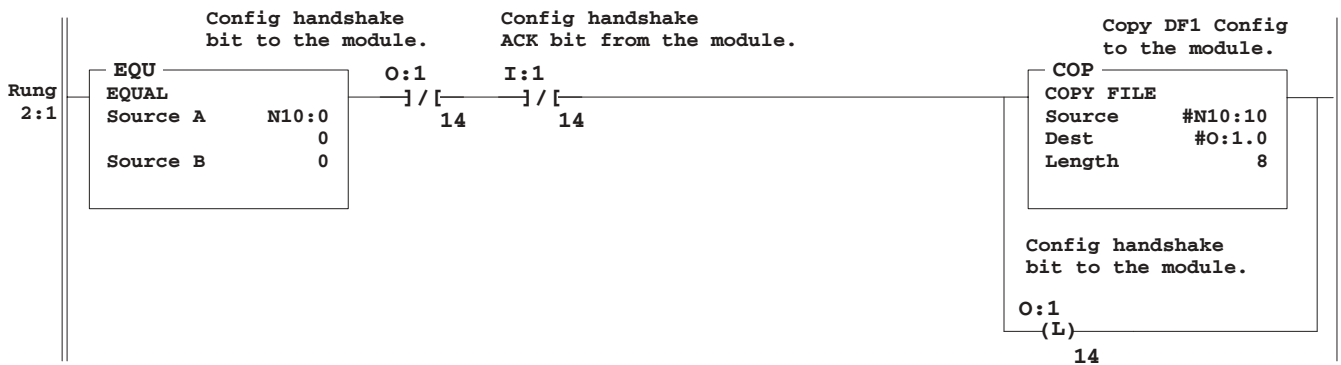
At the end of this configuration sequence, data file N11:10-47 reflects the configuration parameters as read from the interface module.

The user program for the backplane configuration example follows starting on the next page.

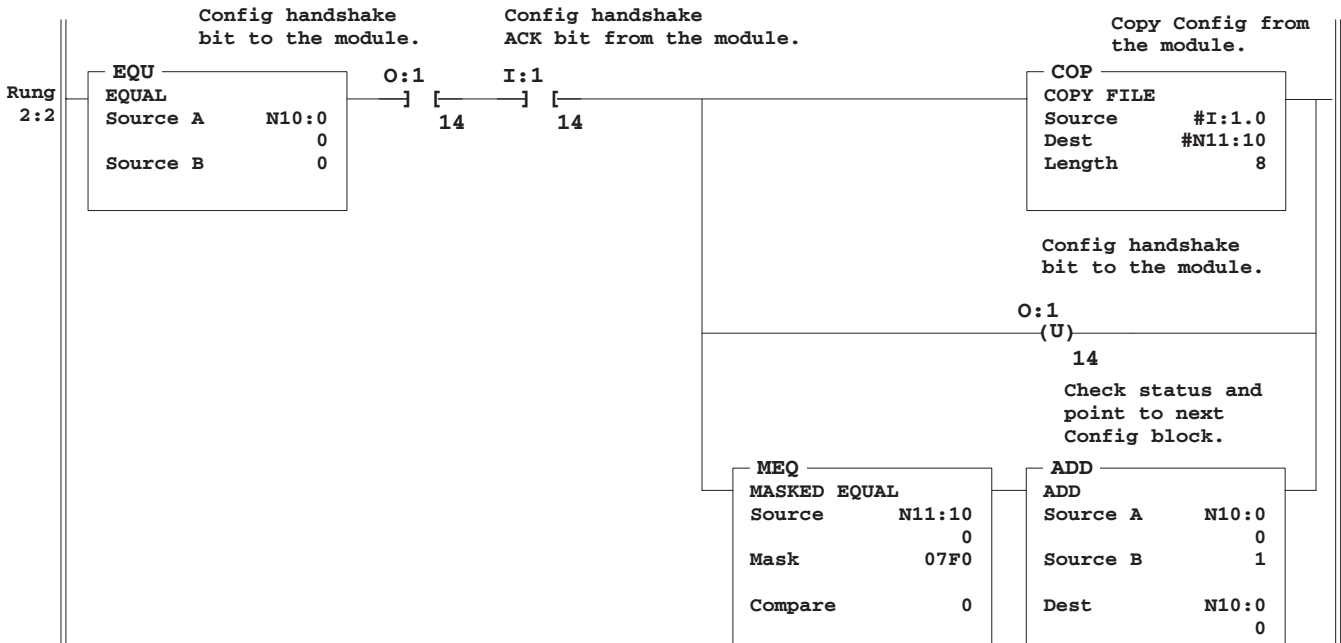
N10:0 is initialized here. N10:0 points to the Config block that is being transferred.



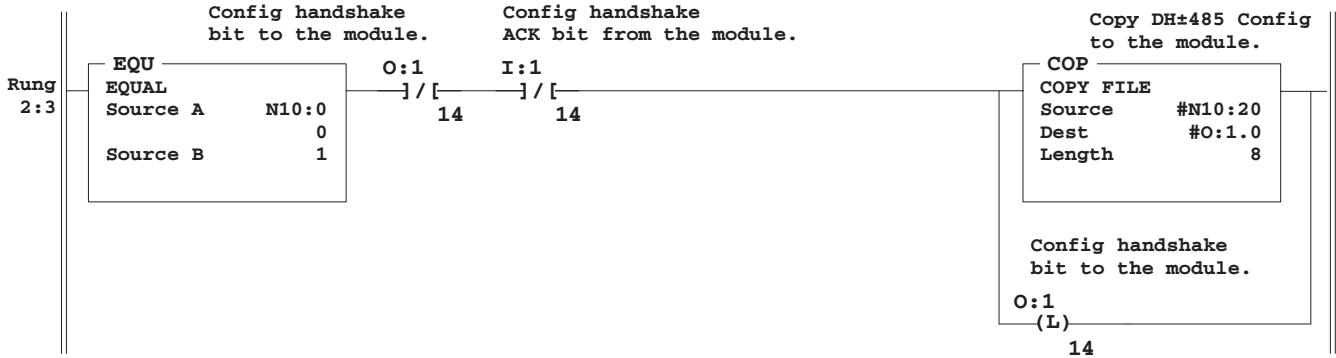
This rung copies a new DF1 Config block to the interface module.



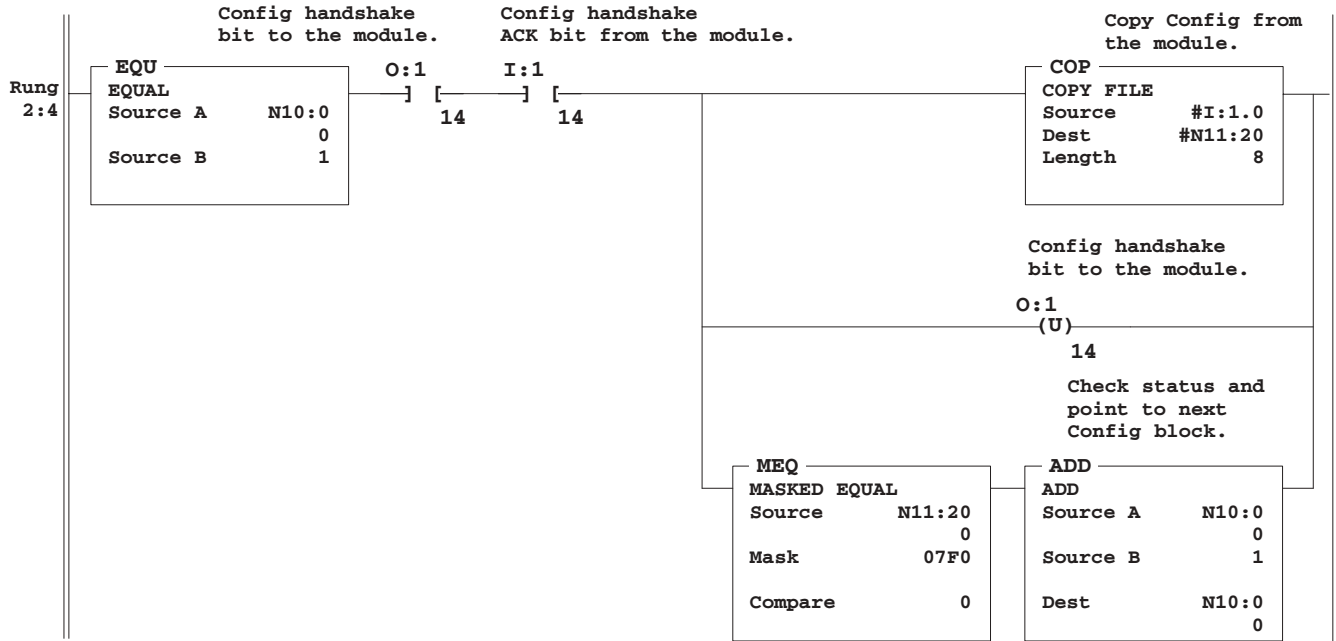
This rung checks the results of the DF1 Config from the interface module.



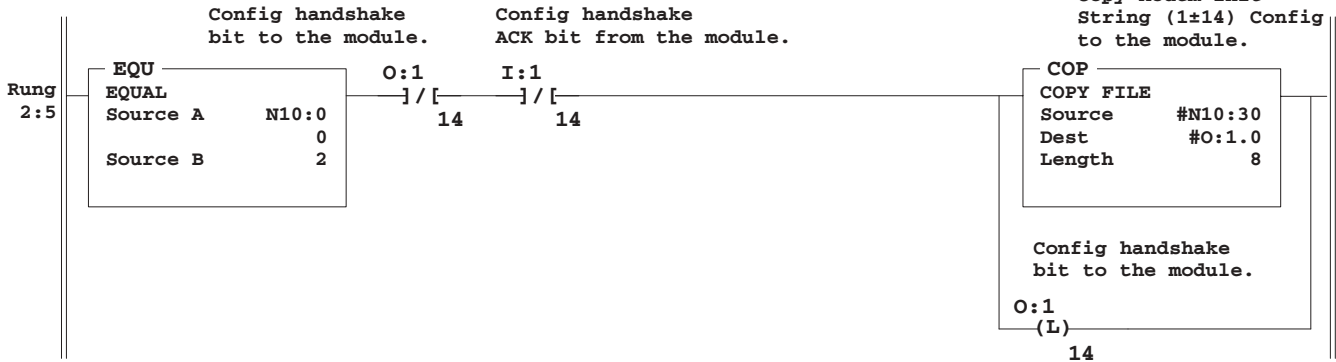
This rung copies a new DH±485 Config block to the interface module.



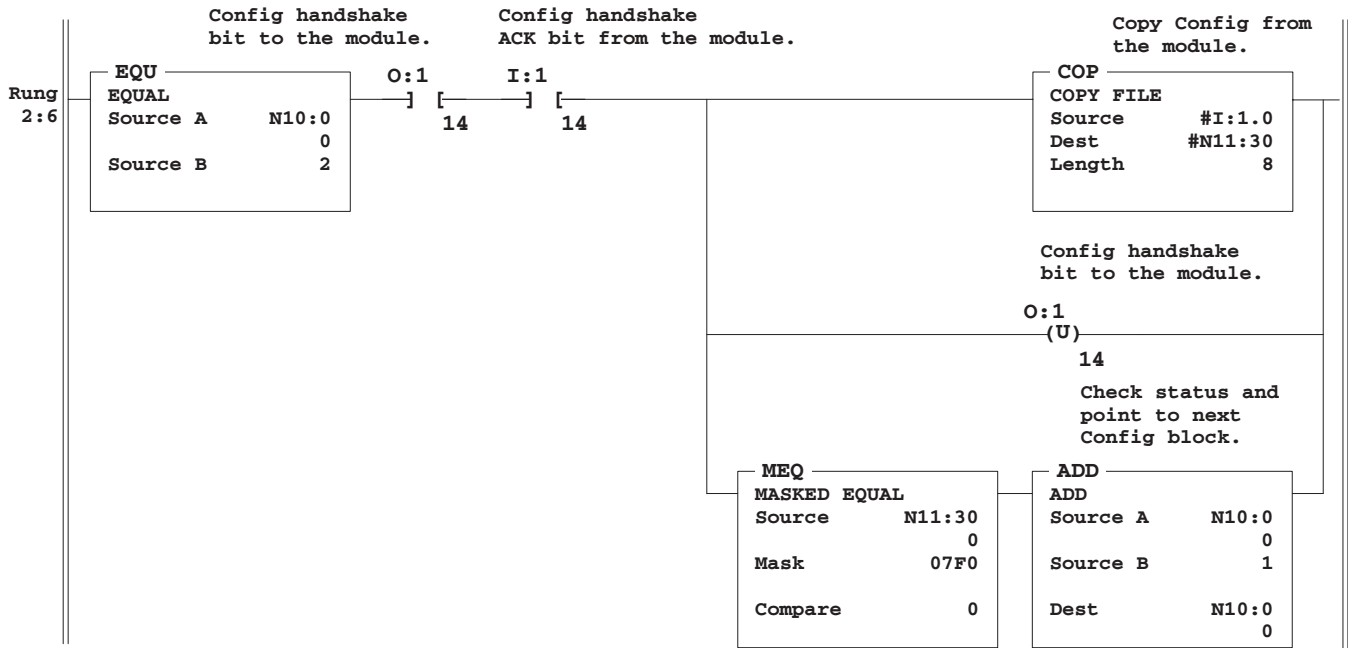
This rung checks the Modem Init String (1±14) from the interface module.



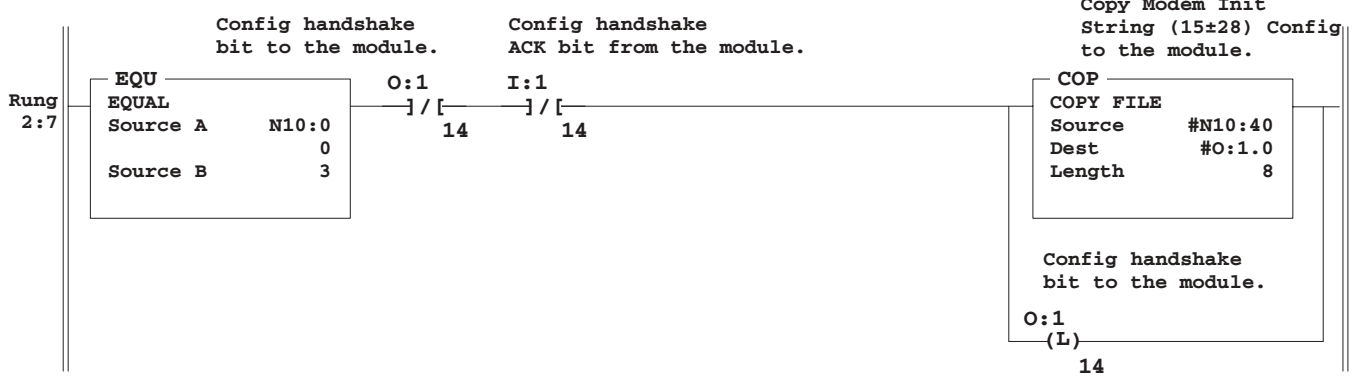
This rung copies a new Modem Init String (1±14) Config block to the module.



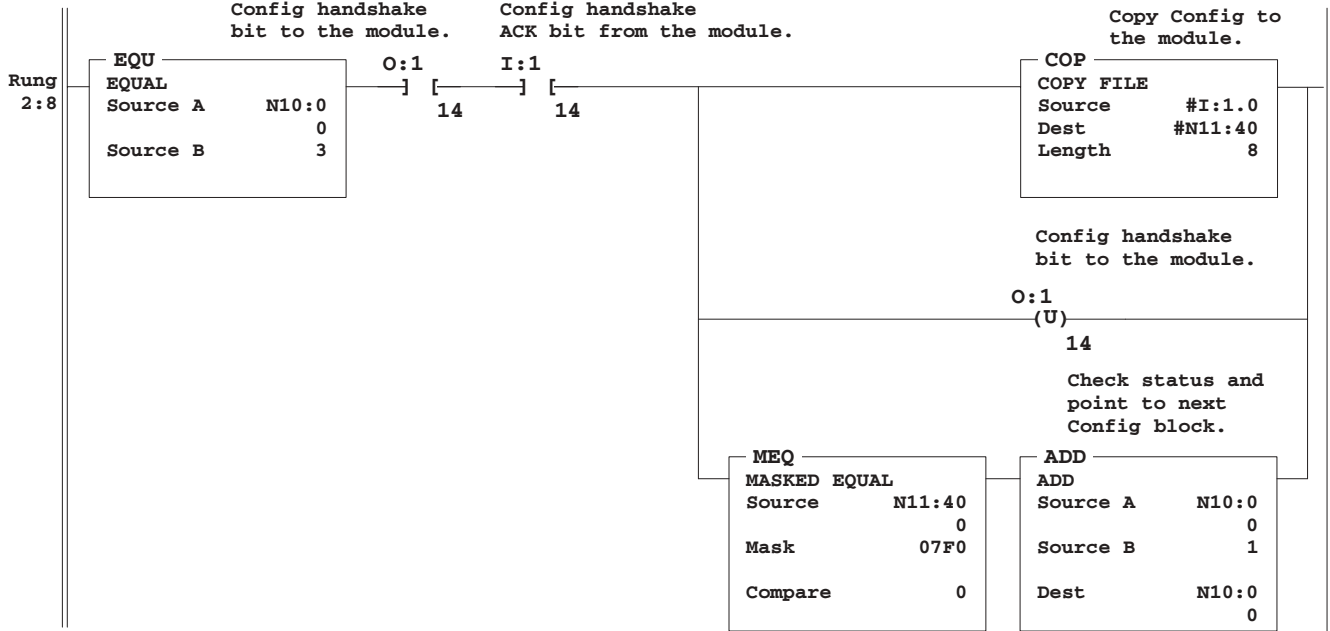
This rung checks the Modem Init String (15±28) from the interface module.



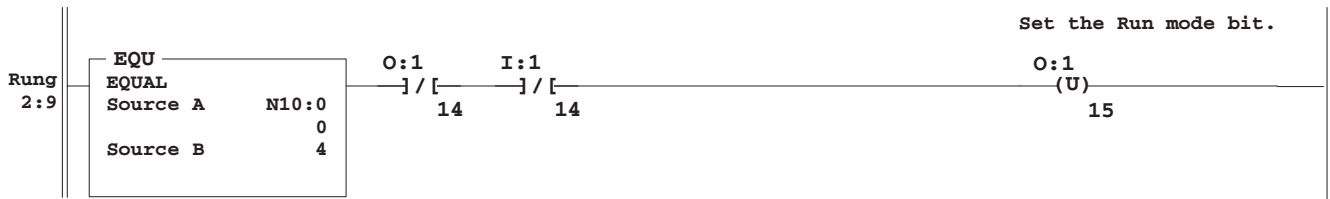
This rung copies a new Modem Init String (15±28) Config block to the module.



This rung checks the Modem Init String (15+28) from the interface module.



Set the interface module to Run mode.



Set the Run mode bit.

Rung 2:10 <END>

## Configuration Data Table

Shown below is the configuration information for N10 in Decimal radix.

Configuration Data Table

Address	0	1	2	3	4	5	6	7	8	9
N10:0	0	0	0	0	0	0	0	0	0	0
N10:10	-32766	6154	1282	1796	37	100	5	7	0	0
N10:20	-32765	7941	22	12000	0	0	0	0	0	0
N10:30	-32764	25444	25958	26472	26986	27500	28014	28528	0	0
N10:40	-32763	16706	17152	0	0	0	0	0	0	0



## Supplementary Example Using the Backplane

These supplementary examples demonstrate how to use the backplane to operate the interface module's Real Time Clock and Data Echo features.

### IMPORTANT

Before you begin these applications, be sure that the JW4 jumper is in vertical Run mode (module configuration ID=3509).

## Real Time Clock

You can use the interface module as a Real Time Clock (RTC) in conjunction with normal module operation. This example shows you how to set up the Calendar/Clock Function using the backplane.

## Parameter Settings

The values used by the RTC are in N10:1-7, and are initialized as shown in the table below.

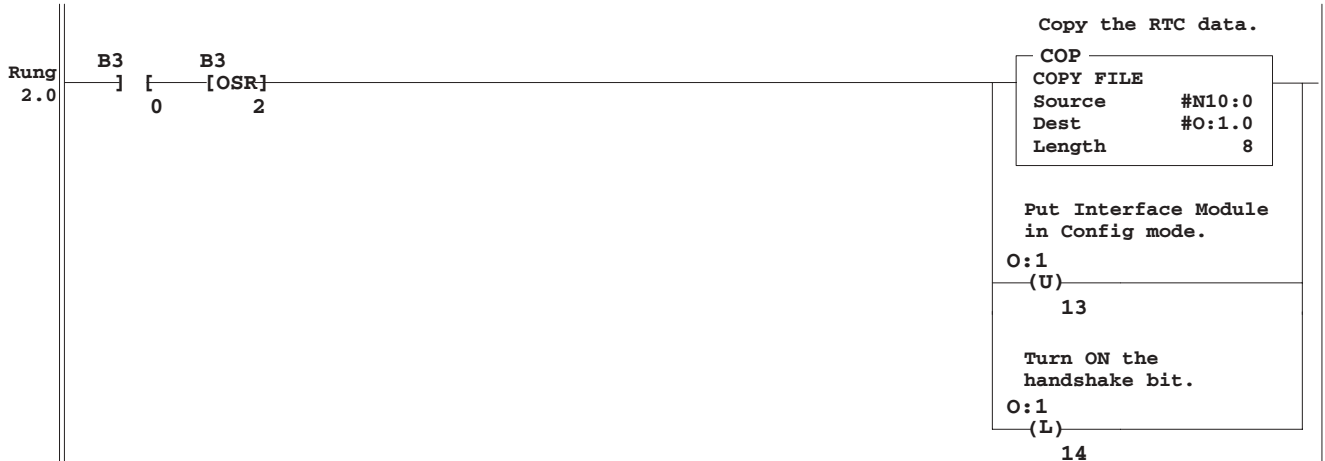
### Parameter Settings

In this example	Equals
Day	5
Month	12
Year	1993
Day of the week	4 (Wednesday)
Hours	11
Minutes	15
Seconds	30

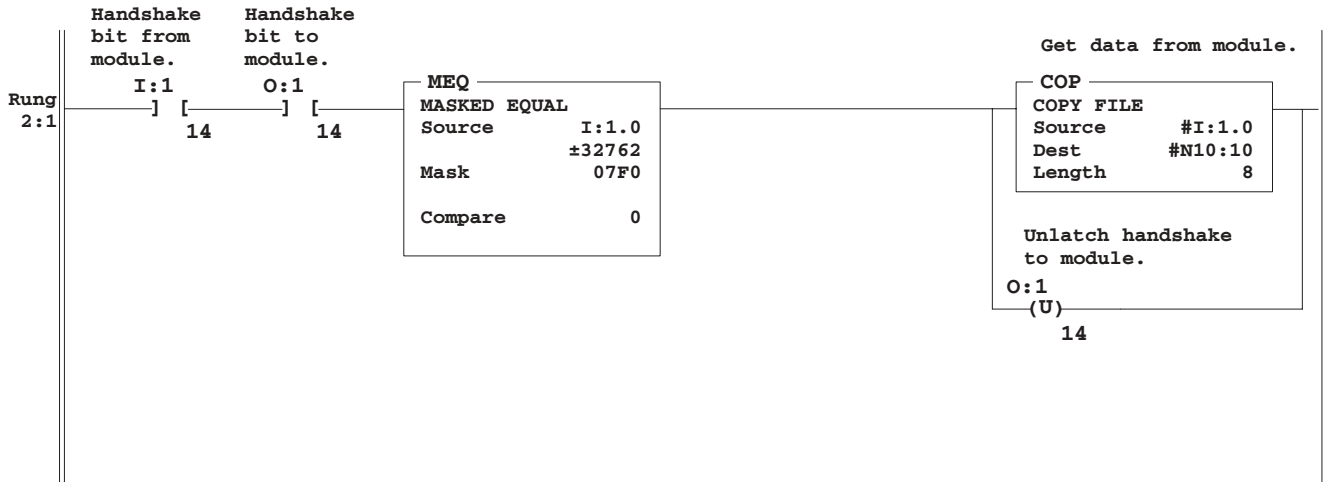
### *User Program*

The example program shown on the following page initializes the interface module's calendar and RTC when bit B3:0/0 is toggled from low to high. Bit B3:0/1 is toggled every 2.56 seconds, and the new RTC values that are read are then placed in data file N10:11-17.

This rung initializes the module.



This rung gets the calendar/clock data from the module.



This rung sets the 2.56 second free-run counter.



Rung 2.3 <END>

*Configuration Data Table*

Shown below is the configuration information for N10 in Decimal radix.

**Configuration Data Table**

<b>Address</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>
N10:0	1	5	12	93	4	11	15	30	0	0
N10:10	0	0	0	0	0	0	0	0	0	0
N10:20	0	0	0	0	0	0	0	0	0	0

**Data Echo Feature**

The Data Echo feature gives the SLC processor the ability to verify that the interface module is operating properly. This example shows you how to set up the Data Echo using the backplane.

*User Program*

This program shown on the following pages checks for proper interface module operation every 40 seconds, and resets the module if proper operation is not detected.

This rung provides a 40 second base timer.



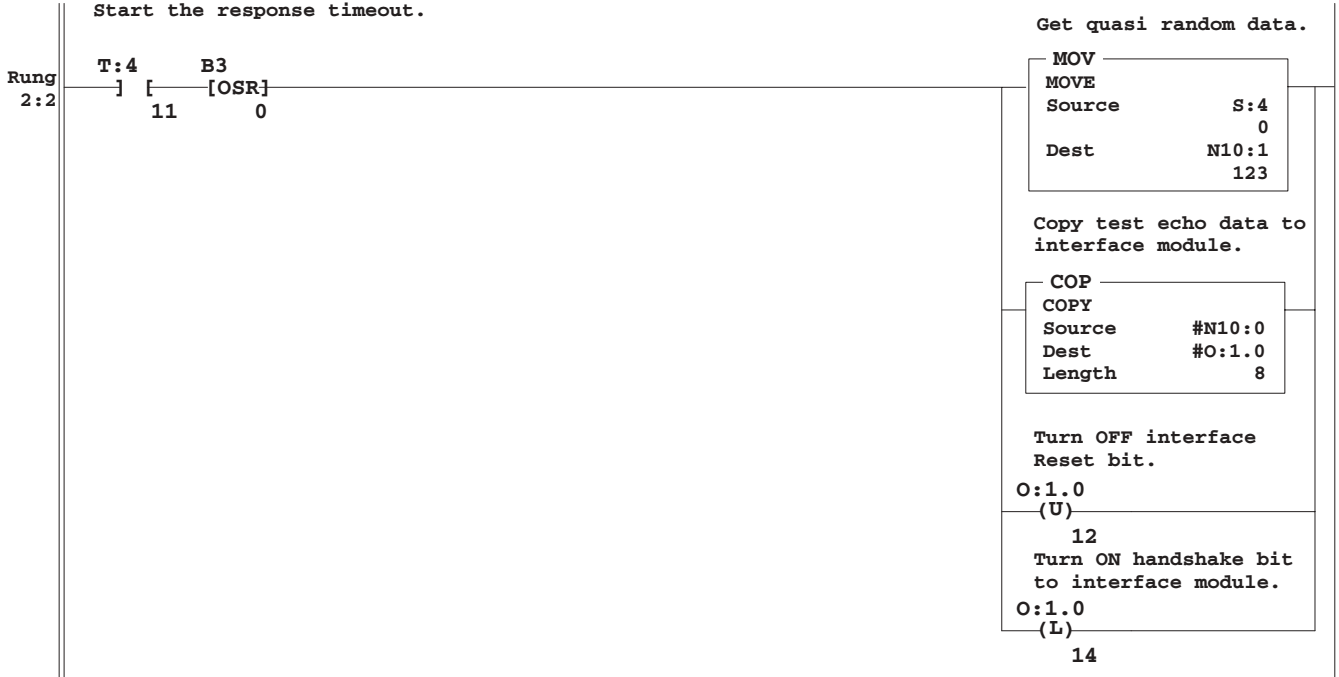
This rung provides a 5 second timer.

Start the response timeout.

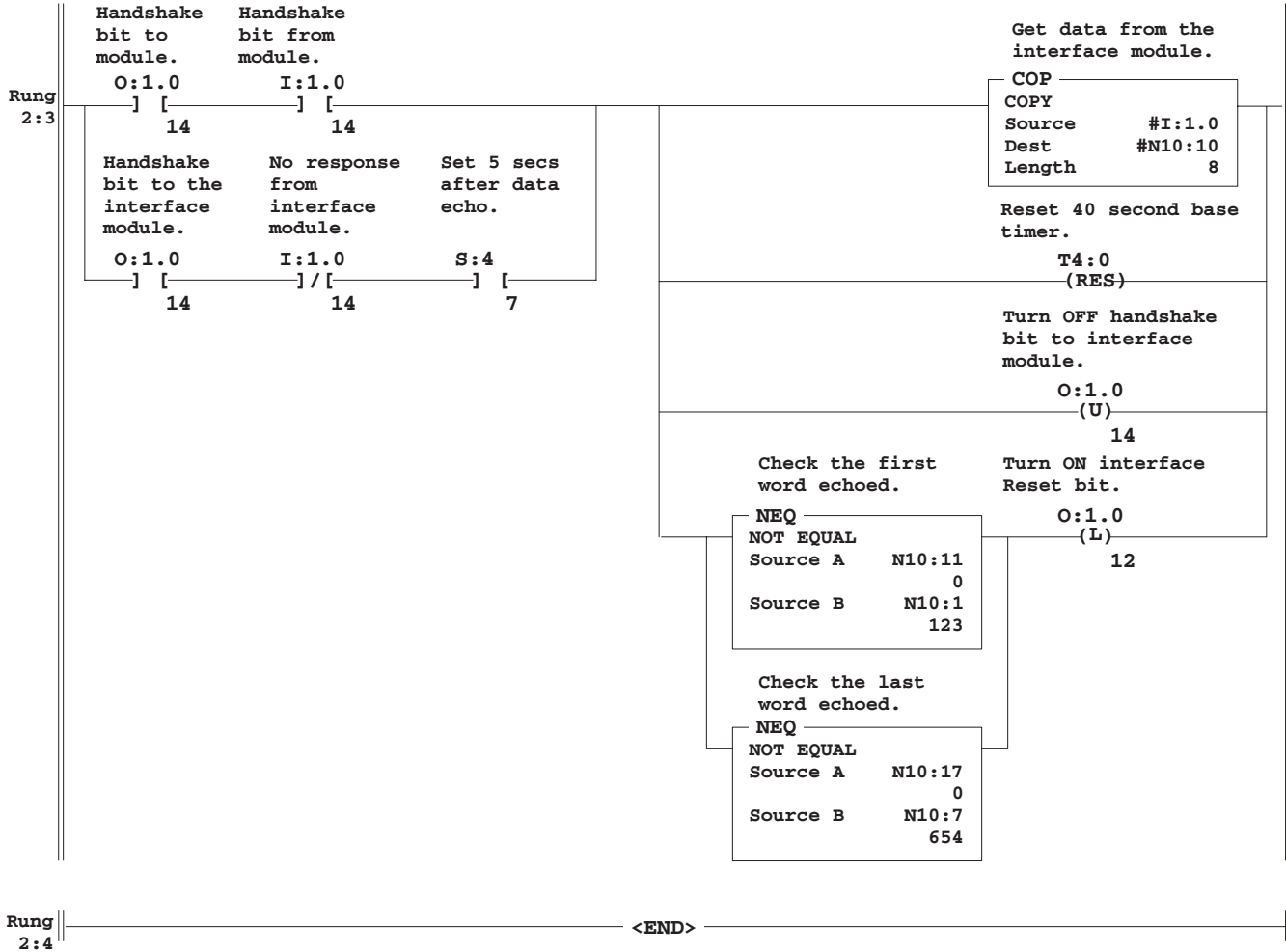


This rung initializes the interface module.

Start the response timeout.



This rung checks that proper data was echoed from the module, or that 5 seconds passed without interface module response.



Rung 2:4

<END>

### Configuration Data Table

Shown below is the configuration information for N10 in Decimal radix.

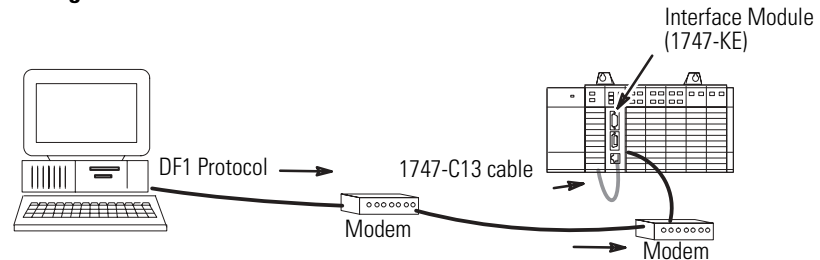
**Configuration Data Table**

Address	0	1	2	3	4	5	6	7	8	9
N10:0	6	XXX	456	789	345	678	321	654	0	0
N10:10	0	0	0	0	0	0	0	0	0	0
N10:20	0	0	0	0	0	0	0	0	0	0

## RSLogix Software to SLC Network via Modem Example

One of the primary purposes for the interface module is to connect RSLogix software to a SLC 500 network by using modems. This example shows you how to make this type of connection by taking you through the steps necessary to set up the following system.

### RSLogix Software to SLC Network



To connect RSLogix software to a SLC 500 network, the serial communications port on the interface module that uses the DF1 protocol must be configured to match the interface parameters for the computer serial port where RSLinx software is installed.

The text starting on the next page describes the procedure you use to do this.

## Configure the Module's Serial Port

The steps below describe how to configure the interface module's serial port using an ASCII terminal.

However, you may use an alternate configuration method if you choose (for example, ASCII terminal emulation software or backplane communication). To configure the module's serial port:

1. Place the interface module's JW4 jumper into either horizontal or vertical configuration mode, depending on which functionality you chose.

See Chapter 4

2. Connect an RS-232 cable between an ASCII terminal and the interface module's configuration port. Please refer to Chapter 4 for RS-232 cable pinouts between the interface module's configuration port and the ASCII terminal serial port.

Use one of the cable diagrams on page 4-8 for no hardware handshaking.

3. Configure the module. The DF1 port and the DH-485 settings for the interface module are as shown below.

Setup Summary			
CONFIG PORT	DF1 PORT	DH-485 PORT	DF1 PRTCL (Full Dup)
Baud . . . . 1200	Baud . . . . 1200	Baud . . . . 19200	DPD . . . . . Off
Bits/char . . . . 8	Bits/char . . . . 8	Node . . . . . 2	Checksum . . . . . CRC
Parity . . . . None	Parity . . . . None	Max Node Add . 31	CCD . . . . . Off
Stop Bits . . . . 1	Stop Bits . . . . 1	Msg Time 10000ms	Modem Init Delay . . . . 1S
Hndshking . Soft		Pass Thru . . . . Off	Msg Time . . . . 10000mS
			RTS/CTS . . . . . Off
			Em Resp Detect . . . ADER
			ACK T ime . . . . 200x5mS
			ENQ Retries . . . . . 2
			NAK Retries . . . . . 2
Modem Init String = ATZ			
Hit any key to continue. . . . .			

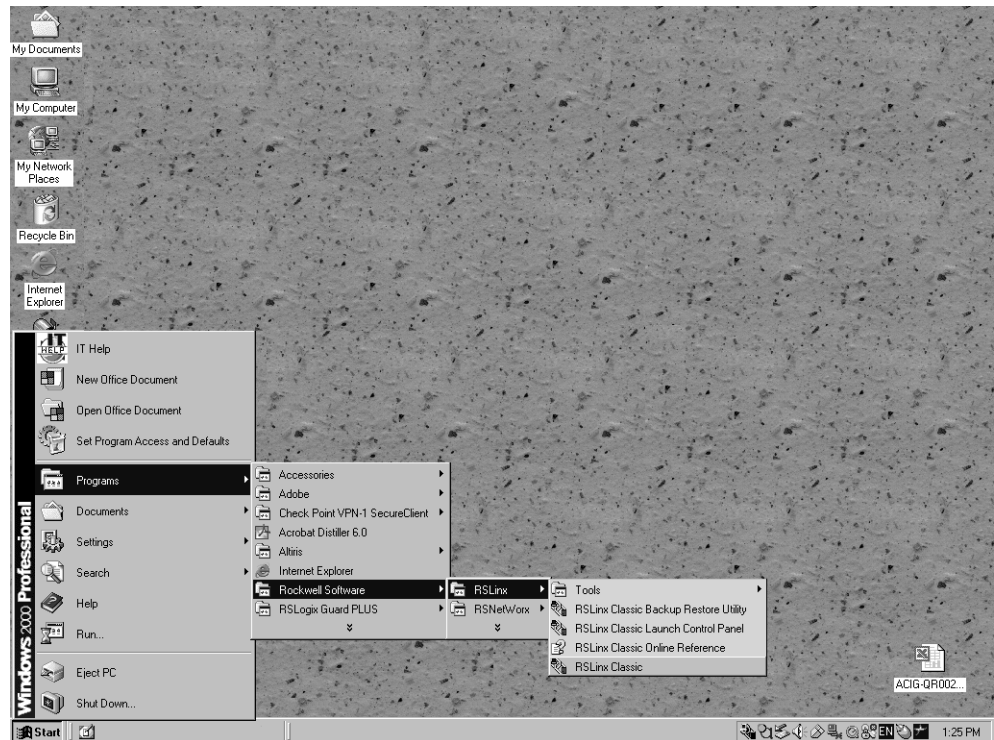
4. Once the interface module is configured, place the module's JW4 jumper into either horizontal or vertical Run mode, depending on which functionality you chose.

## Configure the DF1 Modem Driver Using RSLinx 2.x or Later

The DF1 driver makes the communication connection between the PC (sending modem) and the 1747-KE module (receiving modem). Once configured, this driver can be called by the programming software used to program the SLC processor.

The steps below describe how to configure the DF1 modem driver using RSLinx Classic version 2.x. To begin:

1. Start RSLinx software.
2. Click on Start>Program Files>Rockwell Software>RSLinx>RSLinx Classic.

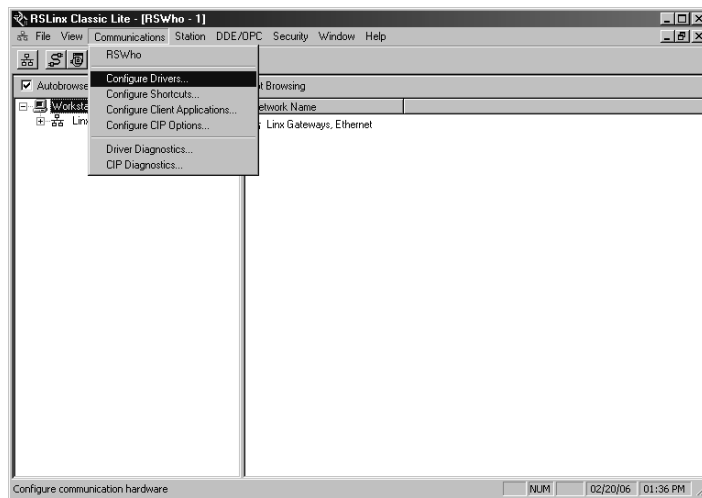


Once RSLinx software is opened, you'll need to add the communication driver required for RSLinx software to communicate across a modem to network hardware. To configure the driver:

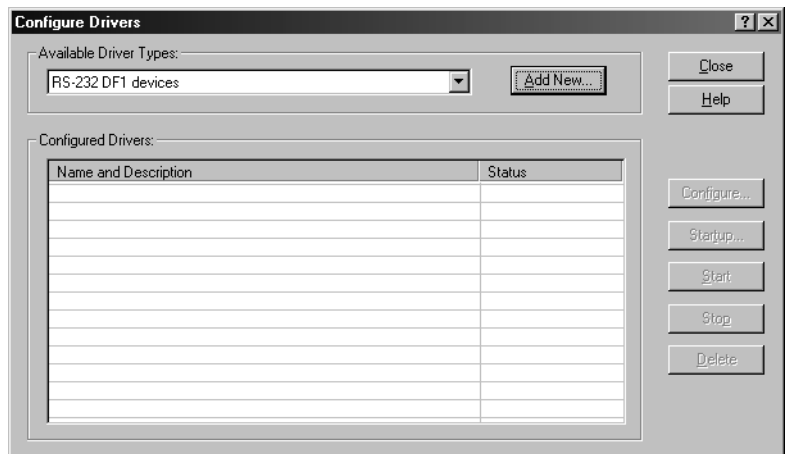
1. Select the Communications menu.
2. Scroll down and select the Configure Drivers.



The driver configuration screen appears.



From the driver configuration window, you will need to add a new RS-232 DF1 driver or modify an existing RS-232 DF1 driver so it can be configured for modem communication.



### *Modify an Existing Driver*

If an RS-232 DF1 driver is already configured, double-click on the driver in the Configured Drivers window.

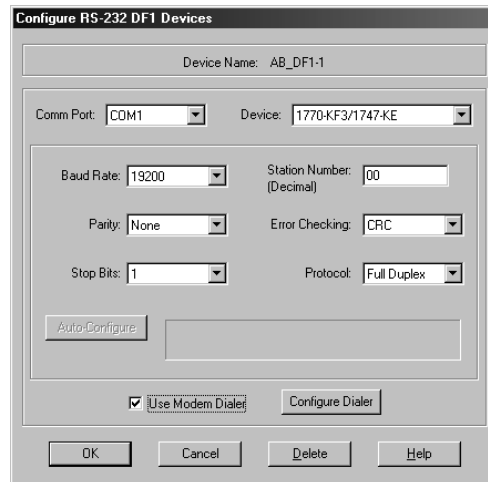
### *Add a New Driver*

If an RS-232 DF1 driver is not configured:

1. Select RS-232 DF1 in the Available Drivers window.
2. Click the Add New button.

### *Configure the driver for KE Communication through a Modem*

Set all the parameters to match the configuration.



The station number is the DH-485 node address of the KE Module and should have a unique number.

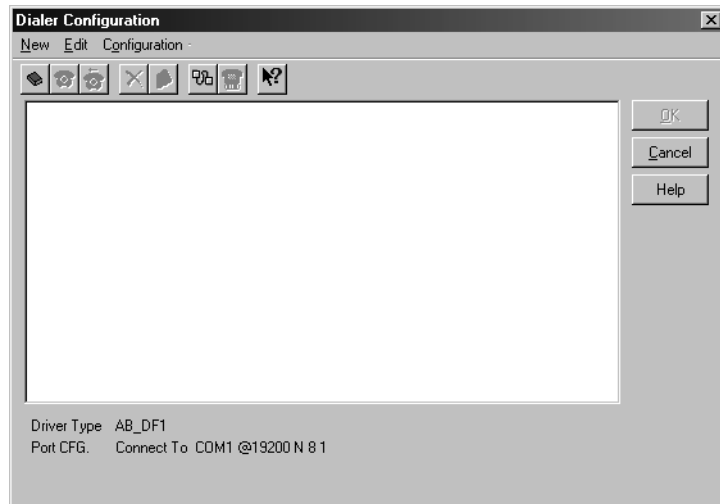
Once the parameters are set:

1. Check the Use Modem Dialer box.
2. Click the Configure Dialer button.

The Modem Dialer Windows opens which lets you to go through the modem dialer configuration.

### Modem Dialer Configuration Dialog

The Modem Dialer configuration window serves two purposes; one as a phone book and the other as an operator. The window associates a name with the phone number and stores it for later use. The window also will dial the number and send out the proper modem initialization strings required to establish modem connection.



To start the modem configuration routine:

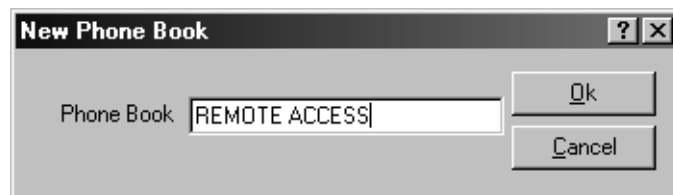
1. Press the following icon from the tool bar.



The New Phone Book dialog appears.

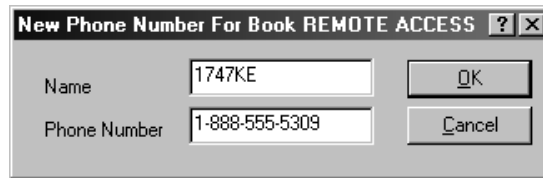
2. Type in a name.

Choose a name that relates to the phone book and not to the specific connection.

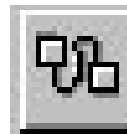


3. Click Ok.
4. In the Name field, type in a unique name for the connection.

5. Tab to the Phone Number field and enter the phone number of the remote network modem.



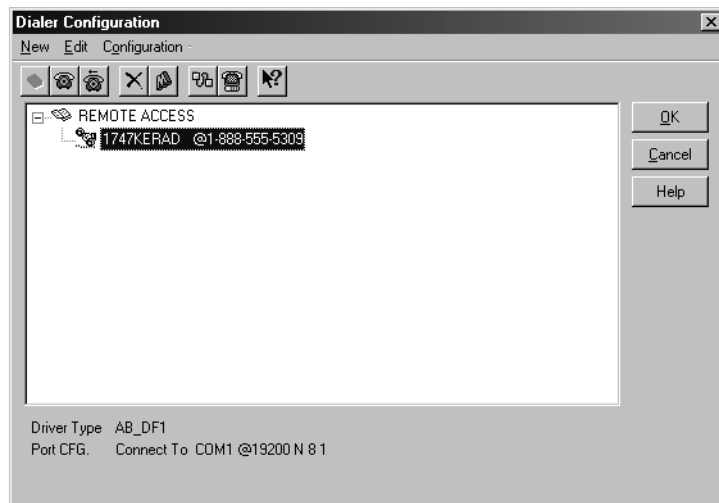
6. Click OK.
7. To adjust the modem port parameters, click the following icon.



8. To adjust the modem dialing parameters, click the following icon.



9. To complete the connection configuration, highlight 1747KERAD and click OK.



The modem dialer configuration is now complete. In order to verify a proper DF1 connection, RSLinx software will attempt to connect to the network device.

**IMPORTANT**

Before continuing, the PC modem must be connected to a working outside phone line and the network modem must be connected to the incoming phone line specified in the phone book.

Also, the network modem must be connected to a working Allen-Bradley network.

Once the proper connections are verified, the AB\_DF1-1 driver can be tested.

**Configure RS-232 DF1 Devices**

Device Name: AB\_DF1-1

Comm Port: COM1 Device: 1770-KF3/1747-KE

Baud Rate: 19200 Station Number: 00 (Decimal)

Parity: None Error Checking: CRC

Stop Bits: 1 Protocol: Full Duplex

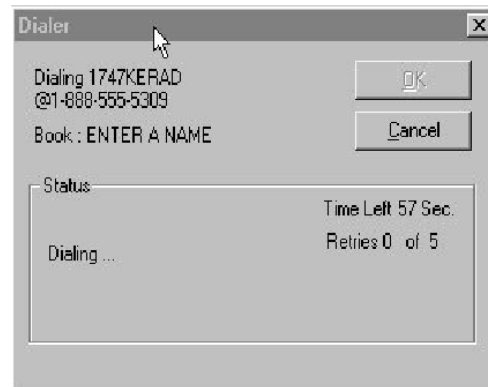
Auto-Configure

Use Modem Dialer Configure Dialer

OK Cancel Delete Help

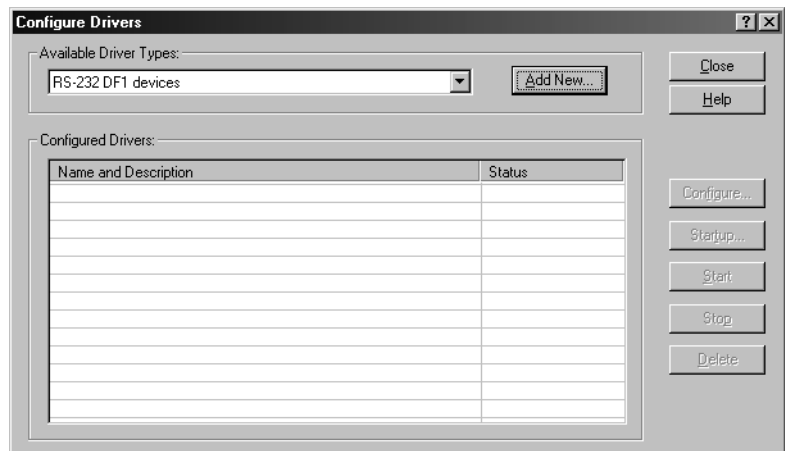
- To complete the driver configuration and attempt a connection, click OK.

The Dialer window appears and relays the information about the attempted connection. The dialer will repeatedly attempt to establish a connection until the time duration expires or retries as shown in the Dialer dialog.



When the connection is properly established, the status will be connected to the 1747-KE module.

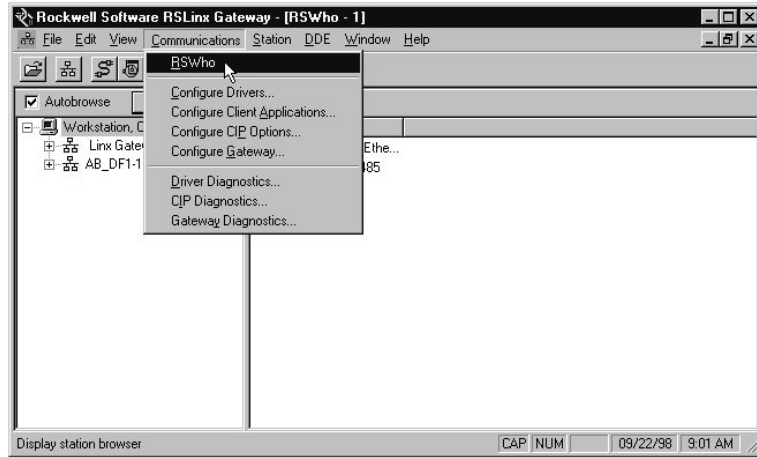
- Click OK to exit the dialer and maintain a connection to the network device.
- If the connection was successful, click OK at the Modem Initialization dialog which will return you to the Configure Drivers dialog.



A successful connection is indicated by the status shown as Running in the AB\_DF1 driver. You are now ready to view the network connection.

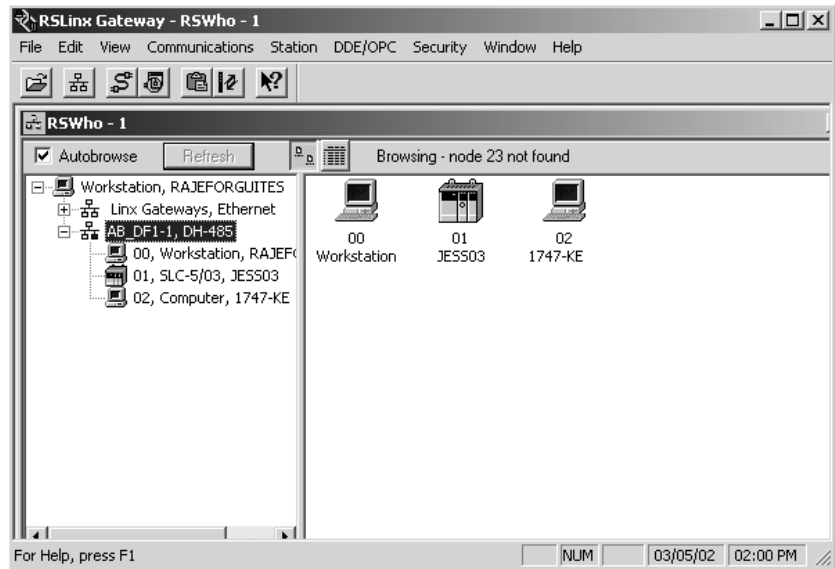
13. Click Close to exit the Configure Drivers dialog.

14. Click on Communications>RSWho



If everything was completed properly, you should be remotely monitoring the DH-485 network and all existing devices on the network.

The following is an example network configuration.





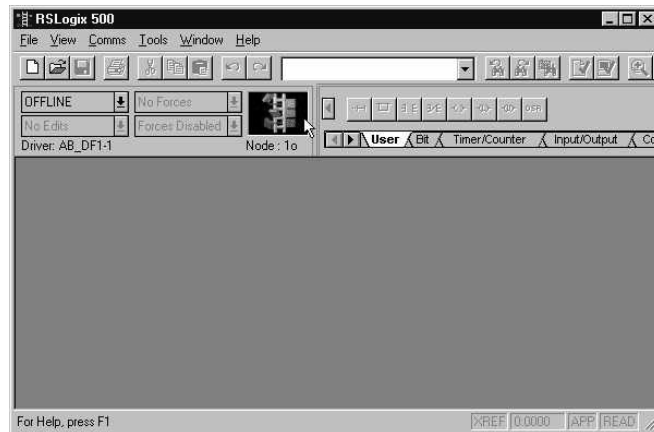
## Go Online using RSLogix 500 Software and RSLinx Version 2.x and Later

The DF1 driver makes the communication connection between the PC (sending modem) and the 1747-KE module (receiving modem). Once configured, this driver can be called by the programming software used to program the SLC processor.

The steps below describe how to go online using RSLogix500 software and RSLinx version 2.x. To begin:

1. Start RSLogix500 software.

If the RSLogix500 software is properly installed, the main dialog appears.



2. Select Comms>System Comms from the main menu.



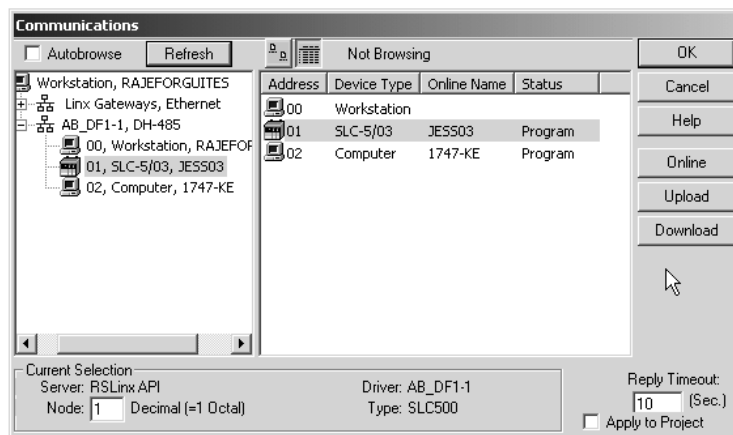
The System Communication dialog appears.

3. Select the driver of the PLC controller.

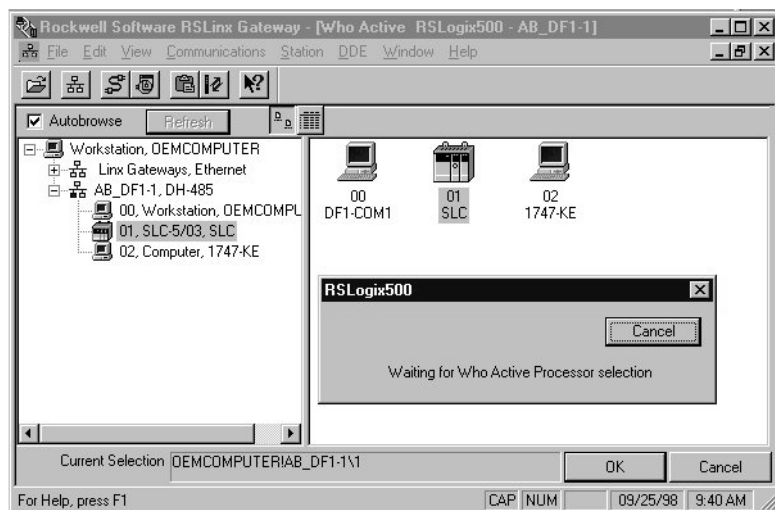
Make sure the driver currently selected is AB\_DF1-1. If another driver is in the driver window, click on the combo box down arrow and select the AB\_DF1-1 driver.

4. Select the node address of the PLC controller.

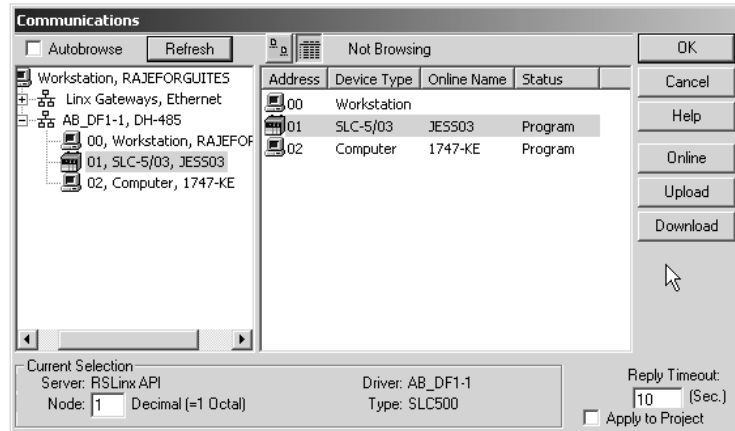
If the node address is known then enter the value directly into the Processor Node dialog. If the processor node is unknown, the value can be selected from RSLinx software's NetworkWho.



5. To obtain the current processor node, double-click on the highlighted node.

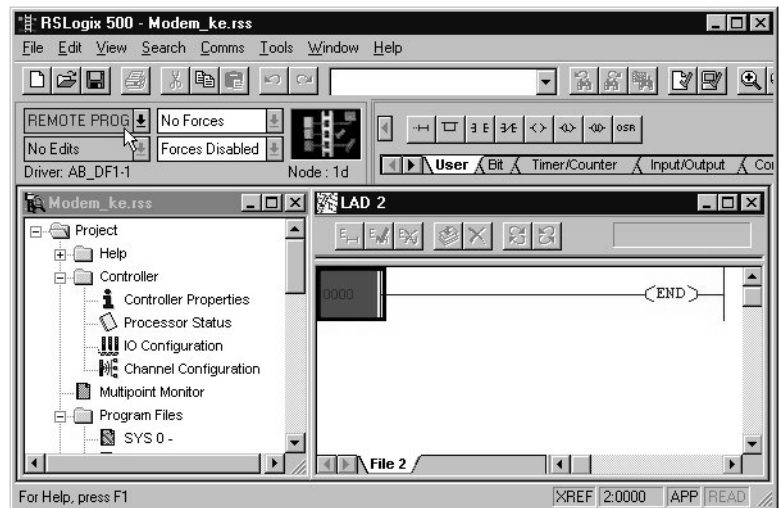


The program returns to the System Options dialog and the Processor Node dialog is populated with the node address selected in the NetworkWho.



6. Click the Online button.

If everything occurred correctly, you will have a remote connection with the processor. This is indicated by the Remote Run or Program indicator.





## Specifications

This appendix contains information regarding hardware specifications for the DH-485/RS-232C Interface Module.

### Hardware Specifications

The module hardware specifications are listed in the following tables.

#### Hardware Specifications

Attribute	Value
Power Supply Loading at 5V dc	0.150 A (module only)
	0.150 A (module with link coupler)
Power Supply Loading at 24V dc	0.070 A (module only) <sup>(2)(3)</sup>
	0.125 A (module with link coupler)
Noise Immunity	NEMA Standard ICS 2-230
Vibration	Displacement: 0.015 in., peak-to-peak at 5...57 Hz
	Acceleration: 2.5 g at 57...2000 Hz
Shock (operating)	30 g
Port Isolation <sup>(1)</sup>	
CONFIG Port	500V ac
DF1 Port	500V ac
CONFIG and DF1 Port	500V ac
Ambient Temperature Rating	Operating: 0...+60 °C (+32...+140 °F) Storage: -40...+85 °C (-40...+185 °F)
Humidity	5...95% without condensation
Clock/Calendar Accuracy	±1 minute/month at 25 °C (77 °F) +0, -6 minute/month at 60 °C (140 °F)

<sup>(1)</sup> Port DH485 is not isolated.

<sup>(2)</sup> If a 1747-AIC link coupler is connected to the 1747-KE module with a 1747-C11 cable, the link coupler draws its power (0.085 A @ 24V dc) through the module. Add this to the current listed for the link coupler requirements.

<sup>(3)</sup> If a 1747-AIC link coupler is connected to the 1747-KE module with a 1747-C13 cable, then the power for the link coupler comes from either an SLC 500 controller or an external power supply.

**IMPORTANT**

The 1747-KE module requires both 5V dc and 24V dc power from the SLC backplane. The power consumption of the module must be taken into consideration when planning your SLC 500 system. Refer to the documentation supplied with your SLC 500 fixed or modular controller for additional information on power supplies and current requirements.

---

## Certification

### Product Certifications

Certification	Value
Certification	c-UL-us listed
	Class 1, Groups A, B, C, or D, Division 2
	CE compliant for all applicable directives
	C-Tick marked for all applicable acts

## Port Isolation

### Port Isolation

Port	Isolation	Isolation Voltage
CONFIG	Backplane to Port	500V dc
DF1	Backplane to Port	500V dc
CONFIG and DF1	CONFIG to DF1	500V dc

**IMPORTANT**

The DH-485 Port is not isolated.

---

---

## Maximum Communication Distances

### Maximum Communication Distances

Communication Rate (Kbps)	Max. Distance Allowed in m (ft)			
	RS-232	RS-423	RS-422	RS-485
300	15 (50)	1230 (4000)	1230 (4000)	1230 (4000)
600	15 (50)	920 (3000)	1230 (4000)	1230 (4000)
1200	15 (50)	770 (2500)	1230 (4000)	1230 (4000)
2400	15 (50)	502 (1650)	1230 (4000)	1230 (4000)
4800	15 (50)	245 (800)	1230 (4000)	1230 (4000)
9600	15 (50)	120 (400)	1230 (4000)	1230 (4000)
19200	15 (50)	60 (200)	1230 (4000)	1230 (4000)

---

**IMPORTANT**

When communicating in RS-232 mode, use the RS-423 jumper settings.

When communicating in RS-423 mode, use RS-423 or compatible receivers.

---





## PLC-5 to SLC 500 Communications

This appendix details how to use the PLC-5 Message instruction to access an SLC 500 processor. This method uses PLC-2 Unprotected Reads and Unprotected Writes to access the Common Interface File, CIF, File 9 of an SLC processor.

### Overview

PLC-2 Unprotected Reads and Writes are not really implemented as unprotected in the SLC processor. They are subject to the SLC's file protection schemes. For instance, they will be rejected if a download is in process or the CIF file is already open by another device. These types of read and write commands are somewhat universal in that they are implemented in many other Allen-Bradley Programmable Controllers.

---

**IMPORTANT**

Although the format of the Unprotected Reads and Writes is the same as used in other PLC processors, the implementation of the address parameter is different. In Allen-Bradley's PLC products, the address is interpreted as a byte address. In some SLC 500 products, the address is interpreted as a word address.

---

- The SLC 500 and 5/01 processors use word addressing exclusively
- The SLC 5/02, prior to Series C FRN 3 processor, also use word addressing exclusively
- The SLC 5/02 Series B, FRN 3 processor and above have a selection bit, S:2/8, which allows selection of either word or byte addressing
- The DTAM for the SLC processors use word addressing exclusively

The CIF is actually like any of the other SLC data files except that it is designated as the target file for all PLC-2 Unprotected Read and Unprotected Write commands that are received by the SLC. It is always File 9. The CIF can be defined as bit, integer, timer, counter, or control data types. However, only bit or integer files should be used to make addressing easier.

**IMPORTANT**

File 9 must be created and defined at the time that the SLC processor is programmed. File 9 must also be made large enough to include the unprotected read and write addressing space. Otherwise, all unprotected reads and unprotected writes will be rejected by the SLC processor.

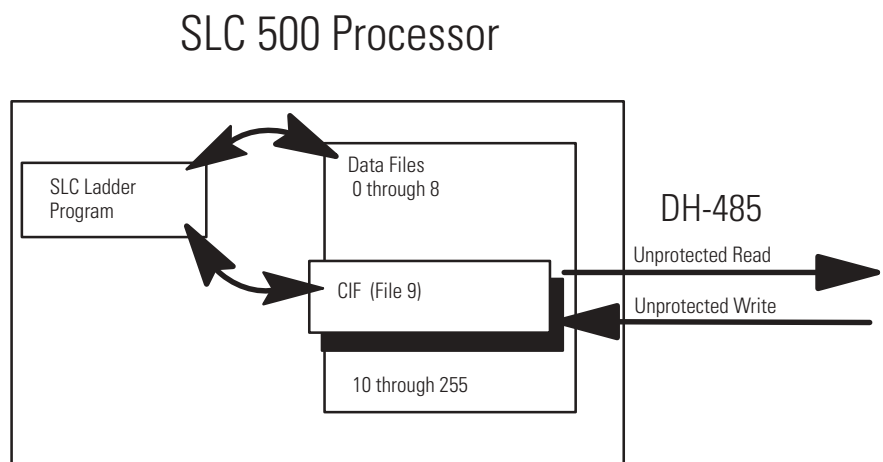
**PLC-5 Message Instruction**

When using the PLC-5 Message instruction, the Destination Address is entered in octal. The PLC-5 processor automatically translates the octal address to a byte address by doubling the decimal equivalent. Therefore, 010 (base 8) becomes 16 (base 10) and 177 (base 8) becomes 254 (base 10). The PLC-5 Message instruction does not allow an octal address less than 010 (base 8) to be entered.

**Use the SLC 500 CIF File**

In application, the CIF can be thought of as a data buffer between all the other SLC data files and the DH-485 port. The SLC processor must be programmed, using ladder logic, to transfer data between the CIF and the other data files as shown here.

**SLC 500 CIF File**



The CIF can be managed by designating areas to be written to and areas to be read from. If it is desired to know when data has changed in the CIF, use ladder logic to program handshaking bits in your CIF data.

## Use the PLC-5 Message Instruction with Word

The PLC-5 Message instruction's octal Destination Address must be between 010 (base 8) and 177 (base 8). This range corresponds to word 16 (base 10) through word 254 (base 10) in the SLC processor. Only even numbered words (16, 18, 20,... 254) in the SLC processor can be addressed by the PLC-5 Message instruction. The maximum value for the PLC-5 Message instruction Size in Elements parameter is 112 when the destination is an SLC processor (assuming 1 word elements).

For example, write 10 words from N7 in a PLC-5 to an SLC 5/02 using the PLC-5's Message instruction. To write 10 words:

1. Set up the source address in the Message instruction as N7:0.
2. Set the Size in Elements to 10.
3. Set up the Command Type as PLC-2 Unprotected Write.
4. Set up the Destination Address as 010 (base 8). This corresponds to the SLC address, N9:16.

Since 10 words will be written, make sure that the N9 file in the SLC processor is created to at least N9:25.

It is assumed that the Message instruction will be set up for a remote destination, since there must be a bridge between the PLC-5 processor and the SLC 5/02 processor, such as a 1784-KA5 linking a DH+ and the DH-485 network. The 1747-KE module can be used as a bridge between the DF1 and DH-485 network.

## Use the PLC-5 Message Instruction with Byte

### IMPORTANT

The byte addressing mode is selected in the SLC processor by setting bit S:2/8 to 1. (The default is S:2/8 = 0 for word addressing.) This selection bit is only available in the SLC 5/02 Series B, FRN 3 processor or later.

The PLC-5 Message instruction's octal Destination Address must be between 010 (base 8) and 377 (base 8). This range corresponds to byte 16 (base 10) through byte 510 (base 10). This allows odd and even words in the SLC processor to be addressed by the PLC-5 Message instruction.

### Destination Address

Byte	Word	SLC Processor Address
16	8	N9:8
18	9	N9:9
20	10	N9:10
...	...	...
510	255	N9:255

The maximum value for the PLC-5 Message instruction Size in Elements parameter is 41 when the destination is an SLC processor (assuming 1 word elements).

For example, write 10 words from N7 in a PLC-5 to an SLC 5/02 using the PLC-5's processor Message instruction. To write 10 words:

1. Set up the source address in the Message instruction as N7:0.
2. Set the Size in Elements to 10.
3. Set up the Command Type as PLC-2 Unprotected Write.
4. Set up the Destination Address as 010 (base 8). This corresponds to the SLC address, N9:8.

Since 10 words will be written, make sure that the N9 file in the SLC processor is created to at least N9:17.

It is assumed that the Message instruction will be set up for a remote destination, since there must be a bridge between the PLC-5 processor and the SLC 5/02 processor, such as a 1784-KA5 linking a DH+ and the DH-485 network. The 1747-KE module can be used as a bridge between the DF1 and DH-485 network.

---

## Lithium Battery Replacement, Handling, and Disposal

This appendix contains important information you should know when using lithium batteries.

### Battery Replacement

Your module provides back-up power for RAM through a replaceable lithium battery (catalog number 1747-BA). This battery provides back-up for approximately five years. A BAT LOW indicator on the front of the module alerts you when the battery voltage has fallen below the replace battery threshold level.

To replace the lithium battery:

1. Remove power from the SLC 500 power supply.

---

**ATTENTION**

Do not remove the module from the SLC 500 chassis until all power is removed from the SLC 500 power supply.

- 
2. Remove the module from the chassis by depressing the retainer clips at both the top and bottom of the module and slide it out.

---

**IMPORTANT**

If the top or bottom retainer clips are broken when removing the module they can be easily replaced. Pry the broken clip(s) off from the bottom with a screwdriver, if necessary. Do not twist off. Snap in the replacement clip. Order catalog number 1746-R15 (2 per package).

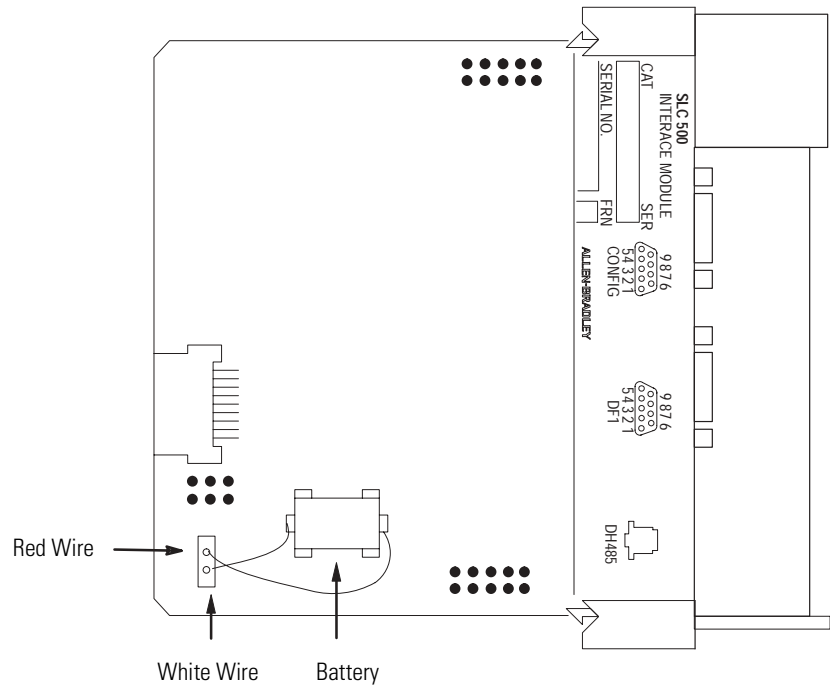
---

**ATTENTION**

Do not expose the module to surfaces or other areas that may typically hold an electrostatic charge. Electrostatic charges can alter or destroy memory.

---

### Battery Location



3. Unplug the battery connector.

#### **IMPORTANT**

The module has a capacitor that provides 30 minutes of battery back-up while the battery is disconnected. Data in RAM is not lost if the battery is replaced within 30 minutes.

4. Remove the battery from the retaining clips.
5. Insert a new battery into the battery retaining clips.
6. Plug the battery connector into the socket with the red lead wire on top and the white lead wire on the bottom.
7. Re-insert the module into the SLC 500 chassis.
8. Restore power to the SLC 500 power supply module.

## Battery Handling

The procedures listed below must be followed to be sure of proper battery operation and reduce personnel hazards.

- Use battery only for intended operation
- Do not ship or dispose of cells except according to recommended procedures
- Do not ship on passenger aircraft

---

**ATTENTION**

Do not charge the batteries. An explosion could result or the cells could overheat causing burns.

Do not open, puncture, crush, or otherwise mutilate the batteries. A possibility of an explosion exists and toxic, corrosive, and flammable liquids would be exposed.

Do not incinerate or expose the batteries to high temperatures.

Do not attempt to solder batteries. An explosion could result.

Do not short positive and negative terminals together. Excessive heat can build up and cause severe burns.

---

## Storage

Store lithium batteries in a cool, dry environment, typically +20 to +25 °C (+68 to +77 °F) with 40% to 60% humidity. Store the batteries and a copy of the battery instruction sheet in the original container, away from flammable materials.

## Transportation

### *One or Two Batteries*

Each battery contains 0.23 g of lithium. Therefore, up to two batteries can be shipped together within the United States without restriction. Regulations governing shipment to or within other countries may differ.

### *Three or More Batteries*

Procedures for the transportation of three or more batteries shipped together within the United States are specified by the Department of Transportation (DOT) in the Code of Federal Regulations, CRF49, “Transportation”. An exemption to these regulations, DOT – E7052, covers the transport of certain hazardous materials classified as flammable solids. This exemption authorizes transport of lithium batteries by motor vehicle, rail freight, cargo vessel, and cargo-only aircraft, providing certain conditions are met. Transport by passenger aircraft is not permitted.

A special provision of the DOT – E7052 (11th Rev., October 21, 1982, par. 8-a) provides that:

Persons that receive cell and batteries covered by this exemption may reship them pursuant to the provisions of 49 CFR 173.22a in any of these packages authorized in this exemption including those in which they were received.

The Code of Federal Regulations, 49 CFR 173.22a, relates to the use of packaging authorized under exemptions. In part, it requires that you must maintain a copy of the exemption at each facility where the packaging is being used in connection with shipment under the exemption.

Shipment of depleted batteries for disposal may be subject to specific regulation of the countries involved or to regulations endorsed by those countries, such as the IATA Restricted Articles Regulations of the International Air Transport Association, Geneva, Switzerland.

Regulations for transportation of lithium batteries are periodically revised.



## Battery Disposal

The following procedures must be followed when disposing of lithium batteries.

---

**ATTENTION**

Do not incinerate or dispose of lithium batteries in general trash collection. Explosion or violent rupture is possible. Batteries should be collected for disposal in a manner to prevent against short circuiting, compacting, or destruction of case integrity and hermetic seal.

---

For disposal, batteries must be packaged and shipped in accordance with the transportation regulations, to a proper disposal site. The U.S. Department of Transportation authorizes shipment of “Lithium batteries for disposal” by motor vehicle only in regulation 173.1015 of CRF49 (effective January 5, 1983). For additional information contact:

U.S. Department of Transportation  
Research and Special Programs Administration  
400 Seventh Street, S.W.  
Washington, D.C. 20590

Although the Environmental Protection Agency at this time has no regulations specific to lithium batteries, the material contained may be considered toxic, reactive, or corrosive. The person disposing of the material is responsible for any hazards created in doing so. State and local regulations may exist regarding the disposal of these materials.



## **Interface Module Configuration Worksheets**

This appendix contains worksheets to help you configure the interface module. You will find worksheets on:

- DF1 Full-duplex.
- DF1 Half-duplex.

## DF1 Full-duplex

Name: \_\_\_\_\_ Date: \_\_\_\_\_

### DH485 Port

Parameter	Options	Your Configuration
Node Address	0...31 (decimal)	
Max. Node Address	1...31 (decimal)	
Message Timeout	100...12,750 ms	
Pass Through	Disabled, Enabled	
Communication Rate	300, 600, 1200, 2400, 4800, 9600, 19200	

### DF1 Port

Parameter	Options	Your Configuration
Communication Rate	300, 600, 1200, 2400, 4800, 9600, 19200	
Bits Per Character	7, 8	
Parity	Even, Odd, None	
Stop Bits	1, 2	

### DF1 Full-duplex

Parameter	Options	Your Configuration
Duplicate Packet Detection	Enabled, Disabled	
Checksum	BCC, CRC16	
Constant Carrier Detect	Disabled, Enabled	
Modem Init String		
Modem Init String Delay	0...25 s	
Message Timeout	100...12,750 ms	
Hardware Handshaking	Disabled, Enabled	
Embedded Response Detect	Embedded Response, Auto Detect Embedded Response	
ACK Timeout	(0...65,535) x 5 ms	
ENQuery Retries	0...254	
NAK Received Retries	0...254	

**DF1 Half-duplex**

Name: \_\_\_\_\_ Date: \_\_\_\_\_

**DH485 Port**

<b>Parameter</b>	<b>Options</b>	<b>Your Configuration</b>
Node Address	0...31 (decimal)	
Max. Node Address	1...31 (decimal)	
Message Timeout	100...5000 ms	
Pass Through	Disabled, Enabled	
Communication Rate	300, 600, 1200, 2400, 4800, 9600, 19200	

**DF1 Port**

<b>Parameter</b>	<b>Options</b>	<b>Your Configuration</b>
Communication Rate	300, 600, 1200, 2400, 4800, 9600, 19200	
Bits Per Character	7, 8	
Parity	Even, Odd, None	
Stop Bits	1, 2	

**DF1 Half-duplex**

<b>Parameter</b>	<b>Options</b>	<b>Your Configuration</b>
Duplicate Packet Detection	Disabled, Enabled	
Checksum	BCC, CRC16	
Constant Carrier Detect	Disabled, Enabled	
Modem Init String		
Modem Init String Delay	0...25 s	
Message Timeout	100...12,750 ms	
Hardware Handshaking	Disabled, Enabled	
Poll Timeout	(0...65,535) x 5 ms	
Message Retries	0...254	
RTS On Delay	(0...65,535) x 5 ms	
RTS Off Delay	(0...65,499) x 5 ms	
Local/Remote Mode	Local, Remote	
Slave Address/ Group Number	Slave Address = 0...254 Group Number = 0...7	
Master Station Address	0...254 (decimal)	



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## Installation Assistance

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