



Installation Instructions

SLC 500TM BASIC and BASIC-T Modules

(Catalog Number 1746-BAS and 1746-BAS-T)

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Important User Information

Because of the variety of uses for the products described in this publication, those responsible for the application and use of this control equipment must satisfy themselves that all necessary steps have been taken to assure that each application and use meets all performance and safety requirements, including any applicable laws, regulations, codes and standards.

The illustrations, charts, sample programs and layout examples shown in this guide are intended solely for purposes of example. Since there are many variables and requirements associated with any particular installation, Allen-Bradley does not assume responsibility or liability (to include intellectual property liability) for actual use based upon the examples shown in this publication.

Allen-Bradley publication SGI-1.1, *Safety Guidelines for the Application, Installation, and Maintenance of Solid-State Control* (available from your local Allen-Bradley office), describes some important differences between solid-state equipment and electromechanical devices that should be taken into consideration when applying products such as those described in this publication.

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Throughout these installation instructions we use notes to make you aware of safety considerations:

ATTENTION



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

Attention statements help you to:

- identify a hazard
- avoid the hazard
- recognize the consequences

IMPORTANT

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

For More Information

Related Publications

For	Refer to this Document	Pub. No.
More detailed instructions on installing your BASIC or BASIC-T module, as well as information on software, component selection, and programming.	SLC 500 BASIC User Manual	1746-UM004A-US-P
A reference manual that contains BASIC language commands, control and support functions.	BASIC Language Reference Manual	1746-RM001A-US-P
A detailed description of BASIC Development Software installation and use, including configuration and programming.	BASIC Development Software Programming Manual	1747-PM001A-US-P

If you would like a manual, you can:

- download a free electronic version from the internet:
www.theautomationbookstore.com
- purchase a printed manual by:
 - contacting your local distributor or Rockwell Automation representative
 - visiting www.theautomationbookstore.com
 - calling 1.800.963.9548 (USA/Canada) or 001.330.725.1574 (Outside USA/Canada)

Hazardous Location Considerations

This equipment is suitable for use in Class I, Division 2, Groups A, B, C, D or non-hazardous locations only. The following WARNING statement applies to use in hazardous locations.

WARNING**WARNING: EXPLOSION HAZARD**

- Substitution of components may impair suitability for Class I, Division 2.
 - Do not replace components or disconnect equipment unless power has been switched off.
 - Do not connect or disconnect components unless power has been switched off.
 - All wiring must comply with N.E.C. article 501-4(b).
-

Environnements dangereux

Cet équipement est conçu pour être utilisé dans des environnements de Classe 1, Division 2, Groupes A, B, C, D ou non dangereux. La mise en garde suivante s'applique à une utilisation dans des environnements dangereux.

MISE EN**AVERTISSEMENT: DANGER D'EXPLOSION**

- La substitution de composants peut rendre cet équipement impropre à une utilisation en environnement de Classe 1, Division 2.
 - Ne pas remplacer de composants ou déconnecter l'équipement sans s'être assuré que l'alimentation est coupée.
 - Ne pas connecter ou déconnecter des composants sans s'être assuré que l'alimentation est coupée.
-

Module Overview

The BASIC module is a single-slot module that resides in a SLC 500 fixed or modular controller rack. The BASIC-T module is a higher speed version of the BASIC module with identical hardware features, including two configurable serial ports for RS-232/423, RS-422, and RS-485 communication with I/O devices. Communication to an SLC 500 processor can take place across the 1746 I/O backplane or on the DH485 network through the module's DH485 port. Both modules also feature 24K bytes of battery-backed RAM, optional 8K or 32K byte non-volatile memory modules, and multiple LEDs for operator interface.

NOTE

The 1746-BAS is compatible with memory module catalog numbers 1747-M1, -M2, -M3, and -M4 only.

The 1746-BAS-T is compatible with memory module catalog numbers 1771-DBMEM1 and -DBMEM2.

The modules can be programmed using an ASCII terminal or a personal computer equipped with 1747-PBASE BASIC development software.

NOTE

Due to the high speed of the 1746-BAS-T, existing programs written for the 1746-BAS may require adjustment for identical operation using the 1746-BAS-T module.

Identifying the Communication Ports

There are three communication ports on the front of the BASIC and BASIC-T modules. The location, name, and pin numbers of these ports are listed on the inside of the BASIC module door as shown in Figure 1. They are:

- PRT1 - Used to interface the module with user devices. This port is a serial port that accommodates RS-232/423, RS-422, and RS-485 communication modes. Port PRT1 is capable of operating full-duplex at 300, 600, 1200, 2400, 4800, 9600, and 19200 baud.
- PRT2 - Used to interface the module with user devices or a modem using DF1 protocol. This port is a serial port that accommodates RS-232/423, RS-422, and RS-485 communication modes. Port PRT2 is capable of operating full-duplex at 300, 600, 1200, 2400, 4800, 9600, and 19200 baud.
- DH485 - Used to interface the module with the DH485 network. This port is not isolated and cannot directly drive the DH485 network. You must use a 1747-AIC link coupler to link port DH485 with the DH485 network.

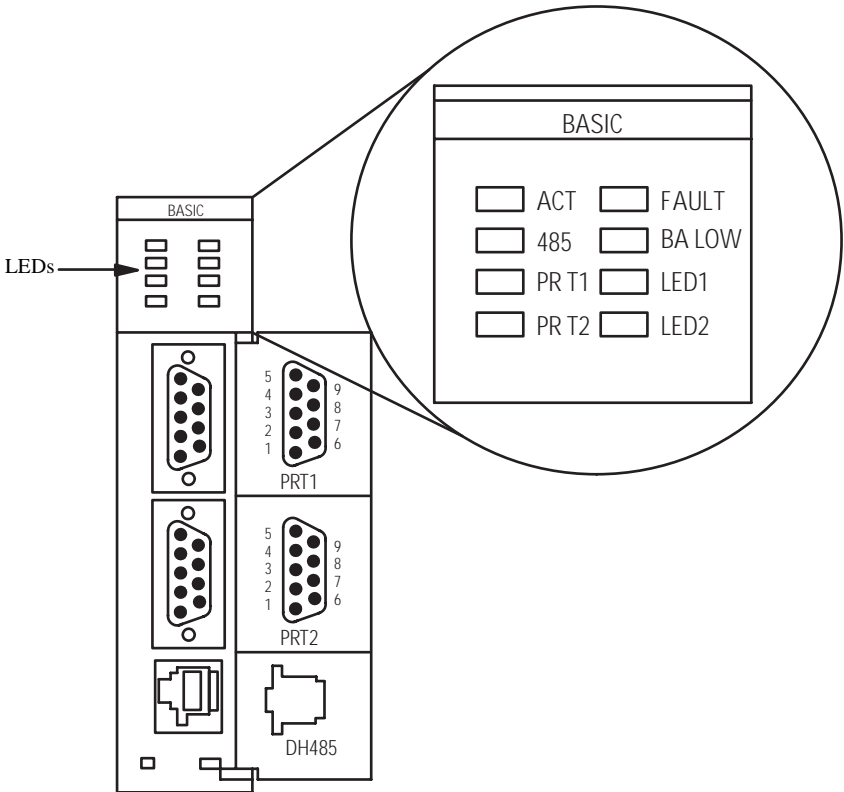
IMPORTANT

When DF1 protocol is selected on port PRT2, DH485 communications are disabled.

LEDs

There are eight LEDs on the front of the BASIC and BASIC-T modules. These LEDs are used for module diagnostics and status indication. Figure 1 shows the location and labeling of these LEDs.

Figure 1 Communication Ports and LEDs



See page 13 for PRT1 and PRT2 pin assignments.

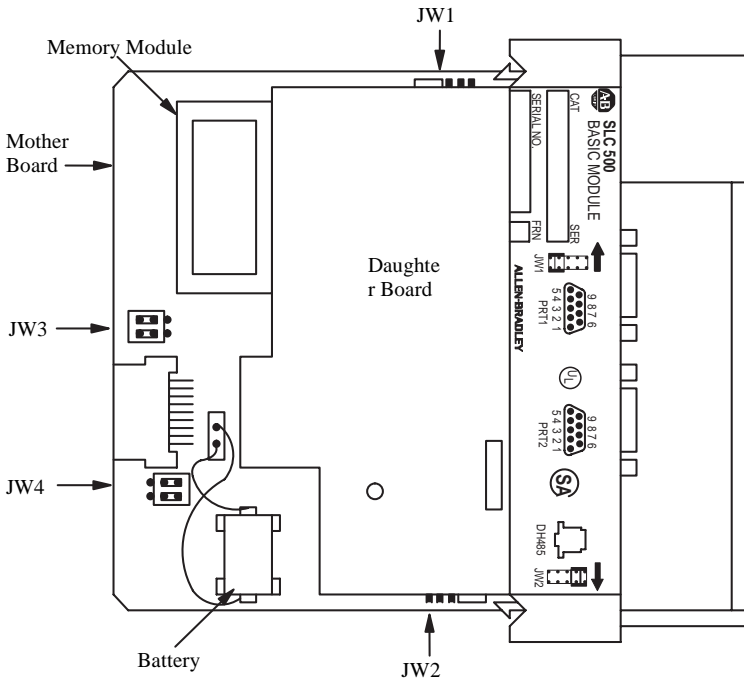
Table 1 LED Status and Indications

LED	Color	Status	Indication
ACT	Green	ON	The module is receiving power from the backplane and is executing BASIC code.
		Flashing	The module is in Command mode.
		OFF	The module is not receiving power from the backplane. A fault condition exists.
485	Green	ON	Port DH485 on the module is active for communication.
		OFF	Port DH485 on the module is not active for communication.
PRT1	Green	Flashing	Port PRT1 on the module is transmitting or receiving signals.
		OFF	Port PRT1 on the module is not transmitting or receiving signals.
PRT2	Green	Flashing	Port PRT2 on the module is transmitting or receiving signals.
		OFF	Port PRT2 on the module is not transmitting or receiving signals.
FAULT	Red	ON	A system problem was detected during background diagnostics. Contact your local Allen-Bradley representative.
		OFF	No system problems are detected during background diagnostics.
BA LOW	Red	ON	The voltage of the battery that backs up RAM is low. A new battery is needed.
		OFF	The voltage of the battery that backs up RAM is at an acceptable level.
LED1	Amber	ON	User definable. LED activated through the user program.
		OFF	User definable. LED de-activated through the user program.
LED2	Amber	ON	User definable. LED activated through the user program.
		OFF	User definable. LED de-activated through the user program.

Setting the Module Jumpers

The BASIC and BASIC-T modules have four sets of jumpers that you need to set. Jumpers JW1 and JW2 configure ports PRT1 and PRT2. Jumper JW3 configures the type of optional memory module. Jumper JW4 configures the program port. Figure 2 shows the location of these jumpers.

Figure 2 Jumper Locations



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.

ATTENTION

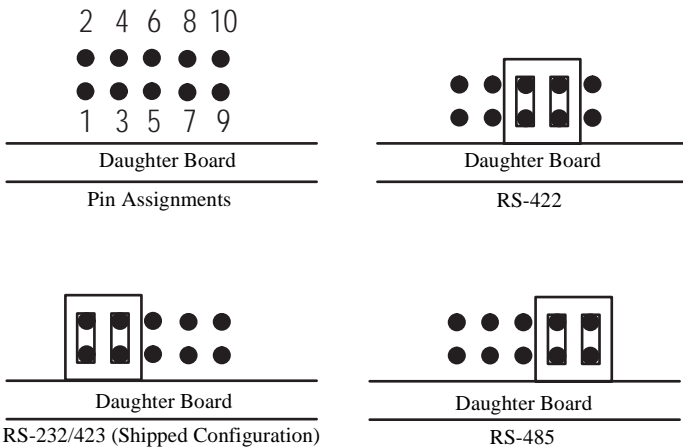
Settings other than those shown for each jumper are illegal and may cause damage to the module.

Setting Jumper JW1

Use jumper JW1 to select one of the following configurations for port PRT1:

- RS-232/423
- RS-422
- RS-485

Figure 3 Jumper JW1 Pin Assignments and Settings

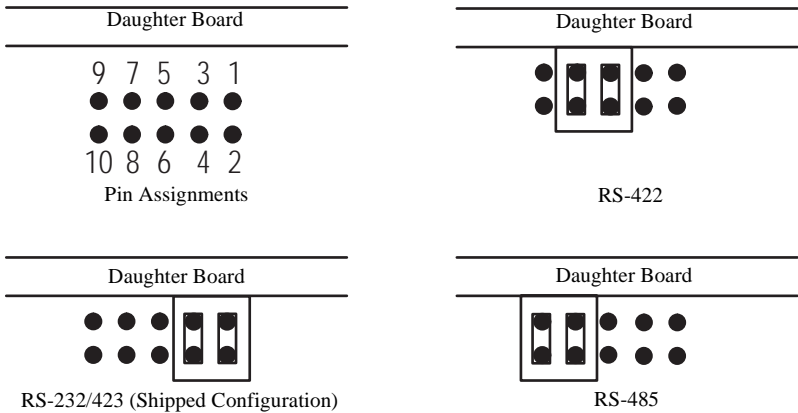


Setting Jumper JW2

Use jumper JW2 to select one of the following configurations for port PRT2:

- RS-232/423
- RS-422
- RS-485

Figure 4 Jumper JW2 Pin Assignments and Settings

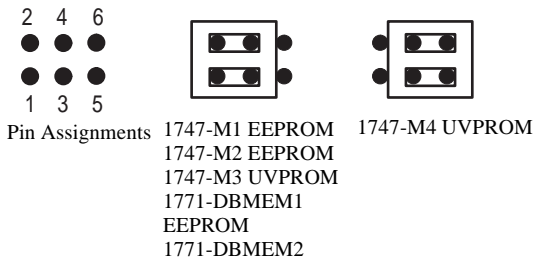


Setting Jumper JW3

Use jumper JW3 to configure the memory module socket for one of the following optional memory modules:

- 1747-M1, 8K bytes EEPROM (compatible with 1746-BAS only)
- 1747-M2, 32K bytes EEPROM (compatible with 1746-BAS only)
- 1747-M3, 8K bytes UVPROM (compatible with 1746-BAS only)
- 1747-M4, 32K bytes UVPROM (compatible with 1746-BAS only)
- 1771-DBMEM1, 8K bytes EEPROM (compatible with 1746-BAS-T only)
- 1771-DBMEM2, 32K bytes EEPROM (compatible with 1746-BAS-T only)

Figure 5 Jumper JW3 Pin Assignments and Settings

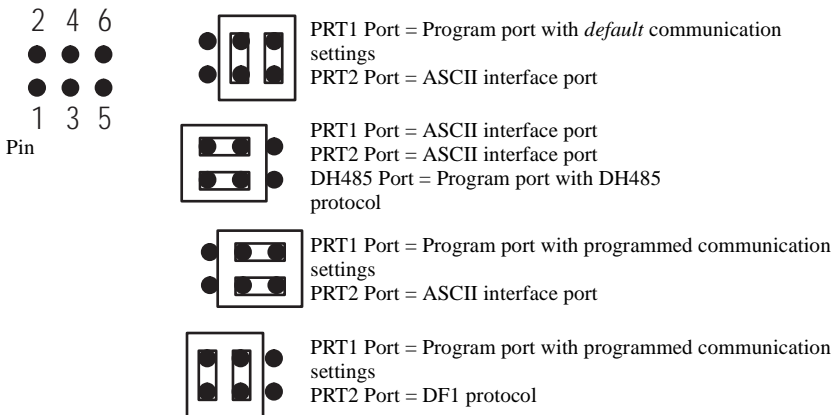


Setting Jumper JW4

Use jumper JW4 to select one of the following configurations for the module ports:

- PRT1 Port = Program port with *default* communication settings
PRT2 Port = ASCII interface port
DH485 Port = Run time DH485 operation only
- PRT1 Port = ASCII interface port
PRT2 Port = ASCII interface port
DH485 Port = Program port with DH485 protocol
- PRT1 Port = Program port with programmed communication settings
PRT2 Port = ASCII interface port
DH485 Port = Run time DH485 operation only
- PRT1 Port = Program port with programmed communication settings
PRT2 Port = DF1 protocol
DH485 Port = Disabled

Figure 6 Jumper JW4 Pin Assignments and Settings



IMPORTANT

The first setting shown in Figure 6 is the default configuration. When the jumper is set in this position, the module always powers up in *Command mode* at 1200 baud, no parity, 8 data bits, and 1 stop bit.

IMPORTANT When DF1 protocol is selected for port PRT2, port DH485 is not available for DH485 programming or run time operation.

DF1 communication must be enabled through the BASIC program.

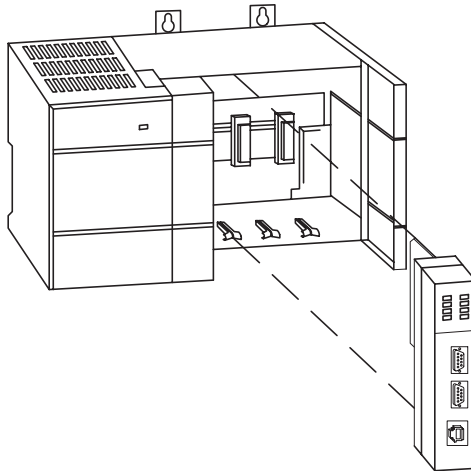
Installing Your Module

Once you have set the jumpers on your module, you are ready to install it in your:

- SLC 500 fixed controller expansion chassis
- SLC 500 modular controller 1746 I/O chassis

Your BASIC or BASIC-T module may be installed in any open slot of your SLC 500 I/O chassis except the first slot of the first chassis, which is reserved for the processor or adapter module. Figure 7 shows a module being installed in an SLC 500 I/O chassis.

Figure 7 Installation in a SLC 500 I/O Chassis



ATTENTION



Never install, remove, or wire any module with power applied to the chassis.

Wiring the Communication Ports

Ports PRT1 and PRT2 can communicate to user devices through RS-232/423, RS-422, and RS-485 communication modes. The communication mode you select depends on the setting of jumpers JW1 and JW2. Table 2 lists the pin assignments for ports PRT1 and PRT2.

Refer to the MODE command in the *BASIC Reference Manual*, publication 1746-RM001A-US-P, for the default programming port configuration information.

IMPORTANT

When default communications are selected via JW4, the module always powers up in the *Command mode* at 1200 baud, no parity, 8 data bits, and 1 stop bit.

Pin Assignments

Use these pin assignments to wire the mating connector of the cable used to interface a user device to port PRT1 or PRT2. The sockets of this connector must be wired to correspond to the selected communication mode.

Table 2 Ports PRT1 and PRT2 Pin Assignments

Pin	RS-232/423	RS-422	RS-485	IBM AT Standard RS-232 Signals
1	Note 1	422 TXD -	TRXD -	DCD or CD
2	RXD	422 RXD -	(1)	RXD
3	TXD	(2)	(2)	TXD
4	DTR	(2)	(2)	DTR
5	COMMON	COMMON	COMMON	COMMON
6	DSR	422 RXD +	(1)	DSR
7	RTS	(2)	(2)	RTS
8	CTS	(2)	(2)	CTS
9	(3)	422 TXD +	TRXD +	RI

- (1) In RS-485 mode, these pins are still connected to their RS-422 receivers. Do not use these pins in RS-485 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 mode.
- (3) In RS-423 mode, these pins are still connected to their RS-422 loads. Do not use these pins in RS-423 mode.

Wiring diagrams for the RS-232/423 communication mode are shown starting on page 16.

Hardware Handshaking

The module uses the following rules when hardware handshaking is enabled. The module:

- does not transmit until CTS (Clear to Send) becomes active
- examines DSR (Data Set Ready) following the receipt of a character. If DSR is active, the character is placed in the input queue. If DSR is inactive, the character is assumed to be noise and is discarded.

DTE and DCE Overview

IMPORTANT You need to know whether the device connecting to the module has a DTE or DCE interface. Figures 8 through 12, starting on page 16, are provided to help you make the appropriate connection.

DTE - Data Terminal Equipment

The serial ports are configured as 9-pin Data Terminal Equipment (DTE), as are most terminals or computer ports.

Table 3 DTE Configurations

DTE 9 Pinout	Signal Description	Signal from DTE Perspective	DTE 25 Pinout	Signal Description
Pin #			Pin #	
1	NC-No Connection	Input	8	CD-Carrier Detect
2	RXD-Received Data	Input	3	
3	TXD-Transmitted Data	Output	2	
4	DTR-Data Terminal Ready	Output	20	
5	COM-Signal Common	Shared	7	
6	DSR-Data Set Ready	Input	6	

Table 3 DTE Configurations

7	RTS-Request to Send	Output	4	
8	CTS-Clear to Send	Input	5	
9	NC-No Connection	Input	22	RI-Ring Indicator

DCE - Data Communication Equipment

Devices such as modems are Data Communication Equipment (DCE). The pinouts on these terminals are defined for ease of interfacing with DTE equipment.

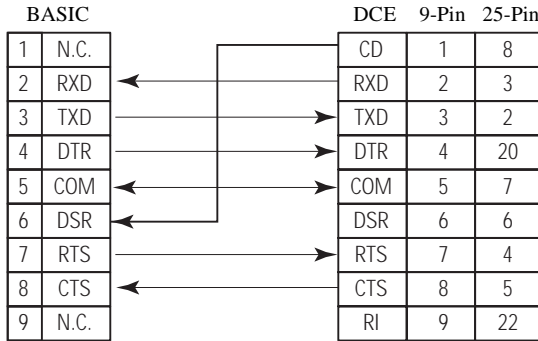
Table 4 DCE Configurations

DCE 9 pinout	Signal Description	Signal from DCE Perspective	DCE 25 pinout
Pin #			Pin #
1	CD-Carrier Detect	Output	8
2	RXD-Received Data	Output	3
3	TXD-Transmitted Data	Input	2
4	DTR-Data Terminal Ready	Input	20
5	COM-Signal Common	Shared	7
6	DSR-Data Set Ready	Output	6
7	RTS-Request to Send	Input	4
8	CTS-Clear to Send	Output	5
9	RI-Ring Indicator	Output	22

IMPORTANT

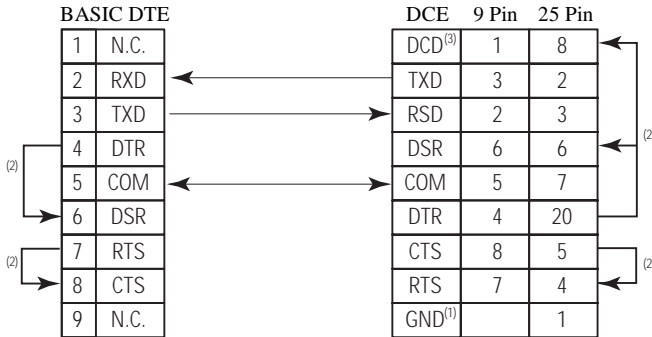
All signal directions listed in the previous two tables are valid. For example, TXD, Transmitted Data, is a DTE output but is also a DCE input. The signal description is the same for both the DTE and DCE but the direction of the signal (perspective) has changed based on whether you have a DTE or DCE device.

Figure 8 RS-232/423 Wiring Diagram - 1746-BAS or 1746-BAS-T to a Modem (Hardware Handshaking Enabled)



IMPORTANT For DCE devices other than modems, connect the DSR of the module with the DSR of the device. The CD signal of the device (other than a modem) is not used.

Figure 9 RS-232/423 Wiring Diagram - 1746-BAS or 1746-BAS-T to DTE Device (Hardware Handshaking Disabled)

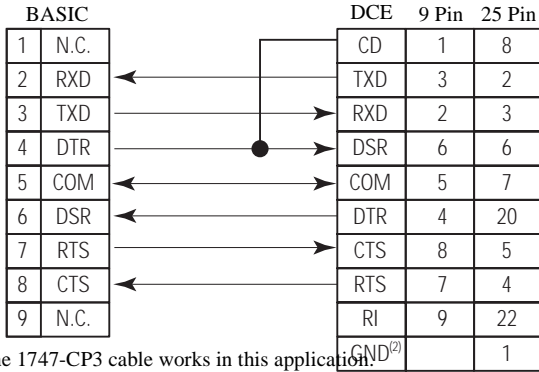


(1) Connect to the shield of the cable.

(2) Jumpers are only needed if you cannot disable the hardware handshaking on the port.

Figure 10 RS-232/423 Wiring Diagram - 1746-BAS or 1746-BAS-T to Printer

(Hardware Handshaking Enabled, Standard Printer Adapter Cable)⁽¹⁾



(1) The 1747-CP3 cable works in this application.

(2) Connect to the shield of the cable.

Figure 11 RS-422 Wiring Diagram

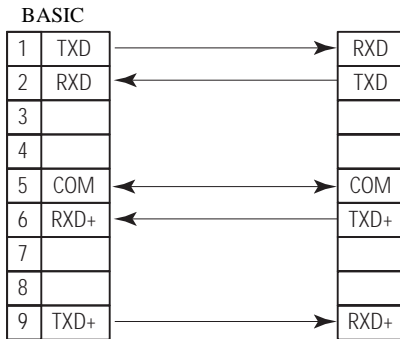
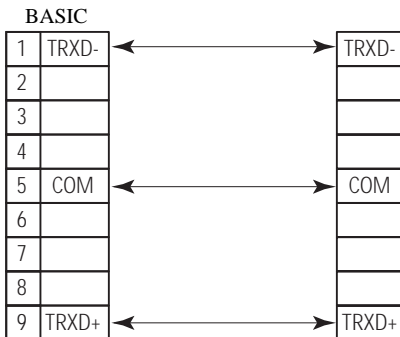


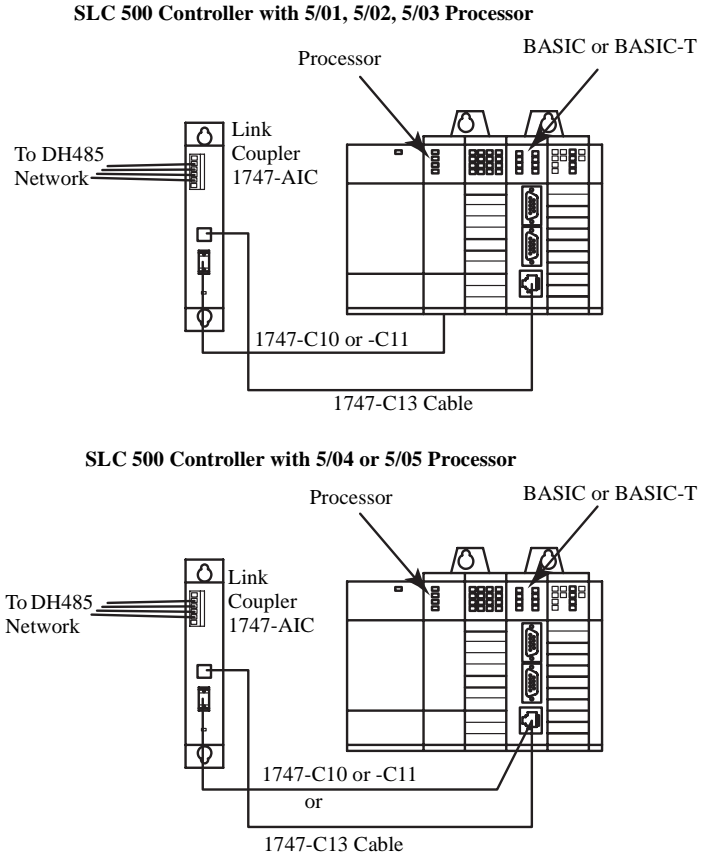
Figure 12 RS-485 Wiring Diagram



Wiring to Port DH485

Port DH485 can communicate to user devices through the DH485 communication mode. Use a 1747-C10 cable or 1747-C13 cable to connect the module to a link coupler interfaced with the DH485 network.

Figure 13 Connecting the Module to a DH485 Network



IMPORTANT

The 1747-C13 cable acts only as a communication link and does not carry 24V dc power. Use a 1747-C10 or -C11 cable to carry power from the processor to the link coupler, or from the link module to the link coupler as shown above.

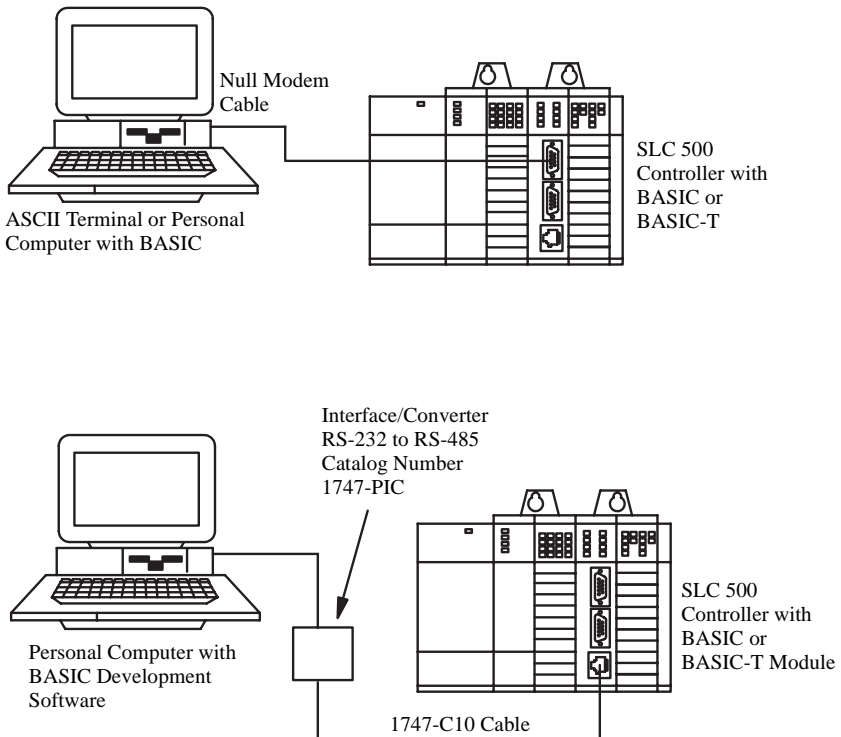
Powering Up Your Module

Once you have installed your BASIC or BASIC-T module in your SLC 500 chassis, you are ready to power up your SLC 500 system and begin programming.

Programming Your Module

Your BASIC or BASIC-T module can be programmed using an ASCII terminal or ASCII terminal emulation software. You can also use a personal computer with the BASIC Development Software (catalog number 1747-PBASE). Use an ASCII terminal to enter a BASIC program one line at a time. Use a personal computer with the BASIC development software to create a BASIC program that is then downloaded to your module. Typical configurations are shown below:

Figure 14 Module Configurations



Specifications

The module specifications are listed in the following tables.

Table 5 General Specifications

Description	Specification
Power Supply Loading at 5V dc	0.150A (module only)
	0.150A (module with link coupler)
Power Supply Loading at 24V dc	0.040A (module only)
	0.125A (module with link coupler) ⁽¹⁾
Noise Immunity	NEMA Standard ICS 2-230
Vibration	Displacement: 0.015 inch, peak-to-peak at 5 to 57 Hz
	Acceleration: 2.5Gs at 57 to 2000 Hz
Shock (operating)	30Gs
Port Isolation ⁽²⁾	
Port PRT1	710V dc for 1 minute (Backplane to port)
Port PRT2	710V dc for 1 minute (Backplane to port)
Port PRT1 to Port PRT2	710V dc for 1 minute (Port PRT1 to Port PRT2)
Ambient Temperature Rating	Operating: 0 to +60°C (+32°F to +140°F) Storage: -40°C to +85°C (-40°F to +185°F)
Humidity	5 to 95% without condensation
Clock/Calendar Accuracy	±1 minute/month at 25°C +0, -6 minute/month at 60°C
Agency Certification	<ul style="list-style-type: none"> • UL listed • CSA approved • Class 1, Division 2, Groups A, B, C or D • CE compliant for all applicable directives • Marine Certified (<i>1746-BAS only</i>)

(1) If a Hand-Held Terminal, Data Table Access Module, or interface converter is connected to the link coupler, the additional backplane power draw of these components (shown in the table on page 21) must be added to the 0.125 Amperes listed in the table above. This only applies when the module is connected to the network via the link coupler and 1747-C10 cable or 1747-C11 cable. This does not apply when the 1747-C13 cable is used.

(2) Port DH485 is not isolated.

Table 6 Power Consumption of Hand-Held Terminal, Data Table Access Module, and Interface

Component	Operating Voltage	Current Requirement
Hand-Held Terminal	24V dc	0.105A
Data Table Access Module	24V dc	0.104A
Interface Converter	24V dc	0.060A

IMPORTANT The module receives its 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.

Table 7 Maximum Communication Distances

Communication Rate (bps)	Maximum Distance Allowed in meters (feet)			
	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)
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 Use the RS-423 jumper settings when communicating in RS-232 mode.

Battery Replacement, Handling, Storage, and Disposal

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, follow these steps:

1. Remove power from the SLC 500 power supply module.
-

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 while 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



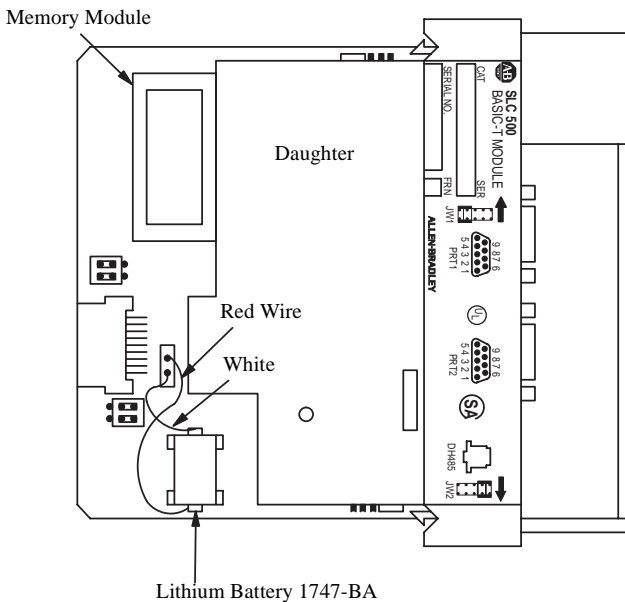
Do not expose the module to surfaces or other areas that may typically hold an electrostatic charge. Electrostatic charges can alter or destroy memory.

3. Unplug the battery connector. See Figure 15 for battery connector location.

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. See Figure 15 for battery connector orientation.
7. Re-insert the module into the SLC 500 chassis.
8. Restore power to the SLC 500 power supply.

Figure 15 Module Battery



Handling

The procedures listed below must be followed to ensure 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. An explosion could result, 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°C to +25°C (+68°F to +77°F) with 40% to 60% humidity.

Transportation

One or Two Batteries - Each battery contains 0.23 grams of lithium. 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.

IMPORTANT Regulations for transportation of lithium batteries are periodically revised.

Disposal

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.

For a lithium battery material safety data sheet (MSDS), contact the manufacturer:

Sanyo Energy Corporation
600 Supreme Drive
Bensenville, IL 60106

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