Allen-Bradley

Technical Data

SLC 500™ BASIC and BASIC-T Modules and BASIC Development Software

(Catalog Numbers 1746-BAS, 1746-BAS-T, and 1747-PBASE)

Provides a foreign device interface to your SLC 500 processor. The SLC 500 BASIC and BASIC-T Modules each provide two configurable serial ports for interfacing to computers, modems, printers and other RS-232-C compatible devices. In addition, the modules can be used for off-loading complex math routines from an SLC 500 processor, conserving valuable ladder logic memory. The BASIC-T module is a high-speed module which can execute a BASIC program four times faster than the 1746-BAS.

Powerful software simplifies programming. The BASIC Development Software, catalog number 1747-PBASE, provides a high level BASIC programming language, powerful debugger, ASCII terminal emulator, and a thorough Help system to streamline BASIC and BASIC-T module programming and troubleshooting.

The modules, which are programmed using the BASIC language, add additional functionality to any SLC 500 application. These flexible modules interface to all SLC 500 processors and to the DH-485 network.

Overview

The BASIC and BASIC-T modules can be programmed with the BASIC Development Software thus saving valuable development time. This software, which runs on an MS-DOS compatible computer, facilitates program creation, editing, translating, debugging, uploading, and downloading of BASIC programs to the modules.

Used together, the BASIC and BASIC-T modules and the BASIC Development Software provide a powerful solution to your data collection and foreign device interface applications.

The BASIC and BASIC-T modules provide the following benefits:

Benefit	Feature
Familiar programming language	Programs in a subset of the Intel 52 BASIC language
Communication to a variety of operator interfaces	Two serial ports can be configured to support RS-232/423, RS-422, and RS-485 communication to external devices.
Ample memory for data collection	24K bytes of battery-backed RAM and optional 8K or 32K byte non-volatile memory modules are provided.
Modem interface capabilities	The Allen-Bradley DF1 protocol can be implemented in full-duplex and half-duplex slave modes.
Communication to one or more SLC 500 processors	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.
Addition of high-level arithmetic to an SLC 500 system	Trigonomic functions and floating-point calculations and conversions can be performed.
4-times faster program execution allows the 1746-BAS-T module to handle high speed applications that cannot be handled by the 1746-BAS.	BASIC-T High Speed performance

The BASIC Development Software provides the following benefits:

Benefit	Feature
Simplified BASIC program creation	English language macros from a macro library replace cryptic CALL instructions. Custom macro libraries of commonly used routines can be created for a specific application.
Friendly program editing environment	Editing is facilitated by a full-featured text editor, intuitive pull-down menus and an extensive HELP system for all menus and BASIC instructions.
Reduced troubleshooting time	Powerful debugging tools such as single-step program execution, split screen function that displays the source program and translated program simultaneously, and a watch window for monitoring selected variables facilitate troubleshooting.

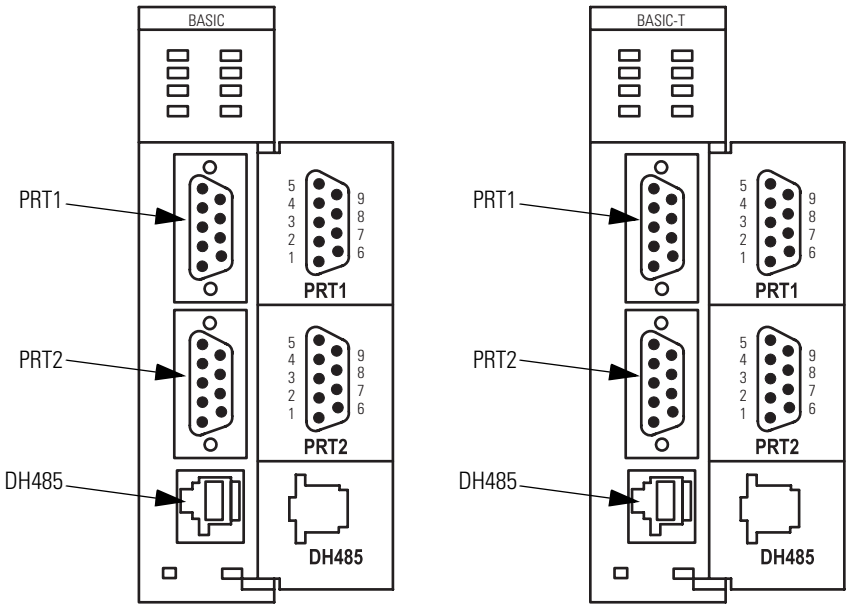
Module Integration

The BASIC or BASIC-T module resides in a single slot of a 1746 I/O chassis. Typical configurations include integrating the module with any SLC 500 fixed or modular controller. Communication between the module and the SLC controller takes place across the SLC backplane.

Communications

There are three communication ports on the front of the BASIC or BASIC-T module. The 2 serial ports can be configured to communicate with a variety of devices such as operator interfaces, printers, and modems. The DH485 port enables the module to interface to the DH485 network.

Figure 1 Communication Ports



The 2 serial ports, PRT1 and PRT2, have the following characteristics:

- ability to interface with user devices
- configurable communication modes: RS-232/423, RS-422, and RS-485
- selectable full-duplex baud rates of 300 to 19200 baud
- 9 pin D-shell serial port
- electrically isolated to 710V dc

Port PRT2 also enables the module to communicate with a modem. The Allen-Bradley DF1 protocol, full-duplex or half-duplex slave mode can be selected.

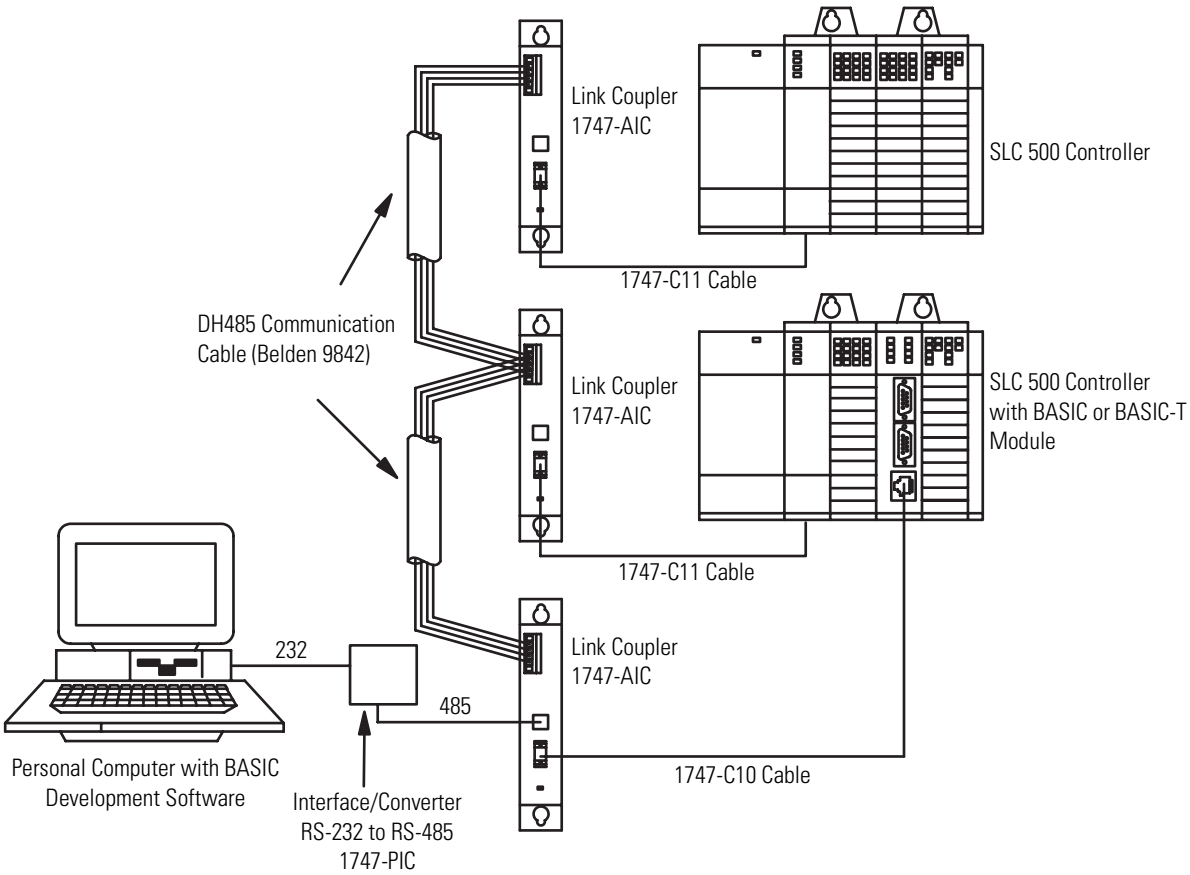
Port DH485 interfaces the module with the DH485 network. An isolated link coupler (1747-AIC) is required for connection to the network. However, user initiated DH485 communication is disabled when the DF1 protocol is selected.

DH485 Communications

Your BASIC or BASIC-T module interfaces with a DH485 network when it is necessary to communicate to more than one SLC processor. The following components can be used:

- 1747-AIC Isolated Link Coupler — provides an electrically isolated network connection for an SLC 500 controller or a module
- 1747-PIC Interface/Converter — converts the RS-232 signal levels at your personal computer to RS-485 signal levels required to establish communication to an SLC 500 controller or the DH-485 network
- 1784-KR DH485 Interface Card and 6001-F2E DH485 Driver Software — enables your personal computer to communicate across the DH485 network for data acquisition applications replacing the 1747-PIC interface/converter and the 1747-AIC isolated link coupler
- 1770-KF3 DH485 Communication Interface Module — links a personal computer, modem, or any RS-232-C device communicating with DF1 protocol to a DH485 network

Figure 2 DH485 Network Interface



DF1 Communications

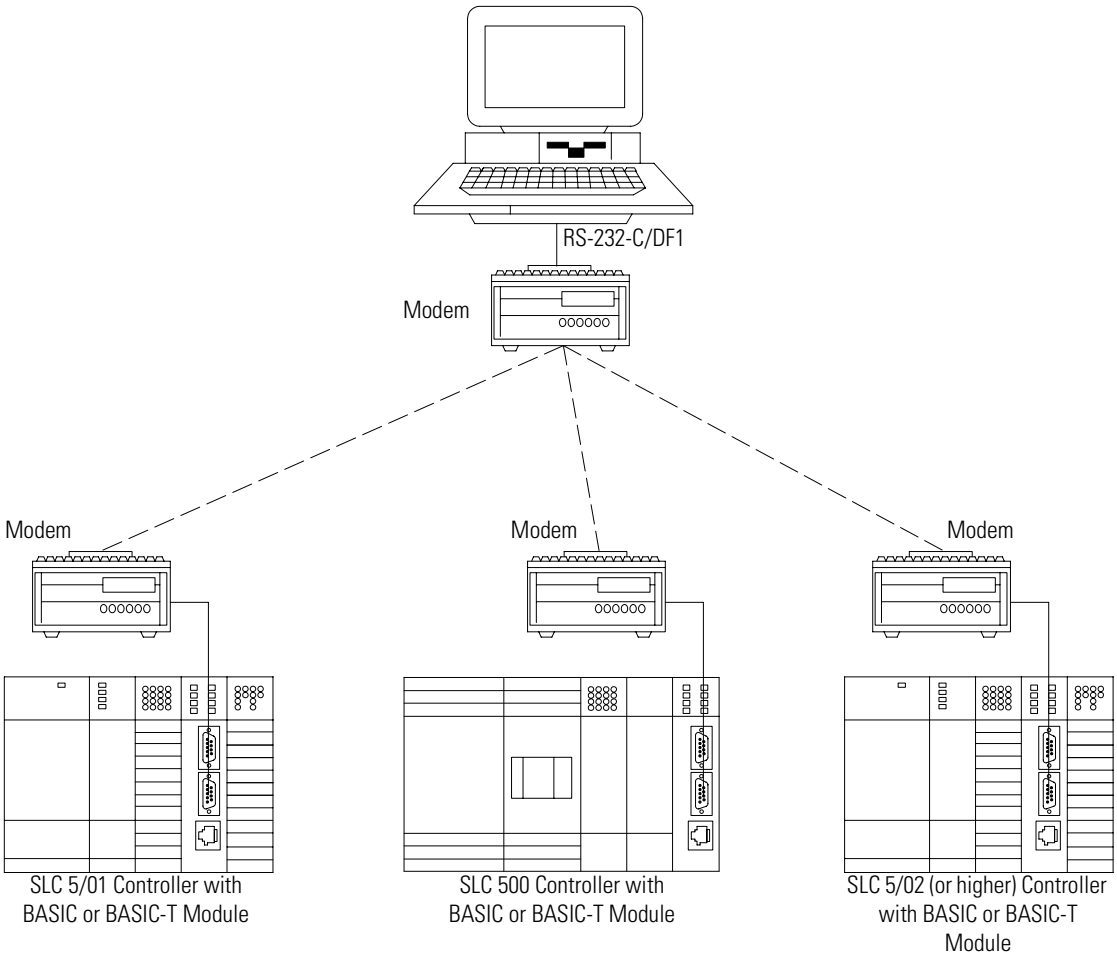
Your BASIC or BASIC-T module uses DF1 protocol to communicate through port PRT2 with external devices such as modems. Communication with the external devices can be accomplished using one of the following:

Leased phone line — a private phone line that is leased from the phone company. Leased phone lines provide a phone link between modems that is available for communication at all times. Typically, leased phone lines are used when you have frequent or constant communication between the module and external devices.

Radio link — a communications link between radio modems. Typically are used when phone lines are inaccessible or expensive to use.

Dial-up modem — a dial-up or phone modem capable of communicating across standard phone lines. One dial-up modem initiates the communication, while another modem receives the communication.

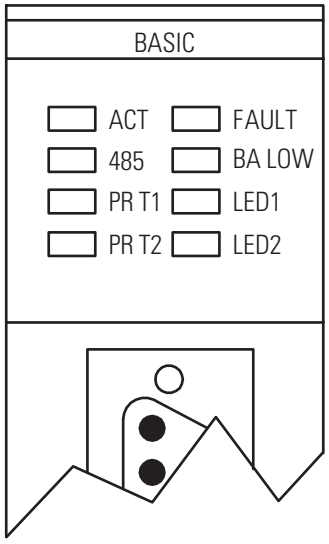
Figure 3 DF1 Network Interface



Diagnostics

The eight LEDs on the front of the module are used for module diagnostics and operator interface.

Figure 4 Diagnostic LEDs



LED	Indicates
ACT	the module's mode and whether the module is receiving power from the backplane.
485	whether port DH485 is actively engaged in communication
PRT1	whether port PRT 1 is transmitting and receiving signals
PRT2	whether port PRT2 is transmitting and receiving signals
FAULT	a system problem was detected during background diagnostics
BA LOW	that the voltage of the battery that backs up RAM is low
LED1	user-defined condition
LED2	user-defined condition

Memory Requirements

The module offers two types of memory modules for BASIC programming:

- a 24K byte battery backed RAM to store BASIC programs and protected variables
- an optional 8K or 32K byte memory module to store BASIC programs

The optional memory module provides non-volatile storage of user BASIC programs and port configuration. You can use any of the following memory module options:

for 1746-BAS only	for 1746-BAS-T only
1747-M1 (8K byte EEPROM)	1771-DBMEM1 (8K byte EEPROM)
1747-M2 (32K byte EEPROM)	1771-DBMEM2 (32K byte EEPROM)
1747-M3 (8K byte UVPROM)	
1747-M4 (32K byte UVPROM)	

Programming the BASIC and BASIC-T Modules

The module is programmed using a subset of the Intel BASIC 52 programming language. Programming is performed using an ASCII terminal or an IBM personal computer running the BASIC Development Software. While the BASIC Development Software is not required, it offers considerable advantages to the programmer.

The BASIC Development Software simplifies the creation of BASIC programs. A library of macro instructions is provided. These macros replace the cryptic CALL instructions that are characteristic of Intel BASIC 52. You can also create your own library of macro instructions that are customized to fit your particular application.

The BASIC Development Software has a full featured text editor that streamlines program editing and incorporates the following features:

- intuitive pull-down menus. These can be accessed with a mouse or cursor control keys
- extensive HELP system for all menus and BASIC instructions
- multiple window capability for simultaneous viewing of files
- cut and paste, search and replace, and undo and redo functionality
- keystroke macro support
- easy line drawing capability

After the source program is written, it is translated into the BASIC program that is downloaded into the module. The software has a terminal emulation mode that is used to communicate to the module to execute, monitor, and debug the BASIC program. Powerful debugging tools are available that reduce the time required to troubleshoot your program. These tools include:

- single-step program execution
- split screen capability for viewing source program and translated file simultaneously
- watch window for monitoring select variables
- Go to cursor” operation for stepping to designated areas in the program

The system requires:

- 640K byte of RAM
- 1 hard disk drive with 2M byte free disk space
- 1 floppy disk drive (3 1/2" or 5 1/4")
- DOS version 3.1 to 6.22
- monochrome or color monitor (CGA, EGA, VGA)
- 1 RS-232 compatible serial port

Typical programming interface configurations are shown in the following figures.

Figure 5 BASIC Development Software Programming Interface (RS-232)

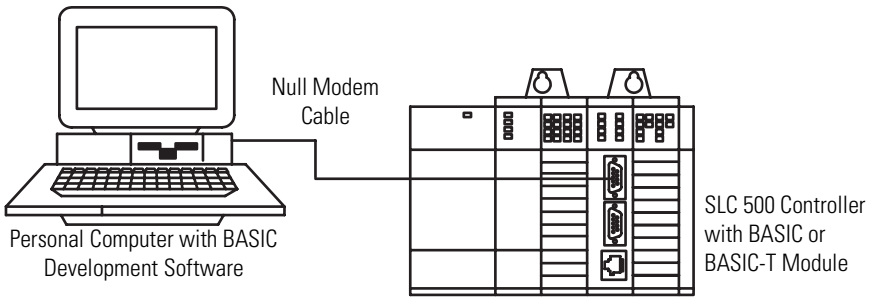


Figure 6 BASIC Development Software Interface (DH-485)

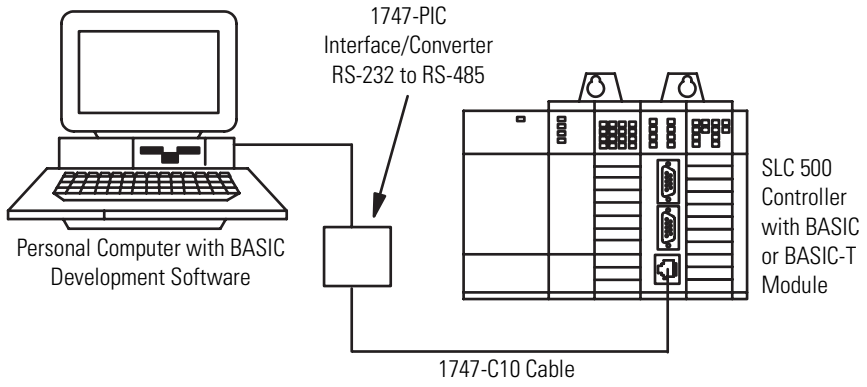
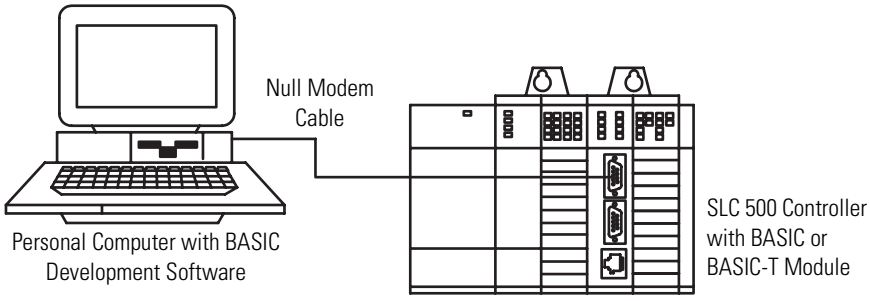


Figure 7 ASCII Terminal Programming Interface



Specifications

Memory Size	24K bytes battery-backed RAM	
Optional Memory Modules	for 1746-BAS	1747-M1 (8K byte EEPROM) 1747-M2 (32K byte EEPROM) 1747-M3 (8K byte UVPROM) 1747-M4 (32K byte UVPROM)
	for 1746-BAS-T	1771-DBMEM1 (8K byte EEPROM) 1771-DBMEM2 (32K byte EEPROM)
Number of Ports	3	
Serial Ports	2	
Port Configuration	RS-232/423, RS-422, RS-485, DH485	
Port Isolation	Backplane to PRT1	710V dc for 1 minute
	Backplane to PRT2	710V dc for 1 minute
	PRT1 to PRT2	710V dc for 1 minute
Modem Support	DF1 half-duplex slave or full-duplex	
Data Rates	300 to 19200 baud	
Data Transfer	SLC 500 and SLC 5/01	8 input words (SLC input image table) 8 output words (SLC output image table)
	SLC 5/02 and higher	8 input words (SLC input image table) 8 output words (SLC output image table) 64 input words and 64 output words (SLC M0/M1 file)
Maximum Communication Distance:	RS-232 (300 to 19200 bps)	15 m (50 ft.)
	RS-423 (300 bps)	1230 m (4000 ft.)
	RS-423 (600 bps)	920 m (3000 ft.)
	RS-423 (1200 bps)	770 m (2500 ft.)
	RS-423 (4800 bps)	245 m (800 ft.)
	RS-423 (9600 bps)	120 m (400 ft.)
	RS-423 (19200 bps)	60 m (200 ft.)
	RS-422 (300 to 19200 bps)	1230 m (4000 ft.)
	RS-485 (300 to 19200 bps)	1230 m (4000 ft.)
Clock/Calendar Accuracy	±1 minute/month at 25°C (77°F) 0, -6 minute/month at 60°C (140°F)	
Backplane Current Draw	BASIC or BASIC-T module only	150 mA at 5V dc 40 mA at 24V dc
	BASIC or BASIC-T module with Link Coupler	150 mA at 5V dc 125 mA at 24V dc

General Specifications

Operating Temperature	0°C to 60°C (32°F to 140°F)
Storage Temperature	-40°C to +85°C (-40°F to +185 °F)
Relative Humidity	5% to 95% (non-condensing)
Noise Immunity	NEMA Standard ICS 2-230
Vibration	Displacement: 0.381 mm (0.015 in.) peak-to-peak at 5 to 57 Hz Acceleration: 2.5 G at 57 to 2000 Hz
Shock (operating)	30 G

Agency Certification

- UL listed
- CSA approved
- Class 1, Division 2, Groups A, B, C, or D
- CE compliant for all applicable directives
- Marine Certified *(1746-BAS only)*

Related Products

SLC 500 ™ BASIC and BASIC-T Modules User Manual	1746-UM004A-US-P
BASIC Language Reference Manual	1746-RM001A-US-P
BASIC Development Software Programming Manual	1746-PM001A-US-P
8K byte EEPROM Memory Module for 1746-BAS only	1747-M1
32K byte EEPROM Memory Module for 1746-BAS only	1747-M2
8K byte UVPROM Memory Module for 1746-BAS only	1747-M3
32K byte UVPROM Memory Module for 1746-BAS only	1747-M4
8K byte EEPROM Memory Module for 1746-BAS-T only	1771-DBMEM1
32K byte EEPROM Memory Module for 1746-BAS-T only	1771-DBMEM2
Communication Cable	1747-C10, 1747-C11
DH485 Interface Card	1784-KR
DH485 Driver Software	6001-F2E
Interface Converter (RS-232 to RS-485)	1747-PIC
Link Coupler	1747-AIC
SLC 500	1747-L20, -L30, -L40
SLC 5/01	1747-L511, -L514
SLC 5/02	1747-L524
SLC 5/03	1747-L531, -L532
SLC 5/04	1747-L541, -L542, -L543
SLC 5/05	1747-L551, -L552, L-553

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