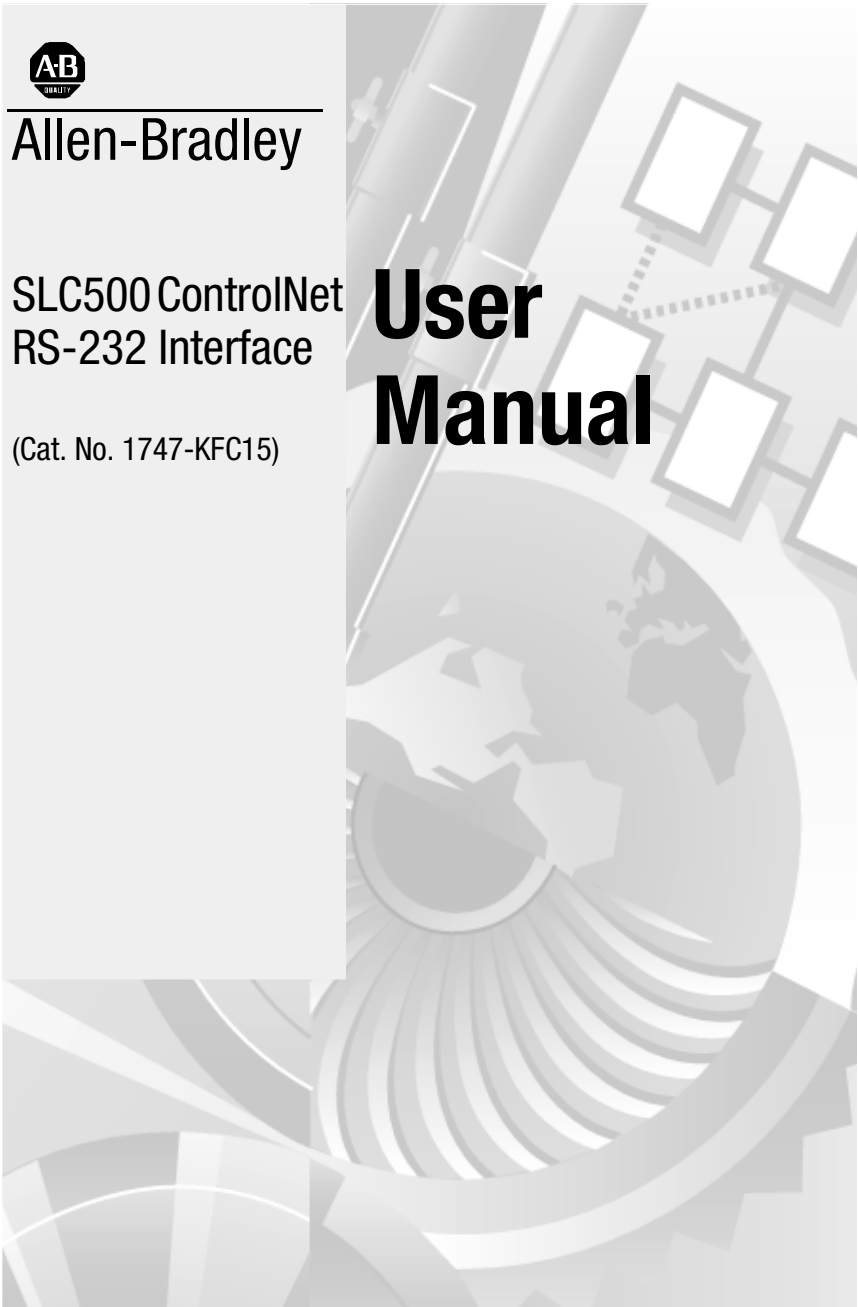# Allen-Bradley

SLC500 ControlNet
RS-232 Interface

(Cat. No. 1747-KFC15)

User Manual

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.

Due to the rapid change in technology and part availability, Allen-Bradley reserves the right to change the appearance of certain products which may not match those shown in this manual.

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Throughout this manual 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.

The 1747-KFC15 allows an SLC500 modular processor to communicate with the ControlNet™ network via the processor's RS-232 serial port.

Purpose of the Manual

Throughout this manual we refer to the 1747-KFC15 Communication Interface as the KFC15 module. Use this manual to:

- install and configure the KFC15 module

- understand how the KFC15 module communicates on the network (procedures and protocols)

- troubleshoot for problems

Related Publications

The following publications contain information related to the KFC15 module:

Publication	Publication Number
Allen-Bradley ControlNet Cable System Planning and Installation Manual	1786-6.21
Allen-Bradley ControlNet Cable System Component List	AG-2.2
Allen-Bradley Industrial Automation Wiring and Grounding Guidelines	1770-4.1
SLC 5/03 and 5/04 Modular Processors Installation Instructions	1747-5.27

Related Products

The KFC15 module creates an interface between the ControlNet network and an SLC500 processor. It has been verified to work with the following products:

- Allen-Bradley ControlNet taps (1786-TPR, 1786-TPS, 1786-TPYR and 1786-TPYS)

- Allen-Bradley high voltage ac and dc type repeaters (1786-RPT and 1786-RPTD)

- Allen-Bradley PLC-5® processors (1785-L20C15, -L40C15, -L60C15, and -L80C15)

- Allen-Bradley computer interface cards (1784-KTC15 and 1784-KTCX15)

- Allen-Bradley 1794 FLEX I/O Adapters (1794-ACN15 and 1794-ACRN15)

- Allen-Bradley 1771 I/O Adapters (1771-ACN15 and 1771-ACNR15)

- Rockwell Software's RSLogix500™, and RSLinx™

- Network Access cable (1786-CP)

Other ContolNet devices and software that comply with the ControlNet Network specifications can also be used with the KFC15 module.

Glossary of Terms and Abbreviations

This manual may use the following terms as defined below:

ControlNet

The communication architecture that allows the exchange of messages between devices that follow the ControlNet specifications. ControlNet is a real-time, control-layer network that provides high-speed transport for both time-critical I/O and message data. A ControlNet network can be either single or redundant media.

DF1

Allen-Bradley's RS-232 proprietary protocol.

Full Duplex

The ability to simultaneously send/receive data between devices, point-to-point.

Half Duplex

The data transmission in one direction at a time, usually point-to-multipoint.

NAP (Network Access Port)

An input/output (RJ-45 style) connector for a programming terminal to gain full access to the network.

Network

A collection of connected nodes (end devices). The connection paths between any pair of nodes can include repeaters, routers, bridges, and gateways.

Network Address

The network address of a node on the ControlNet network. This address must be in the range of 1 to 99 (decimal) and be unique to that subnet. A subnet can contain a maximum of 99 nodes.

Node

Any physical device connecting to the ControlNet network that requires a network address in order to function on the network.

NUT (Network Update Time)

The rate at which access to the network is granted.

PCCC (Programmable Controller Communications Commands)

An application-level command set that Allen-Bradley programmable controllers use to communicate across networks.

Repeater

A two-port active physical layer component that reconstructs all traffic it hears on one network segment side and retransmits it to another network segment side. Repeaters allow for extensions in network distance, conversion to alternate media (coaxial cable, fiber, etc.) and altering the topology of the network.

RS-232C Port

A serial port that complies with accepted industry standards for serial communications connections.

Segment

Trunkline sections connected via taps with terminators at each end, and with no repeaters.

Serial Port

Input/output connector for a device that transmits data and controls bits sequentially over a single transmission line. (See RS-232C port.)

Subnet

Network segments connected by repeats to make up on ControlNet network.

Tap

The connection device between any device and the trunkline. A tap is required for each node and for both sides of each repeater.

Terminator

A special circuit that prevents signal reflections form occurring at the end of the cable.

Trunkline

The bus or central part of a cable system

Trunkline Section

A length of trunkline cable between any two taps.

Table of Contents

Introducing the 1747-KFC15 Module

Overview of the 1747-KFC15 Module

The KFC15 module enables you to communicate with your SLC500 processor using a ControlNet network. You can examine the processor's ladder program, monitor program operation, and make program changes. The KFC15 module acts as a bridge between a ControlNet network and your SLC500 processor's RS-232C serial port.

SLC500 Processor

30667-M

RS-232C

Laptop PC

ControlNet
Network B

ControlNet
Network A

Desktop PC

30668-M
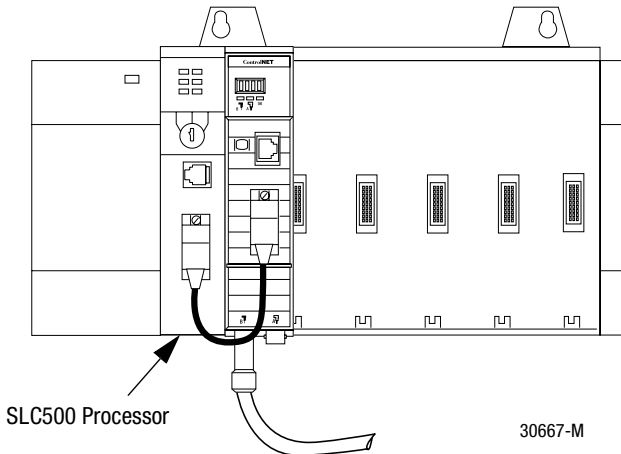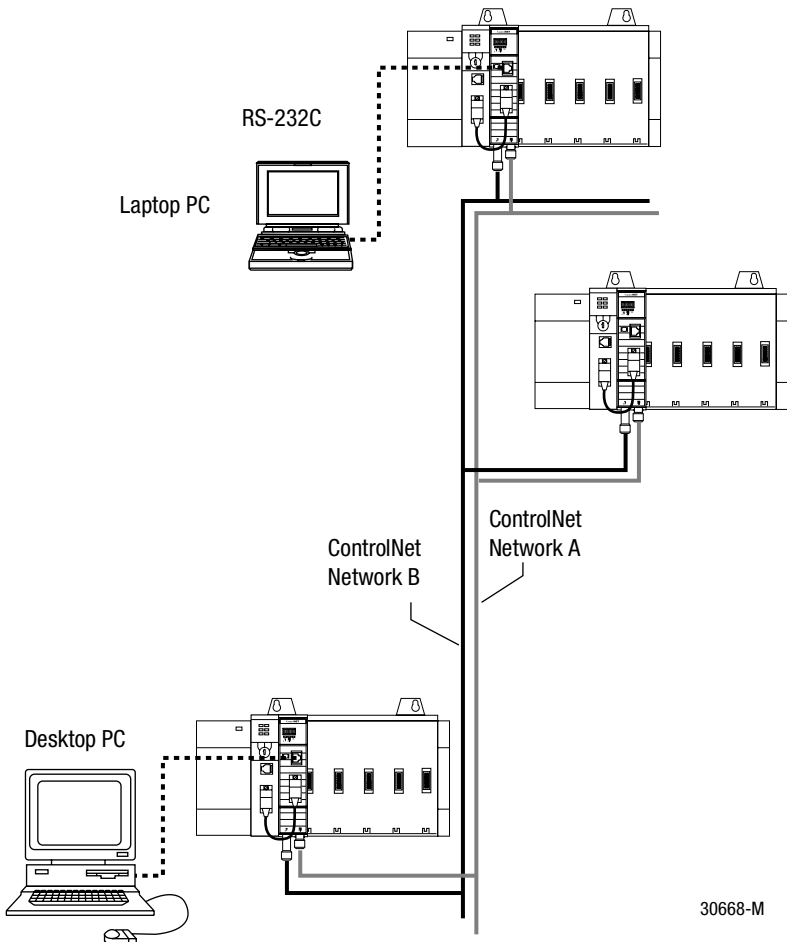
The KFC15 module connects to the ControlNet network from one
(channel A) or both of its two BNC connectors via a standard, one-meter,
ControlNet coaxial tap. For redundant media, both connectors are used.

The KFC15 module has two ports for device connections:

RS-232C serial port—provides half- or full-duplex communication with a serial port on your SLC500 processor.

network access port—lets you connect a ControlNet programming terminal or other device to the KFC15 module for full network access without disrupting the cable wiring

The serial port uses DF1 protocol while the network access port handles ControlNet packets directly.

Status LEDs and the dot matrix display on the front of the KFC15 indicate current operating conditions of the unit and communication activities taking place through the ports.

Display on the
1747-KFC15
module

30662-M
30665-M

Top View of Module

Rotary Switches

30666-M
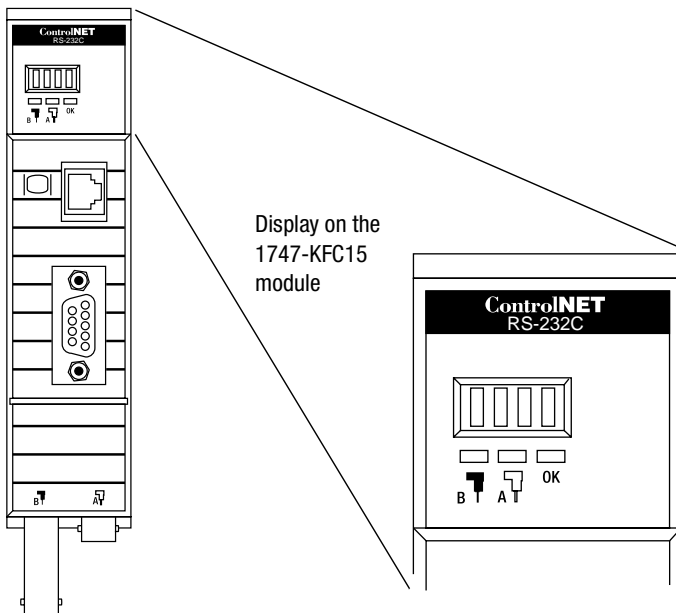
3 Banks of
DIP Switches

30663-M
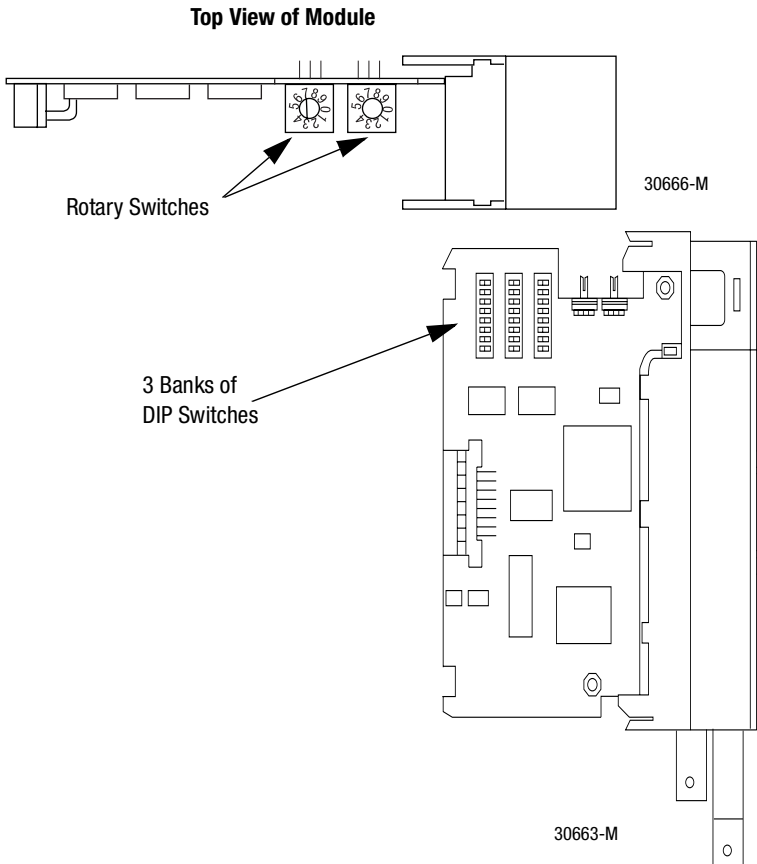
You use the three banks of DIP switches to configure the RS-232C serial
communication parameters. Two rotary switches are available to set the
ControlNet network address. To verify your settings, you can use the dot
matrix display located on the front of the module. Refer to Chapter 2 and
Chapter 4 for more information.

Compatibility

The KFC15 is compatible with the following interfaces:

• RS-232C serial ports that comply with DF1 protocol

• ControlNet devices that comply with the ControlNet specification

• Programming terminal products that comply with ControlNet
   specifications for the Network Access Port

Contents of Your Order

Make sure that you have these items before you discard any packing
material. If an item is missing or incorrect, contact your local
Allen-Bradley office.

• 1747-KFC15 module

• RS-232 cable

• *SLC500 ControlNet RS-232 Interface User Manual*
   (pub. no. 1747-5.34)

European Union Directive 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.

Low Voltage Directive

This product is tested to meet Council Directive 73/23/EEC Low Voltage, by applying the safety requirements of EN 61131-2 Programmable Controllers, Part 2 - Equipment Requirements and Tests.

For specific information required by EN 61131-2, see the appropriate sections in this publication, as well as the Allen-Bradley Industrial Automation Wiring and Grounding Guidelines For Noise Immunity, publication 1770-4.1.

This equipment is classified as open equipment and must be mounted in an enclosure during operation to provide safety protection.

CSA Hazardous Location Approval

CSA certifies products for general use as well as for use in hazardous locations. **Actual CSA certification is indicated by the product label** as shown below, and not by statements in any user documentation.

Example of the CSA certification product label:

To comply with CSA certification for use in hazardous locations, the following information becomes a part of the product literature for this CSA-certified industrial control product.

**CL I, DIV 2
GP A,B,C,D
TEMP**

- This equipment is suitable for use in Class I, Division 2, Groups A, B, C, D, or non-hazardous locations only.
- The products having the appropriate CSA markings (that is, Class I, Division 2, Groups A, B, C, D) are certified for use in other equipment where the suitability of combination (that is, application or use) is determined by the CSA or the local inspection office having jurisdiction.

Important: Due to the modular nature of a programmable control system, the product with the highest temperature rating determines the overall temperature code rating of a programmable control system in a Class I, Division 2, location. The temperature code rating is marked on the product label as shown.

Temperature code rating:

**CL I, DIV 2
GP A,B,C,D
TEMP**

Look for temperature code rating here.
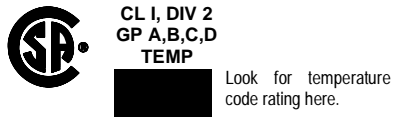
The following warnings apply to products having CSA certification for use in hazardous locations.

WARNING: Explosion hazard--

- Substitution of components may impair suitability for Class I, Division 2.
- Do not replace components unless power has been switched off or the area is known to be non-hazardous.
- Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.
- Do not disconnect connectors unless power has been switched off or the area is known to be non-hazardous. Secure any user-supplied connectors that mate to external circuits on this equipment by using screws, sliding latches, threaded connectors, or other means such that any connection can withstand a 15 Newton (3.4 lb.) separating force applied for a minimum of one minute.
- Batteries must only be changed in an area known to be non-hazardous.

CSA logo is a registered trademark of the Canadian Standards Association.

Approbation d'utilisation dans des emplacements dangereux par la CSA

La CSA certifie les produits d'utilisation générale aussi bien que ceux qui s'utilisent dans des emplacements dangereux. La certification CSA en vigueur est indiquée par l'étiquette du produit et non par des affirmations dans la documentation à l'usage des utilisateurs.

Exemple d'étiquette de certification d'un produit par la CSA:

Pour satisfaire à la certification de la CSA dans des endroits dangereux, les informations suivantes font partie intégrante de la documentation ce produit industriel de contrôle certifié par la CSA.

**CL I, DIV 2
GP A,B,C,D
TEMP**

- Cet équipement convient à l'utilisation dans des emplacements de Classe 1, Division 2, Groupes A, B, C, D, ou ne convient qu'à l'utilisation dans des endroits non dangereux.
- Les produits portant le marquage approprié de la CSA (c'est à dire, Classe 1, Division 2, Groupes A, B, C, D) sont certifies a l'utilisation pour d'autres équipements où la convenance de combinaison (application ou utilisation) est déterminée par la CSA ou le bureau local d'inspection qualifié.

Important: Par suite de la nature modulaire du système de contrôle programmable, le produit ayant le taux le plus élevé de temperature détermine le taux d'ensemble du code de température du système de contrôle d'un programmable dans un emplacement de Classe 1, Division 2. Le taux du code de température est indiqué sur l'étiquette du produit.

Taux du code de température:

**CL I, DIV 2
GP A,B,C,D
TEMP**

Le taux du code de température est indiqué ici.
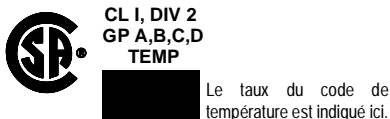
Les avertissements suivants s'appliquent aux produits ayant la certification CSA pour leur utilisation dans des emplacements dangereux.

AVERTISSEMENT: Risque d'explosion --

- La substitution de composants peut rendre ce matériel inacceptable pour lesemplacements de Classe I,
Division 2.
- Couper le courant ou s'assurer quel'emplacement est désigné non dangereux avant de remplacer lescomposants.
- Avant de débrancher l'équipement, couper le courant ou s'assurer que l'emplacement est désigné non dangereux.
- Avant de débrancher les connecteurs, couper le courant ou s'assurer que l'emplacement est reconnu non dangereux. Attacher tous connecteurs fournis par l'utilisateur et reliés aux circuits externes de cet appareil à l'aide de vis, loquets coulissants, connecteurs filetés ou autres moyens permettant aux connexions de résister à une force de séparation de 15 Newtons (3,4 lb. - 1,5 kg) appliquée pendant au moins une minute.
- Afin d'éviter tout risque d'explosion, s'assurer que l'emplacement est désigné non dangereux avant de changer la batterie.

Le sigle CSA est la marque déposée de l'Association des Standards pour le Canada.

Configuring the KFC15 Module

Use this chapter to configure the KFC15 communication parameters via the DIP switches and rotary switches on the module.

Overview of Configuration Procedures

The KFC15 module is configured by using the DIP and rotary switches located on the module. These two types of switches configure the RS-232 serial communication parameters, and the network address. During configuration, the module must not be powered. Once the switches are set, the module can then be installed in the SLC chassis. Located on the front of the KFC module is a dot matrix display, which you can use to verify your settings. Refer to Chapter 5 for more information on the dot matrix display.

Refer to Chapter 4 for information on configuring the communication between the SLC500 and the KFC15 modules.

DIP Switches

30663-M
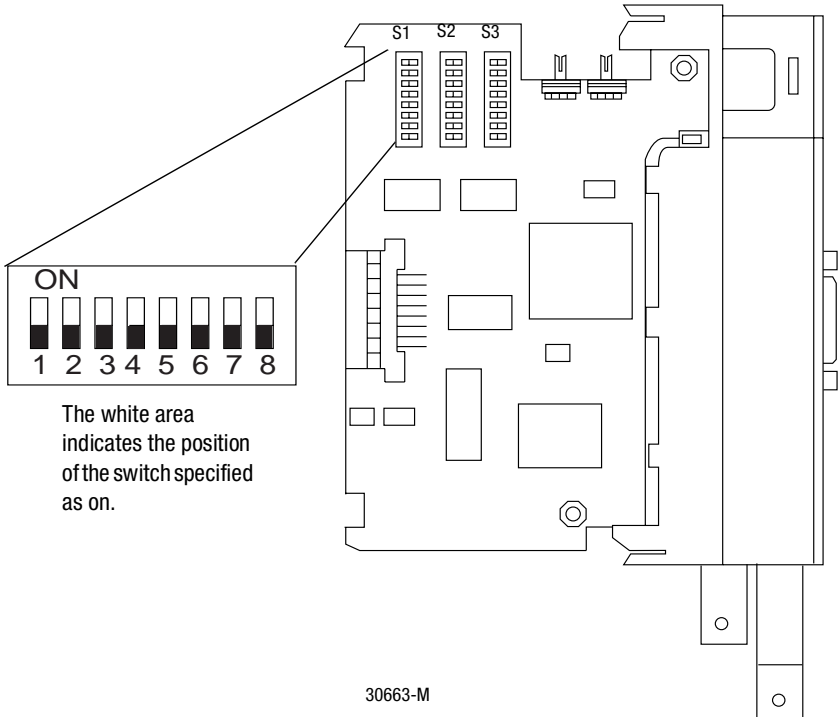
Located within the body of the 1747-KFC15 module are three banks (S1, S2, and S3) of eight DIP switches. These switches are used to configure the RS-232 serial communication port.

Important: The communication parameters between the SLC500 and the KFC15 must be identical. Refer to Chapter 4 for more information.

Use a ball-point pen to set any of the switches within the three banks to on or off.

Important: Do not use a pencil because the tip can break off and short the switch.

Documented in the tables below are the DIP switches, the bank in which they are located, and the parameters controlled by each switch.

Table 2-1: Bank S1 DIP Switches

DIP Switch	Parameter	Description			
Switches 1-3	Upper digit of the DF1 station address	**SW 1/4**	**SW 2/5**	**SW 3/6**	**Digit**
		on	on	on	0
		off	on	on	1
Switches 4-6	Lower digit of DF1 station address	on	off	on	2
		off	off	on	3
		on	on	off	4
		off	on	off	5
		on	off	off	6
		off	off	off	7 (default)
Switches 7-8		Leave off			

Table 2-2: Bank S2 DIP Switches

DIP Switch	Parameters	Description			
Switches 1-3	Serial Port Baud Rate	**Switch 1**	**Switch 2**	**Switch 3**	**Baud Rate**
		off	off	off	1200 (default)
		off	off	on	2400
		off	on	off	4800
		off	on	on	9600
		on	off	off	19200
		on	off	on	38400
		on	on	off	57600
		on	on	on	Reserved
Switch 4	Full/Half duplex	off = Full duplex (default) on = Half duplex			
Switch 5	Parity	off = No parity (default) on = See switch 6			
Switch 6	Odd/Even parity (when used with Switch 5)	off = Odd parity on = Even parity			
Switch 7	Handshake	off = No handshake (default) on = Hardware handshake enable			
Switch 8	Diagnostic Command Execution	off = Disabled (default) on = Enabled			

Table 2-3: Bank S3 DIP Switches

DIP Switch	Parameter	Description					
Switch 1	Duplicate detect	off = Duplicate detect off (default) on = Duplicate detect on					
Switch 2	Error detect	off = CRC error check (default) on = BCC error check					
Switch 3-4	Number of retries	Number of allowable retries per attempt on the RS-232C link: 00 - 07	**SW3**	**SW4**	**Number of retries**		
			on	on	0		
			off	on	1		
			on	off	2		
			off	off	3 (default)		
Switch 5-8	DF1 ACK time-out	The time to wait for an ACK from the host computer.	**SW5**	**SW6**	**SW7**	**SW8**	**Time Out**
			on	on	on	on	.2
			off	on	on	on	.4
			on	off	on	on	.6
			off	off	on	on	.8
			on	on	off	on	1.0
			off	on	off	on	1.2
			on	off	off	on	1.4
			off	off	off	on	1.6
			on	on	on	off	1.8
			off	on	on	off	2.0
			on	off	on	off	2.2
			off	off	on	off	2.4
			on	on	off	off	2.6
			off	on	off	off	2.8
			on	off	off	off	3.0
			off	off	off	off	3.2 (default)

Configuring the KFC15 Module Using Rotary Switches

The KFC15's ControlNet network address is set by the rotary switches S4 and S5. Switch S5 sets the upper digit of the address and S4 the lower. These switches can be turned manually by hand while holding the module in the orientation illustrated below.

Rotary Switches S5 and S4 respectively
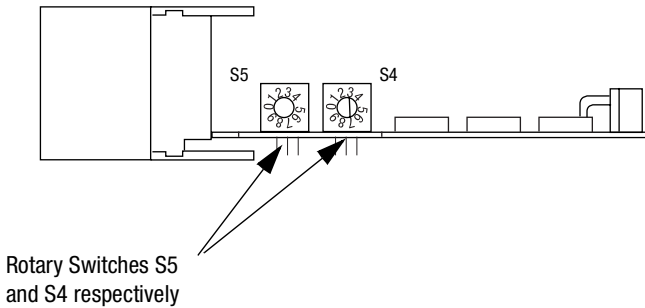
Installing the KFC15 Module

Use this chapter to install the KFC15 module. This chapter describes:

* an overview of the general installation procedure

* how to connect the KFC15 module to your SLC500 processor through the RS-232C serial port

* how to connect the KFC15 module to a host through the isolated network access port (NAP)

* how to connect the KFC15 module to the ControlNet network

Pinout and wiring details are provided in Appendix B, *Cabling and Pinouts*. Read this if you need to construct cables. If a tap is not available on the ControlNet network for the KFC15 module, refer to the *ControlNet Cable System Planning and Installation Manual* (pub. no. 1786-6.2.1) to determine if your cable system can accommodate another node and to plan where to mount the tap, then follow the mounting instructions at the end of this chapter.

If you have attempted to install the KFC15 module and still have questions, please call Rockwell Automation Technical Support at (440) 646-6800.

Electrostatic Damage

⚠	**ATTENTION:** Electrostatic discharge can damage semiconductor devices inside the KFC15 module. To guard against electrostatic damage wear an approved wrist strap grounding device, or touch a grounded object to rid yourself of electrostatic charge before handling the products.

Overview of the Installation Procedure

1. Configure the communications parameters by setting the rotary and DIP switches on the KFC15 as detailed in Chapter 2, *Configuring the KFC15 Module*. Remember that the RS-232 serial communication parameters must be the same between the KFC15 and the SLC500. Refer to Chapter 4 for more information.

2. Make sure that the ControlNet cable system can accommodate additional nodes (one per KFC15 module being installed).

3. Remove power from your SLC500 chassis.

4. Install the KFC15 module into an empty I/O slot. The 1747-KFC15 module must be placed near the SLC processor. In a large chassis, any empty slot will not work.

5. Connect the KFC15 to the ControlNet network using taps.

6. Connect the KFC15 module to your SLC500 processor with the supplied RS-232 cable.

RS-232 cable

30664-M
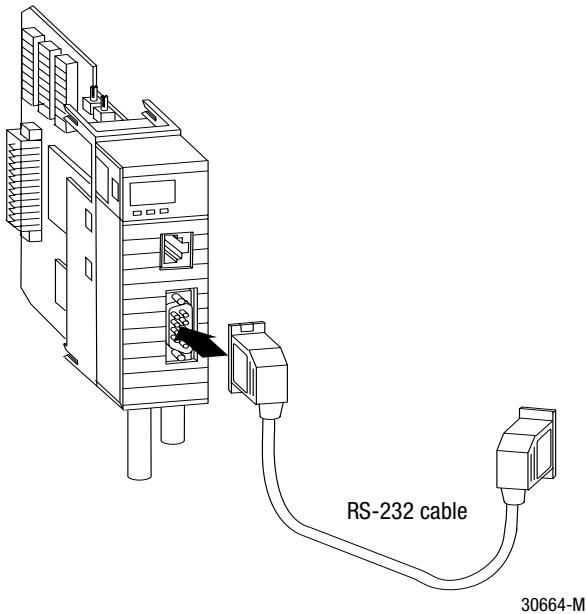
7. Apply power to your SLC500 chassis.

Connecting a Device to the Network Access Port

Use the isolated network access port to connect a transitory device, such as a programming device, to the KFC15 module.

Cables

You must use the Allen-Bradley Network Access cable (cat. no. 1786-CP).

Connecting to the ControlNet Cable System

To connect the KFC15 to the ControlNet cable system use an approved ControlNet tap. Refer to the *ControlNet Cable System Planning and Installation Manual* (pub. no. 1786-6.2.1) for complete instructions on connecting the tap to the cable system.

> ⚠️ **ATTENTION:** If the KFC15 module is connected to a cable system that does not support redundant media, the tap dropline should be connected to the BNC connector labeled channel A. The channel B connector should be unused. If the cable system is redundant, the KFC15 module should be connected such that all devices on the network use the same cable for the same channel. The channel A connector on all products should be connected to the same cable. The same applies for the channel B connectors.

To connect the KFC15 module to the tap do the following:

1. If the KFC15 module is not the last device in the segment:

   • Connect the tap to the coaxial trunkline.

   • Connect the dropline BNC to the channel A BNC of the KFC15 module.

2. If the KFC15 module is the last device in the segment, install a terminator at the end of the cable segment, then follow the instructions in step 1.

3. If using redundant media, repeat either step 1 or step 2 for channel B of the KFC15 module.

Communicating with the KFC15 Module

This chapter explains how to use your 1747-KFC15 module to communicate with your SLC500 processor.

RSLinx and RSLogix500

To use your KFC15 module to communicate with your SLC500 processor, you must have RSLinx and RSLogix500 installed on your personal computer, along with an add-on module or communication card to communication between your PC and the ControlNet network. Examples of add-on modules for this type of configuration are the 1784-KTCX15, 1770-KFC15, and the 1784-PCC.

Setting the Correct Options

To communicate with your SLC500 processor, using RSLogix500, perform the following:

1. Start RSLogix500 and choose **Comms** from the menu.
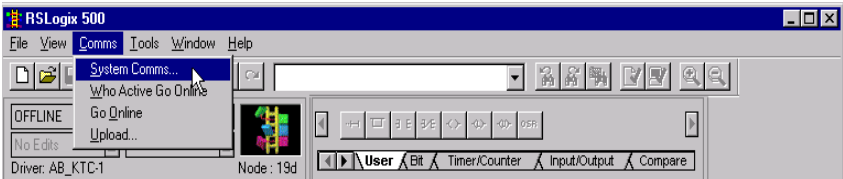
2. Select **System Comms** from the pop-up menu. A dialog box is displayed.

3. Select the **System Communications** tab.

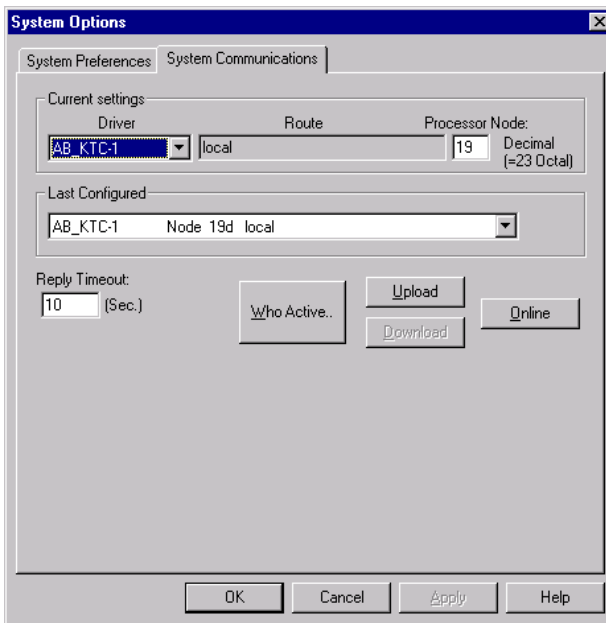**4.** From the **Driver** field, choose the appropriate driver for the add-on module you are using from the drop-down list that was used to configure RSLinx for communications on the ControlNet network.

5. Within the **Processor Node** field, enter the 1747-KFC15 ControlNet network address displaying on the KFC15 module. If you are unsure, remember the network address is set by the rotary switches on the KFC15 module. Refer to Chapter 2 for more information.

At this point you should be able to go on-line with your SLC500 processor.

Verifying the KFC and SLC Processor Communication Parameters

Both the SLC500 and the 1747-KFC15 RS-232 serial communication parameters need to be identical for proper communication. The default DIP switch settings for the KFC15 are the same default settings used for the SLC500. Only if you have changed the SLC500 settings do you need to modify the settings for the KFC15. Below are the steps, performed in RSLinx, to verify the parameters between the two modules.

Determine the Serial Parameters for the SLC Processor

1. Connect a serial cable from one of the communication ports on your computer to the SLC500 processor's serial port.

2. Start RSLinx.

3. From the menu bar choose **Communications**, then **Configure Drivers**.

4. When the dialog box appears, choose **RS232 DF1 Devices** from the **Available Drivers** list. Click on the **Add New** pushbutton.

5. When the dialog box appears, select **SLC-CH0/Micro/Panelview** from the **Device Type** list.

6. Select the **Auto-Configure** pushbutton to obtain the serial parameters.

Once you have confirmed the communication settings for the SLC500, you can use the dot matrix display on the KFC15 to verify the settings are the same. Refer to Chapter 5 for information on interpreting the display. If you are unsure, you can check the three DIP switch banks on the KFC15 module for the particular settings.

Related Publications

Listed below are publications you can reference for information about RSLogix500 and RSLinx.

- *Getting Results with RSNetworks for ControlNet -* pub. no. 9399-CNETGR

- *Getting Results with RSLogix500 with RSNetworks for ControlNet -* pub. no. 9399-RWCNPGR

- *Getting Results with RSLogix500 -* pub. no. 9399-RL50GR

- *Getting Results with RSLinx -* pub. no. 9399-WAB32GR

Chapter **5**

Troubleshooting the KFC15 Module

Use this chapter to interpret the indicators (status LEDs and dot matrix display) on the KFC15 module to help you troubleshoot problems.

Interpreting the Status LEDs

There are three, bi-color (red/green) status LEDs on the top of the KFC15 module. Two are for ControlNet, showing the physical layer status of channels A (primary connection) and B (redundant media connection), and one is for the KFC15 (STATUS). These indicators can help you diagnose problems with the module's installation and operation.

Display on the 1747-KFC15 module

30662-M
30665-M
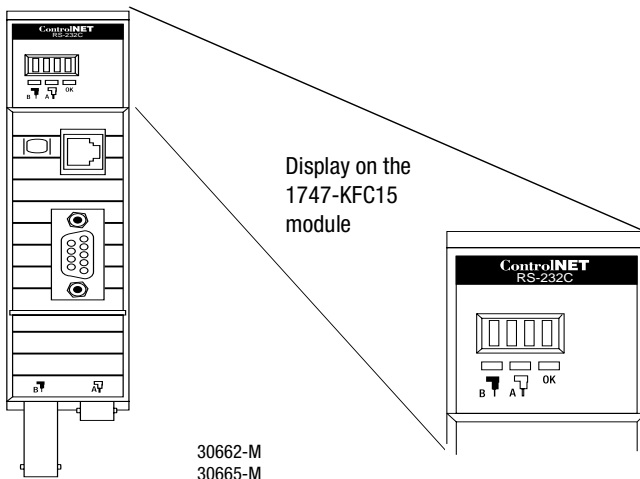
The following terms are used to describe the state of the LEDs:

solid - on continuously in the defined state

flashing - each LED alternates between the two defined states (or with OFF if only one state is defined). This only applies to a single LED viewed independently of the other. If both ControlNet LEDs are flashing, they flash together (in phase).

railroad - both LEDs alternate between the two defined states at the same time. This only applies to both ControlNet LEDs when viewed together. The two LEDs are always in opposite states (out-of-phase).

flickering - intermittent on/off between the two states, often in an erratic pattern

LED	State	Probable Cause	Recommended Action
Channels A and B (viewed together)	OFF	No power or reset	
	SOLID RED	Failed unit	Check network setup then cycle power to the KFC15 module. If the fault persists, contact your authorized Allen-Bradley representative or distributor.
	RAILROAD RED - GREEN	Self test	None
	RAILROAD RED - OFF	Incorrect node configuration (duplicate node, ID, etc.)	Check network address and other ControlNet configuration parameters.

LED	State	Probable Cause	Recommended Action
Channel A or B (viewed separately)	OFF	Channel disabled or unused	Program network for redundant media if required.
	SOLID GREEN	Channel good—data is being received and transmitted on this channel	None
	FLASHING GREEN - OFF	Temporary errors or device is not on-line	None. Unit will correct itself.
	FLASHING RED - GREEN	Bad network configuration	Check network setup then cycle power to the KFC15 module.
	FLASHING RED - OFF	Media fault or no other nodes present on the network	Check media for broken cables, loose connector, missing terminators, etc.
STATUS	OFF	No power is applied to the KFC15 module	None
	SOLID GREEN	Normal operation—the module is OK	None
	FLASHING GREEN	The KFC15 is not properly configured	Check and change parameter settings.
	SOLID RED	Critical fault—the KFC15 has detected an unrecoverable fault and must be replaced	Contact your authorized Allen-Bradley representative or distributor.
	FLASHING RED	Non-critical fault—the KFC15 has detected a recoverable fault	Reconfigure or reset the KFC15.

Interpreting the Dot Matrix Displays

Under normal conditions, the dot matrix display should be displaying the ControlNet network address as well as the ControlNet network status. During operation, the dot matrix display is used to indicate hardware fault conditions. When the STATUS LED is solid or flashing red, the display shows a number indicating the type of hardware fault. The following table gives a description of the faults.

This number	Indicates this fault	Meaning
1	Processor Fault	A hardware fault was detected in the processor. This is a major fault. Return the KFC15 for servicing.
2	Invalid Firmware	The Flash EPROM does not contain valid firmware. New firmware must be downloaded to the unit.
3	Firmware Checksum Fault	A checksum error was detected in the main application code of the Flash EPROM.
4	RAM Fault	The static RAM cannot be written to reliably or a parity error has occurred. Cycle power to the KFC15. If the problem persists, return the KFC15 for servicing.
5	Flash EPROM Write Fault	The Flash EPROM could not be programmed correctly during download of new firmware. This is a major fault. Return the KFC15 for servicing.
9	Invalid Network Address	The chosen network address is greater than the highest network address ControlNet is configured for.
10	Duplicate Network Address	There is a device on the ControlNet network with the same address.
11	Unrecoverable Firmware Error	Failed to re-program the boot block of the Flash EPROM. Return the KFC15 module for servicing.

If the displays show symbols other than those shown in this chapter, this also indicates that the module is malfunctioning. In this case, contact your Allen-Bradley representative.

During the power-up of the KFC15, the display shows the serial port parameters based on the DIP switch settings. Refer to Chapter 2 for details on these parameters.

Product Specifications

RS-232C Interface

- Start Bits   1

- Data Bits   8

- Parity   None, Even, Odd

- Stop Bits   1

- Baud Rates   1200, 2400, 4800,
                              9600,19200, 38400, 57600

- Connector   DB-9P (male)

- Output   RS-232C

- Protocol   Allen-Bradley DF1

- Cable Length   Recommended maximum of
                              7.5 m (25 ft) at 57600
                              baud, or 15 m (50 ft) at
                              lower baud rates

- Cable Type   Shielded

- Ground Isolation   Opto-coupled

ControlNet Interface

- Connectors   Standard BNC Connectors

- Cable   RG-6 75-ohm coaxial cable

- Media Redundancy   Connection for 2 independent
                                coaxial cables

- Ground Isolation   Dual transformers

Network Access Port (NAP) Interface

- Connector   RJ-45 8-pin, phone jack
                                with shield

- Ground Isolation   Opto-coupled

Physical

- Dimensions   140 cm wide x 145 cm long x
                                35 cm high

- Weight   217.6 g

- Mounting   SLC500 chassis

Environmental

- Operating Temperature   0°C to 60°C (32°F to 140°F)

- Storage Temperature   –40°C to 85°C (–40° to 185°F)

- Operating Humidity   5% to 95% (non-condensing)

Agency Safety Certification

- CSA   Approved. Class 1, Group A, B, C or D
                         Division 2

- UL   Listed

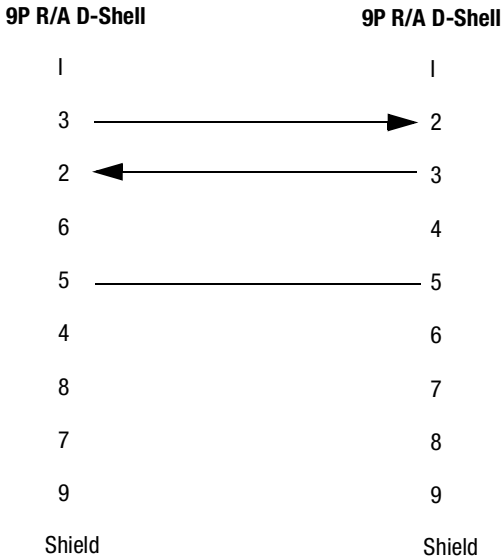- CE   Compliant for all application directives

Appendix **B**

Cabling and Pinouts

This appendix contains the pinout and wiring information required if you need to construct cables before installing the KFC15 to a host device.
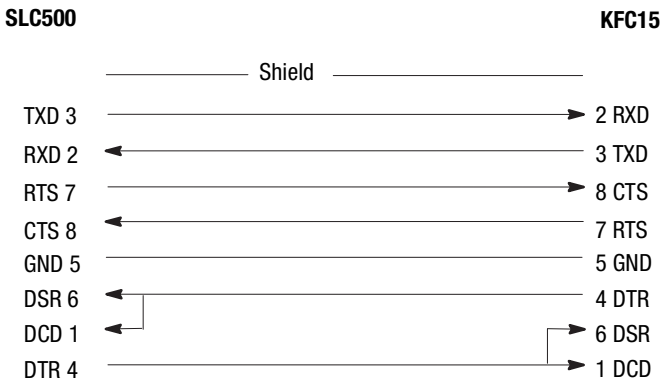
Cabling and Pinouts for RS-232C Connection

The KFC15 RS-232C connector is a DB-9 male with the following EIA standard pinout:

	Signal	I/0	Pin
GND	Chassis ground	.	Housing
TXD	Transmitted data	0	3
RXD	Received data	I	2
RTS	Request to send	0	7
CTS	Clear to send	I	8
DSR	Data set ready	I	6
COM	Signal common	.	5
DCD	Data carrier detect	I	1
DTR	Data terminal ready	0	4

The following diagram illustrates wiring for a DB-9 cable.

9P R/A D-Shell   **9P R/A D-Shell**

I		I	
3	──────────►	2	
2	◄──────────	3	
6		4	
5	──────────	5	
4		6	
8		7	
7		8	
9		9	
Shield		Shield	

The following diagram illustrates the handshake wiring between the
SLC500 and the KFC15.

SLC500   **KFC15**

──────── Shield ────────

SLC500		KFC15
TXD 3	───────────────►	2 RXD
RXD 2	◄───────────────	3 TXD
RTS 7	───────────────►	8 CTS
CTS 8	◄───────────────	7 RTS
GND 5	───────────────	5 GND
DSR 6	◄───	4 DTR
DCD 1	◄───	6 DSR
DTR 4	───────────────►	1 DCD

DF1 Diagnostic Command Support

The information in this appendix deals with DF1 communications between the host processor and KFC15 module. The KFC15 module interprets and responds to the following diagnostic commands from its DF1 RS-232 serial port:

Description	Command Byte	Function Code (hex)
Diagnostic Loop	06	00
Diagnostic Read Counters	06	01
Diagnostic Status	06	03
Reset Diagnostic Counters	06	07

In the Command and Reply Format tables below, all values are in hex and the following abbreviations are used:

ADDR - address of data to be read

CMD - command code

FNC - function code

STS - status code

TNS - transaction number

Diagnostic Loop

You can use this command to check the integrity of the transmissions over the communication link. The command message transmits up to 243 bytes of data to a node interface module. The receiving module should reply to this command by transmitting the same data back to the originating node.

Table C.1: Command Format

1 byte	1 byte	2 bytes	1 byte	243 bytes max
CMD 06	STS	TNS	FNC 00	DATA

Table C.2: Reply Format

1 byte	1 byte	2 bytes	243 bytes max
CMD 46	STS	TNS	DATA

Diagnostic Read Counters

This command reads the diagnostic counters from the KFC15 module. The format of these counters is given below. The address and size fields can have any value (but they must be included).

Table C.3: Command Format

1 byte	1 byte	2 bytes	1 byte	2 bytes	1 byte
CMD 06	STS	TNS	FNC 01	ADDR 0000	SIZE 00

Table C.4: Reply Format

1 byte	1 byte	2 bytes	16 bytes
CMD 46	STS	TNS	DATA

Table C.5: Reply Values

1	Total DF1 packets received, low byte
2	Total DF1 packets received, high byte
3	Total DF1 packets transmitted, low byte
4	Total DF1 packets transmitted, high byte
5	Number of DF1 retries
6	Number of DF1 packets where the retry limit was exceeded
7	Number of DF1 NAKs sent
8	Number of DF1 NAKs received
9	Number of DF1 bad messages received
10	Number of RS–232C line errors
11	Total good ControlNet packets received, low byte
12	Total good ControlNet packets received, high byte
13	Total bad ControlNet packets received, low byte
14	Total bad ControlNet packets received, high byte
15	Total ControlNet packets transmitted, low byte
16	Total ControlNet packets transmitted, high byte

Diagnostic Status

This command requests a block of status information from an RS-232C device. The reply contains the information in its DATA field. The status information varies from device to device. The status block is shown below.

Table C.6: Command Format

1 byte	1 byte	2 bytes	1 byte
CMD 06	STS	TNS	FNC 03

Table C.7: Reply Format

1 byte	1 byte	2 bytes	24 bytes
CMD 46	STS	TNS	DATA

Table C.8: Reply Values

Data Byte	Description	Status Reply
1	Mode/Status Byte	00 (No Modes)
2	Interface/Processor Type Bits 0 – 3: Interface type (E = Extended) Bits 4 – 7: Processor type (F = Computer)	FE (Extended)
3	Extended Interface Type	5F (KFC15) 60 (KFCD15)
4	On-line/Off-line Mode	0 = on-line; 1 = off-line
5	Series/Revision Bits 0–4: Bits 5–7:	0 = Revision A 1 = Revision B, etc. 0 = Series A 1 = Series B, etc.
6 – 16	Bulletin Name = ASCII	"1770-KFC15 " "1770-KFCD15 "
17 – 24	Reserved for factory use only	Values may vary

Diagnostic Counter Reset

This command resets the diagnostic counters listed above.

Table C.9: Command Format

1 byte	1 byte	2 bytes	1 byte
CMD 06	STS	TNS	FNC 07

Table C.10: Reply Format

1 byte	1 byte	2 bytes
CMD 46	STS	TNS

Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products. At http://support.rockwellautomation.com, you can find technical manuals, a knowledge base of FAQs, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools.

For an additional level of technical phone support for installation, configuration, and troubleshooting, we offer TechConnect Support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit http://support.rockwellautomation.com.

Installation Assistance

If you experience a problem with a hardware module within the first 24 hours of installation, please review the information that's contained in this manual. You can also contact a special Customer Support number for initial help in getting your module up and running.

United States	1.440.646.3223 Monday – Friday, 8am – 5pm EST
Outside United States	Please contact your local Rockwell Automation representative for any technical support issues.

New Product Satisfaction Return

Rockwell tests all of its products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning, it may need to be returned.

United States	Contact your distributor. You must provide a Customer Support case number (see phone number above to obtain one) to your distributor in order to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for return procedure.

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