Terms and Abbreviations

This term:	Means:
1747-KFC15	SLC-based module
1756-CNB	a 1756-CNB or 1756-CNBR module; a ControlLogix backplane to ControlNet bridge
1770-KFC15	referred to herein as the module
a.k.a.	also known as
ACK	a DF1 or ControlNet acknowledgement
ControlNet	the communication architecture that allows the exchange of messages between devices that follow the ControlNet specifications It is a real-time, control-layer network that provides high-speed transport for both time-critical I/O and messaging data. A ControlNet cable system can be either single or redundant media.
DF1	DF1 protocol is an Allen-Bradley RS-232 proprietary data-link layer protocol that combines features of subcategories D1 (data transparency) and F1 (two-way simultaneous transmission with embedded responses) of ANSI x3.28 specification. The KFC uses DF1 protocol to communicate on the serial port.
DH+	Data Highway Plus network; existing Allen-Bradley peer-to-peer network for messaging and program upload/download
DH+ PCCC message	a PCCC message that originated from a device on a DH+ network
DHRIO	Data Highway and Remote I/O
DST	the destination address on a DF1 link
full duplex	simultaneous send/receive between devices, point-to-point
half duplex	data transmission in one direction at a time, usually point-to-multipoint
NAK	a DF1 negative acknowledgement
NAP	**n**etwork **a**ccess **p**ort; 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 cable system. 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.
new KFC	Version 4.2 or later of the KFC firmware
node	any physical device connecting to the ControlNet cable system that requires a network address in order to function on the network.
NUT	**n**etwork **u**pdate **t**ime; the rate at which access to the ControlNet network is granted

This term:	Means:
old KFC	Any 1747-KFC15 or 1770-KFC15 firmware released before v4.2, including version 2.2 (a.k.a. version B/B) and older firmware
parallel port	input/output port for a device that transmits multiple data and control bits over wires connected in parallel
PCCC	Programmable Controller Communication Commands; an Allen-Bradley communication protocol used on the Data Highway Plus network
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.
RIO	Remote Input/Output; an Allen-Bradley remote input/output link that supports remote, time-critical, I/O and control communication between a master PLC controller and its remote I/O and adapter mode slave processors
RS-232C port	a serial port that complies with accepted industry standards for serial communications connections
SRC	The source address on a DF1 link
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 control bits sequentially over a single transmission line. (See RS-232C port.)
standard PCCC message	A PCCC message that originated from a device that is not on a DH+ network
subnet	network segments connected by repeaters to make up one ControlNet network
tap	the connection device between any ControlNet 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 from occurring at the end of a cable
trunkline	the bus or central part of a cable system
trunkline section	a length of trunkline cable between any two taps

Method 2: Configure a Path Using the Pushbuttons and 7-segment Display

TIP This method works only for the 1770-KFC15 module. For the 1747-KFC15 module, use method 1.

You can use this method to access Logix controllers that are in slots greater than 2. As many as 99 paths can be defined, with as many as 3 hops each. The ControlNet node address parameter is used to select which of the 99 paths is being defined or viewed. Therefore, you can define only one path for each ControlNet node address on the local ControlNet network.

A path consists of a path length followed by a sequence of port numbers and network addresses or slot numbers.

Path Length

The path length can be set to 0, 2, 4, or 6.

0 – Indicates that no path is configured.

2 – The path contains 1 hop (1 Port and 1 Address/Slot Number).

4 – The path contains 2 hops.

6 – The path contains 3 hops.

Embedded Responses

An embedded response occurs when a DF1 ACK or NAK is embedded within another DF1 message. Embedded responses can improve the throughput of a full-duplex DF1 link since a transmitter will not need to wait any longer than necessary to receive a response (ACK or NAK) to the last message it has sent. The old KFC would always send an embedded response whenever there was an opportunity to do so. However, some DF1 drivers can not tolerate them. Therefore, the new KFC (V4.2 and newer) can be configured to send or not send embedded responses.

By default, the 1770-KFC15 will wait until it hears an embedded response before sending one. This is referred to as embedded-response "auto-detect" mode.

NOTE: This is the only embedded-response mode available on the 1747-KFC15.

The 1770-KFC15 defaults to embedded response "auto-detect" mode but can also be configured to always send or never send embedded responses. Parameter 6 in the 'A' sub-menu is used to configure the embedded response mode. The parameter can have one of the following values:

- 0 – Auto Detect – Default
- 1 – Always send embedded responses
- 2 – Never send embedded responses

To configure this parameter, do the following:

1. Press the [View] key several times until the 'A' sub-menu appears. You see {A - -}
2. Press the [Data] key to enter the sub-menu.
3. You see {0. 0 2} assuming the number of DF1 retries is set to 2.
4. Press the [View] key several times until parameter 6 appears. You see {6 0 0}, indicating that Auto-Detect mode is active.
5. Press the [Data] key to change the value.
6. Press the [View] and [Exit] keys together to save the new value.

For more information on configuring 1770-KFC15 parameters, refer to chapter 4.

Message Reply Time-out

To aid in memory buffer management, a message reply time-out parameter has been added to the V4.2 and later 1770-KFC15 firmware. This is the length of time the KFC will wait for a reply to a request message. Note that this is different than an ACK time-out, which occurs if the network node to which the message was sent cannot respond. The message reply time-out becomes active only after an ACK is received.

If the request message was sent on ControlNet and no reply message is received before the timer expires, an error reply with the status byte set to 2 (2 means undeliverable) is sent on DF1 and the memory buffers are freed up to handle new messages.

If the request message was sent on DF1 and no message is received before the timer expires, no error reply is sent on ControlNet. However, the memory buffers are freed up to handle new messages. It is assumed that the node that originated the original request message on ControlNet has already timed out and does not need a reply.

For the 1770-KFC15, parameter 7 in the 'A' sub-menu is used to configure the message reply time-out. This parameter represents time in seconds and has a range of 1 to 99 seconds. The default value is 5 seconds. For instructions on how to program a parameter in the 'A' sub-menu, refer to chapter 4.

NOTE: For the 1747-KFC15, the message reply time-out is set to 10 times the DF1 ACK time-out. The default value is 32 seconds since the default DF1 ACK time-out value is 3.2 seconds.

TIP In a normally functioning system, the message reply timeout should never occur, since it would be rare for a device to acknowledge a message with an ACK and then never send a reply.

Default DF1 Address

When a standard (non-DH+) PCCC message is received from ControlNet, the KFC must decide to which destination address to send it on the DF1 link. The old KFC would always send such packets with a DF1 destination address equal to the ControlNet address of the KFC. This means that if you are using half-duplex mode, the address of the other DF1 device must be set to the ControlNet address of the KFC. For the new 1770-KFC15, the default DF1 destination address can be configured so that the DF1 address of the other device does not have to match the ControlNet address of the KFC.

For the 1770-KFC15, parameter 8 in the 'A' sub-menu is used to configure the default DF1 address. This parameter is a hexadecimal value and has a range of 0 to FF. The value FE is a special value that indicates that the current ControlNet address should be used. The default value is FE. Therefore, the default behavior is to use the ControlNet address just as the old KFC did. For instructions on how to program a parameter in the 'A' sub-menu, refer to chapter 4.

NOTE: The new 1747-KFC15 will always use the ControlNet address as the default DF1 destination address as did the old KFC.

Note that DH+ PCCC messages (i.e., PCCC messages that originate from a device on DH+) have source and destination information contained in their message header. Therefore, these source and destination values are used for the source and destination addresses on the DF1 link.

DF1 SRC and DST Address

In full-duplex mode, the SRC and DST values are ignored on the DF1 link. This is because full-duplex operation implies a point-to-point configuration with only two nodes on the DF1 link. Since there are only two nodes, there is no need to examine the SRC and DST values. In fact, you will often see the SRC and DST addresses set to the same value on a full-duplex DF1 network.

In half-duplex mode, more than two nodes are allowed to be connected to the DF1 network (if half-duplex modems are used). The SRC and DST address values are used to determine which node is to receive which packet. For example, in half-duplex mode, the KFC will not receive any DF1 messages unless the DST address is equal to its DF1 station address.

DF1 SRC (source) and DST (destination) values are chosen in the following 3 cases:

1. If the message request came in from the DF1 port, the DF1 reply message will have SRC and DST address values that are opposite that of the request message. For example:

- Reply DST = Request SRC
- Reply SRC = Request DST

   This is compliant with the DF1 specification. Note that the old KFC would always set the DST address to its ControlNet address.

2. If a standard PCCC message request comes in from ControlNet, it must be forwarded onto the DF1 link. The DF1 request message will have a DST address equal to the default DF1 destination address (usually set to the KFC's ControlNet address). The DF1 SRC address will be equal to the ControlNet address of the node that sent the message (the ControlNet source address) if the serial port is operating in full-duplex mode. In half-duplex mode, the DF1 SRC address is always set to the KFC's DF1 station address.

- Request DST = default DF1 destination address (Refer to Default DF1 Address on page 6.)
- Request SRC = ControlNet source address (full-duplex mode) or the KFC's DF1 station address (half-duplex mode).

Auto-recovery

An auto-recovery feature has been added so that the new KFC can automatically recover from non-hardware error conditions. The default setting for this feature is "Disabled." It is recommended that this feature be enabled if the KFC is operating in a remote location where a manual reset of the module would be difficult. Using the KFC to connect to a remote location using phone modems is one example.

One example of a non-hardware error condition that could trigger this feature would be that the KFC ran out of memory buffers and was unable to recover from this condition within 35 seconds.

For the 1770-KFC15, parameter 9 in the 'A' sub-menu is used to configure the auto-recovery feature. A parameter value of 0 means disabled (the default), and a value of 1 means enabled. For instructions on how to program a parameter in the 'A' sub-menu, refer to chapter 4.

NOTE: For the 1747-KFC15, switch 7 of DIP switch bank S1 is used to configure the auto-recovery feature. Off means disabled (the default), and on means enabled.

Message Buffers

The new 1770-KFC15 has 18 message buffers. However, if the messages are PCCC messages coming in from ControlNet, the number is limited to 10 outstanding messages.

From an application point of view, this means that a DF1 device (PLC-5, DCS, RSLinx, etc.) connected to the serial port of a new 1770-KFC15 is able to send 18 DF1 messages through the KFC before receiving a reply to any of them. This is referred to as 18 outstanding messages. If a 19th message is sent by the DF1 device before a reply, good or bad, is returned for any of the 18 other messages, the KFC will respond with a NAK to indicate that it is low on memory and does not have a message buffer in which to place the 19th message. If this happens, the DF1 device should wait until it hears a reply to one of the outstanding messages (or until the message times out) and try the 19th message again.

In general, applications using the 1770-KFC15 should be designed so that no more than 18 DF1 messages are outstanding at one time. For example, a PLC-5 connected to the serial port of the 1770-KFC15, should not be programmed to execute more than 18 message instructions at one time that would send DF1 messages to the KFC's serial port.

NOTE: The new 1747-KFC15 has 67 message buffers. If a 1747-KFC15 is used, then 67 DF1 message instructions can be executed simultaneously.

The picture is different for applications that send PCCC messages to the KFC via ControlNet. For example, consider an application that has 3 PLC-5 processors and a KFC all connected to ControlNet. The KFC has some DF1 device connected to its serial port. The PLC-5 processors have been programmed with message instructions that read data from the DF1 device via ControlNet and the KFC. This application should be designed so that no more than 10 message instructions execute at one time in all 3 of the PLC-5 processors.

Diagnostic Counter Reset

This command resets the diagnostic counters listed above.

Table C.10 Command Format

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

Table C.11 Reply Format

1 byte	1 byte	2 bytes
CMD 46	STS	TNS

1747-KFC15 Meters

Instead of counters, the 1747-KFC15 module shows traffic activity and error conditions on 6 display-panel meters. The meters come in 2 groups of 3 and are to the right of the OK and address messages. For example, if the 1747-KFC module's ControlNet address is 30 and all the meters are at maximum value, you would see:

OK ||| |||

alternating with:

30 ||| |||

From left to right, the meters are:

1. DF1 Packets Sent
2. DF1 Packets Received
3. CNet Packets Received
4. DF1 NAKs Sent or Received
5. DF1 Line Errors (framing + parity + overrun)
6. DF1 PCCC status byte, STS, non-zero in Rx or Tx packet.

Since meters 4, 5, and 6 display errors, the values on these meters will persist for about 8 seconds to give the user time to view them.