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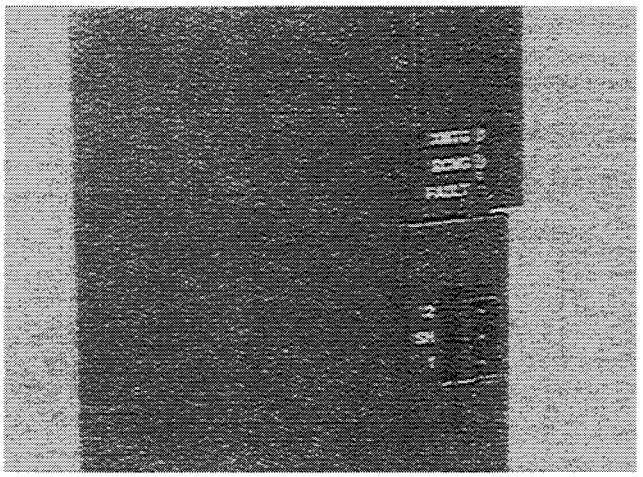
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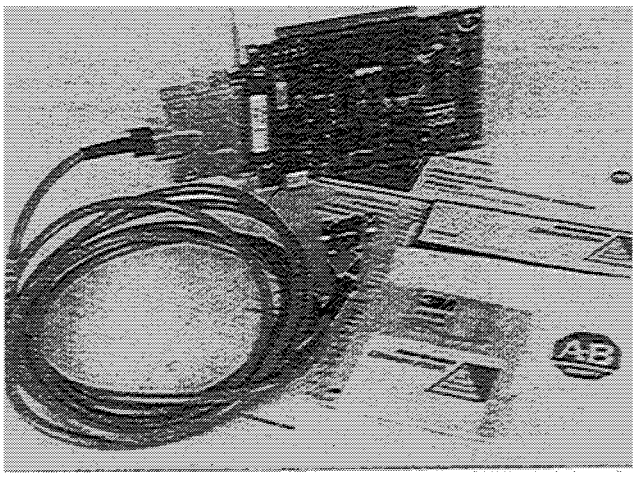
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ALLEN-BRADLEY

Data Highway
Local Area Network

Product Data





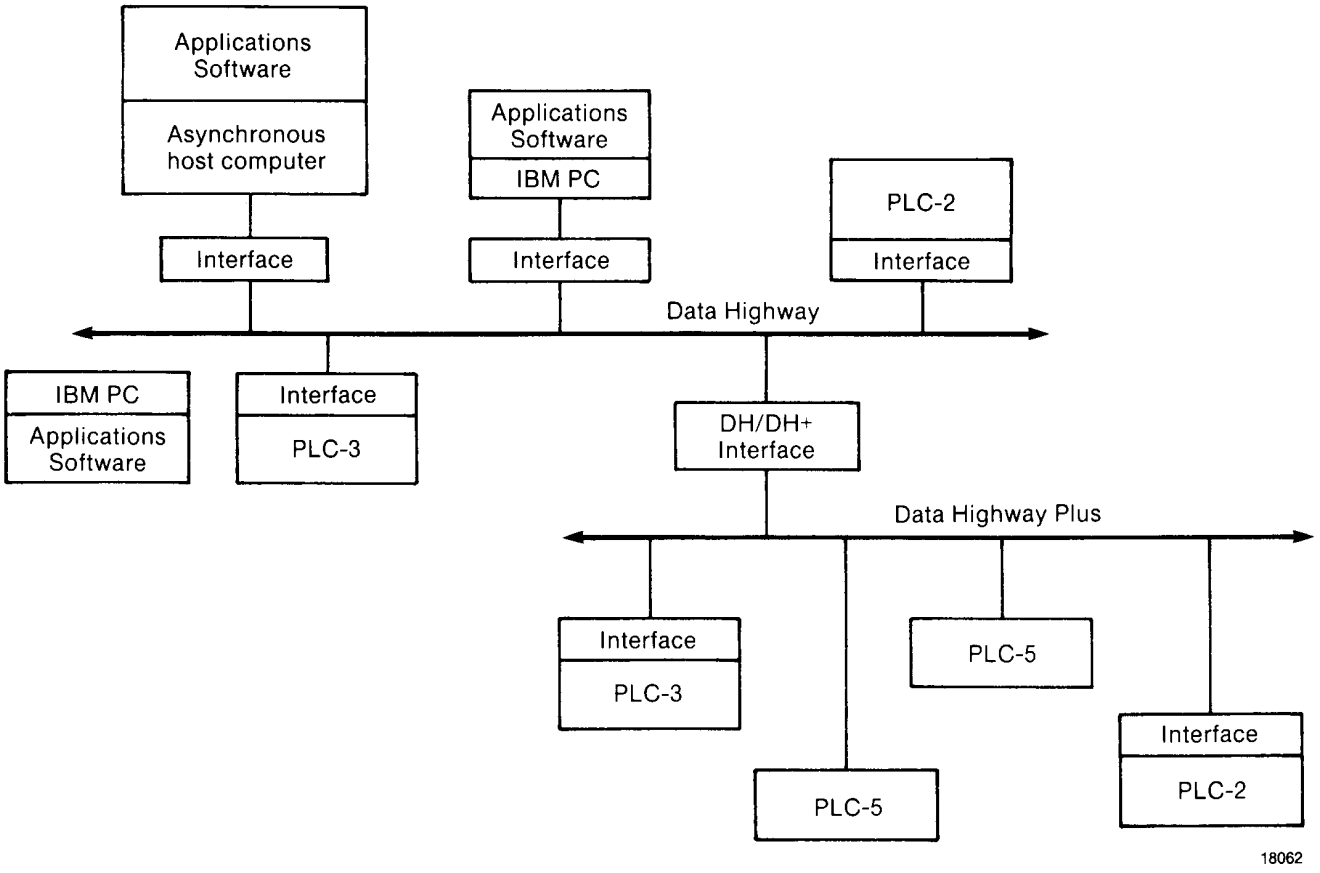
Introducing Data Highway

The Allen-Bradley Data Highway (figure 1) is a local area network (LAN) designed for plant floor applications. Data Highway features:

- industrial-hardened surfaces
- floating-master communication that allows reliable data transport
- easy reconfiguration to meet changing manufacturing needs

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Figure 1
A Typical Data Highway Configuration



Data Highway allows you to communicate with a variety of devices, including:

- programmable controllers
- computers
- RS-232-C/ RS-422 devices
- Fisher Instrumentation systems
- color graphics systems

Data Highway works with various devices and software packages. You can use Data Highway alone or combine it with Data Highway Plus as part of a plant-wide Computer Integrated Manufacturing (CIM) facility. This document is designed to help you determine how a Data Highway network can work to your greatest advantage. Inside, you will find information on:

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Section:	Page:
Data Highway Cabling: Trunkline and Droplines Station Connectors	3 4 4
Using Hardware Interfaces to Connect: RS-232-C and RS-422-A Devices PLC-®2 Family Programmable Controllers PLC-3 Family Programmable Controllers Fisher Controls PROVOX®	6 7 8 9
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Data Highway Cabling

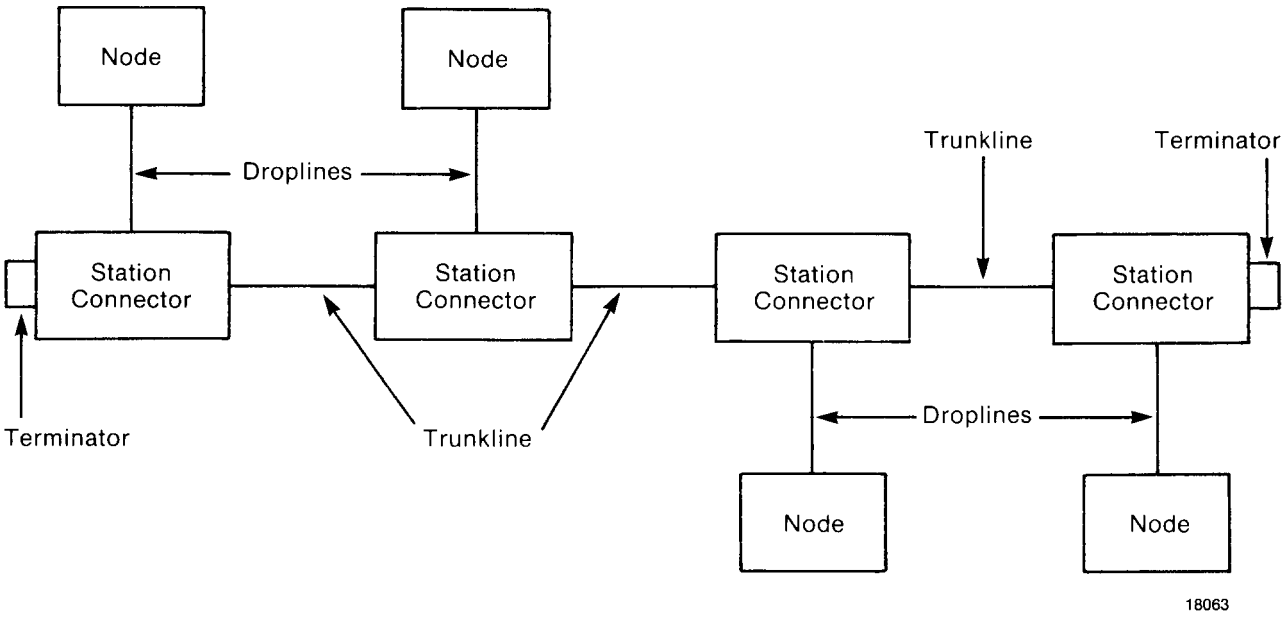
Cabling provides the physical means of transporting data between **nodes.** A node is the point where a device connects to a network. On your Data Highway network, a node is a hardware interface.

Your Data Highway cabling system (figure 2) consists of the following parts:

- a trunkline
- droplines
- station connectors

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Figure 2
Components of a Data Highway Cable System



Trunkline and Droplines Trunkline and Droplines

The **trunkline** is the main channel of communication and is manufactured from twinaxial cable. The maximum length of a trunkline on Data Highway is 10,000 feet.

Droplines connect each node to the trunkline and are made of the same cable as the trunkline. Each dropline can be up to 100 feet long.

When planning your cable system, be sure to:

- isolate the cable from high amounts of electrical voltage and noise
- avoid tension by providing some slack in the cable

For more information on Data Highway cabling, refer to the *Data Highway Cable Assembly and Installation Manual* (publication 1770-6.2.1).

Station Connectors

Station Connectors connect droplines to the trunkline. Station connectors include a 150-ohm resistor you install on the terminating stations (located at each end of the trunkline) to maintain proper impedance on the network.

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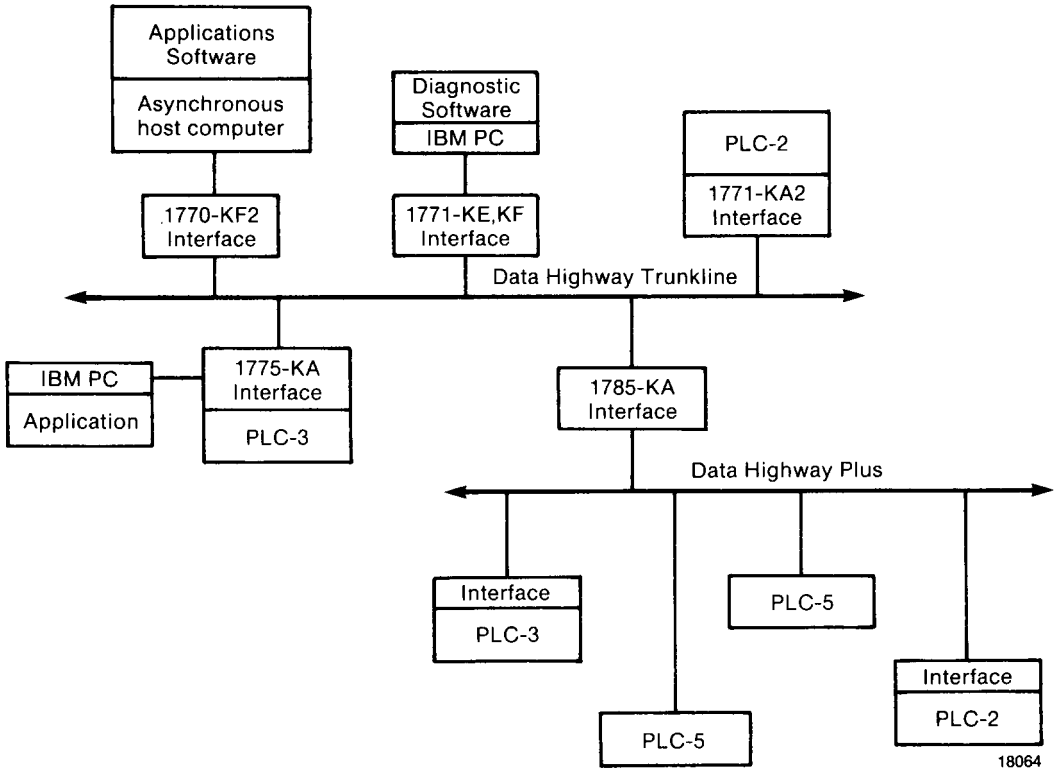
Using Interfaces to Connect Devices to Data Highway

Devices send and receive data over your Data Highway network through hardware interfaces. The devices you can connect to your Data Highway network and their corresponding hardware interfaces are listed below.

To Connect This Device:	Use This Interface:
Desktop RS-232-C/RS-422-A Device	1770-KF2 Data Highway/Data Highway Plus Asynchronous Interface Module
Industrial RS-232-C Device	1771-KE, -KF Communication Controller Module
PLC-2 Family Programmable Controller	1771-KA2 Communication Adapter Module
PLC-3 Family Programmable Controller	1771-KA PLC-3 Communication Adapter Module 1775-SR, -SR5 PLC-3 Family I/O Scanner Communication Adapter Module
Fisher PROVOX	1771-KX1 PROVOX System Interface Module

You connect these interfaces to droplines on your cable system (figure 3).

Figure 3
Hardware Interfaces on a Data Highway Network



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The following sections discuss the hardware interfaces you use to connect various devices to your Data Highway network.

The 1770-KF2 Asynchronous Interface Module

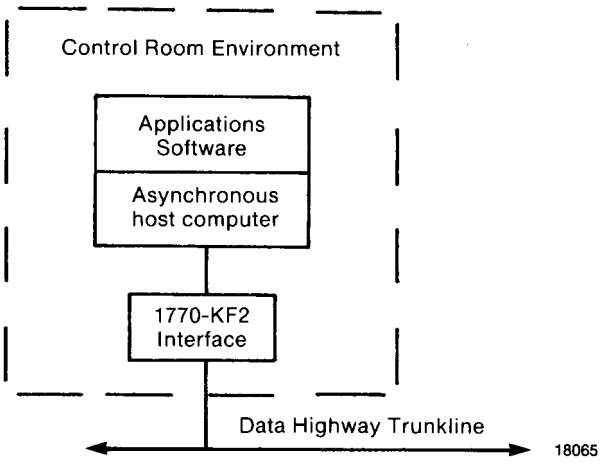
The 1770-KF2 desktop RS-232-C/RS-422-A device interface allows an intelligent asynchronous device (such as a computer or graphics system) to communicate over:

- a Data Highway network
- a Data Highway Plus network

To find out about the Data Highway Plus network, refer to the *Data Highway Plus Local Area Network Product Data* (publication 1785-2.6).

The 1770-KF2 interface is designed to operate in a control room environment (figure 4).

Figure 4
A Host Computer and 1770-KF2 Interface in a Data Highway Configuration



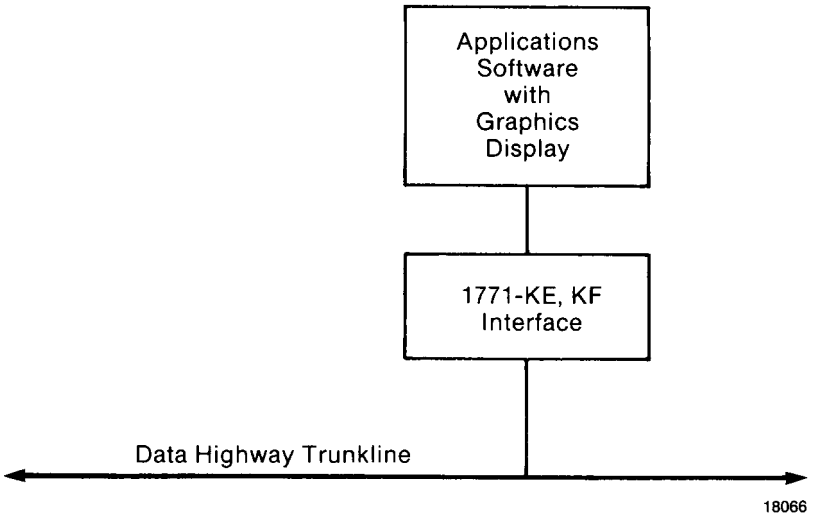
Specifications for the 1770-KF2 are listed on page 18.

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The 1771-KE, -KF Communication Controller Module

The 1771-KE, -KF interface allows an RS-232-C device, such as a personal computer or graphics display, to communicate over your Data Highway network (figure 5).

Figure 5
A Graphics Display with 1771-KE Interface in a Data Highway Configuration



The 1771 industrial RS-232-C-device interface is available in two versions:

Cat. No.	Module Type
1771-KE	mounts in a slot of 1771 I/O chassis
1771-KF	stand-alone mounting (requires additional power source)

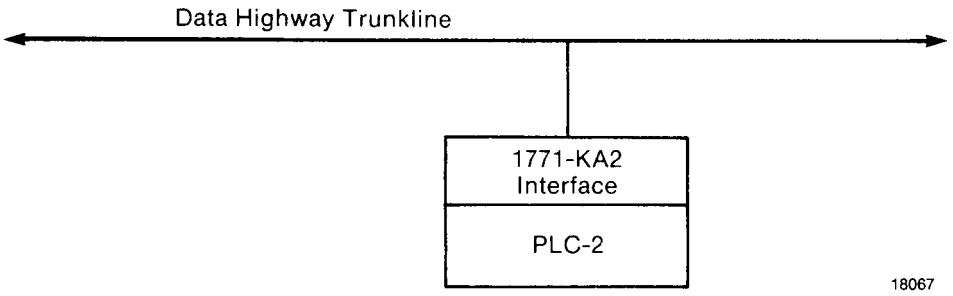
Specifications for the 1771-KE, -KF are listed on page 19.

The 1771-KA Communication Adapter Module

You can connect any PLC-2 family programmable controller to your Data Highway network using the 1771 -KA2 interface (figure 6). This interface mounts in the chassis of an Allen-Bradley Bulletin 1771 I/O chassis.

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Figure 6
A PLC-2 Family Interface in a Data Highway Configuration



Specifications for the 1771-KA2 are listed on page 18.

The 1775-KA, -S5, -SR5 PLC-3 Family Communication Adapter Module

You connect a PLC-3 to your Data Highway using a 1775-KA, -S5, or -SR5 interface. It fits into a main chassis or expander chassis, and allows you to interface a PLC-3 family programmable controller with your Data Highway network. Choose the interface that corresponds to your device and needs:

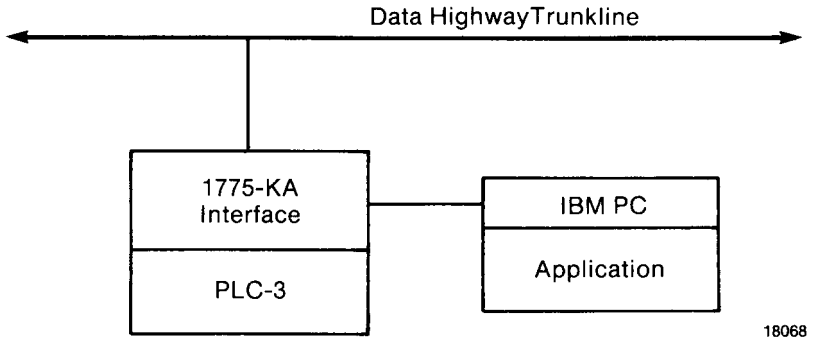
Interface Catalog No.:	Compatible Devices:	Peripheral Communication Channels:
1775-KA	PLC-3 PLC-3/10	communicates with a programmable RS-232-C device
1775-S5	PLC-3	3 I/O channels containing as many as 4,096 I/O [1]
1775-SR5	PLC-3/10	

[1] A 4th I/O channel is available when the interface is not connected to your Data Highway network. Refer to *I/O Scanner Communication Adapter Module Product Data* (publication 1775-2.24).

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The 1775-KA PLC-3 family interface can communicate with a computer or other programmable RS-232-C device while connected to your Data Highway network (figure 7).

Figure 7
A PLC-3 Connected to a Computer in a Data Highway Configuration



To find out more about the 1775-S5, -SR5 PLC-3 family interface, refer to the *I/O Scanner Communication Adapter Module Product Data* (publication 1775-2.24).

Specifications for the 1775-KA, -S5, -SR5 are listed on page 20.

The 1771-KX1 PROVOX System Interface Module

The Allen-Bradley 1771-KX1 interface lets you connect Fisher Controls' PROVOX system to your Data Highway network.

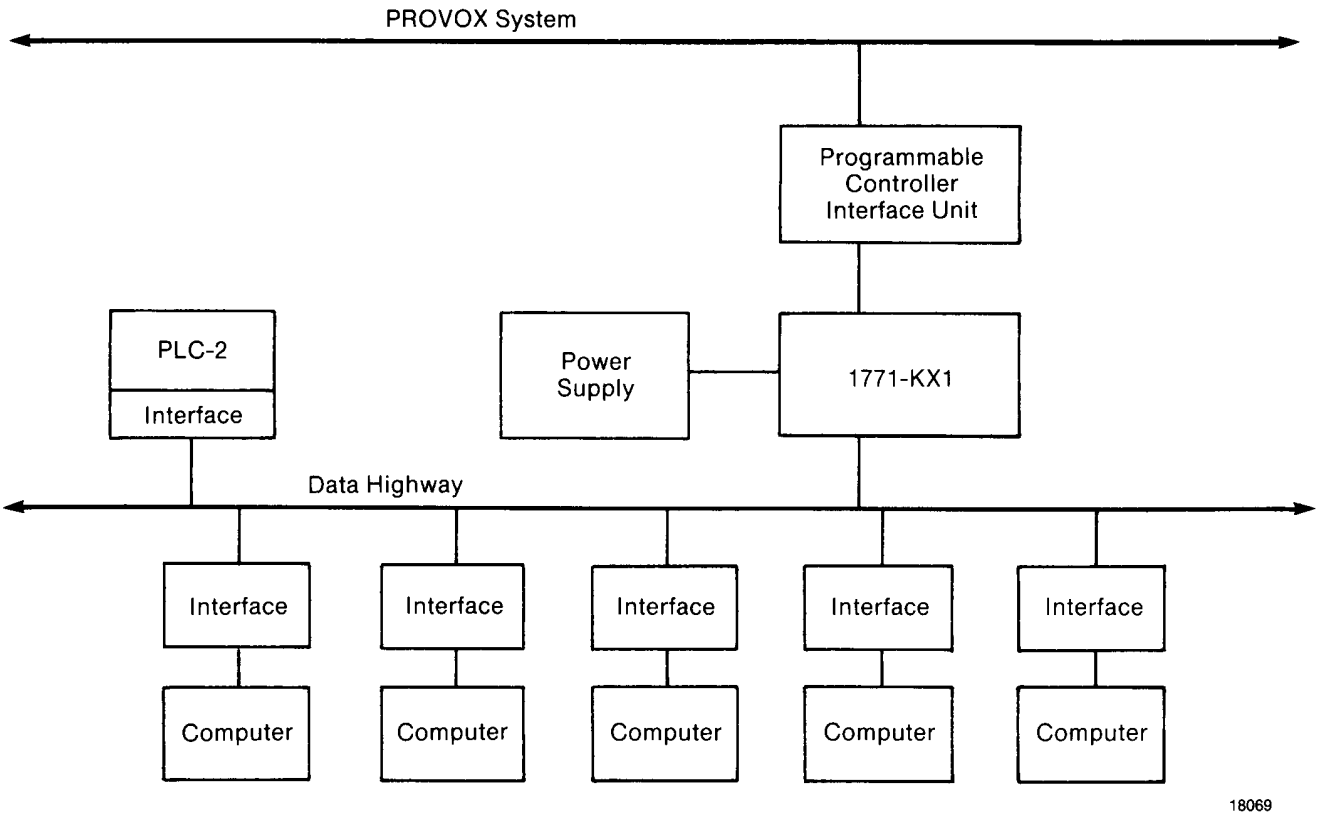
The KX1 allows communication with up to 8 workstations on Data Highway (figure 8). It enables the PROVOX system to access certain memory locations within the PC stations.

The KX1 is a directional gateway. It allows the PROVOX system to send command messages to nodes on Data Highway, but Data Highway nodes cannot send commands to the PROVOX.

CAUTION: Do not program any PC-to-PC communication on the Data Highway. Such communications can cause timeouts and loss of data on the KX1-to-PROVOX link.

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Figure 8
A Data Highway Configuration with 1771-KX1 Interface to PROVOX



Specifications for the 1771-KX1 are listed on page 20.

Connecting Data Highway to Other Networks

The networks you can connect to Data Highway and their corresponding hardware interfaces are listed below.

To Connect Data Highway to:	Use This Interface:
Data Highway Plus	1785-KA Communication Adapter Module
Broadband Cable Trunkline	1771-KRF Broadband Communication Interface

The following sections discuss the hardware interfaces listed above.

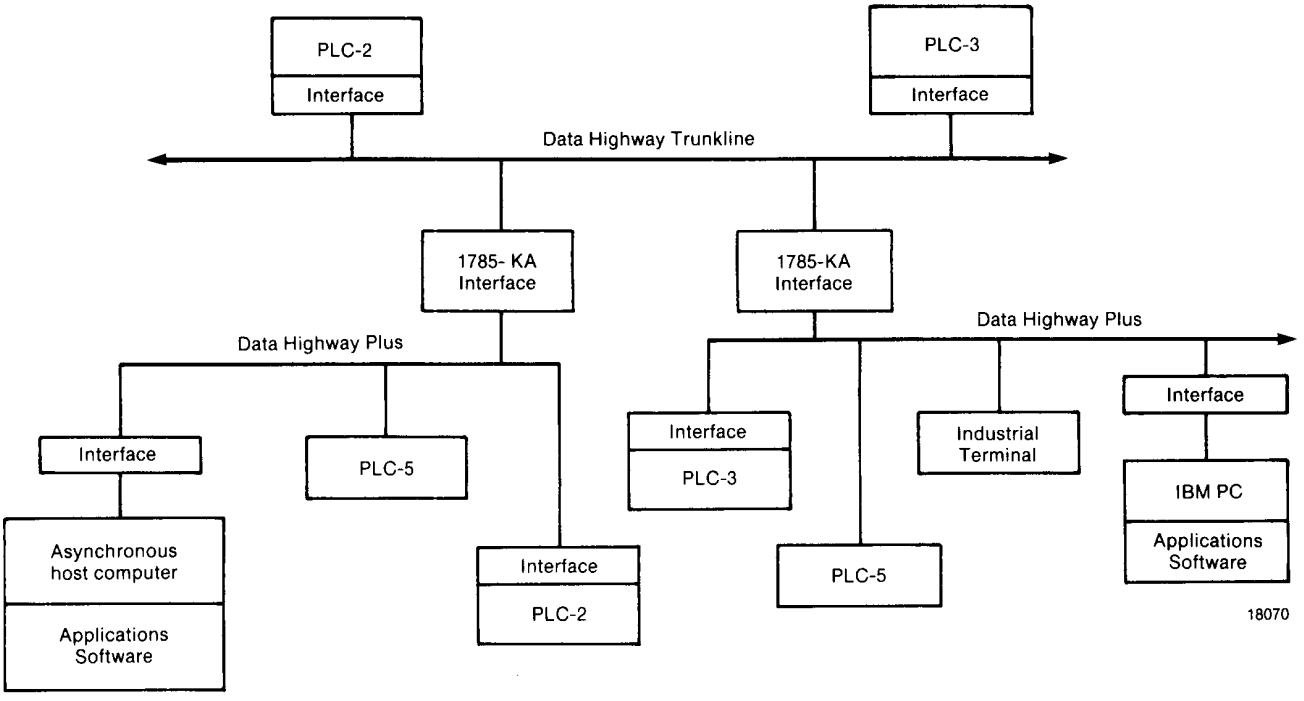
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The 1785-KA Communication Adapter Module

You can connect your Data Highway to Data Highway Plus using the 1785-KA interface. You can also use a Data Highway network to interconnect several Data Highway Plus subnetworks (figure 9). This enables you to communicate with PLC-5 family programmable controllers.

To find out about the Data Highway Plus network and what it can do for you, refer to the *Data Highway Plus Local Area Network Overview* (publication 1785-2.6).

Figure 9
A Data Highway/Data Highway Plus Network Configuration



Important: Data Highway nodes can access Allen-Bradley PLCs on Data Highway Plus (through the 1785-KA); they **cannot** access a **computer** on Data Highway Plus. Likewise, a PLC on Data Highway Plus can access nodes on Data Highway and remote Data Highway Plus networks.

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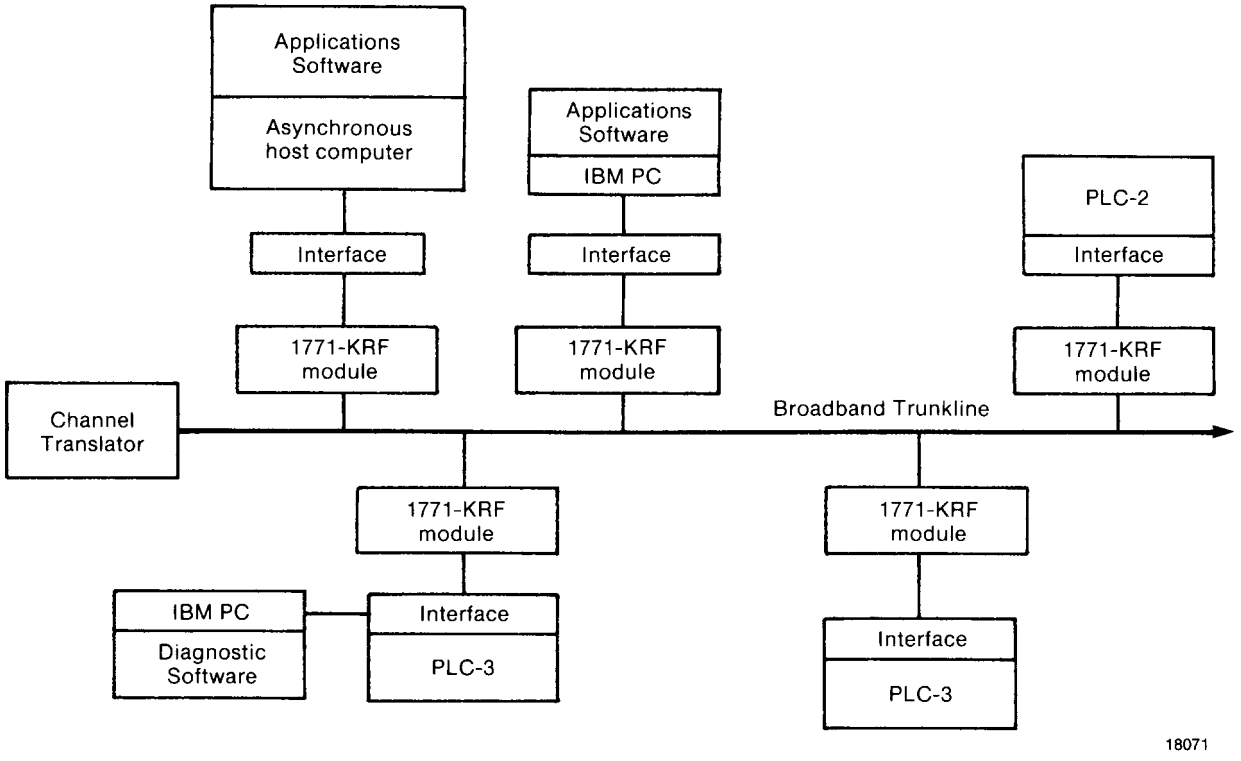
A computer connected to Data Highway Plus can access nodes on the local Data Highway Plus network. It **cannot** access **nodes** on the Data Highway or on a remote Data Highway Plus.

Specifications for the 1785-KA are listed on page 20.

The 1771-KRF Broadband Communication Interface

You can connect your Data Highway stations to a broadband cable network using the Allen-Bradley 1771 -KRF interface module (figure 10).

Figure 10
A Data Highway (over Broadband) Configuration

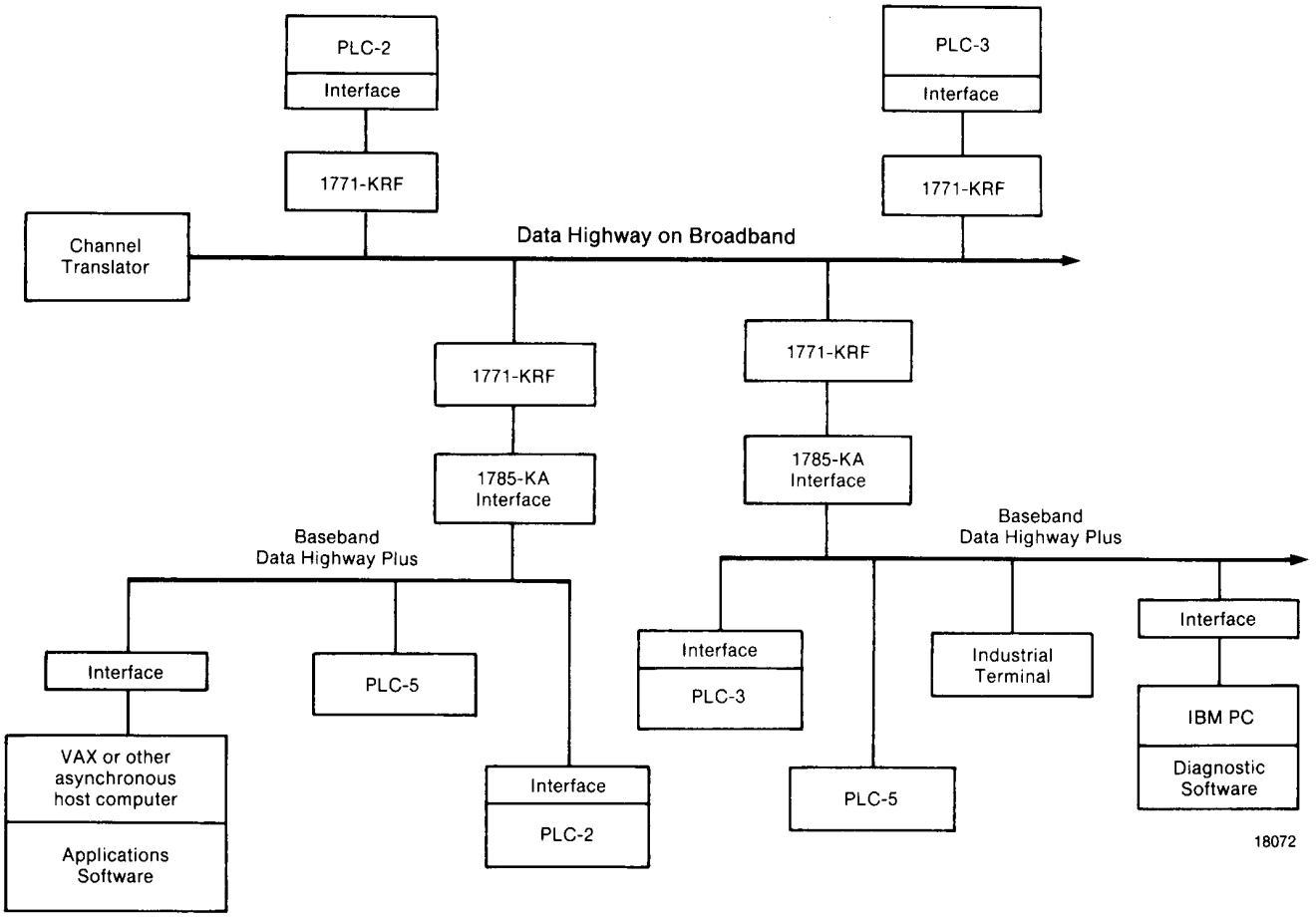


The 1771 -KRF, which you install in an I/O rack, receives input signals from a Data Highway module and transmits them on a broadband cable. This lets you transmit the Data Highway protocol directly over the broadband, creating a Data Highway link on a broadband cable instead of on the standard twinaxial baseband cable.

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You can use the 1771-KRF in conjunction with the 1785-KA to connect a Data Highway Plus baseband network to a broadband Data Highway network. You can also connect baseband Data Highway Plus subnetworks to a broadband Data Highway trunkline (figure 11).

Figure 11
Data Highway Plus Subnetworks Connected by Data Highway (on Broadband)



Important: If you connect individual Data Highway stations to a broad-band cable network, you must have one KRF module for each station.

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The KRF is frequency agile over 18 sub-channel pairs. This allows up to 18 Data Highway links to operate on a single broadband cable system. To implement any Data Highway-broadband cable connection:

- you must have an Allen-Bradley 6600 Channel Translator at the head-end of the broadband cable system
- you must verify that the KRF has been tested with the Data Highway module you intend to connect. Refer to the 1771-KRF User's Manual (publication 1771-6.5.59) for a list of qualified modules.

Specifications for the 1771-KRF are listed on page 19.

Data Highway Software

This section describes the following Data Highway software packages:

- 6001-NET communication software
- 6001-F3E diagnostic software

For more information on ordering Data Highway software, refer to the following publications:

- *Data Highway, Data Highway II, and Data Highway Plus Network Software Product Data* (publication 6006-2.3)
- *Data Highway Diagnostic Software Product Data* (publication 6001-2.3)

6001-NET Communication Software

The 6001-NET software enables an application program running on your TM TM computer to communicate on a Data Highway network.

The 6001-NET software has the following features:

- a Data Highway/ DF1 packet generator you call from your application programs
- a control processor capable of handling multiple applications
- a network database that allows you to configure your network independent of your applications
- a sample FORTRAN application you can use as a programming example and to test your network

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6001-F3E Diagnostic Software

You install the 6001-F3E diagnostic software on your IBM™ PC/ XT™, PC/ AT™, or compatible personal computer. The 6001-F3E software uses high-resolution color graphs and tables to:

- give you an overview of the characteristics of each node on your Data Highway network
- display the diagnostic counters for any node on your network to help you spot potential problems
- plot the distribution of response times for variable and fixed-size messages so you can determine the range of message sizes that will optimize your network's performance

Data Highway Ordering

This section contains information on ordering the following components for your Data Highway network:

- cabling system
- hardware interfaces

Cabling System

When constructing a Data Highway cabling system, you need to order a station connector (cat. no. 1770-SC) for each node on your network. In addition, you will need twinaxial cable for both the trunkline and the dropline. If you order your cable from a source other than Allen-Bradley, it must be Belden cable part number 9463.

Important: Any cable other than those recommended by Allen-Bradley will result in unreliable performance on your Data Highway network.

For more information on the cabling system, refer to the *Data Highway Cable Assembly and Installation Manual* (publication 1770-6.2.1).

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Hardware Interfaces

The following table describes each interface and the catalog number you should use to order it.

Interface for:	Description:	Catalog No.:
Desktop RS-232-C/ RS-422-A Device	allows an RS-232-C/RS-422-A compatible device to communicate over Data Highway designed tor a control room environment	1770-KF2
RS-232-C Device	allows an RS-232-C-device to communicate over Data Highway Options: ▪ 1771-KF is stand-alone ▪ 1771-KE requires a slot in a 1771 I/O chassis	1771-KE,-KF
PLC-2 Family Programmable Controller	allows your PLC-2 family programmable controller to communicate over Data Highway requires a slot in a 1771 I/O chassis	1771-KA2
PLC-3 Family Programmable Controller	allows your PLC-3 family programmable controller to communicate over Data Highway Options: ▪ 1775-KA allows you to directly connect a computer to your PLC-3 ▪ 1775-S5 -SR5 includes a 3-channel I/O scanner requires a slot in a PLC-3 chassis	1775-KA, -S5, -SR5
Fisher Controls PROVOX System	allows a Fisher Controls PROVOX system to communicate with PCs on your Data Highway stand-alone	1771-KX1
Data Highway/ Data Highway Plus	allows you to connect a Data Highway Plus network to your Data Highway network requires a slot in a 1771 I/O chassis	1785-KA
Data Highway Broadband network	allows you to connect Data Highway stations to a broadband Data Highway trunkline	1771-KRF

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Where to Read More

To find out more about the products mentioned in this overview, refer to these publications:

Publication Title/Publication Type:	Publication Number:
Data Highway Cable and Installation Manual	1770-6.2.1
Data Highway II Overview	1779-2.10
Data Highway Plus Overview	1785-2.6
Data Highway, Data Highway II, Data Highway Plus Network Software Overview	6006-2.3
Data Highway Diagnostic Software Product Data	6001-2.3
I/O Scanner Communication Adapter Module Product Data	1775-2.24
PLC-2 Program Development Software Profile	6200-1.7
PLC-3 Program Development Software Profile	6200-1.8
Data Highway/Data Highway Plus Protocol and Command Set Reference Manual	1770-6.5.16
Data Highway to Data Highway Plus Interface Module (1785-KA) User's Manual	1785-6.5.1
Data Highway or Data Highway Plus/Asynchronous (RS-232-C or RS-422-A) Interface Module (1770-KF2) User's Manual	1770-6.5.13
Data Highway RS-232-C Interface Module (1771-KE,-KF) User's Manual	1771-6.5.15
Data Highway PLC-2 Family (1775-KA) Communication Adapter Module (1775-S5, -SR5) User's Manual	1775-6.5.1 1775-6.5.5
PLC-4 Microtrol Communication Interface User's Manual	1773-801
PROVOX System Interface Module (1771-KX1) User's Manual	1771-6.5.16

These publications are available from Allen-Bradley. Contact your local Allen-Bradley sales office for more information.

Specifications

Data Highway

Cabling	Twinaxial cable
Protocols Supported	▪ DF1 ▪ RS-232-C ▪ RS-422-A
Communication Scheme	floating-master
Communication Rate	57.6 Kb

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1770-KF2

Power Requirements	0.30 A @ 115/230 VAC
Maximum Baud Rate	19.2 Kbps
Interface Ports	▪ RS-232-C/RS-422-A compatible ▪ Data Highway or Data Highway Plus dropline
Additional Cabling	You must construct a cable to connect the 1770-KF2 to your asynchronous device. The 1770-KF2 25-pin connector has the following pinout:

Signal:	**RS-232-C Pin:**	**RS-422-A Pin:**
protective ground	1	1
transmitted data (TXD)	2	
received data (RXD)	3	
request to send (RTS)	4	
clear to send (CTS)	5	
data set ready (DSR)	6	
signal ground (GND)	7	
data carrier detect (DCD)	8	
data terminal ready (DTR)	20	
transmitted data A (TDA)		14
transmitted data B (TDB)		25
received data A (RDA)		16
received data B (RDB)		18

Refer to the 1770-KF2 Series B User's Manual (publication 1770-6.5.13) for more information on the 1770-KF2 connector pinouts.

Environment Temperature Rating:	32 to 113°F (0 to 45°C) operational
Humidity Rating:	10 to 80% non-condensing

1771-KA2

Power Requirements	1.2 A @ 5 VDC (supplied by bulletin 1771 I/O chassis backplane)
Interface Ports	▪ PLC-2 family programmable controller ▪ Data Highway dropline ▪ Allen-Bradley Industrial Terminal
Additional Cabling	You must order the appropriate Allen-Bradley cable to connect your PLC-2 to the 1771-KA2: ▪ 1771-CR (10'6") ▪ 1771-CO (3') ▪ 1771-CN (1'6")
Environment Temperature Rating:	32 to 140° F (0 to 60° C) operational
Humidity Rating:	5 to 95% non-condensing

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1771-KE, -KF

Power Requirements	1.2 A @ 5 VDC (-KF requires power supply unit, catalog no. 1771-P2)
Maximum Baud Rate	19.2 Kb
Interface Ports	▪ RS-232-C compatible ▪ Data Highway dropline
Additional Cabling	You must construct a cable to connect the 1771-KE,-KF to your asynchronous device. Cabling for the RS-232-C port of the -KE,-KF module will vary depending on your application. Refer to the 1771-KE,-KF User's Manual (publication 1771-6.5.15) for more information on pinouts. The 1771-KE, -KF 15-pin RS-232-C connector has the following pinout:

Signal:	**RS-232-C Pin:**
protective ground	1
transmitted data (TXD)	2
received data (RXD)	3
request to send (RTS)	4
clear to send (CTS)	5
data set ready (DSR)	6
signal ground (GND)	7
data carrier detect (DCD)	8
data terminal ready (DTR)	11
transmitted data return (TXDRET)	14
received data return (RXDRET)	13

1771-KRF

Power Requirements	1.5A @ 5 VDC
Interface Ports	▪ Data Highway or Data Highway Plus dropline ▪ broadband (coaxial cable) dropline
Additional Cabling	No additional cabling is needed.
Environment **Temperature Rating:**	32 to 140° F (0 to 60° C) operational
Humidity Rating:	5 to 95% non-condensing

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1771-KX1

Power Requirements	1.2 A @5 VDC
Maximum Baud Rate	57.6 Kb
Interface Ports	▪ Data Highway dropline ▪ RS-232-C port
Additional Cabling	You must order an RS-232-C Adapter Cable (catalog no. 1770-CX1) to connect the PROVOX system to the 1771-KX1.
Environment Temperature Rating:	32 to 140° F (0 to 60° C) operational
Humidity Rating:	5 to 95% non-condensing

1775-KA, -S5, -SR5

Power Requirements	Max. of 2.5 A @ 5 VDC from PLC-3 chassis backplane	
Interface Ports	▪ Data Highway dropline ▪ PLC-3 (1775-KA,-S5) or PLC-3/10 (1775-SR5) backplane	
1771-KA only:	RS-232-C compatible programmable device	
1775-S5,-SR5 only:	four I/O channels, 1024 I/O points per channel	
Additional Cabling	Only the 1775-KA module requires an additional cable to connect it to your computer. The 1775-KA 25-pin RS-232-C connector has the following pinout:	
	Signal:	**RS-232-C Pin:**
	chassis/shield drain	1
	transmitted data (TXD)	2
	received data (RXD)	3
	request to send (RTS)	4
	clear to send (CTS)	5
	data set ready (DSR)	6
	data carrier detect (DCD)	7
	data terminal ready (DTR)	20/11
	transmitted data return (TXDRET)	7/14
	received data return (RXDRET)	13/25

1785-KA

Power Requirements	1.2A @ 5 VDC - supplied by Bulletin 1771 I/O chassis backplane
Interface Ports	▪ a Data Highway dropline ▪ a Data Highway Plus dropline ▪ an Allen-Bradley Industrial Terminal (Series 1784)
Additional Cabling	You must construct a cable to connect the 1785-KA to an industrial terminal. Refer to the 1785-KA User's Manual (publication 1785-6.5.1) for the 1785-KA industrial terminal connector pinouts.

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