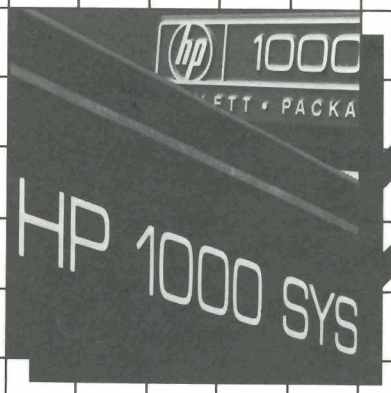
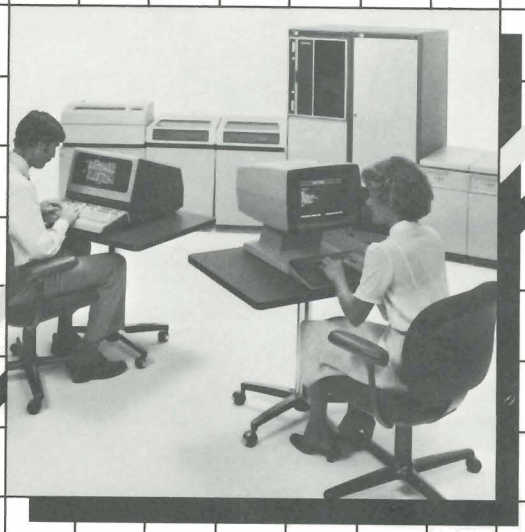
Distributed Systems Network

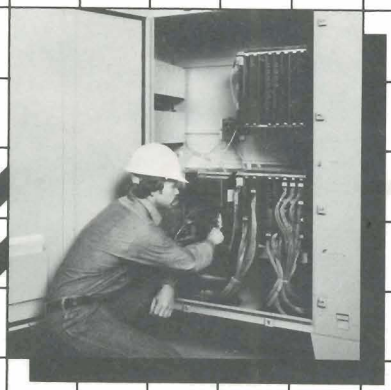
HP 1000 Data Communications Products

HEWLETT PACKARD

Technical Data Supplement







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Technical Data Supplement Information Locator

Product Number Index

A-Series Data Link Multidrop Communication

HEWLETT PACKARD

For HP 1000 A-Series Computer Systems

product numbers:
HP 12092A, 91732A, 3074A, 92901A,
92902A, 92905A, 92908A, 92909A

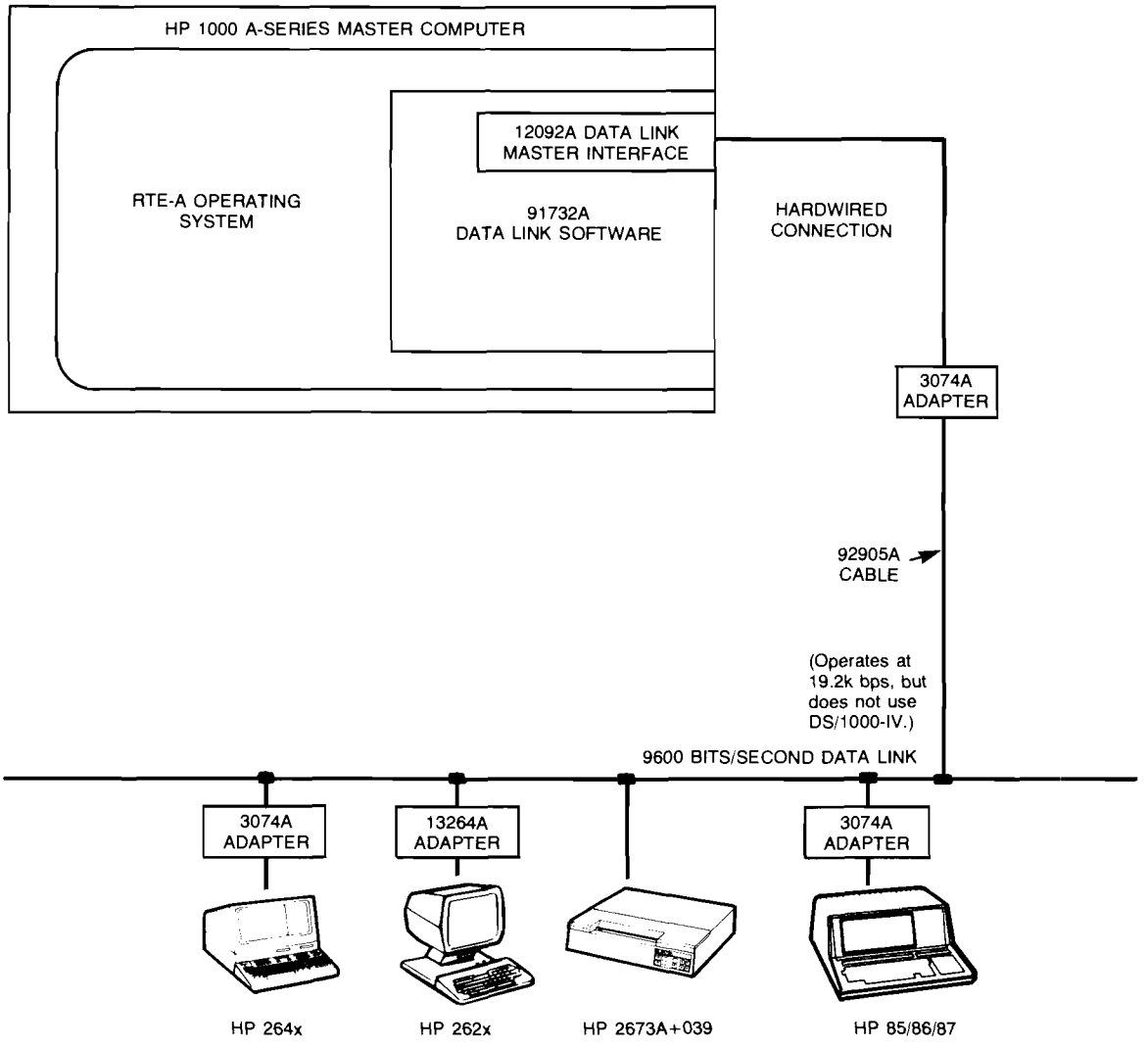


Figure 1. Data Link Overview

The HP 1000 Data Link is a data communications capability used to interface a wide variety of devices to an HP 1000 computer system. The Data Link is a low speed, rugged, flexible, and inexpensive multidrop communications link designed for operator data capture, distributed processing, and distributed control applications. The wide range of devices supported on the Data Link includes HP 1000 A-Series Computers, Desktop Computers, HP 80 Series Personal Computers, CRT Terminals, and Printers.

A minimal Data Link communications capability is formed by the combination of 12092A Data Link Master Interface, 91732A Data Link Software, 3074A Data Link Adapter, and 92909A Data Link Starter Cable, together with a host HP 1000 A-Series computer system. The host computer is designated the Data Link master, and all other devices installed on the Data Link are designated as slave stations.

The high reliability due to CRC-16 error checking, optical isolation, and RS-422 differential voltages, combined with configuration flexibility, makes the Data Link for HP 1000's an ideal low speed, local communication link for factory and plant automation applications.

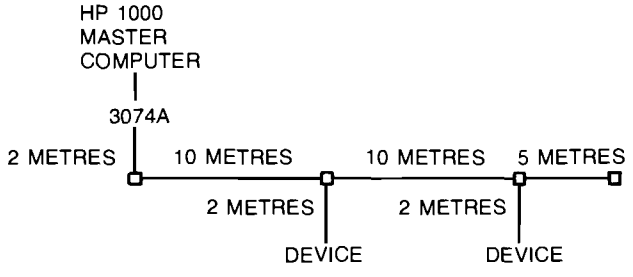
Features

- **Master computer and slave stations can be installed at any location on the Data Link**
- **Up to 64 physical connections per Data Link, subject to system software and performance considerations**
- **Rugged wiring and connectors for harsh industrial environments**
- **Bit rates up to 19.2k bits per second**

- **High noise immunity due to double-shielded, twisted-pair cable**
- **CRC-16 error checking**
- **Up to 4 km (2.5 miles) total Data Link length**
- **Device connections are "make before break" — plugging or unplugging a device does not affect other devices on the link**
- **Multidrop topology provides low cost per additional device connection**
- **Wide selection of link compatible slave stations**
- **Ground isolation provided by opto-isolation of the Data Link from attached slave stations**
- **System Functional Tests for verification of communication between the master computer and slave stations connected to the Data Link**
- **Compatible with data communications analyzers**

Functional description

A Data Link network consists of one master computer and one or more slave stations connected to the Data Link. All stations can be installed at any location on the Data Link by plugging into a connection box on the cable or wiring directly into the cable. The maximum Data Link length is 4 km (2.5 miles). This distance includes the length of the main Data Link cable and twice the distance from the Data Link cable to all slave stations.



This sample Data Link would have a total length of:
(2×2) +10 + (2×2) + 10 + (2×2) +5 = 37 metres

Communication on the Data Link is controlled by the master computer, using multipoint asynchronous Bisync (BSC) protocol with CRC-16 error checking for data integrity. This is similar, but not identical to, IBM Bisync. See the Data Link Software Data Sheet (91732A) and the 12092A Data Link Master Interface data summary (page 17) for more information on the communication software and hardware.

Excellent ground loop isolation noise immunity is provided by the optical isolation of the Data Link master from all slave stations connected to the Data Link, RS-422 electrical levels, sensitive signal receivers and drivers, and the 100 ohm termination of the twisted pair cable itself.

The Data Link can operate at bit rates up to 19.2k bits/second. All slave stations connected to the Data Link must operate at the same bit rate. Maximum speeds for the supported devices are given below:

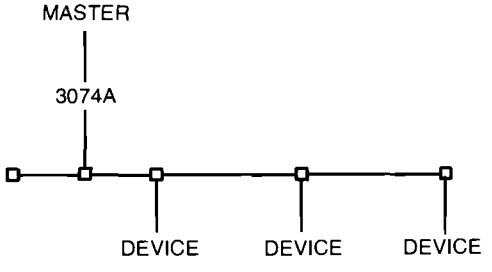
Computers	**Speed**
9835/9845 Desktop Computers	9600 bps
9826A/9836A Desktop Computers	19.2k bps
HP 85/86/87 Personal Computers	9600 bps
Terminals	
2645A/47A/48A/49B/49C/49G/49I	9600 bps
2624B/26A/29D/29F CRT Terminal	9600 bps
HP 2673A Option 039 Intelligent Graphics Printer	9600 bps

Performance

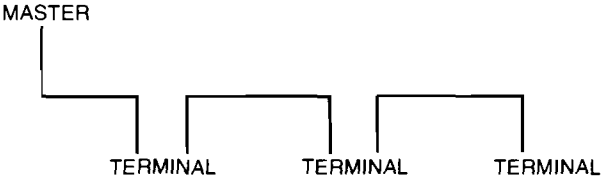
The aggregate throughput of the Data Link is limited to 19.2k bps maximum. The effective data throughput is approximately 1500 characters per second at 19.2k bps, and 850 characters per second at 9600 bps for buffers greater than 2000 bytes. As more devices are installed on the Data Link, the proportionate share of the total bandwidth available for each slave station decreases. With additional slave stations requiring access to the Data Link communication line, the response and transit time per slave station will increase.

Data Link components

NOTE: The terms Multipoint and Multidrop are similar but not identical in meaning. Below are examples of multidrop and multipoint configurations.



MULTIDROP



MULTIPOINT DAISY CHAIN

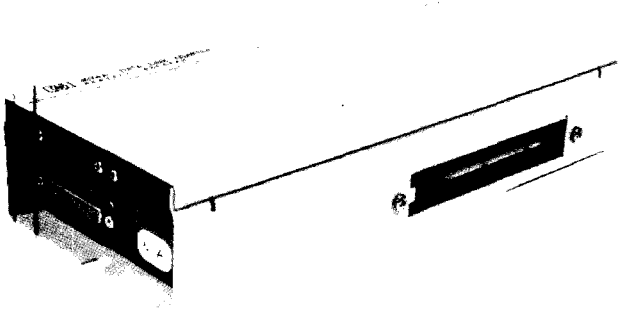
The 12092A Data Link Master Interface and 91732A Data Link Software are used in both the Multipoint configuration for terminals, and the Multidrop Data Link configuration. In multidrop configurations the 3074A converts the RS-232 Multipoint signal levels to Data Link compatible levels, allowing all slave stations to connect to a single data link.

Only certain 262x and 264x terminals operate in a multipoint daisy-chain configuration. See the Data Link Software data sheet (91732A) for additional information regarding multipoint terminal configurations.

The HP 12092A Data Link Master Interface is installed in the master HP 1000 A-Series computer and provides protocol handling and error control for the multipoint communication line. A Z-80 microprocessor with two 2k byte read buffers and three 2k byte write buffers off-loads the protocol handling and buffering from the CPU. All protocol and retries are done by on-board firmware. Interface output is an RS-232-C communications line using a Multipoint Binary Synchronous (BSC) protocol.

The HP 91732A Data Link Software package contains a driver and support software for communication between the master computer and slave stations connected to the Data Link. All multipoint software features except Group polling and "Who Are You" are supported on the Data Link.

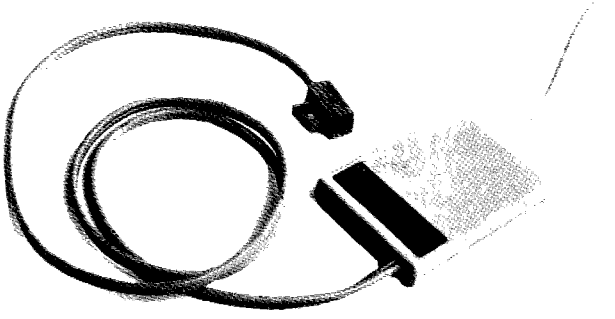
This software allows user written application programs in the master computer to communicate with slave stations connected to the Data Link. For more detailed information, refer to the 91732A Data Link Software data sheet.



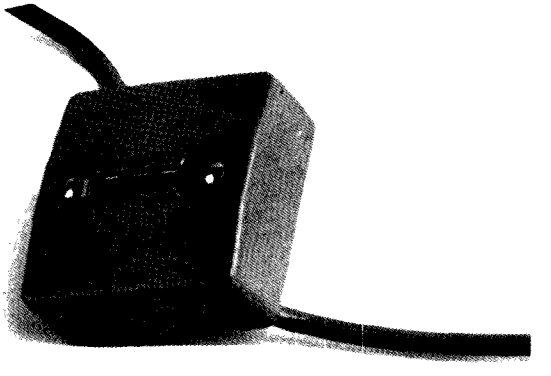
HP 3074A Data Link Adapter. The 3074A connects Asynchronous/Bisync-compatible devices with an RS-232-C or CCITT V24 interface to the Data Link. When connecting the master computer to the Data Link, the 3074A acts as a half-duplex modem and requires the Request To Send signal to be set high whenever data is to be transmitted to the Data Link. The 3074A in return provides a non-delayed Clear To Send signal, a Data Set Ready signal, and has Carrier Detect line processing.

The 3074A contains a power on/off detection feature which prevents transients of the slave device from interfering with link operation when the slave station is turned on or off. Electrical isolation (500V/μS) between devices and the link adapter is ensured by optocouplers.

A Data Link connector compatible with the 92905A Data Link-to-Device cable, an RS-232-C connector for computer or terminal connection, and a device power connector are part of the 3074A. The adapter can be easily mounted on any flat surface of at least 250 mm by 110 mm (9.8 inches by 4.3 inches).

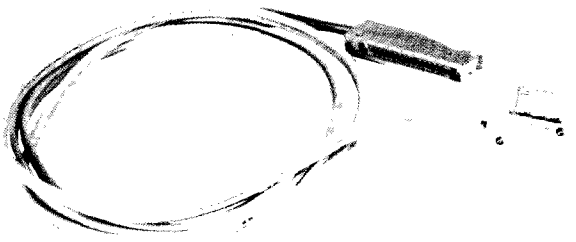


HP 13264A Data Link Adapter. The 13264A converts the RS-232-C standard electrical levels for 9826A, 9836A, and 262x datacom-type devices to the Data Link standard levels and vice-versa.

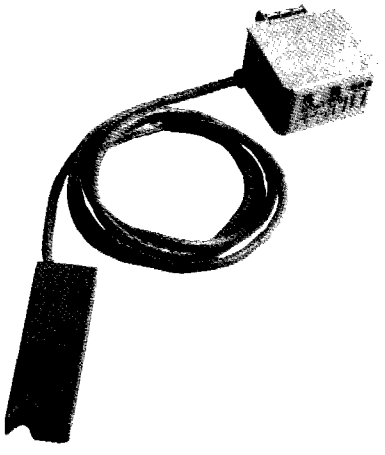


HP 92901A Data Link Connection Box. One connection box (product number 92901A for a pack of 5) is required for each device. The box is constructed of plastic, measuring 6.5 cm (2.6 inches) square and contains a set of six metal contacts with screw terminations. The contacts are designed so that a slave station can be connected and removed without disturbing link communications. Spare boxes can be installed on the cable where needed, and a security feature enables each device cable to be physically locked into the connection box.

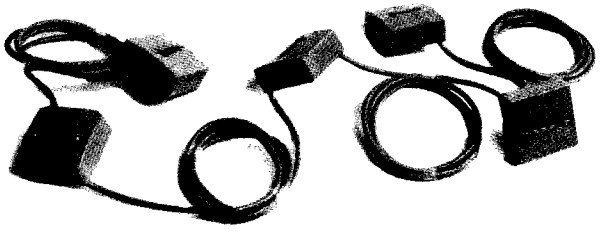
HP 92902A Data Link Cabling. The Data Link Cable (HP 92902A or Belden 9463) is a twisted-pair, double-shielded cable which can be ordered in lengths of 100 or 300 metres. For longer distances, additional 100 or 300 metre sections may be ordered and added to the link through the use of the Data Link Connection Boxes (92901A). The Data Link Cable may not be run outside a building.



HP 92905A Data Link-to-Device Cable. This cable extends the Data Link to the device (or adapter). It is two metres (6.5 feet) long and is fitted with a Data Link connector at one end and a connector for a 3074A at the other end.



HP 92908A Data Link Tester. This diagnostic tool plugs into a Data Link connection box. LED indicators on the tester can monitor communications traffic on the Data Link, and are used to locate cable faults.



HP 92909A Data Link Test Cable. Pre-configured Data Link cable consisting of a 4 metre length of 92902A cable with five equally spaced 92901A connection boxes installed. This cable is used for initial Data Link installation and verification by the HP Customer Engineer. Subsequent cabling of the Data Link for the final network can be connected to the end of the 92909A cable. In this manner, the 92909A can be used for troubleshooting and initial verification of device operation before the complete Data Link is installed.

Specifications

General

Maximum length: 4 km (2.5 miles)

Maximum data rates: 19.2k bps (maximum rate of the Data Link master computer. Maximum Data Link operational speed must not exceed that of the slowest slave station connected to the Data Link)

Protocol: Binary Synchronous Communication in an asynchronous environment

Data Link interface circuit electrical characteristics: 5V differential signals

Maximum common mode slew rate: 500V/μs

Common mode noise immunity: 500 mV

Differential noise immunity: 100 mV

Electrical isolation of 3074A: 500V/μs

Maximum capacities: 64 devices per Data Link, 4 Data Links per HP 1000 A-Series Master Computer for rates to 19.2k bps).

Cable (mechanical)

Cable: HP 92902A or Belden 9463

Construction: two conductor, twisted pair shielded cable, per UL style 2464

Conductor: 20 AWG stranded tinned copper

Insulation: PVC per UL style 1007

Outer shield: Braid of 36 AWG tinned copper for 90% (physical) coverage

Inner shield: Aluminum mylar for 100% coverage

Cable lay: Twisted pair of conductors

Jacket: PVC rated for 105°C (220°F) at 300V (HP 92902A) PVC rated for 60°C (140°F) at 150V (Belden 9463)

Cable (electrical)*

Voltage rating: 300 Vrms

Resistance: 0.032 ohm/m

Capacitance (between conductors): 130 pF/m

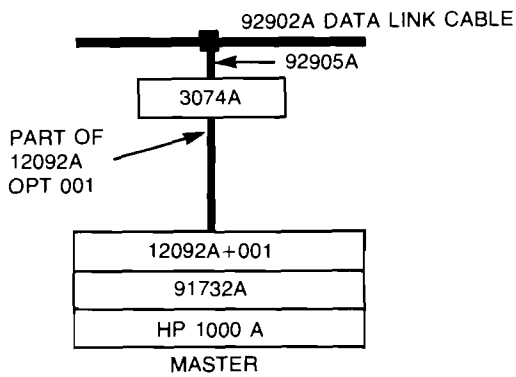
Inductance (between conductors): 0.65 μH

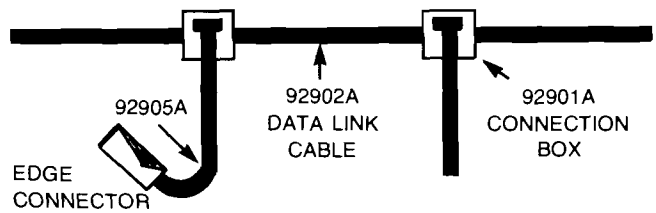
** Data Link voltage levels are compatible with RS-422 test equipment.*

Supported Devices and Data Link Adapters

Device	Product	Adapter
Computers	HP 1000 A-Series Master CPU HP 85, 86, and 87 Personal Computers	3074A 82966A and 3074A
Terminals and Printers	2645A/47A/48A/49B/49C/49G CRT Display Terminals 2624B/26A/29D/29F CRT Display Terminals 2673A Option 039 Intelligent Graphics Printer	3074A 13264A none required

Ordering information





Data Link components

92901A Five Data Link Connection Boxes

92902A* Shielded Twisted Pair Data Link Cable
Opt. 001: 100 metres
Opt. 002: 300 metres

92905A Data Link-to-Device Cable

**Belden cable, product number 9463, can be used in place of the HP 92902A cable.*

A-Series Master Computer

12092A Data Link Master Interface (includes interface, 5.17m (17 ft) 5061-4914 cable, and technical manual)

91732A Data Link Software with one of Use Options 600, 700, or 890 (includes software and technical manuals; one of Media Options 022, 041, 042, 044, or 051 must be specified)

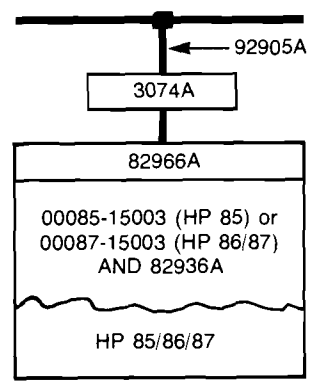
Opt. 022: 7908/11/12/14 compatible cartridge tape media
Opt. 041: 1.2Mb Flexible disc media
Opt. 042: Minifloppy disc media
Opt. 044: Microfloppy disc media
Opt. 051: 9-track 1600 bpi magnetic tape media
Opt. 600: Use in A600/A600+ Computer
Opt. 700: Use in A700 Computer
Opt. 890: Use in A900 Computer or any other A-Series Computer

3074A Data Link Adapter

92905A Data Link-to-Device Cable (one required for 3074A connection)

92909A Data Link Test Cable

92908A Data Link Tester



To Connect HP 85, 86, or 87 Order:

00085-15003 I/O ROM for **HP 85**

00087-15003 I/O ROM for **HP 86 or HP 87**

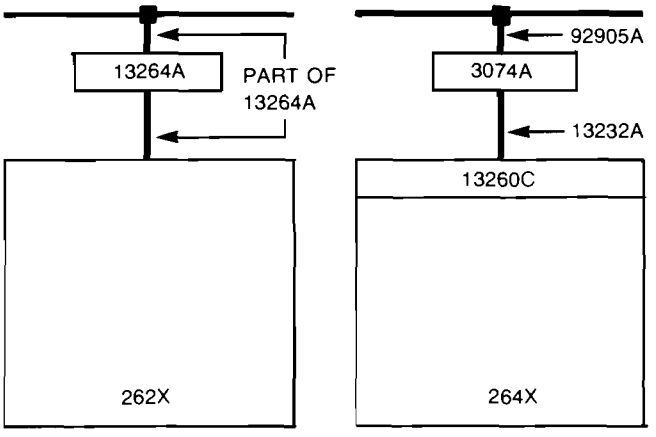
82936A ROM Drawer

82966A Series 80 Data Link Interface

3074A Data Link Adapter

92905A Data Link-to-Device Cable

92901A Five Data Link Connection Boxes, if needed



To Connect CRT Terminals Order:

262x Series:

2624B/26A/29D/29F CRT Display Terminal

13264A Data Link Adapter

92901A Five Data Link Connection Boxes, if needed

264x Series:

2645A/48A/49B/49C CRT Display Terminal with at least 4k bytes more memory than standard display

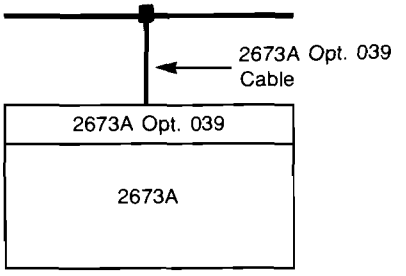
Opt. 033: Asynchronous Multipoint communication (13260C accessory)

13232A Terminal to Adapter Modem Cable

3074A Data Link Adapter

92905A Data Link-to-Device Cable

91901A Five Data Link Connection Boxes, if needed



To Connect HP 2673A Order:

2673A Intelligent Graphics Printer with Option 039 DSN Data Link Interface instead of standard HP-IB interface (includes cable)

92901A Five Data Link Connection Boxes, if needed

To Obtain Software Support Services Order:

91732T Customer Support Service for 91732A software (same media option as 91732A)

91732V Support for an additional copy of 91732A

91732S Software Subscription Service for 91732A software (same media option as 91732A)

91732W Right to Copy 91732S updates to One Additional System

91732Q Manual Update Service for 91732A software manuals

Data Link Software

HEWLETT PACKARD

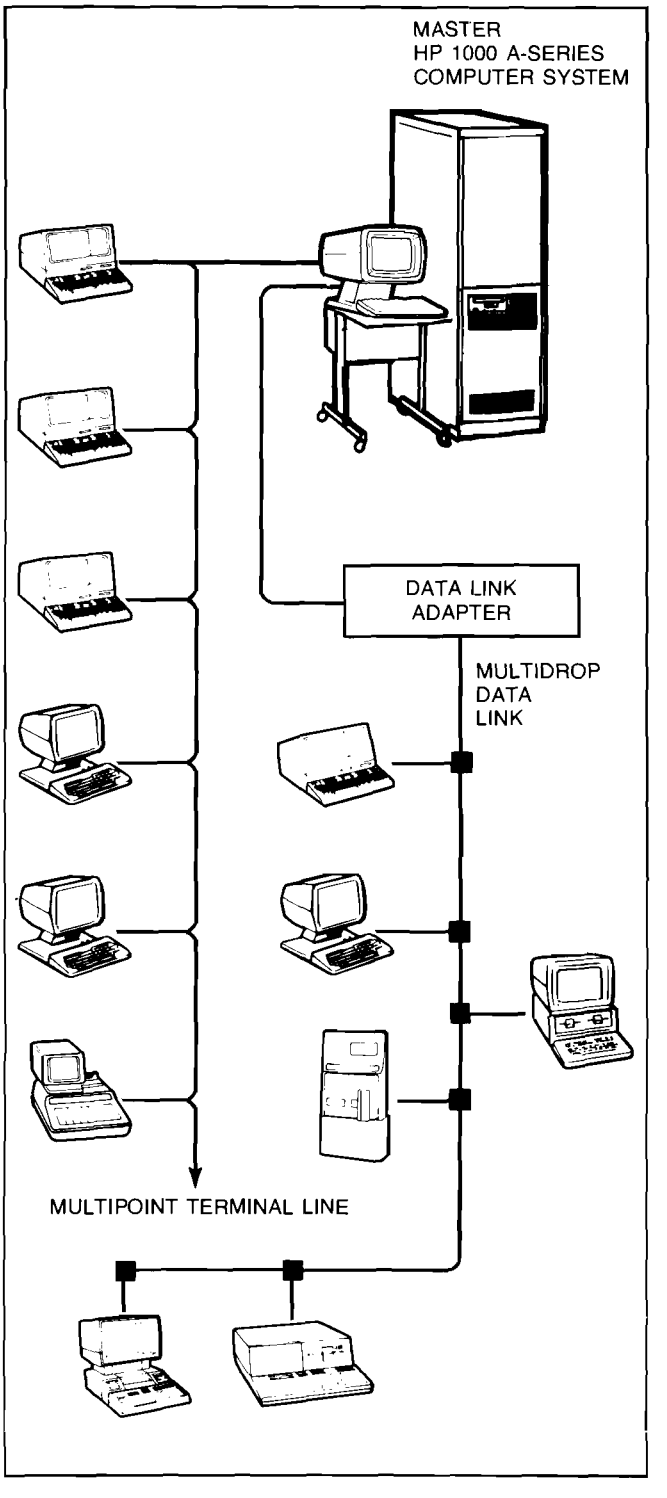
For HP 1000 A-Series Computers product number 91732A

The 91732A is a software package for multidrop Data Link Communication or multipoint terminal communication.

The multidrop Data Link communication link utilizes the 91732A software and 12092A Data Link Master Interface for communication and protocol handling. This data sheet covers the features of 91732A software common to multidrop Data Link and multipoint terminal as well as those only pertaining to the multipoint terminal communications. In a multipoint configuration, HP 2624B, 2626A, 2629D, 2629F, 2645A, 2647A, 2648A, 2649B, 2649C, and 2649G display terminals can be connected to an HP 1000 A-Series based computer system using the 12092A Data Link Master Interface. For detailed information on the Data Link, refer to the Data Link data sheet.

Features

- **Supports single I/O channel communication with multiple stations on a single communication line**
- **Program development and application program execution at terminals in both multipoint terminal and multidrop Data Link configurations on disc-based RTE-A systems**
- **Application program execution on memory-based RTE-A systems**
- **Computer-to-interface block transfers up to 2046 characters long at direct memory access rates**
- **Support for up to four 12092A Data Link Master Interfaces at 19.2k baud in an A-Series computer**
- **Multipoint master application program capability**
- **Multipoint network status program**
- **"Who-Are-You" command identification of terminals in a multipoint terminal connection (not available with multidrop Data Link connections)**
- **Automatic acknowledgement of data entry on multipoint terminals on both multipoint terminal lines and multidrop Data Link connections**
- **Group and line message broadcast capability**
- **Intelligent priority polling algorithm**
- **Power fail/auto restart program**
- **System functional tests for multipoint terminal lines and multidrop Data Link connections**
- **Supports communication with HP 1000 computers, and 9826/35/36/45 desktop computers and/or HP 85/86/87 personal computers in a multidrop Data Link configuration**



The 91732 software supports connection of multiple devices to HP 1000 Computers, via single hardwired, multidropped, modems, or Data Link communications lines, and the 12092A Data Link Master Interface.

Functional description

Multidrop Data Link

The HP 1000 Data Link is a multidrop communications link which utilizes the 91732A Software and 12092A Data Link Master Interface for communication between the master computer and slave stations connected to the Data Link. HP 9826/35/36/45 Desktop Computers, HP 85/86/87 Personal Computers, 262x and 264x Terminals, and 2673A+039 Printers can be connected to the Data Link. For more information about the Data Link, refer to the Data Link data sheet.

Multipoint and Data Link Usage

User-written application programs access devices connected either in multipoint terminal or multidrop Data Link configuration by their Logical Unit (LU) number. Reading from and writing to devices is supported from both FORTRAN 77 READ/WRITE statements and RTE EXEC calls. Each device can be running under the control of its own unique application program for read and write only. Therefore, a single communications line can be shared and effectively utilized. The multipoint interface queries the status of all devices in sequence such that: (1) Pending Read, Write, and Control requests to a device can be serviced, and (2) an enabled device can be "routinely polled" and thereby get RTE system attention or can schedule a program in the multipoint master computer. This querying process is TRANSPARENT to the user's application program. Users of multipoint line and multidrop Data Link terminals can utilize programs such as RTE File Manager, Edit/1000 (screen mode not supported), and the FORTRAN 77, Pascal/1000, and BASIC/1000C compilers.

Data Transfer Mode

All data transfers between the buffer on the 12092A interface and the user's application program are done via direct memory access. All devices operate in block mode.

Support of User-Written Master Application Programs

The 91732A software supports user-written master application programs for communication and control of devices in both a multipoint terminal line or a multidrop Data Link configuration.

Auto Acknowledgement

The 91732A software optionally provides for an audible auto acknowledgement at any terminal in both a multipoint line and multidrop Data Link configuration. As soon as the 12092A interface has unloaded a message to the computer system, an audible response is sounded at the terminal, alerting the operator that data can now be entered.

Multipoint Status Display

The 91732A software includes a dynamic status program (DYNST) which displays pertinent information about all currently active multipoint lines and multidrop Data Links and stations. By data link lines, it displays available LUs, line configuration, and cumulative statistics on line performance, including numbers of good blocks received and transmitted, NAKs transmitted, and received, etc. It also displays device status, including the LUs on each line, DVT and IFT availability, and request type. The station used by DYNST can be a terminal on a multipoint line or multidrop Data Link.

Terminal Status Querying and Initialization

A "Who-Are-You" command is available to the application programmer. It obtains the device identification and status of every operational (power turned on) terminal within a group of terminals. This is NOT available on a multidrop Data Link configuration, only on a multipoint terminal line. A Group is a logical subset of all terminals connected to the multipoint line. The terminals respond in the sequence of their physical position within the group. If the system is suitably generated, it is possible to programmatically initialize all the terminals within the group.

Alternatively, all devices and terminals in multipoint line and multidrop Data Link configurations can be initialized by FMGR commands from a system terminal.

Message Broadcasting

The 91732A software provides the capability to broadcast a message simultaneously to all terminals in a group, or all of the terminals on a multipoint line or multidrop Data Link.

Transparent Transmission

The 91732A software and interface card firmware support the transparent transmission of binary files as well as ASCII characters.

Intelligent Terminal Servicing

The 12092A interface firmware includes a priority polling algorithm. The user configures each device to be at one of four priority levels. The 12092A firmware polls each priority level twice as often as the next lower level. Completion of communication for a device being serviced has higher priority than all polling.

Data Link Utilities

AUTO7	Power fail restart program.
CONFG	Configuration report program.
VERDL	Program for verifying operation of devices on the data link.
DYNST	Program for reporting status of devices on the data link.
AEXMP	Program for exercising terminals on the data link.

System Level Exerciser

A system-level exerciser program (AEXMP) is supplied with the 91732A software. The exerciser sends a specified terminal one or more lines of data, and causes the same lines of data to be transmitted back to the exerciser program for verification.

System Functional Tests

The system functional tests (VERDL) supplied with the 91732A software are designed for verification of communication between the master computer and stations connected to either the multidrop Data Link or multipoint terminal line.

Functional specifications

Interfaces and Data Rates

Number of 12092A interfaces supported: 4

Maximum data rate (k bps): 19.2

Compatible Multipoint terminals

2624B, 2626A, 2629D, 2629F, 2645A, 2647A, 2648A, 2649B, 2649C, and 2649G display terminals.

Multipoint Modem Support

Multidropped Bell 202T Modems are supported over leased Bell System Multipoint Lines, with the restriction that group I.D.s cannot go across multiple drops.

Compatible multidrop Data Link devices.

See the Data Link data sheet.

Number of Terminals Per Multipoint Line

Normally, up to 32 terminals can be connected to the 12092A interface via a single multipoint line. The following three factors determine the number of terminals which can be connected:

1. The number of terminals that can be *physically* connected depends upon the transmission mode. Asynchronously, up to 32 terminals can be *physically* connected; the distance between any two terminals can be 609 metres (2000 ft), provided that the total line length does not exceed 4876 metres (16000 ft), regardless of transmission speed up to a maximum distance between any two terminals is also 609 metres (2000 ft) and maximum total line length is also 4876 metres (16000 ft), but the number of terminals per line depends upon the average distance between terminals and line speed, as summarized in Table 1.
2. The maximum number of *logically connectable* terminals may be constrained by the logical unit number capacity of the RTE operating system in which the 12092A and its supporting 91732A software are operated.
3. Finally, the number of terminals that can be *realistically* supported depends upon the amount of text character I/O generated by each terminal on the line, the length of those text blocks, the speed of the line itself, and other user-dependent requirements, such as response time.

Table 1. Average line lengths between multipoint terminals on a synchronous line

Terminals per line	Average line length versus line speeds of: 2400 bps	4800 bps	9600 bps
4	609m (2000 ft)	609m (2000 ft)	609m (2000 ft)
8	609m (2000 ft)	609m (2000 ft)	365m (1200 ft)
16	609m (2000 ft)	365m (1200 ft)	146m (480 ft)
32	365m (1200 ft)	146m (480 ft)	36.5m (120 ft)

RTE System Capabilities Accessible From Multipoint Line and Multidrop Data Link Terminals

The 91732A software gives multipoint line and multidrop Data Link stations the same access to system capabilities as non-multipoint terminals, except that:

1. Intra-line character edits (CTRL/R,I,C,T to Replace, Insert, Cancel, or Truncate characters) are not effective in the multipoint environment wherein whole lines are transmitted to Edit/1000 at a time. However, the multipoint terminals have the intelligence, buffering, and predefined keys to support selective forward tab spacing and backspacing, and the replacement, insertion, or deletion of characters within a line without interrupting the 12092A interface. The screen mode of Edit/1000 is not available on multipoint line and multidrop Data Link terminals.
2. Terminal peripherals, such as Mini cartridges, are addressed as subchannels to the Terminal Logical Unit. Therefore, while user-written multipoint subroutines can access the terminal peripherals, there is no direct interface between the RTE File Manager and those peripherals.

Power Fail Restart

Working in conjunction with the RTE power fail/auto restart driver ID.43, a power fail restart program (AUTO7) furnished with the multipoint software resets each 12092A interface in the system so that I/O may resume after a power failure. A power failure message is broadcast to all multipoint terminals on the system.

Approximate Memory Requirements

AUTO7: 10 kb

CONFG: 30 kb

VERDL: 10 kb

DYNST: 32 kb

AEXMP: 14 kb

Ordering information

91732A Data Link Software (Must order Use Option 600, 700, or 890)

The 91732A product includes:

1. Software on media option 022, 041, 042, 044, or 051, **one of which must be ordered.**
2. 91732-90001 Data Link/Multipoint Subsystem Reference Manual

91732A Media Options

022: Provides 91732A Software on 7908/11/12/14 compatible cartridges.

041: Provides 91732A Software on 1.2M byte flexible disc for 9895A.

042: Provides 91732A Software on minifloppy discs for Model 6 Microsystem.

044: Provides 91732A Software on microfloppy disc.

051: Provides 91732A Software on 1600 bpi, 9-track magnetic tape.

91732A/R Use Options

600: Use in A600/A600+ Computer.

700: Use in A700 Computer.

890: Use in A900 Computer or any other A-Series Computer.

91732R Right to Copy 91732A Software For Use on an Additional Computer System

The 91732R Right to Copy product is available only to customers who have purchased a license to use 91732A. 91732R, which must be ordered with one of Use Options 600, 700, or 890, consists of:

1. The right to make one copy of software purchased with the 91732A product for use on an additional system.
2. 91732-90001 Data Link/Multipoint Subsystem Reference Manual.

Software support products available

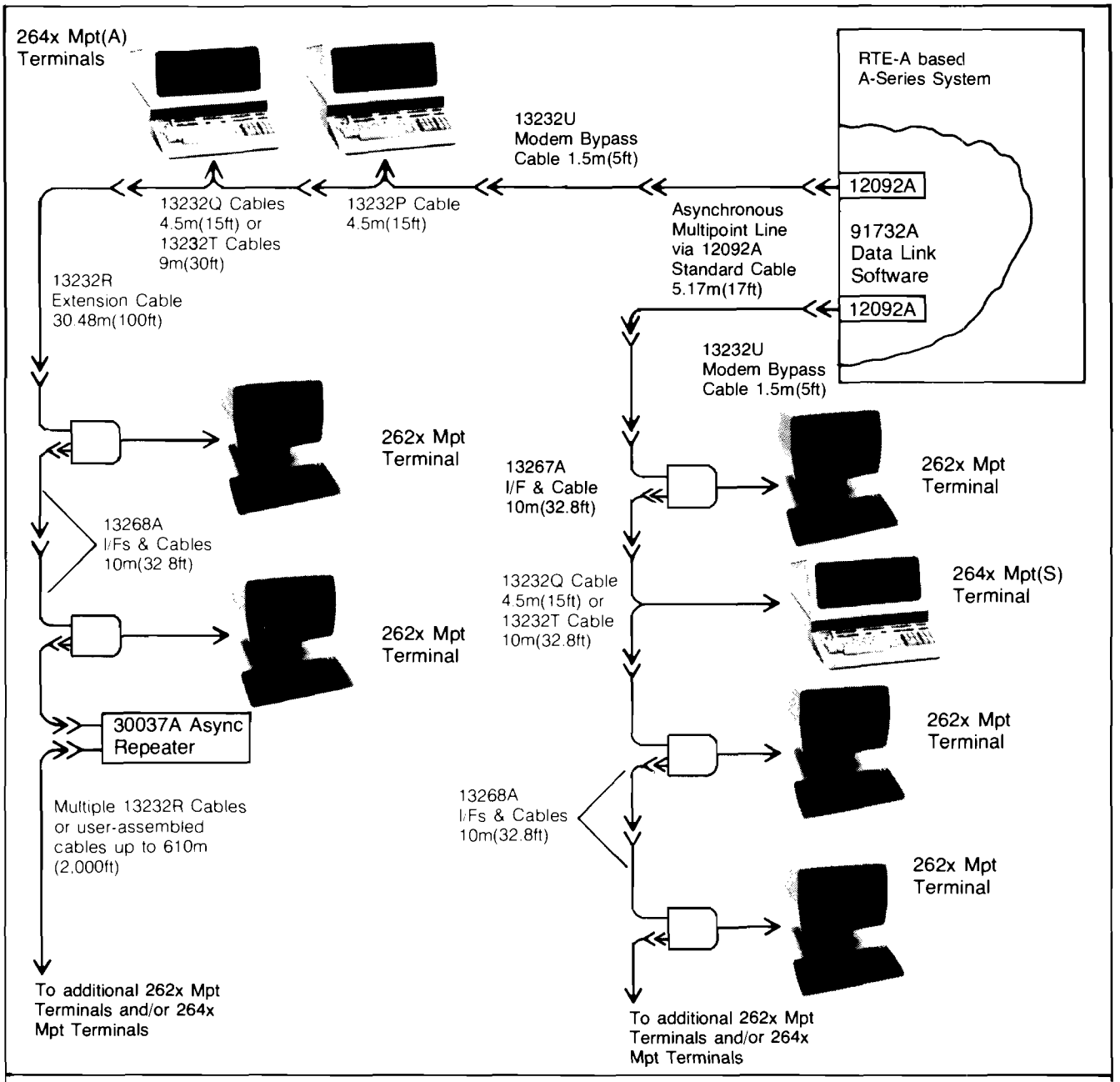
99086D+C00 **Category Support for Data Comm "B" Software**

91732A+S00 **Software Materials Subscription (SMS)**

91732A+W00 **Extended SMS**

Information on the coverage provided by these products is presented in HP Software Support Program data sheets, which are available from your HP Sales Representative.

HP 1000 A-Series Sample Multipoint Line Connection Configurations



LEGEND:

264x Mpt	=	2645A/48A/49B/49C terminal with Async multipoint option 033 (or 13260C accessory) and at least 4kb more than standard display memory.
262x Mpt	=	2624B/26A/29D/29F terminal with 13267A Async multipoint interface pod for first terminal on the line, 13268A Async multipoint interface pod for each additional terminal on the line.
13232P	=	Modem multipoint cable to first 264x Mpt terminal on the line.
13232Q	=	Multipoint continuation cable to 264 Mpt terminal that is not the first terminal on the line.
13232T	=	Power protect multipoint continuation cable to 264x Mpt terminal that is not the first terminal on the line.

DSN/Multileaving Remote Job Entry (DSN/MRJE) is a subsystem of the HP 1000 that supports RTE-6/VM or RTE-A disc-based Hewlett-Packard A/E/F-Series computer systems for Multileaving Remote Job Entry. With the DSN/MRJE facility, the HP 1000 emulates the major facilities and capabilities of workstations that work with one of the following Job Entry Systems on the host: HASP II (Version 4 or later), JES2 or JES3.

Features

- **Emulation of an IBM HASP multileaving workstation**
- **Support for connections to HASP II (version 4 or later), JES2, and JES3 job entry systems**
- **Support under RTE-A as well as RTE-6/VM**
- **Queued mode device assignment for output**
- **Standard mode device assignment for input and output**
- **Interactive and programmatic scheduling of batch jobs**
- **Concurrent access to the host for up to seven users**
- **Concurrent usability of other processing facilities of the HP 1000 system**
- **Any supported input/output device or file on the HP 1000 may be used to submit job input or receive job output**
- **Workstation console commands may be issued from any MRJE session terminal, which can be any terminal connected to the HP 1000 system**
- **Extensive help facility for the user**
- **Usability of switched (dial-up) or leased (dedicated) communication lines**
- **Line speeds up to 9600 bps**
- **Uses intelligent interface that minimizes communications overhead on the computer**

Functional description

The 91782A DSN/MRJE 1000 and a 12043A/12260A interface equips an HP 1000 computer to emulate a workstation operating with a HASP II (Version 4 or later), JES2, or JES3 Job Entry System on the Host. With this facility, multiple users of the HP 1000 can concurrently transfer batch jobs to and receive output from an IBM system or IBM plug-compatible system.

DSN/MRJE 1000 provides two modes of device assignment, standard and queued output. In standard mode, each assigned HP 1000 output device (LU or file) can receive a single job output from the host automatically. After job output returns, the HP 1000 device is unlocked (unassigned). The user reassigns the device to receive another job output. Standard mode is used to submit all jobs to the host.

Queued output mode allows DSN/MRJE users to queue HP 1000 supported output devices (lu or a set of files). Once a device is queued, multiple user's output can return automatically to the queued device. Queued output mode eliminates the need for user intervention in receiving multiple jobs to an output device.

Output can be received by HP 1000 supported output devices or files and jobs can be submitted to the host via HP 1000 supported input devices or files.

With DSN/MRJE 1000, users can interactively or programmatically schedule the transfer of batch jobs to the host and receipt of batch output from the host. Use of DSN/MRJE does not require the dedication of the entire system; other subsystems of the HP 1000 system can be used concurrently with DSN/MRJE 1000. An extensive help facility prompts the user with an explanation of what inputs are expected. Users can issue workstation console commands for controlling host job activity from any terminal on the HP 1000 system. A powerful set of ten commands is provided for job control (see Table 1).

Table 1. DSN/MRJE 1000 User Commands

COMMAND	FUNCTION
ASSIGN	Associates a DSN/MRJE virtual device with an RTE file name or device for transferring a data set to or from the host
CONFIGURE	Defines or modifies DSN/MRJE configuration
DISPLAY	Displays DSN/MRJE configuration information
CONSOLE	Assigns user's terminal to be the DSN/MRJE console
EXIT	Terminates the DSN/MRJE session
SIGNOFF	Shuts down the communications link with the host processor
SIGNON	Establishes communications with the host
TRANSFER	Reads DSN/MRJE commands from a file until an EXIT command or end of file is read
USE	Sets DSN/MRJE to the configuration specified in a configuration file
HELP	Provides a brief description of a DSN/MRJE command or about help itself

DSN/MRJE 1000 supports switched (dial-up) lines or leased (dedicated) lines at line speeds up to 9600 bps. An intelligent, microprocessor-based communication card offloads line protocol functions from the computer, freeing it for other tasks. The (12043A or 12260A) card handles generation and checking of the multileaving bisync protocol, CRC-16 block check error control, and modem control.

DSN/MRJE 3000 has a superset of user capabilities as compared to DSN/MRJE 1000, as summarized in Table 2.

Table 2. DSN/MRJE 1000 – DSN/MRJE 3000 Comparison

COMPARISON ITEMS	DSN/MRJE 1000	DSN/MRJE 3000
Emulation of multileaving workstation	Yes	Yes
Supported under	RTE-A and RTE-6/VM	MPE
Usable host job entry systems	HASP II, JES2, and JES3	HASP, JES2, JES3, and RES
Programmatic scheduling	Yes, via RTE	Yes, via MPE
Number of concurrent multiple users	Up to seven	Limited by the number the HP 3000 can support
Input queueing of jobs	No	Yes, provides job management capabilities*
Usability of any supported I/O device	Yes	Yes
Number of input streams	Up to seven	Up to seven
Number of output streams	Up to eight	Up to seven
Host console commands from any user terminal	Yes	Yes
Job output queueing (Automatic reception of jobs)	Yes	Yes, provides job management capabilities*
Concurrent use with other software subsystems	Yes	Yes
Help facility	Yes	Customizable error and help messages
Hot printer support	Yes	Yes
Spooled printer support	No	Yes, provides job management capabilities*
Flexible, easy-to-use commands	Yes	Yes, provides job management capabilities*
Uses intelligent interface card	Yes (PSI)	Yes (INP)
Job output automatically transmittable to other DSN/DS nodes	No	Yes
Maximum modem data rate	9600 bps	9600 bps
Supports both switched and leased lines	Yes	Yes
Concurrent communication with multiple hosts	No	Yes

** DSN/MRJE on the HP 3000 provides job management features such as job input and output spooling, using the banner to route output, and individual user capabilities that are not available on DSN/MRJE 1000. Please see the DSN/MRJE 3000 reference manual and data sheet for product details.*

Functional specifications

Compatible Job Entry Systems

HASP II (Version 4 or later),
JES2, or
JES3

Communications Protocol

Multileaving bisynchronous (conversational mode) link level protocol.

Job Stream Capacity

There can be 17 job streams interleaved on a single line, including:

- Seven card reader streams
- Eight printer/card punch streams
- One console device (one input stream and one output stream)

Compatible Modems

RS-232-C Modems: Bell 201C (2400 bps)
Bell 208A (4800 bps leased line)
Bell 208B (4800 bps switched line)
Bell 209A (9600 bps leased line)

RS-449 Modems: Bell 2024A

Supported Printers

A-Series: 2631B with option 214
2608S with option 214

E/F-Series: 2608A with option 210 or 26099A interface
2608S with option 210
2617A with option 100 or 12845B interface
2619A with option 100 or 12845B interface
2631B with option 210

Supported carriage control features: When used with driver type Dxx12, DSN/MRJE provides the following carriage control features, subject to the capabilities of the particular printer used:

1. Spacing before or after print
2. Page eject before or after print
3. Overprint and printer channel control

Product requirements

Local System

A disc-based A/E/F-Series computer system operating under RTE-A or RTE-6/VM.

NOTE: DSN/MRJE 1000 works only with the File Manager in RTE-A and RTE-6/VM, not with the new Command Interpreter file system in RTE-A.

Local System Memory

The DSN/MRJE subsystem requires 96k bytes plus 6k bytes for each user. DSN/MRJE also requires the minimum amount of disc storage necessary to store files using the RTE file manager.

Printer Carriage Control Support

Driver type Dxx12 is required for carriage control.

Communications Interface in Local System

In A-Series system: 12043A Programmable Serial Interface.

In E/F-Series system: 12260A Programmable Serial Interface.

User-Furnished Modem

One of the compatible modems listed above.

Communications Line

A switched (dial-up) or leased (dedicated) telephone line between the modem at the HP 1000 system and the modem at the host system.

Job Entry Requirement

The host must support one of the following Job Entry Systems: HASP II (Version 4 or later, JES2, or JES3.

Installation and customer Responsibilities

1. Installation is not included with DSN/MRJE for the HP 1000. It is therefore the responsibility of the customer, although Hewlett-Packard will provide installation service on request at prevailing service rates, to install the product.
2. Installation of all communication facilities (cables and/or modems) and their connection to the HP 1000 computer system equipped with DSN/MRJE is the customer's responsibility.
3. The establishment of successful communication between the HP 1000 computer system equipped with DSN/MRJE and the host is the customer's responsibilty.
4. Prior to the customer's installation of DSN/MRJE on the HP 1000, the customer is responsible for installation of a switched or non-switched synchronous communications line between the HP 1000 system and the host mainframe system. This line must be matched with a pair of modems that are compatible with DSN/MRJE 1000 at each end of the line. The customer should also conduct appropriate tests to ensure that the line and modems are functioning properly.
5. Also prior to installation of the DSN/MRJE product on the HP 1000, the customer should arrange installation of the necessary host mainframe system software and hardware to support DSN/MRJE, and arrange installation of the host mainframe software in a compatible manner to the intended use of DSN/MRJE and consistent with the specifications of DSN/MRJE. Non-standard modifications to host system software may prevent operation of DSN/MRJE. Hewlett-Packard does not warrant the successful operation of DSN/MRJE if modifications have been made.

Ordering information

91782A Right to Use DSN/MRJE

The 91782A product, which must be ordered with one of Use Options 600 through 891, consists of:

1. DSN/MRJE 1000 software on one of Media Options 020 through 051, **one of which must be ordered.**
2. 91782-90001 DSN/MRJE Programmer's Reference Manual (includes software numbering catalog).
3. 91782-90003 DSN/MRJE customer course "A Guide for New Users".

91782A Media Options

020: Provides 91782A software/updates on 264x minicartridges.

022: Provides 91782A software/updates on 7908/11/12/14 compatible cartridge tape.

041: Provides 91782A software/updates on 8-inch flexible disc.

042: Provides 91782A software/updates on 5.25-inch flexible (minifloppy) disc .

044: Provides 91782A software/updates on 3.5-inch (microfloppy) disc.

050: Provides 91782A software/updates on 800 bpi, 9-track mag tape.

051: Provides 91782A software/updates on 1600 bpi, 9-track mag tape.

91782A Use Options

600: Use in A600/A600+ system.

601: Upgrade from previous version of 91782A option 600 to latest version of same for user not on support service.

700: Use in A700 or E/F-Series system.

701: Upgrade from previous version of 91782A option 700 to latest version of same for user not on support service.

890: Use in A900 system.

891: Upgrade from previous version of 91782A option 890 to latest version of same for user not on support service.

91782R Right to Copy DSN/MRJE

The 91782R product is available only to customers who have purchased a Right to Use 91782A. 91782R, which must be ordered with one of Use Options 600 through 891, consists of:

1. The right to make one copy of software purchased with 91782A for use on one additional system.
2. 91782-90001 DSN/MRJE Programmer's Reference Manual (includes software numbering catalog).
3. 91782-90003 DSN/MRJE customer course "A Guide for New Users".

91782R Use Options

600: Use in A600/A600+ system. Prerequisite is 91782A option 600.

601: Upgrade to latest version of 91782 for use on A600/A600+ system for customers not on software support service. Prerequisite is 91782R option 600 and 91782A option 601 or current software support service on another node.

700: Use in A700 or E/F-Series system. Prerequisite is 91782A option 700.

701: Upgrade to latest version of 91782 for use on A700 or E/F-Series system for customers not on software support service. Prerequisite is 91782R option 700 and 91782A option 701 or current software support service on another node.

890: Use in A900 system. Prerequisite is 91782A option 890.

891: Upgrade to latest version of 91782 for use on A900 system for customers not on software support service. Prerequisite is 91782R option 890 and 91782A option 891 or current software support service on another node.

Software Support Products Available

99087D+C00 **Category Support for Data Comm "C" Software**

91782A+S00 **Software Materials Subscription (SMS)**

91782A+W00 **Extended SMS**

Information on the coverage provided by these products is presented in HP Software Support Program data sheets, which are available from your HP Sales Representative.

HP 1000 Communications Interfaces Summary Supplement

Product and Opt Numbers	Interface Name and Description	Specifications (Capacity, Logic Levels, Data Rates, etc.)
NEW A-SERIES COMMUNICATIONS INTERFACES		
12041A	MULTI-USE 8-CHANNEL MULTIPLEXER for use with 94200A/94201A Programmable Controller Interface/1000 (PCIF/1000) software operating under RTE-A. The 12828A RS-232-C Multiplexer panel is also required. The 12041A Interface includes systems. The interface includes: 1. 5061-3427 Interface card. 2. 5180-1968 Self-test/download EPROM (installed). 3. 5061-3467 80-pin edge connector kit. 4. 5061-4901 Test connector. 5. 5955-7631 Installation manual.	CAPACITY: Up to 8 ports per multiplexer. BUFFERING: Two 254 byte transmit buffers and two 254 byte receive buffers for each channel. INTERFACE LEVEL: RS-423A/RS-232-C and CCITT V.24. PROGRAM-SELECTABLE DATA RATES: 19200, 9600, 4800, 2400, 1200, 300, 150, 134.5, 110, 75, and 50 bits/second. COMMUNICATION MODE: Asynchronous, bit-serial.
12828A	RS-232-C MULTIPLEXER PANEL for use with 12041A or 12261A Multiplexer. The panel is included with 12040B/12792B Mulitplexer and includes 1. 12828-60001 Multiplexer panel. 2. 12828-00004 Rack mounting bracket (accommodates two multiplexer panels). 3. 12828-60002 3m (10 ft) Interface Cable. 4. 12828-60003 Connector kit for user-fabricated extension cable. 5. 12828-90001 Installation manual.	CAPACITY: Eight 25-pin female RS-232-C connector ports with three-wire RS-232-C interface to each port. MOUNTING: The multiplexer panel may be rack mounted using included hardware or may be used standing on its own rubber feet on a desk, table, or shelf. MAXIMUM CABLE LENGTH: 91m (300ft) from multiplexer interface to multiplexer panel. PANEL TO PROGRAMMABLE CONTROLLER CONNECTION CABLES: See the 94200A/94201A PCIF/1000 data sheet or the 92140A PCL/1000 data sheet.
12043A -001	MULTI-USE PROGRAMMABLE SERIAL (modem) INTERFACE for use with 91782A DSN/MRJE 1000 Multileaving Remote Job Entry software. The interface includes 1. 5061-4912 Interface card. 2. 5180-1966 Self-test/download EPROM installed with 1258-0124 jumper plugs as required and appropriate. 3. 5061-4914 5.17m (17 ft) RS-232-C Interface Cable. 4. 5061-4916 PSI Diagnostic Test Hood. 5. 5955-7630 Installation manual. 5061-4923 5.17m (17 ft) RS-449 Interface Cable instead of 5061-4914 RS-232-C cable.	TRANSMISSION MODE: Full or half duplex, bit-serial synchronous or asynchronous.
12092A -001	DATA LINK MASTER INTERFACE for use with 91732A Data Link Software operating under RTE-A. The interface includes: 1. 5061-4912 Interface card. 2. 12092-80001 and 80002 ROMs. 3. 5061-4914 5.17m (17 ft) Interface Cable. 4. 5061-4916 PSI Diagnostic Test Hood. 5. 5955-7632 12092A Firmware Manual. 6. 12042-91001 Programmable Serial Interface manual. Provides the latest Data Link ROMs and firmware manual (deletes other parts of interface).	COUNTERPART SLAVE INTERFACE: 12072A in A/L-Series computer. INTERNALLY-CLOCKED, SWITCH-SELECTABLE DATA RATES: 19200, 9600, 4800, 2400, 1800, 1200, 600, and 300 bits/second. 19200 bits/second rate is supported only in data link configuration, not in multipoint configuration. PHYSICAL INTERFACE: EIA RS-449, RS-232-C, and CCITT V.28, 5V differential voltage level with 120V dc isolation from ground. MESSAGE PROTOCOL: Asynchronous HP Multipoint, similar to IBM Bisync. NUMBER OF DEVICES: Up to 64. MESSAGE BLOCK SIZE: 16 to 2032 characters. CHARACTER BUFFERING: Two 2032 byte input buffers and three 2032 byte output buffers.
37222A	INTEGRAL MODEM CARD for terminal communication via direct connection to telephone line and remote modem from A-Series system operating under RTE-A or L-Series system operating under RTE-XL or RTE-L. The interface includes: 1. 37222-60001 Plug-in modem card. 2. 37222-60002 Telephone line connector module. 3. 37222-80001 firmware ROM. 4. IAF5-6001 I/O Processor chip.	COMMUNICATION MODES: Full-duplex, asynchronous data on dial-up lines, Bell 212A/103/113 compatible. Modes: 212A/V.22 mode; 103/113 mode Data Rates: 1200 bps; 300 bps Trans Rate Tol: +/-0.01%; +/-0.01% Rec Rate Tol: +1%/-2.5%; +/-4% Modulation Type: Four-phase differential phase shift keyed; Binary phase coherent frequency shift keyed CHARACTER LENGTH: 10 bits (1 start bit, 8 data bits, 1 stop bit)

HP 1000 Communications Interfaces Summary Supplement, continued

Product and Opt Numbers	Interface Name and Description	Specifications (Capacity, Logic Levels, Data Rates, etc.)
NEW A-SERIES COMMUNICATIONS INTERFACES, continued		
37222A	INTEGRAL MODEM CARD, continued MODEM-TO-TELEPHONE LINE ACCESSORY CABLES 15561A 2.1m (7 ft) Modem Telephone Cable with Bell modular telephone jack 15562A 3m (9.8 ft) Modem Telephone Cable w/British Telecom modular telephone jack 15563A 3m (9.8 ft) Modem Telephone Cable with spade terminals	TRANSMIT LEVEL: -9 dBm maximum (600 ohm impedance) allowing permissive connection as defined in Part 68 of FCC Rules. V.22 GUARD TONE: 180 Hz, 6 dB below main power level, switchable V.22 CALLING TONE: Single tone 0.5s on, 4s off, switchable AUTO-DIAL: 10 +/-1 pps pulse dial rate with 39% make/61% break duty cycle in North America, 33% make/67% break duty cycle in U.K., switch-selectable, 4 second pre-dial delay, and 3 second minimum delay between completion of one call and start of the next AUTO-REDIAL: 0 to 8 redials, programmable, before failure report, 60 seconds between successive redials, 40 second failed call delay after last digit dialed TANDEM DIALING: Pauses may be inserted in the dialing sequence to allow dialing through a PBX AUTO-ANSWER: Automatic speed detection of the calling modem and configuration of computer port speed with a minimum of one ring cycle ring detect delay AUTO-DISCONNECT: Auto-answer mode disconnects after 16-18 seconds if no carrier is received. Auto-dial mode disconnects in 40 seconds after last digit dialed if no answer is received. Loss of carrier for 1.2 seconds results in disconnect, drop-outs shorter than 1 second are ignored. Replacement of carrier by voice or tone causes disconnect within 15 seconds after start of false signal, a response that is switchable.
NEW M/E/F-SERIES COMMUNICATIONS INTERFACES		
12260A -001	MULTI-USE PROGRAMMABLE SERIAL (modem) INTERFACE for use with 91782A DSN/MRJE 1000 Multileaving Remote Job Entry software. The interface includes 1 5061-4913 Interface card 2 5180-1966 Self-test/download EPROM 3 5061-4914 5.17m (17 ft) RS-232-C Interface Cable 4 5061-4916 PSI Diagnostic Test Hood 5 5955-7630 Installation manual 5061-4923 5.17m (17 ft) RS-449 interface Cable instead of 5061-4914 RS-232-C cable.	TRANSMISSION MODE: Full or half duplex, bit-serial synchronous or asynchronous.
12261A	MULTI-USE 8-CHANNEL MULTIPLEXER for use with 92140A PCL/1000-AB Programmable Controller Link/1000 software operating under RTE-6/VM. The 12828A RS-232-C Multiplexer panel (previous page) is also required. The 12261A Interface includes: 1 5061-3415 Interface card 2 5180-1968 Self-test/download EPROM 3 5061-3467 80-pin edge connector kit 4 5061-4901 Test connector 5 5955-7631 Installation manual.	CAPACITY: Up to 8 ports per multiplexer. BUFFERING: Two 254 byte transmit buffers and two 254 byte receive buffers for ach channel. INTERFACE LEVEL: RS-423A/RS-232-C, and CCITT V.24 PROGRAM-SELECTABLE DATA RATES: 19,200, 9600, 4800, 2400, 1200, 300, 150, 134.5, 110, 75, and 50 bits/second. COMMUNICATION MODE: Asynchronous, bit-serial.

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