# DMF32 MULTIFUNCTION COMMUNICATIONS CONTROLLER

The DMF32 is an intelligent, high-performance, communications controller that enables a combination of modems and terminals to communicate with the VAX-11/730™ computer system.
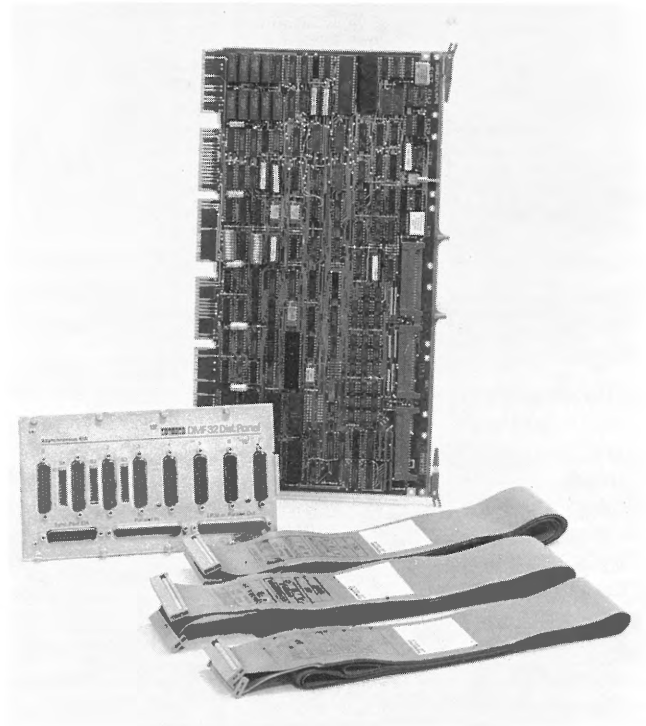
The DMF32 controller contains an eight line asynchronous interface for operation with modems and terminals, a single line synchronous interface for connection to a network communication facility, and a parallel interface for operating a line printer or a user developed device.

The use of the Direct Memory Access (DMA) mode and SILO's (first-in, first-out buffers) in the controller permit fast data transfers and reduced interrupt overhead of the Central Processor Unit (CPU).

The DMF32 operation is supported by the VAX/VMS™ (Virtual Memory System) version 3 software.

## HIGHLIGHTS

- Concurrent operation of three controllers contained on one hex height module
- Two of the eight asynchronous channels provide full modem control and individually selectable transmit and receive baud rates.
- Six asynchronous channels for local terminal communication with no modem controls.
- One DMA synchronous channel with low level support for byte oriented protocols (DDCMP) and bit oriented protocols.
- General Purpose DMA or SILO mode parallel interface for connection to a user specific device or intelligent DMA line printer controller.
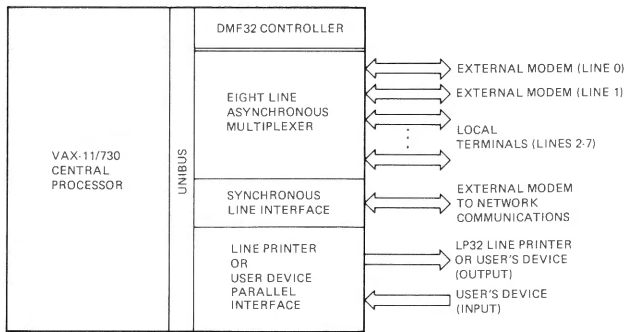
## DESCRIPTION

The DMF32 Multifunction Communications Controller is a UNIBUS™ compatible option that enables three Input/Output (I/O) devices to operate concurrently with the VAX-11/730 computer system. The controller contains an eight channel asynchronous multiplexer interface, a single channel synchronous line interface, and a combination general purpose parallel interface which operates with either a line printer or a user device.

The asynchronous line interface provides transmit and receive lines for eight asynchronous devices. Two of these channels include full modem control with individually selectable baud rates for the transmit and receive lines. The remaining six channels are available for local video terminals such as the VT100™ series.

The synchronous line interface can be connected to a network communication facility through an external modem. In a DECnet™ communication network, the synchronous line may operate either as a point-to-point station or as a multipoint tributary station.

The line printer interface provides data and control signals to a high speed line printer. The printing speed of the device can be up to 1200 lines per minute. When the line printer interface is connected for operation the general purpose user's interface cannot be used.

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DMF32 CONTROLLER

VAX-11/730 CENTRAL PROCESSOR

UNIBUS

EIGHT LINE ASYNCHRONOUS MULTIPLEXER

EXTERNAL MODEM (LINE 0)
EXTERNAL MODEM (LINE 1)
LOCAL TERMINALS (LINES 2-7)

SYNCHRONOUS LINE INTERFACE

EXTERNAL MODEM TO NETWORK COMMUNICATIONS

LINE PRINTER OR USER DEVICE PARALLEL INTERFACE

LP32 LINE PRINTER OR USER'S DEVICE (OUTPUT)
USER'S DEVICE (INPUT)

The general purpose interface transfers 16-bits of data between a user specific device and the VAX-11/730 system. The signal levels are TTL compatible.

The maximum throughput rate of the interfaces contained on the DMF32 controller is dependent on the applications programs and on the number of modems and devices connected to the controller.

Software support is included in the VAX/VMS version V3.0 operating system and on DECnet VAX version 3.0 software. The 16-bit parallel interface is supported only with sample driver documentation since the user device driver is designed for specific customer applications.

### Asynchronous Multiplexer Interface

The asynchronous multiplexer interface consists of eight channels. Each channel has a transmit and receive line for communication with a modem or terminal. The transmit and receive lines can be programmed to operate at one of 16 baud rates of from 50 bits per second to 19.2 kbits per second. Two of the channels (lines 0 and 1) provide full modem control and split speed capability to allow the transmit and receive baud rates to be independently selected.

The baud rates that can be selected for each serial line are listed as follows:

| Desired Baud Rate | Actual Baud Rate | Deviation % |
|---|---|---|
| 50 | 50 | 0.0 |
| 75 | 75 | 0.0 |
| 110 | 110 | 0.0 |
| 134.50 | 134.52 | 0.0166 |
| 150 | 150 | 0.0 |
| 300 | 300 | 0.0 |
| 600 | 600 | 0.0 |
| 1200 | 1200 | 0.0 |
| 1800 | 1800 | 0.0 |
| 2000 | 2005 | 0.253 |
| 2400 | 2400 | 0.0 |
| 3600 | 3600 | 0.0 |
| 4800 | 4800 | 0.0 |
| 7200 | 7200 | 0.0 |
| 9600 | 9600 | 0.0 |
| 19200 | 19800 | 3.125 |

Transfers can be initiated by program control for the Direct Memory Access (DMA) mode or for the SILO mode. During the DMA mode of operation, the transmit line receives characters for transmission from the main memory of the CPU as specified by the buffer address and the character count. This allows blocks of data to be transferred without processor intervention at high data transfer rates.

During the SILO mode of operation, each transmit line buffer can store up to 32 characters for transmisson. These characters are loaded into the transmit SILO buffer under program control. During reception, a 48 character receive SILO buffer is shared by all eight of the receive lines. Program interrupts are generated either after 16 characters have been entered into the SILO buffer or after a program selectable time delay has occurred after the SILO buffer has become non-empty. A zero time delay indicates that an interrupt is generated as soon as the buffer becomes non-empty.

One of these two modes of output is dynamically selected by the VMS terminal driver, depending on the number of characters to be transmitted, so as to reduce the CPU overhead.

Six of the asynchronous channels are available for Data Terminal Equipment (DTE) such as VT100 video display terminals or similar devices. These six channels do not provide modem control. The remaining two modem channels can be connected to either video display terminals or to Data Communication Equipment (DCE) such as Digital DF03 data sets or equivalent modems.

The asynchronous channels are compatible with EIA RS-232-C, RS-423 standards and with CCITT V.24 and V.28 standards.

### Synchronous Line Interface

The synchronous line interface is a full duplex, DMA, single transmit and receive channel that provides full modem control. The DMA transfers are double buffered with both the transmitter and receiver having two sets of byte count and buffer address registers. The double buffering enables a high message throughput.

Low level communication protocol support is contained in the microcode of the DMF32 controller and includes Digital Data Communications Message Protocol (DDCMP), Synchronous Data Link Control (SDLC), High Level Data Link Control (HDLC) and a general purpose byte oriented protocol (GENBYTE).

The microcode frames the messages, generates and checks the Cyclic Redundancy Check (CRC) and transfers the messages by DMA operations to and from the main memory of the CPU. All message acknowledgement and high level network functions are controlled by the host level software.

The synchronous channels are compatible with EIA RS-232-C, RS-423 and CCITT V.24 and V.28 standards.

The synchronous line interface is supported by the VAX/VMS Version 3.0 software as a DDCMP DECnet device.

### Line Printer or User Device Interface

The DMF32 option includes an interface that can be connected to a line printer terminal or to a user developed device. The user device interface enables parallel data transfers in a half duplex DMA mode of operation. It also permits data transfers through a 32-word SILO register in

the half duplex SILO mode of operation. The DMA mode provides double buffering to enhance the controller operation.

The line printer section of the DMF32 controller operates with high speed line priners such as the Digital LP32 series or equivalent printers. The DMF32 microcode includes low level printer formatting functions and the printer operation is supported by the VAX/VMS V3.0 operating system software.

The device interface allows a user to connect special I/O devices to the DMF32 controller. Separate input and output ports are included to enable 16-bit parallel data transfers to and from the device. The data and control signals are TTL compatible. The device interface may be operated in a compatibility mode where it is functionally similar to a DR11-C parallel interface.

## PHYSICAL CONFIGURATION

The DMF32 controller is available in two optional configurations depending on the VAX system. The option designations for the VAX systems are as follows.

| Option | System |
|--------|--------|
| DMF32-AA | VAX-11/730 (included in CPU Cabinet) |
| DMF32-AB | VAX-11/730 Expander Cabinet Option |

The DMF32 option consists of a standard length, hex - height module, three internal flat cables, a distribution panel and panel mounting frame. The module can be inserted into a Small Peripheral Controller (SPC) slot of a standard UNIBUS System Unit provided that adequate power and cooling are available.

The distribution panel attaches to the 48.26 cm (19.0 in) mounting frame supplied with the DMF32-AB option. The mounting frame can be installed at the rear of the expansion cabinet. The three internal cables connect the module to the distribution panel connectors.
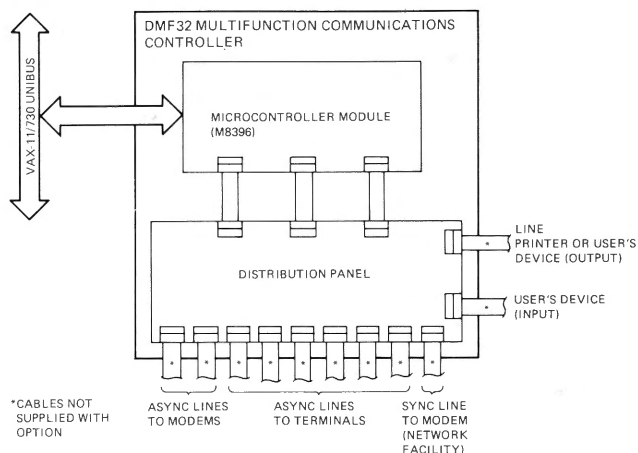


## Distribution Panel

The distribution panel contains nine 25-pin EIA compatible connectors for the cables to the DTE or DCE equipment. It also includes two 37-pin EIA connectors for the TTL parallel data devices which are the line printer or general purpose user device. Three flat cables are supplied with the DMF32 option and connect the microprocessor module to the distribution panel. The user device cables, except for the cable connecting the parallel interface to the user's device, are available in various lengths from the Digital Accessories and Supplies Group.

# SPECIFICATIONS

## Performance Characteristics

### Asynchronous Line Multiplexer

| | |
|---|---|
| Operating Modes: | full or half duplex |
| Signal Compatibility: | RS-232-C and RS-423, CCITT V.28/V.24 |
| Line Baud Rates: | 50 b/s to 19.2 kb/s (Lines 0 and 1 are split speed) |
| Lines 0 and 1 signals | TX DATA<br>RX DATA or SEC RX DATA<br>RTS, CTS, DSR, CAR<br>SEC CAR, SEC RTS<br>DTR, RI, DSRS<br>USER TX (pin 18)<br>USER RX (pin 25) |
| Lines 2-7 | TX DATA<br>RX DATA |

### Synchronous Line

| | |
|---|---|
| Operating Mode: | full or half duplex |
| Signal Compatibility: | EIA RS-232C and RS-423 CCITT V.24 and V.28 |
| Line Baud Rates: | 19.2 kb/s (max.) |
| Synchronous line signals | TX DATA, RX DATA<br>RTS, CTS, DSR, CAR,<br>DTR, RI, DSRS,<br>TX CLK (DCE source)<br>RX CLK (DCE source)<br>TX CLK (DTE source)<br>USER TX (pin 18)<br>USER RX (pin 25) |

### Line Printer Options

| | |
|---|---|
| Printers Available | LP32-AA, -BA (285/200 lpm)<br>LP32-EA, -EB (600/445 lpm)<br>LP32-GA, -GB (1220/905 lpm) |

### UNIBUS Loading

| | |
|---|---|
| Microcontroller Module (M8396) | one dc load<br>5.5 ac loads |

## Power Requirements

| | |
|---|---|
| Microcontroller Module (M8396) | +5V ±5%, 8A<br>+15V ±5%, 0.5A<br>−15V ±5%, 0.5A |
| heat dissipation | 167 Btu/h (total) |

## Physical Size

| | |
|---|---|
| Microcontroller module (M8396) | height (hex):39.7 cm (15.7 in.), length (standard): 30.2 cm (11.9 in.) |
| Distribution panel | height 10.1. cm (4.0 in.) length 21.6 cm (8.5 in.) |
| Panel Mounting frame | height 13.3 cm (5.25 in.) length 48.2 cm (19.0 in.) |

## Device Cables*

| | |
|---|---|
| Asynchronous Lines (FCC qualified) | BC22E-10, 25 (16-conductor) |
| | BC22D-10, -25, (26-conductor null modem) |
| Synchronous Line | BC22F-10, -25 (25-conductor) |
| Line Printer Interface | BC27A-25 included with LP32-AA, -BA, -EA, -EB |
| | BC27B-25 included with LP32-GA, -GB |
| Parallel Interface | Not supplied |

\* Digital cable types or equivalent type.

## Environment

Operating

| | |
|---|---|
| Temperature | 10° to 40°C (50° to 104°F) |
| Relative Humidity | 10 to 90% (no condensation) |
| Wet Bulb Temperature | 28°C (82°F) max. |
| Dew Point Temperature | 2°C (36°F) min. |
| Altitude | sea level to 2.4 km (8 kft) |

## Shipping*

| | |
|---|---|
| Temperature | −40° ot 66°C (−40 to 151°F) |
| Relative Humidity | 0 t 95% (no condensation) |
| Altitude | sea level to 9 km (31 kft) |

\* Unit packaged for shipping

### ORDER CODE: ED-22297-20