

HP 13255

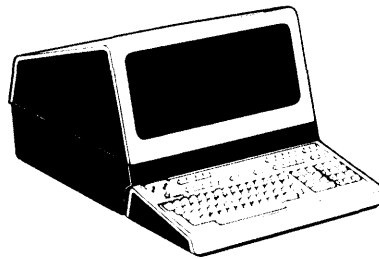
ASYNCHRONOUS MULTIPOINT INTERFACE MODULE

Manual Part No. 13255-91106

PRINTED

AUG-01-76

DATA TERMINAL
TECHNICAL INFORMATION



HEWLETT  PACKARD

1.0 INTRODUCTION.

The Asynchronous Multipoint Interface Module provides an RS232C compatible, asynchronous data communications interface. Hardware is provided (non RS232C) to permit multipoint daisy-chaining of terminals. A programmable baud rate generator is included as well as two bytes of program accessible switches. Refer to module section 13255-91086 for parts lists for the US Modem Cable Assembly (02640-60131) and the Data Comm Self Test Hood Assembly (02645-60002).

2.0 OPERATING PARAMETERS.

A summary of operating parameters for the Asynchronous Multipoint Interface Module is contained in tables 1.0 through 6.7.

Table 1.0 Physical Parameters

Part Number	Nomenclature	Size (L x W x D) +/-0.100 Inches	Weight (Pounds)
5061-2403	Modem Bypass Cable Ass'y	N/A	N/A
5061-2409	European Modem Cable Ass'y	N/A	N/A
02640-60106	Async Multipoint I/F PCA	12.9 x 4.0 x 0.6	0.50
02640-60131	US Modem Cable Assembly	N/A	N/A
02640-60132	Modem Multipoint Cable Ass'y	N/A	N/A
02640-60133	Multipoint Cable Ass'y	N/A	N/A
02640-60134	Multipoint Extension Cable Assembly	N/A	N/A
02640-60140	Power Down Protect PCA	N/A	N/A
02645-60002	Data Comm Self Test Hood	N/A	N/A
02645-60004	Self Test Connector Ass'y	N/A	N/A
Number of Backplane Slots Required: 1			

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NOTE: This document is part of the 264XX DATA TERMINAL product series Technical Information Package (HP 13255).

1.0 INTRODUCTION.

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02640-60134	Multipoint Extension Cable Assembly	N/A	N/A
02640-60140	Power Down Protect PCA	N/A	N/A
02645-60002	Data Comm Self Test Hood	N/A	N/A
02645-60004	Self Test Connector Ass'y	N/A	N/A
Number of Backplane Slots Required: 1			

Table 2.0 Reliability and Environmental Information

Environmental:	(X) HP Class B	() Other:
Restrictions:	Type tested at product level	
Failure Rate: 1.876 (percent per 1000 hours)		

Table 3.0 Power Supply and Clock Requirements - Measured
(At +/-5% Unless Otherwise Specified)

+5 Volt Supply @ 400 mA	+12 Volt Supply @ 150 mA	-12 Volt Supply @ 70 mA (An additional 200 mA required for 02640-60140 cable)	+42 Volt Supply @ mA NOT APPLICABLE
115 volts ac @ A	NOT APPLICABLE	220 volts ac @ A	NOT APPLICABLE
Clock Frequency: 4.915 MHZ +/-0.1%			

Table 4.0 Jumper Definitions

PCA Designation	Function	
	In	Out
INT	Interrupt on <u>ATN2</u>	Interrupt on <u>ATN</u>
PL6 thru PL0	Respond to an Interrupt poll on any one of these bus data bits	No Effect
A4,A11,A10,A9	Address Bit is a "0" in the Module Address	Address Bit is a "1" in the Module Address
-12	Connect -12V to P2, Pin N	No Effect
2SB	Transmit and receive characters framed with 1 start and 1 stop bit	Transmit and receive characters framed with 1 start and 2 stop bits

Table 5.0 Connector Information

Connector and Pin No.	Signal Name	Signal Description
P1, Pin 1	+5V	+5 Volt Power Supply
-2	GND	Ground Common Return (Power and Signal)
-3	SYS CLK	4.915 MHz System Clock
-4	-12V	-12 Volt Power Supply
-5	ADDR0	Negative True, Address Bit 0
-6	ADDR1	Negative True, Address Bit 1
-7		Not Used
-8	ADDR3	Negative True, Address Bit 3
-9	ADDR4	Negative True, Address Bit 4
-10	ADDR5	Negative True, Address Bit 5
-11	ADDR6	Negative True, Address Bit 6
-12	ADDR7	Negative True, Address Bit 7
-13	ADDR8	Negative True, Address Bit 8
-14	ADDR9	Negative True, Address Bit 9
-15	ADDR10	Negative True, Address Bit 10
-16	ADDR11	Negative True, Address Bit 11
-17		}
-18		}
-19		} Not Used
-20		}
-21	I/O	Negative True, Input Output/Memory
-22	GND	Ground Common Return (Power and Signal)

Table 5.0 Connector Information (Cont'd.)

Connector and Pin No.	Signal Name	Signal Description
P1, Pin A	GND	Ground Common Return (Power and Signal)
-B	PULL	Negative True, Polled Interrupt Identification Request
-C	+12V	+12 Volt Power Supply
-D	PWR ON	System Power On
-E	BUS0	Negative True, Data Bus Bit 0
-F	BUS1	Negative True, Data Bus Bit 1
-H	BUS2	Negative True, Data Bus Bit 2
-J	BUS3	Negative True, Data Bus Bit 3
-K	BUS4	Negative True, Data Bus Bit 4
-L	BUS5	Negative True, Data Bus Bit 5
-M	BUS6	Negative True, Data Bus Bit 6
-N	BUS7	Negative True, Data Bus Bit 7
-P	WRITE	Negative True, Write/Read Type Cycle
-R	ATN2	Negative True, CTU and Polled Interrupt Request
-S		Not Used
-T	PRIOR IN	Bus Controller Priority In
-U	PRIOR OUT	Bus Controller Priority Out
-V	PROC ACTIVE	Negative True, Processor Active (Controlling Bus)
-W		} Not Used
-X		
-Y	REQ	Negative True, Request (Bus Data Currently Valid)
-Z	ATN	Negative True, Data Comm Interrupt Request

Table 5.1 Connector Information

Connector and Pin No.	Signal Name	Signal Description
P2, Pin 1	BAO+	} Differential, Daisy-Chain Signal Carrying } Data from the Terminals to a Modem or CPU } (output)
-2	BAO-	
-3	BAI+	} Differential, Daisy-Chain Signal Carrying } Data from the Terminals to a Modem or CPU } (input)
-4	BAI-	
-5	CAO	} Daisy-Chain Signal Indicating that One of } the Terminals in the Chain is Requesting } to Send (output)
-6	CBO	} Daisy-Chain Signal Originating at the Modem } Indicating That it is Clear for the Termi- } nals to Transmit (output)
-7	CAI+	} Daisy-Chain Signal Indicating that One of } the Terminals in the Chain is Requesting } to Send (input)
-8	CAI-	
-9	CBI+	} Daisy-Chain Signal Originating at the Modem } Indicating That it is Clear for the Termi- } nal to Transmit (input)
-10	CBI-	
-15	BBO+	} Differential, Daisy-Chain Signal Carrying } Data from a Modem to Terminals in the Chain } (output)
-11	BBO-	
-12		} } Not Used
-13		}
-14	CE	RS232C Ring Indicator

Table 5.1 Connector Information (Cont'd.)

Connector and Pin No.	Signal Name	Signal Description
P2, Pin A	GND	Frame Ground
-B	BA	RS232C Transmitted Data
-C	BB	RS232C Received Data
-D	CA	RS232C Request To Send
-E	CB	RS232C Clear To Send
-F	CC	RS232C Data Set Ready
-H	AB	RS232C Signal Ground
-J	CF	RS232C Carrier Detect
-K	BBI+) Differential, Daisy-Chain Signal) Carrying Data From the Modem to the) Terminals (input)
-L	BBI-	
-M	SCA	RS232C Secondary Channel Request To Send
-N	SCF	RS232C Secondary Channel Carrier Detect
-P	CD	RS232C Data Terminal Ready
-R	CH	RS232C Data Signal Rate Selector
-S		Not Used

Table 6.0 Module Bus Pin Assignments

Function Performed:	Value	Bus Signal
Output Data for Transmission	X	ADDR 15
Poll Bit: Switch Selectable (Bit 6-0)	X	ADDR 14
	X	ADDR 13
Module Address: (ADDR 11,10,9,4) = (A11,A10,A9,A4)	X	ADDR 12
Switch Selectable	A11	ADDR 11
Data Comm = (1110)	A10	ADDR 10
	A9	ADDR 9
Function Specifier: ADDR3 = 0	X	ADDR 8
ADDR5 = 1	X	ADDR 7
ADDR6 = 1	1	ADDR 6
	1	ADDR 5
	A4	ADDR 4
	0	ADDR 3
Data Bus Bit Interpretation:	X	ADDR 2
	X	ADDR 1
	X	ADDR 0
B7		
Output Data Bit 7	B7	BUS 7
	B6	BUS 6
	B5	BUS 5
B6		
Output Data Bit 6	B4	BUS 4
	B3	BUS 3
	B2	BUS 2
	B1	BUS 1
B5		
Output Data Bit 5	B0	BUS 0
		1=Logical 1=Bus Low
		0=Logical 0=Bus High
		X=Don't Care
B4		
Output Data Bit 4		
B3		
Output Data Bit 3		
B2		
Output Data Bit 2		
B1		
Output Data Bit 1		
B0		
Output Data Bit 0		

Table 6.1 Module Bus Pin Assignments

Function Performed:	Value	Bus Signal																																																																																																							
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B7, B6 set number of data bits per character	X	ADDR 2																																																																																																							
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B2	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1																																																																																									
B1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1																																																																																									
B0	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1																																																																																									

1=Logical 1=Bus Low
0=Logical 0=Bus High
X=Don't Care

Table 6.2 Module Bus Pin Assignments

Function Performed:	Value	Bus Signal
Output Control Byte 2 (Modem Control Byte)	X	ADDR 15
Pol1 Bit: Switch Selectable (Bit 6-0)	X	ADDR 14
	X	ADDR 13
Module Address: (ADDR 11,10,9,4) = (A11,A10,A9,A4)	X	ADDR 12
Data Comm = (1110)	A11	ADDR 11
	A10	ADDR 10
	A9	ADDR 9
Function Specifier: ADDR5 = 0	X	ADDR 8
ADDR6 = 1	X	ADDR 7
	1	ADDR 6
	0	ADDR 5
Data Bus Bit Interpretation:	A4	ADDR 4
	X	ADDR 3
B7	X	ADDR 2
0 = Enable Daisy-Chain CAI and CBO	X	ADDR 1
1 = Inhibit Daisy-Chain CAI and CBO	X	ADDR 0
	B7	BUS 7
B6 Not Used	B6	BUS 6
	B5	BUS 5
B5 Not Used	B4	BUS 4
	B3	BUS 3
	B2	BUS 2
B4	B1	BUS 1
0 = Terminal Mode	B0	BUS 0
1 = Channel Monitor Mode		
		1=Logical 1=Bus Low
		0=Logical 0=Bus High
		X=Don't Care
B3		
0 = CH On		
1 = CH Off		
B2		
0 = CD On		
1 = CD Off		
B1		
0 = SA On		
1 = SA Off		
B0		
0 = CA On		
1 = CA Off		

Table 6.3 Module Bus Pin Assignments

Function Performed:	Value	Bus Signal
Output Control Bits	X	ADDR 15
Poll Bit: Switch Selectable (Bit 6-0)	X	ADDR 14
	X	ADDR 13
Module Address: (ADDR 11,10,9,4) = (A11,A10,A9,A4)	X	ADDR 12
Switch Selectable	A11	ADDR 11
Data Comm = (1110)	A10	ADDR 10
	A9	ADDR 9
Function Specifier: ADDR5 = 0	X	ADDR 8
ADDR6 = 0	A7	ADDR 7
	0	ADDR 6
Only one bit in each of the pairs A0,A1 and A3,A7 can be set to "1" for a given output command	0	ADDR 5
	A4	ADDR 4
	A3	ADDR 3
A0	X	ADDR 2
0 = No Effect	A1	ADDR 1
1 = Reset Timer	A0	ADDR 0
A1	B7	BUS 7
0 = No Effect	B6	BUS 6
1 = Set Timer	B5	BUS 5
	B4	BUS 4
A3	B3	BUS 3
0 = No Effect	B2	BUS 2
1 = Enable Transmission Complete Interrupt	B1	BUS 1
	B0	BUS 0
A7	1=Logical 1=Bus Low	
0 = No Effect	0=Logical 0=Bus High	
1 = Enable Transmitter Ready Interrupt	X=Don't Care	
Data Bus Bit Interpretation: Not Applicable		

Table 6.4 Module Bus Pin Assignments

Function Performed:	Value	Bus Signal
Input Received Character	X	ADDR 15
Poll Bit: Switch Selectable (Bit 6-0)	X	ADDR 14
	X	ADDR 13
Module Address: (ADDR 11,10,9,4) = (A11,A10,A9,A4)	X	ADDR 12
Switch Selectable	A11	ADDR 11
Data Comm = (1110)	A10	ADDR 10
	A9	ADDR 9
Function Specifier: ADDR5 = 0	X	ADDR 8
ADDR6 = 0	X	ADDR 7
	0	ADDR 6
	0	ADDR 5
	A4	ADDR 4
	X	ADDR 3
Data Bus Bit Interpretation:	X	ADDR 2
	X	ADDR 1
	X	ADDR 0
B7		
Input Data Bit 7	B7	BUS 7
	B6	BUS 6
	B5	BUS 5
B6		
Input Data Bit 6	B4	BUS 4
	B3	BUS 3
	B2	BUS 2
	B1	BUS 1
B5		
Input Data Bit 5	B0	BUS 0
		1=Logical 1=Bus Low
		0=Logical 0=Bus High
		X=Don't Care
B4		
Input Data Bit 4		
B3		
Input Data Bit 3		
B2		
Input Data Bit 2		
B1		
Input Data Bit 1		
B0		
Input Data Bit 0		

Table 6.5 Module Bus Pin Assignments

Function	Value	Bus Signal
Performed: Input Status Byte 1 (Interrupt Status)	X	ADDR 15
Parity Bit: Switch Selectable (Bit 6-0)	X	ADDR 14
Module Address: (ADDR 11,10,9,4) = (A11,A10,A9,A4) Switch Selectable Data Comm = (1110)	X	ADDR 13
	X	ADDR 12
	A11	ADDR 11
	A10	ADDR 10
Function Specifier: ADDR3 = 0 ADDR5 = 1 ADDR6 = 0	A9	ADDR 9
	X	ADDR 8
	X	ADDR 7
Data Bus Bit Interpretation: An interrupt is generated if any condition causes B0, B1, or B7 to be set to the "1" value. Values of B5 and B6 are valid only if B7 = 1	0	ADDR 6
	1	ADDR 5
	A4	ADDR 4
	0	ADDR 3
B7 0 = Receiver Register Empty 1 = Receiver Register Full (Cleared by inputting a character)	X	ADDR 2
	X	ADDR 1
	X	ADDR 0
	B7	BUS 7
B6 0 = No Parity Error 1 = Parity Error (Cleared by inputting status)	B6	BUS 6
	B5	BUS 5
	B4	BUS 4
	B3	BUS 3
B5 0 = No Overrun Error 1 = Overrun Error (Cleared by inputting status or character)	B2	BUS 2
	B1	BUS 1
	B0	BUS 0
B4, B3, B2	Not Used	
B1 0 = No Timer Interrupt 1 = Timer Interrupt Active (Cleared by resetting the timer)	1=Logical 1=Bus Low	
	0=Logical 0=Bus High	
B0 0 = No Transmit Interrupt 1 = Transmit Interrupt Active (Set when CB comes up, cleared by outputting character or dropping CA or CB)	X=Don't Care	

Table 6.6 Module Bus Pin Assignments

Function	Value	Bus Signal
Performed: Input Status Byte 2 (Modem Status)	X	ADDR 15
Poll Bit: Switch Selectable (Bit 6-0)	X	ADDR 14
	X	ADDR 13
Module Address: (ADDR 11,10,9,4) = (A11,A10,A9,A4) Switch Selectable Data Comm = (1110)	X	ADDR 12
	A11	ADDR 11
	A10	ADDR 10
	A9	ADDR 9
Function Specifier: ADDR3 = 1	X	ADDR 8
ADDR5 = 1	X	ADDR 7
ADDR6 = 0	0	ADDR 6
	1	ADDR 5
	A4	ADDR 4
Data Bus Bit Interpretation:	1	ADDR 3
B7	X	ADDR 2
Always 1	X	ADDR 1
Indicates Multipoint PCA in System	X	ADDR 0
B6	B7	BUS 7
Always 0	B6	BUS 6
Indicates Async Multipoint PCA in System	B5	BUS 5
	B4	BUS 4
	B3	BUS 3
B5	B2	BUS 2
0 = CAI Off (Downline CA)	B1	BUS 1
1 = CAI On	B0	BUS 0
B4	1=Logical 1=Bus Low 0=Logical 0=Bus High X=Don't Care	
B3		
0 = SB On		
1 = SB Off		
B2		
0 = CC On		
1 = CC Off		
B1		
0 = CF On		
1 = CF Off		
B0		
0 = CB On		
1 = CB Off		

Table 6.7 Module Bus Pin Assignments

Function Performed: Input Jumper Settings	Value	Bus Signal
	X	ADDR 15
Poll Bit: Switch Selectable (Bit 6-0)	X	ADDR 14
	X	ADDR 13
Module Address: (ADDR 11,10,9,4) = (A11,A10,A9,A4)	X	ADDR 12
Switch Selectable	A11	ADDR 11
Data Comm = (1110)	A10	ADDR 10
	A9	ADDR 9
Function Specifier: ADDR5 = 0	X	ADDR 8
ADDR6 = 1	X	ADDR 7
	1	ADDR 6
A3	0	ADDR 5
0 = Select Jumper Character 0 (J00-J07)	A4	ADDR 4
1 = Select Jumper Character 1 (J10-J17)	A3	ADDR 3
	X	ADDR 2
Data Bus Bit Interpretation:	X	ADDR 1
	X	ADDR 0
0 = Closed Switch		
1 = Open Switch		
B7	B7	BUS 7
Switch 7	B6	BUS 6
	B5	BUS 5
B6	B4	BUS 4
Switch 6	B3	BUS 3
	B2	BUS 2
B5	B1	BUS 1
Switch 5	B0	BUS 0
B4		
Switch 4		
B3		
Switch 3		
B2		
Switch 2		
B1		
Switch 1		
B0		
Switch 0		

1=Logical 1=Bus Low
0=Logical 0=Bus High
X=Don't Care

- 3.0 FUNCTIONAL DESCRIPTION. Refer to the block diagram (figure 1), schematic diagram (figure 2), daisy-chain logical connection (figure 3), component location diagram (figure 4), and parts list (5061-2403, 5061-2409, 02640-60106, 02640-60132, 02640-60133, 02640-60134, 02640-60140, and 02645-60004) located in the appendix.

The purpose of the Asynchronous Multipoint Interface PCA is to transmit and receive start-stop serial data and provide modem control and status lines. Data character format is described in EIA RS404. The line interface is compatible with RS232C and the terminal's daisy-chain circuitry. Figure 3 illustrates the daisy-chain connection when more than one terminal is sharing an RS232C line. BA, BB, CA, and CB are RS232C signals; all others are daisy-chain signals.

3.1 UART AND DATA ROUTING.

- 3.1.1 The UART (Universal Asynchronous Receiver/Transmitter) is an LSI device used to convert from the 8-bit parallel data format of the terminal data bus to the serial, start-stop data format of the channel. The line monitor multiplexer determines whether data being transmitted from the modem or to the modem is sampled by the PCA.

- 3.1.2 The UART is a Western Digital TR1602B. The line monitor multiplexer (U58) is used to route received data to the UART. Normally it routes the BB (BBI) signal to the receiver input. However, if the channel monitor mode bit (Bit 4) is set in the control register and the CAI signal is high, the BAI signal will be routed to the UART receiver. This function is used when the terminal is operated as a passive line monitor.

3.2 BAUD RATE GENERATOR.

- 3.2.1 The baud rate generator uses the bus 4.915 MHz System Clock (SYS CLK) to generate a clock for the UART. The following rates are selectable programmatically: 50 (800 Hz), 75 (1200 Hz), 110 (1760 Hz), 134.5 (2152 Hz), 150 (2400 Hz), 200 (3200 Hz), 300 (4800 Hz), 600 (9600 Hz), 1200 (19.2 kHz), 1800 (28.8 kHz), 2400 (38.4 kHz), 3600 (57.6 kHz), 4800 (76.8 kHz), 7200 (115.2 kHz), 9600 (153.6 kHz), and 19200 (307.2 kHz).

- 3.2.2 The first stage of the baud rate generator (U31 and U32) is a divide-by-5 and 1/3 circuit which divides the 4.915 MHz bus clock to 921.6 kHz for the MM5307 (U33). The circuit contains a synchronous counter and two J-K flip-flops (U32). The counter is programmed as a divide-by-5 or a divide-by-6 circuit depending on the state of the flip-flops. When the Q output of the first flip-flop (U32, Pin 9) is high, the counter divides by 5; when low it divides by 6. The counter divides by 5 twice and by 6 once to produce an average divisor of 5 and 1/3. The flip-flops (U32, Pin 9 and U32, Pin 5) follow the 11-00-10 sequence repetitively.
- 3.2.3 A 4-bit program constant is loaded into the LS175 register (U34) to program the circuit. (Refer to table 6.1 for additional information.) All of the baud rates except 200 and 19200 are generated by U33. When the 1000 code (200 baud) is in the baud rate register (U34) it is decoded by several gates and converted to a 1010 by an OR gate before reaching U33. This decoding logic also programs another synchronous counter (U25) to divide by 9. The 1010 code (1800 baud) on U33 provides an 1800 baud clock to the counter which divides it by 9 to generate the 200 baud clock. The proper routing of these signals is done with an LS51 AND-OR-Invert (U24) pack. When the generator is programmed with an 0000 code, the counter functions as a divide-by-16 while being clocked at 4.915 MHz. The divide-by-16 counter outputs 307.2 kHz (19200 baud) which is routed to the UART by the LS51 (U24).
- 3.3 INSTRUCTION DECODER.
- 3.3.1 The instruction decoder consists of an LS138 3-to-8 decoder (U47) and several gates. This circuit uses control and address lines on the terminal data bus to generate control signals on the PCA.

3.3.2 Four exclusive-OR gates (U46) that can be programmed by the A4, and A11 through A9 switches on the PCA are used to decode the module's address and to enable U47. The control signals are decoded as follows:

A D D R 6	A D D R 5	A D D R 3	W R I T E	I / O	R E Q	U 4 7	
1	1	0	1	1	1	Y0	Output data.
0	1	X	1	1	1	Y2	Output configuration byte.
1	0	X	1	1	1	Y1	Output modem control byte.
0	0	X	1	1	1	Y3	Output control bits.
0	1	0	0	1	1	Y6	Input interrupt status.
0	1	1	0	1	1		Input modem status.
1	0	0	0	1	1	Y5	Input Jumper 0 byte.
1	0	1	0	1	1		Input Jumper 1 byte.
0	0	X	0	1	1	Y7	Input data.

3.3.3 The control bits output command does several things depending on addresses 0, 1, 3, and 7:

A D D R 7	A D D R 3	A D D R 1	A D D R 0	
X	X	X	1	Reset timer.
X	X	1	X	Set timer.
X	1	X	X	Enable transmission complete interrupt.
1	X	X	X	Enable transmitter ready interrupt.

3.3.4 Switch selectable interrupt polling is also provided. When a read operation is performed with POLL low, the PCA will drive one of the data bus lines (Bit0-6 switch selectable) low when an interrupt is active.

3.4 STATUS-JUMPER MULTIPLEXING.

3.4.1 This circuit is used to gate one of two status bytes (see tables 6.5 and 6.6) or one of two switch programmable bytes onto the terminal data bus. Four LS153 multiplexers (U22, U23, U13, and U12) are used for this function. The byte selection is as follows:

A	B	
0	0	Jumper 0
0	1	Jumper 1
1	0	Interrupt Status
1	1	Modem Status

3.5 CONTROL REGISTER. The control register is used to latch the RS232C outputs, control the line monitor multiplexer, and to inhibit or enable the daisy-chain control lines. Table 6.2 indicates the bit and polarity designation.

3.6 INTERRUPT LOGIC.

3.6.1 The interrupt network is primarily an AND-OR circuit. The AND function decides if an interrupt is active; the OR function directs the interrupt signal to the appropriate interrupt line. Interrupts can be

directed to the $\overline{\text{ATN}}$ or $\overline{\text{ATN2}}$ line depending on the position of the INT

switch (open = $\overline{\text{ATN}}$, closed = $\overline{\text{ATN2}}$). There are three possible interrupts: transmit, receive, and timer. Whenever the UART receives a character it generates a Data Ready (DR) interrupt at U51, Pin 19. The Output Control Bits command can condition the transmit interrupt (U36, Pin 12) to be a Transmission Complete (U37, Pin 6) or a Transmitter Ready (U37, Pin 3) interrupt. The Transmission Complete interrupt indicates that both the Transmitter Register and the Transmitter Holding Register of the UART are empty. The Transmitter Ready interrupt indicates that the Transmitter Holding Register of the UART is empty. A transmit interrupt can only be active when both CA (CA0) and CB (CBI) are turned on. A timer interrupt occurs about 45 milliseconds after the timer is set. If the timer is reset within this period no interrupt will occur.

3.6.2 The timer network consists of a one-shot (U38), a flip-flop (U49, Pin 6), and a gate. When the timer is set, the Q output (Pin 8) of the one-shot goes high. At the next bus System Clock, the flip-flop is cleared (U49, Pin 6 goes high). When the one-shot times out (U38, Pin 6 goes high) a timer interrupt is generated (U39, Pin 8 goes high). This circuit can be reset at any time.

3.7 LINE RECEIVERS.

3.7.1 Line receivers are provided for both daisy-chain and RS232C operation. The RS232C receivers are standard MC1489A's (U18, U19) with a 330 picofarad noise suppression capacitor. The daisy-chain data lines (BAI, BBI) are received with a high impedance (1.2K) Schottky (U410, U411) opto-isolator. These receivers are driven differentially. The daisy-chain control line receivers are high gain (4370) opto-isolators (U411, U511). The 470-ohm parallel input resistor is used to raise the threshold of the receiver to the midpoint of the received signal. All isolators are buffered with Schmitt inverters (U510).

3.8 LINE DRIVERS.

3.8.1 Line drivers are provided for both RS232C and daisy-chain operation. The RS232C drivers are standard (U512, U29) with a 330 picofarad slew rate limiting capacitor. The daisy-chain data line drivers (BA0, BBO) are peripheral driver chips (U110, U210) with active pullup networks. Two 3.3-ohm resistors and an NPN transistor (Q2, Q4, Q6, Q8,) are used for temporary short circuit protection. The line is driven with a 17 volt differential signal. This scheme is used to make the drive signal symmetrical with respect to the threshold of the receiver. Symmetry is critical on the data signals. Delay is harmless. The control lines are driven with peripheral driver chips with a 330-ohm output impedance. The control lines are driven slowly to eliminate transmission effects.

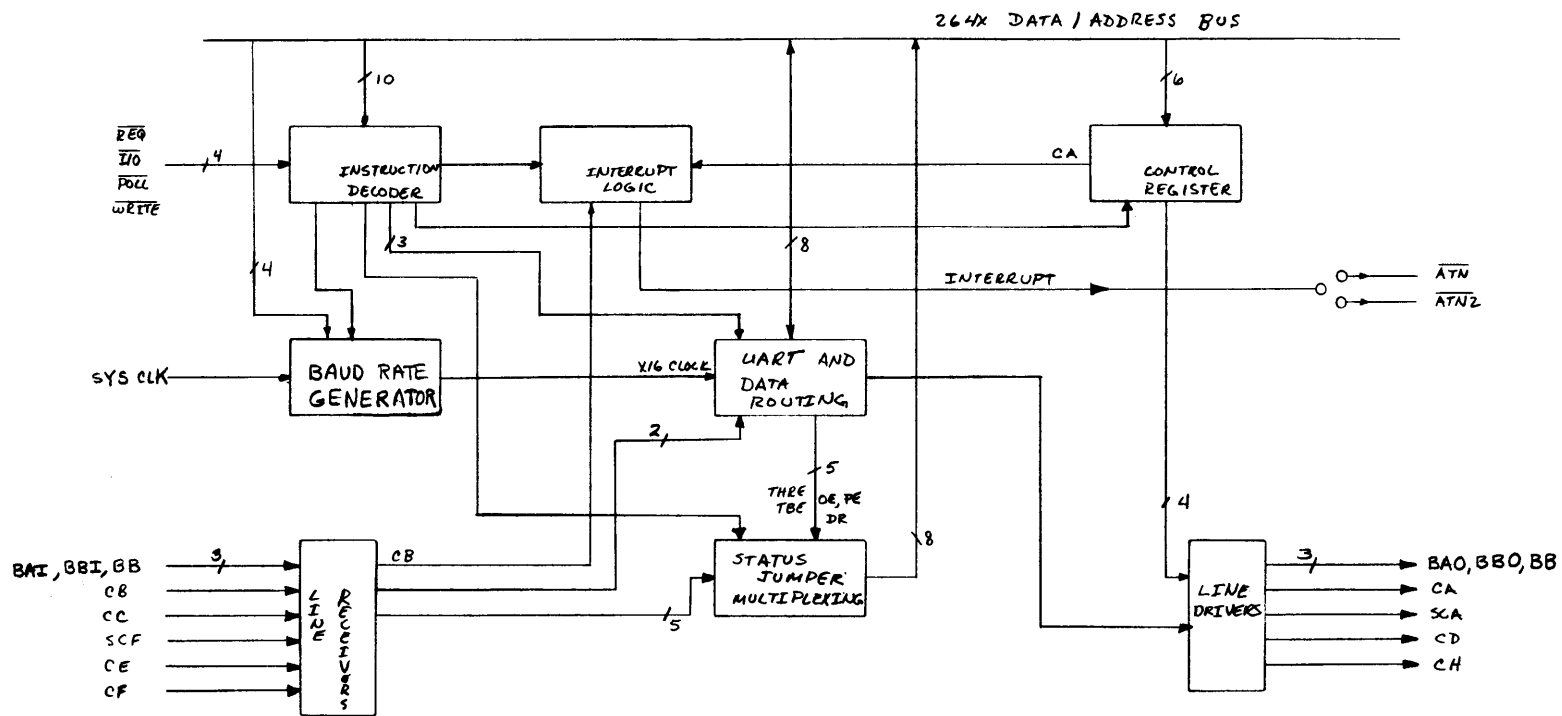


Figure 1
Asynchronous Multipoint Interface Block Diagram
AUG-01-76
13255-91106

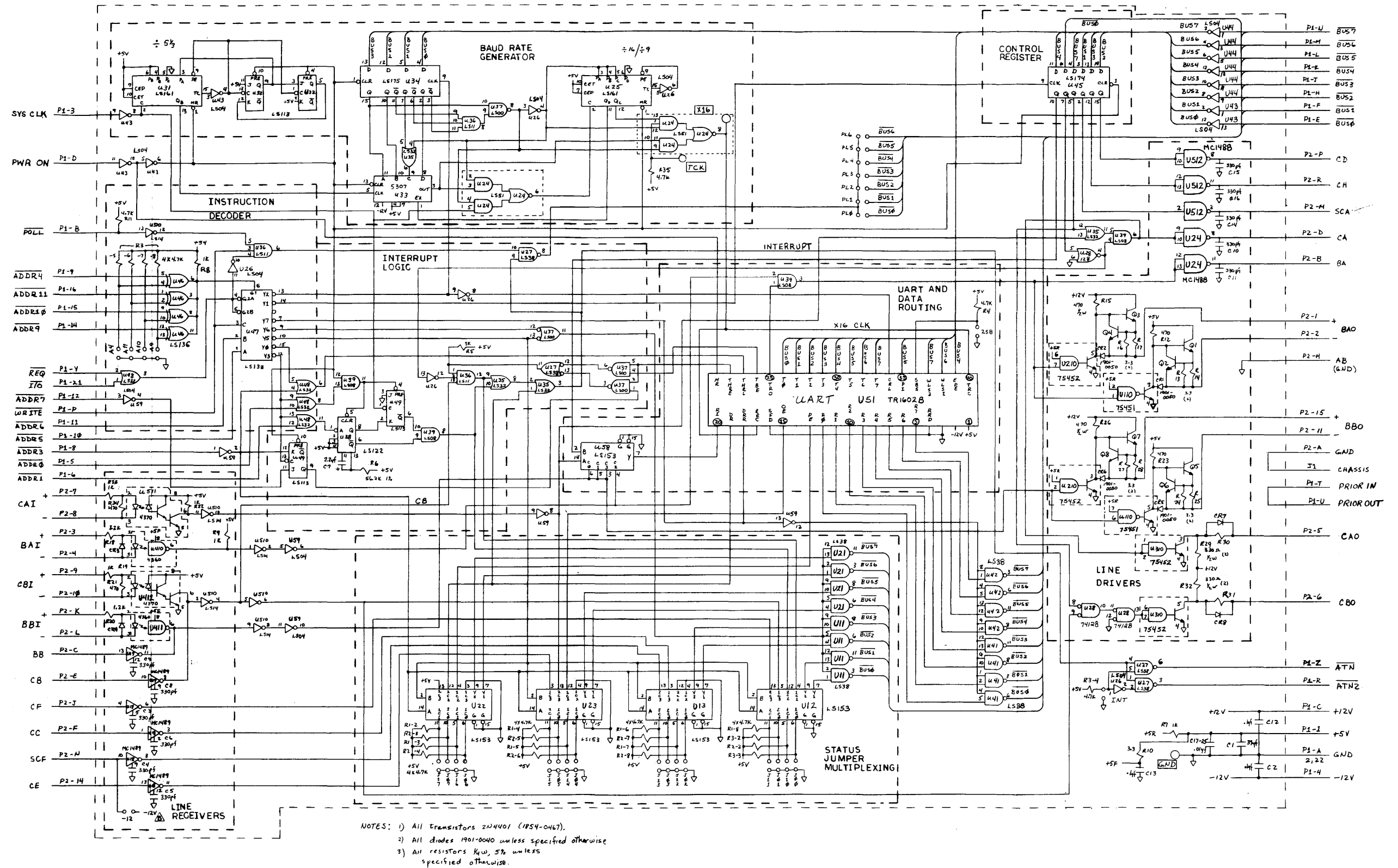


Figure 2
 Asynchronous Multipoint Interface PCA
 Schematic Diagram
 AUG-01-76 13255-91106

NOTE: The modem side signals can go directly to the modem or through other terminals to the modem.

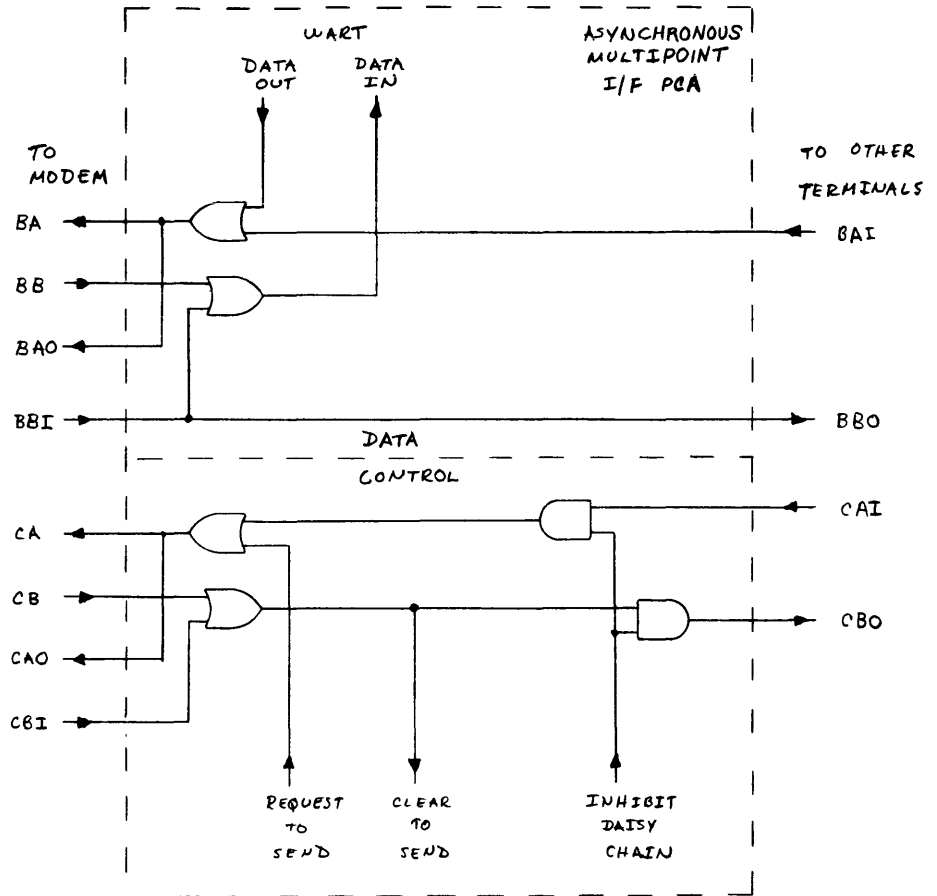


Figure 3
 Daisy-Chain Logical Connection Diagram
 AUG-01-76 13255-91106

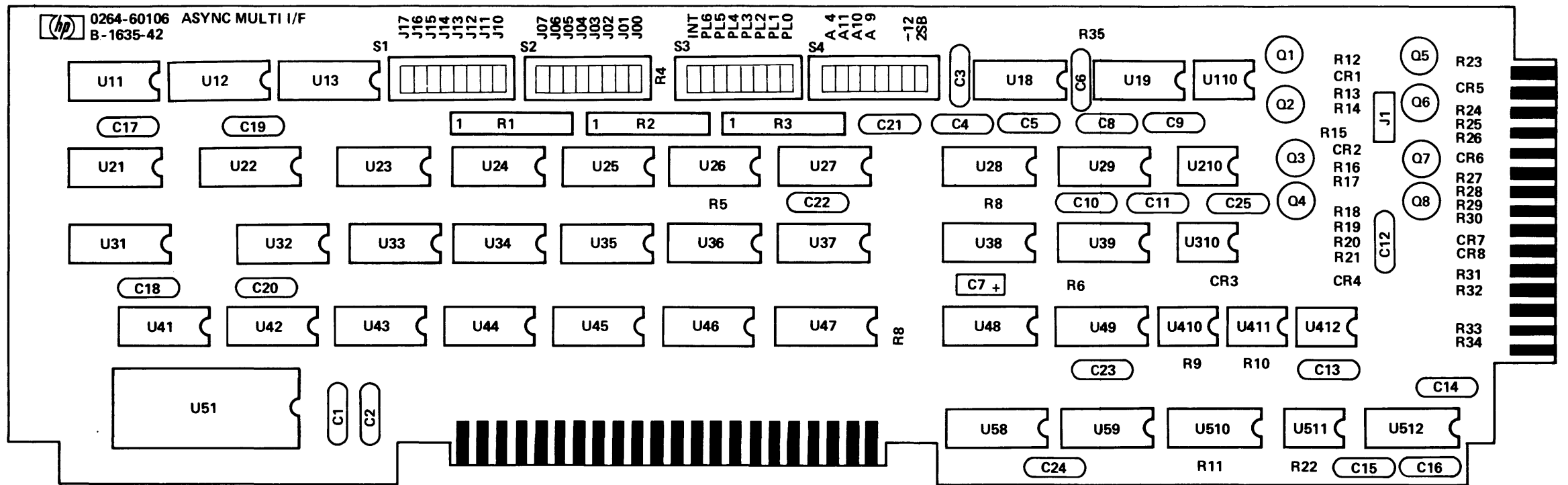


Figure 4
Asynchronous Multipoint Interface PCA
Component Location Diagram
AUG-01-76 13255-91106

Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
	02440-60106	1	A SYNC MULTIPPOINT INTERFACE ASSEMBLY DATE CODE: C-1635-42 REVISION DATE: 10-23-76	28480	02640-60106
C1	0160-0393	1	CAPACITOR-FXD 39UF+-10% 10VDC TA	56289	1500396X9010B2
C2	0150-0121	3	CAPACITOR-FXD .1UF +80-20% 50WVDC CER	28480	0150-0121
C3	0160-3572	11	CAPACITOR-FXD 330PF +-10% 500WVDC CER	28480	0160-3572
C4	0160-3572		CAPACITOR-FXD 330PF +-10% 500WVDC CER	28480	0160-3572
C5	0160-3572		CAPACITOR-FXD 330PF +-10% 500WVDC CER	28480	0160-3572
C6	0160-3572		CAPACITOR-FXD 330PF +-10% 500WVDC CER	28480	0160-3572
C7	0180-0197	1	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	1500225X9020A2
C8	0160-3572		CAPACITOR-FXD 330PF +-10% 500WVDC CER	28480	0160-3572
C9	0160-3572		CAPACITOR-FXD 330PF +-10% 500WVDC CER	28480	0160-3572
C10	0160-3572		CAPACITOR-FXD 330PF +-10% 500WVDC CER	28480	0160-3572
C11	0160-3572		CAPACITOR-FXD 330PF +-10% 500WVDC CER	28480	0160-3572
C12	0150-0121		CAPACITOR-FXD .1UF +80-20% 50WVDC CER	28480	0150-0121
C13	0150-0121		CAPACITOR-FXD .1UF +80-20% 50WVDC CER	28480	0150-0121
C14	0160-3572		CAPACITOR-FXD 330PF +-10% 500WVDC CER	28480	0160-3572
C15	0160-3572		CAPACITOR-FXD 330PF +-10% 500WVDC CER	28480	0160-3572
C16	0160-3572		CAPACITOR-FXD 330PF +-10% 500WVDC CER	28480	0160-3572
C17	0160-2055	9	CAPACITOR-FXD .01UF +80-20% 100WVDC CER	28480	0160-2055
C18	0160-2055		CAPACITOR-FXD .01UF +80-20% 100WVDC CER	28480	0160-2055
C19	0160-2055		CAPACITOR-FXD .01UF +80-20% 100WVDC CER	28480	0160-2055
C20	0160-2055		CAPACITOR-FXD .01UF +80-20% 100WVDC CER	28480	0160-2055
C21	0160-2055		CAPACITOR-FXD .01UF +80-20% 100WVDC CER	28480	0160-2055
C22	0160-2055		CAPACITOR-FXD .01UF +80-20% 100WVDC CER	28480	0160-2055
C23	0160-2055		CAPACITOR-FXD .01UF +80-20% 100WVDC CER	28480	0160-2055
C24	0160-2055		CAPACITOR-FXD .01UF +80-20% 100WVDC CER	28480	0160-2055
C25	0160-2055		CAPACITOR-FXD .01UF +80-20% 100WVDC CER	28480	0160-2055
CR1	19C1-0050	4	DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
CR2	19C1-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
CR3	19C1-0040	4	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
CR4	19C1-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
CR5	19C1-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
CR6	19C1-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
CR7	19C1-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
CR8	19C1-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
E1	0360-0124	3	TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-0124
E2	0360-0124		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-0124
E3	0360-0124		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-0124
J1	1251-1126	1	CONNECTOR-SGL CONT SKT .08-IN-BSC-SZ RND	74970	105-0754-001
Q1	1854-0467	8	TRANSISTOR NPN 2N4401 SI TO-92 PD=310MW	04713	2N4401
Q2	1854-0467		TRANSISTOR NPN 2N4401 SI TO-92 PD=310MW	04713	2N4401
Q3	1854-0467		TRANSISTOR NPN 2N4401 SI TO-92 PD=310MW	04713	2N4401
Q4	1854-0467		TRANSISTOR NPN 2N4401 SI TO-92 PD=310MW	04713	2N4401
Q5	1854-0467		TRANSISTOR NPN 2N4401 SI TO-92 PD=310MW	04713	2N4401
Q6	1854-0467		TRANSISTOR NPN 2N4401 SI TO-92 PD=310MW	04713	2N4401
Q7	1854-0467		TRANSISTOR NPN 2N4401 SI TO-92 PD=310MW	04713	2N4401
Q8	1854-0467		TRANSISTOR NPN 2N4401 SI TO-92 PD=310MW	04713	2N4401
R1	1810-0125	3	NETWORK-RES 8-PIN-SIP .125-PIN-SPCG	11236	750
R2	1810-0125		NETWORK-RES 8-PIN-SIP .125-PIN-SPCG	11236	750
R3	1810-0125		NETWORK-RES 8-PIN-SIP .125-PIN-SPCG	11236	750
R4	0663-4725	3	RESISTOR 4.7K 5% .25W FC TC=-400/+700	01121	C84725
R5	0663-1025	7	RESISTOR 1K 5% .25W FC TC=-400/+600	01121	C81025
R6	0757-0459	1	RESISTOR 56.2K 1% .125W F TC=0/+100	24546	C4-1/8-T0-5622-F
R7	0663-1025		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	C81025
R8	0663-1025		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	C81025
R9	0663-1025		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	C81025
R10	0663-0335	9	RESISTOR 3.3 5% .25W FC TC=-400/+500	01121	C83365
R11	0663-4725		RESISTOR 4.7K 5% .25W FC TC=-400/+700	01121	C84725
R12	0663-4715	4	RESISTOR 470 5% .25W FC TC=-400/+600	01121	C84715
R13	0663-0335		RESISTOR 3.3 5% .25W FC TC=-400/+500	01121	C83365
R14	0663-0335		RESISTOR 3.3 5% .25W FC TC=-400/+500	01121	C83365
R15	0666-4715	2	RESISTOR 470 5% .5W CC TC=0+529	01121	E84715
R16	0663-0335		RESISTOR 3.3 5% .25W FC TC=-400/+500	01121	C83365
R17	0663-0335		RESISTOR 3.3 5% .25W FC TC=-400/+500	01121	C83365
R18	0663-1225	2	RESISTOR 1.2K 5% .25W FC TC=-400/+700	01121	C81225
R19	0663-1025		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	C81025
R20	0663-1225		RESISTOR 1.2K 5% .25W FC TC=-400/+700	01121	C81225
R21	0663-4715		RESISTOR 470 5% .25W FC TC=-400/+600	01121	C84715
R22	0663-1025		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	C81025
R23	0663-4715		RESISTOR 470 5% .25W FC TC=-400/+600	01121	C84715
R24	0663-0335		RESISTOR 3.3 5% .25W FC TC=-400/+500	01121	C83365
R25	0663-0335		RESISTOR 3.3 5% .25W FC TC=-400/+500	01121	C83365

Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
			ASYN MULTIPOINT INTERFACE ASSEMBLY CONT'D.		
R20	0666-4715		RESISTOR 470 5% .5W CC TC=0+529	01121	E84715
R27	0663-0335		RESISTOR 3.3 5% .25W FC TC=-400/+500	01121	C83365
R28	0663-0335		RESISTOR 3.3 5% .25W FC TC=-400/+500	01121	C83365
R29	0666-3315	4	RESISTOR 330 5% .5W CC TC=0+529	01121	E83315
R30	0666-3315		RESISTOR 330 5% .5W CC TC=0+529	01121	E83315
R31	0666-3315		RESISTOR 330 5% .5W CC TC=0+529	01121	E83315
R32	0666-3315		RESISTOR 330 5% .5W CC TC=0+529	01121	E83315
R33	0663-1025		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	C81025
R34	0663-4715		RESISTOR 470 5% .25W FC TC=-400/+600	01121	C84715
R35	0663-4725		RESISTOR 4.7K 5% .25W FC TC=-400/+700	01121	C84725
S1	3111-2094	4	SWITCH-TGL DIP ROCKER ASSEMBLY 8-1A NS	28480	3101-2094
	3131-0392	4	COV-RKR 0.922 IN LG; 0.422 IN W; 0.217	28480	3131-0392
S2	3111-2094		SWITCH-TGL DIP ROCKER ASSEMBLY 8-1A NS	28480	3101-2094
	3131-0392		COV-RKR 0.922 IN LG; 0.422 IN W; 0.217	28480	3131-0392
S3	3111-2094		SWITCH-TGL DIP ROCKER ASSEMBLY 8-1A NS	28480	3101-2094
	3131-0392		COV-RKR 0.922 IN LG; 0.422 IN W; 0.217	28480	3131-0392
S4	3111-2094		SWITCH-TGL DIP ROCKER ASSEMBLY 8-1A NS	28480	3101-2094
	3131-0392		COV-RKR 0.922 IN LG; 0.422 IN W; 0.217	28480	3131-0392
U11	1820-1209	5	IC-DIGITAL SN74LS38N TTL LS QUAD 2 NAND	01295	SN74LS38N
U12	1820-1244	5	IC-DIGITAL SN74LS153N TTL LS 4	01295	SN74LS153N
U13	1820-1244		IC-DIGITAL SN74LS153N TTL LS 4	01295	SN74LS153N
U18	1820-0990	2	IC-DIGITAL MC1489AL DTL QUAD NAND	04713	MC1489AL
U19	1820-0990		IC-DIGITAL MC1489AL DTL QUAD NAND	04713	MC1489AL
U21	1820-1209		IC-DIGITAL SN74LS38N TTL LS QUAD 2 NAND	01295	SN74LS38N
U22	1820-1244		IC-DIGITAL SN74LS153N TTL LS 4	01295	SN74LS153N
U23	1820-1244		IC-DIGITAL SN74LS153N TTL LS 4	01295	SN74LS153N
U24	1820-1210	1	IC-DIGITAL SN74LS51N TTL LS DUAL 2	01295	SN74LS51N
U25	1820-1818	2	IC, DIGITAL 74LS161	28480	1820-1818
U26	1820-1199	4	IC-DIGITAL SN74LS04N TTL LS HEX 1	01295	SN74LS04N
U27	1820-1209		IC-DIGITAL SN74LS38N TTL LS QUAD 2 NAND	01295	SN74LS38N
U28	1820-1074	1	IC-DIGITAL SN74128N TTL QUAD 2 NOR	01295	SN74128N
U29	1820-0509	2	IC-DIGITAL MC1488L DTL QUAD LINE	04713	MC1488L
U31	1820-1818		IC, DIGITAL 74LS161	28480	1820-1818
U32	1820-1213	2	IC-DIGITAL SN74LS113N TTL LS DUAL	01295	SN74LS113N
U33	1820-1348	1	IC-DIGITAL MM5307 PMS	27014	MM5307N
U34	1820-1195	1	IC-DIGITAL SN74LS175N TTL LS QUAD	01295	SN74LS175N
U35	1820-1208	2	IC-DIGITAL SN74LS32N TTL LS QUAD 2 OR	01295	SN74LS32N
U36	1820-1203	1	IC-DIGITAL SN74LS11N TTL LS TPL 3 AND	01295	SN74LS11N
U37	1820-1197	1	IC-DIGITAL SN74LS00N TTL LS QUAD 2 NAND	01295	SN74LS00N
U38	1820-1422	1	IC-DIGITAL SN74LS122N TTL LS	01295	SN74LS122N
U39	1820-1201	1	IC-DIGITAL SN74LS08N TTL LS QUAD 2 AND	01295	SN74LS08N
U41	1820-1209		IC-DIGITAL SN74LS38N TTL LS QUAD 2 NAND	01295	SN74LS38N
U42	1820-1209		IC-DIGITAL SN74LS38N TTL LS QUAD 2 NAND	01295	SN74LS38N
U43	1820-1199		IC-DIGITAL SN74LS04N TTL LS HEX 1	01295	SN74LS04N
U44	1820-1199		IC-DIGITAL SN74LS04N TTL LS HEX 1	01295	SN74LS04N
U45	1820-1196	1	IC-DIGITAL SA74LS174N TTL LS HEX	01295	SN74LS174N
U46	1820-1215	1	IC-DIGITAL SN74LS136N TTL LS QUAD 2	01295	SN74LS136N
U47	1820-1216	1	IC-DIGITAL SN74LS138N TTL LS 3	01295	SN74LS138N
U48	1820-1208		IC-DIGITAL SN74LS32N TTL LS QUAD 2 OR	01295	SN74LS32N
U49	1820-1213		IC-DIGITAL SN74LS113N TTL LS DUAL	01295	SN74LS113N
U51	1820-1219	1	IC-DIGITAL TR1602B TTL*	0026W	TR1602B
U54	1820-1244		IC-DIGITAL SN74LS153N TTL LS 4	01295	SN74LS153N
U59	1820-1199		IC-DIGITAL SN74LS04N TTL LS HEX 1	01295	SN74LS04N
U110	1820-0535	1	IC-DIGITAL SA754518P TTL DUAL 2 AND	01295	SN754518P
U210	1820-0799	2	IC-DIGITAL SN754528P TTL DUAL 2 NAND	01295	SN754528P
U310	1820-0799		IC-DIGITAL SN754528P TTL DUAL 2 NAND	01295	SN754528P
U410	1990-0429	2	OPTO-ISOLATOR LED-IC GATE IF=10MA-MAX	28480	1990-0429
U411	1990-0429		OPTO-ISOLATOR LED-IC GATE IF=10MA-MAX	28480	1990-0429
U412	1990-0494	2	OPTO-ISOLATOR LED-PDIO/XSTR IF=20MA-MAX	28480	1990-0494
U510	1820-1416	1	IC-DIGITAL SN74LS14N TTL LS HEX 1 INV	01295	SN74LS14N
U511	1990-0494		OPTO-ISOLATOR LED-PDIO/XSTR IF=20MA-MAX	28480	1990-0494
U512	1820-0509		IC-DIGITAL MC1488L DTL QUAD LINE	04713	MC1488L

Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
	02640-60134	1	CABLE EXTENDER ASSEMBLY REVISION DATE: 10-23-76	28480	02640-60134
	0850-0855 1251-0142 1251-0352 1251-3271 8120-2305	1 1 2 1	TUBING-HS .046-D/.023-RCVD .016-WALL CONNECTOR 14-PIN M MICRO RIBBON CABLE BUSHING-CIRC STD CONN CONNECTOR 14-PIN F MICRO RIBBON CBL SHIELDED	92194 90949 71468 90949 28480	FIT-221-3/64 CLEAR 57-30140 CA18220-6 57-60140 8120-2305

Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
	02640-60132	1	CABLE ASSEMBLY REVISION DATE: 09-04-76	28480	02640-60132
	0624-0098	2	SCREW-TPG 4-40 .438-IN-LG PAN-HD-POZI	28480	0624-0099
	0850-0855		TUBING-HS .046-D/.023-RCVD .016-WALL	92194	FIT-221-3/64 CLEAR
	1251-0159	1	CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	71785	251-15-30-261
	0890-0291		TBG HS BLK .375D		
	1251-2417	1	CONNECTOR 25-PIN M D SERIES	71468	DBC-25P-F0
	1251-3253	16	CONTACT-CONN MALE CRP .04-IN-CGNT-SZ	71468	030-1952-002
	1251-3271	1	CONNECTOR 14-PIN F MICRORIBBON	9D949	57-60140
	1251-3320	2	ACCESSORY-SUBMIN D CGNN	71468	018-5000-167
	1251-3328	2	ACCESSORY-SUBMIN D CGNN	71785	423-42-22-022
	1251-4339	1	POLARIZING KEY-PC EDGE CGNN	28480	1251-4339
	2150-0078	2	WASHER-LK MLCL NO.-4 .115-IN-ID	28480	2190-0078
	2200-0149	1	SCREW-MACH 4-40 .625-IN-LG PAN-HD-POZI	28480	2200-0149
	2200-0757	2	SCREW-MACH 4-40 .688-IN-LG PAN-HD-POZI	28480	2200-0757
	2220-0010	2	SCREW-MACH 4-40 .5-IN-LG FIL-HC-SLT	28480	2220-0010
	2260-0001	2	NUT-HEX-DBL-CHAM 4-40-THD .094-THK	28480	2260-0002
	2260-0002	1	NUT-HEX-DBL-CHAM 4-40-THD .062-THK	28480	2260-0005
	3030-0009	1	SCREW-SET 6-32 .375-IN-LG SMALL CUP-PT	28480	3030-0009
	8120-1930		CABLE-UNSHLD 26AWG 18-CNDCT JGK-JKT	28480	8120-1930
	8120-2305		CABLE-SHLD 22AWG 8-CNDCT BLK-JKT .27-OD	28480	8120-2305
	5040-6003	1	CLAMP	28480	5040-6003
	5040-6072	1	MOUNTING BLOCK	28480	5040-6072
	5040-6086	1	HOOD, CONNECTOR	28480	5040-6086

Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
	02645-60004	1	SELF TEST CGCONNECTOR ASSEMBLY REVISION DATE: 09-10-76	28480	02645-60004
	0380-0174	2	STANDOFF-RND .25LG 4-40THD .18CD BRS	88245	1550A-11
	0470-0251		ADHESIVE-SEALANT	36003	CLEAR SEAL
	0850-0855	1	TUBING-HS .046-D/.023-RCVD .016-WALL	92194	FIT-221-3/64 CLEAR
	1251-2416	1	CONNECTOR 25-PIN F D SERIES	71468	DBC-255-F0
	1251-3252	15	CONTACT-CGNN FEM CRP .04-IN-CONT-S2	71468	030-1953-000
	1251-3320	1	ACCESSORY-SUBMIN D CGNN	71468	018-5000-167
	1251-3328	2	ACCESSORY-SUBMIN D CGNN	71785	423-42-22-022
	1901-0040	2	DIODE-SWITCHING 30V 50MA 2NS DG-35	28480	1901-0040
	2150-0078	2	WASHER-LK HLCL NG.-4 .115-IN-ID	28480	2190-0078
	2200-0757	2	SCREW-MACH 4-40 .688-IN-LG PAN-HD-POZI	28480	2200-0757
	2220-0010	2	SCREW-MACH 4-40 .5-IN-LG FIL-HD-SLT	28480	2220-0010
	2260-0001	2	NUT-HEX-DBL-CHAM 4-40-THD .094-THK	28480	2260-0002
	8150-2344	1	WIRE 24AWG BK 300V PVC 7X32 80C	28480	8150-2344

Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
	5061-2404	1	EUROPEAN MODEM CABLE ASSEMBLY REVISION DATE: 06-23-76	28480	5061-2404
	0624-0098	2	SCREW-TPG 4-40 .438-IN-LG PAN-HD-POZI	28480	0624-0099
	1251-0159	1	CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	71785	251-15-30-261
	1251-0352	1	CABLE BUSHING-CIRC STD CONN	71468	CA18220-6
	1251-2417	1	CONNECTOR 25-PIN M D SERIES	71468	DBC-25P-F0
	1251-3253	16	CONTACT-CONN MALE CRP .04-IN-CONT-SZ	71468	030-1952-002
	1251-3320	1	ACCESSORY-SUBMIN D CONN	71468	018-5000-167
	1251-3328	2	ACCESSORY-SUBMIN D CONN	71785	423-42-22-022
	1251-4339	1	POLARIZING KEY-PC EDGE CONN	28480	1251-4339
	2150-0078	2	WASHER-LK HLCL NO.-4 .115-IN-ID	28480	2190-0078
	2200-0091	1	SCREW-MACH 4-40 .562-IN-LG PAN-HD-POZI	28480	2200-0091
	2200-0757	2	SCREW-MACH 4-40 .688-IN-LG PAN-HD-POZI	28480	2200-0757
	2220-0010	2	SCREW-MACH 4-40 .5-IN-LG FIL-HD-SLT	28480	2220-0010
	2260-0001	2	NUT-HEX-DBL-CHAM 4-40-THD .094-THK	28480	2260-0002
	2260-0002	1	NUT-HEX-DBL-CHAM 4-40-THD .062-THK	28480	2260-0005
	3030-0143	1	SCREW-SET 6-32 .5-IN-LG SMALL CUP-PT ALY	28480	3030-0143
	8120-1930		CABLE-UNSHLD 26AWG 18-CNDCT JGK-JKT	28480	8120-1930
	5040-6003	1	CLAMP	28480	5040-6003
	5040-6072	1	MOUNTING BLOCK	28480	5040-6072
	5040-6086	1	HOOD, CONNECTOR	28480	5040-6086

Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
	02640-60133	1	MULTIPOINT CABLE ASSEMBLY REVISION DATE: 09-04-76	28480	02640-60133
	0624-0098	2	SCREW-TPG 4-40 .438-IN-LG PAN-HD-POZI	28480	0624-0099
	1251-0142	1	CONNECTOR 14-PIN M MICRO RIBBON	90949	57-30140
	1251-0159	1	CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	71785	251-15-30-261
	1251-0352	2	CABLE BUSHING-CIRC STD CONN	71468	CA18220-6
	1251-3271	1	CONNECTOR 14-PIN F MICRORIBBON	90949	57-60140
	1251-4339	2	POLARIZING KEY-PC EDGE CONN	28480	1251-4339
	2200-0091	1	SCREW-MACH 4-40 .562-IN-LG PAN-HD-POZI	28480	2200-0091
	2260-0002	1	NUT-HEX-DBL-CHAM 4-40-THD .062-TMK	28480	2260-0005
	3030-0143	1	SCREW-SET 6-32 .5-IN-LG SMALL CUP-PT ALY	28480	3030-0143
	8120-2305	1	CABLE-SHLD 22AWG 8-CNDCT BLK-JKT .27-OD	28480	8120-2305
	5040-6004	1	CLAMP, CABLE, SMALL	28480	5040-6004
	5040-6072	1	MOUNTING BLOCK	28480	5040-6072
	5040-6086	1	HOOD, CONNECTOR	28480	5040-6086
	0890-0291		TBG HS BLK .375D		
	0890-0855		TBG HS CLR .046D		

Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
	5061-2403	1	MODEM BYPASS CABLE ASSEMBLY REVISION DATE:09-10-76	28480	5061-2403
	0360-0174	4	STANDOFF-RND .25LG 4-40THD .18GD BRS	88245	1550A-11
	1251-0352		CABLE BUSHING-CIRC STD CONN	71468	CA18220-6
	1251-2416	2	CONNECTOR 25-PIN F D SERIES	71468	DBC-25S-F0
	1251-3251	18	CONTACT-CONN FEM CRP .04-IN-CONT-SZ	71468	030-1953-002
	1251-3252	10	CONTACT-CONN FEM CRP .04-IN-CONT-SZ	71468	030-1953-000
	1251-3320	4	ACCESSORY-SUBMIN D CONN	71468	018-5000-167
	1251-3328	4	ACCESSORY-SUBMIN D CONN	71785	423-42-22-022
	2190-0078	4	WASHER-LK HLCL NO.-4 .115-IN-ID	28480	2190-0078
	2200-0757	4	SCREW-MACH 4-40 .688-IN-LG PAN-HD-POZI	28480	2200-0757
	2220-0010	4	SCREW-MACH 4-40 .5-IN-LG FIL-HD-SLT	28480	2220-0010
	2260-0001	4	NUT-HEX-DBL-CHAM 4-40-THD .094-THK	28480	2260-0002
	8150-2344		WIRE 24AWG BK 300V PVC 7X32 80C	28480	8150-2344
	0890-0291		TBG HS BLK .375D		
	8120-1930		CA 18 X 26 GA UL		

Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
	02640-60140 0490-0520 0757-0797 1251-2035 1901-0050	1 5 1 1 1	POWER DOWN PROTECT PCA REVISION DATE: 09-22-76 RELAY RES 90.9 1% .5W CONN PC2X15.156D DIODE-SILICON		