Model SS-400

Multifunction I/O Controller

Technical Manual

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REVISION HISTORY

ECO No.	Date	Description	Pages
0019	4/2/82	Per ECO	3-5,3-6, 5-1
0061	9/7/82	Per ECO	2-1,2-3, 3-2
0105	3/11/83	Per ECO	8-4
0153	6/30/83	Labeled Switches On/Off	
0328	6/28/84	New ZETACO Cover	
0523	3/3/86	New Cover	

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All possible effort to test a suspected malfunctioning controller should be made before returning the controller to ZETACO for repair. However, if controller or module malfunction has been confirmed, you should return the part to ZETACO. If the part is no longer under warranty, or if the problem is not warranted, then repair will be on a time-and-material basis. A Return Material Authorization (RMA) number is required before shipment and should be referenced on all packaging and correspondence.

To ensure prompt response, the information outlined in the Material Return Information form on the following page should be gathered before calling the ZETACO Hotline for the RMA number. Please include a completed copy of the Material Return Information form with the product. Each product to be returned requires a separate RMA number and Material Return Information form.

To safeguard the product during shipment, please use packaging that is adequate to protect it from damage. Mark the box "Delicate Instrument" and indicate the RMA number(s) on the shipping label.

MATERIAL RETURN INFORMATION

All possible effort to test a suspected malfunctioning controller should be made before returning the controller to ZETACO, Inc. for repair. The speed and accuracy of a product's repair is often dependent upon a complete understanding of the user's checkout test results, problem characteristics, and the user system configuration. Use the form below to record the results of your trouble-shooting procedures. If more space is needed, use additional sheets.

FUNCTION	TEST	RESULT
Serial Port	GNSTP	_____
Real Time Clock	RTCD	_____
Line Printer	LPTD	_____
MUX	QTYDR	_____

Other tests performed:

Please allow our service department to do the best job possible by answering the following questions thoroughly and returning this information with the malfunctioning board.

1. Does the problem appear to be intermittent or heat sensitive? (If yes, explain.)

2. Under what operating system are you running? (AOS, AOS/VS, RDOS, etc.)

3. Describe the system configuration (i.e.; peripherals, controllers, model of computer, etc.)

4. Has the unit been returned before? Same problem?

To be filled out by CUSTOMER:

Model #: _____
Serial #: _____
RMA #: _____ (Call ZETACO to obtain an RMA number.)

Returned by:

Your name: _____
Firm: _____
Address: _____
_____
Phone: _____

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1.0 GENERAL DESCRIPTION

The Multifunction I/O Controller is a high density, multi-device controller which interfaces to the low speed peripherals most commonly used in Data General Minicomputer systems. These interfaces are: two Console Device Controllers, Real Time Clock, Parallel Line Printer and a 4241 Compatible 8 Channel Asynchronous Multiplexer with Full Modem Control.

This I/O Controller can be utilized in any Nova or Eclipse* system where chassis space, power consumption and performance are critical factors. Incorporating the most commonly used peripheral controllers in a single package enables the System Architect to dedicate only one chassis slot for programmed I/O devices, which releasing the others for more complex functions, such as Memory Control, Mag Tape, Disk, D-A, A-D, etc.

*Nova and Eclipse are trademarks of Data General Corporation

2.0 INSTALLATION INSTRUCTIONS

2.1 UNPACKING

Upon receiving the interface package, unpack the contents and inspect the board for visual damage. If any damage is apparent, do not attempt to install the controller but notify ZETACO, Inc. immediately.

2.2 BOARD INSTALLATION

The controller board may be installed in any General I/O, Memory -I/O or I/O only slot of the Data General Nova or Eclipse Minicomputer. Install the controller in the desired slot, component side up and lock into position with release levers. CAUTION: Be sure keyways in backplane connector line up with slots in controller board edge connector. (See Figure 2.1)

If with the selection of the I/O slot a vacant slot or slots exist between the controller and the board below it, the DCHP (Data Channel Priority) and INTP (Interrupt Priority) signals must be physically jumpered on the computer backpanel to maintain priority interrupt continuity. Install one end of wire-wrap jumper to the DCHP - OUT signal and at pin 93 at the "A" connector occupied by the device below the controller. Connect the remaining end to the DCHP - IN signal at pin 94 of the "A" connector occupied by the controller, bridging the vacant slot or slots. Similarly, connect the INTP - OUT signal (pin A-95) from the lower device to the INTP - IN signal at pin A-96 of the controller. This will complete the priority interrupt continuity to the card. If vacant slots exist between the controller and the device above the controller, perform similar strapping of the DCHP and INTP signals to maintain interrupt priority.

2.3 COMPUTER BACKPANEL

The backpanel of the computer provides a means for interconnecting the computer, memory, console and various controller boards and cabling to external peripheral equipment. The backpanel is the vertical printed circuit board mounted on the left side of the computer chassis when viewed from the front.

2.3 COMPUTER BACKPANEL (continued)

On the side of the backpanel facing into the chassis are pairs of printed circuit board female edge connectors, one pair for each slot. The contact, of these connectors protrude through the backpanel to the left side of the minicomputer chassis.

When the made edge connectors of a printed circuit board are inserted into the female edge connectors of a slot, finger contacts on the male edge connectors meet contacts in the female edge connectors. Electrical connections to boards can, therefore, be made to pins on the backpanel.

For each controller card slot, there are two horizontal parallel rows of 100 pins on the backplane. The left group of pins is the A connector, and the right group (as viewed from the left side of the computer) is called the B connector. Numbering of each group of 100 pins is as indicated below (shown only for connector A).

BACK PANEL NUMBERING

A1	A3	A5	A7	A9	A11	A13	A15	A17	A19	A21	A23	A25	A27	A29	A31	A33	A35	A37	A39	A41	A43	A45	A47	A49
A2	A4	A6	A8	A10	A12	A14	A16	A18	A20	A22	A24	A26	A28	A30	A32	A34	A36	A38	A40	A42	A44	A46	A48	A50

A51	A53	A55	A57	A59	A61	A63	A65	A67	A69	A71	A73	A75	A77	A79	A81	A83	A85	A87	A89	A91	A93	A95	A97	A99
A52	A54	A56	A58	A60	A62	A64	A66	A68	A70	A72	A74	A76	A78	A80	A82	A84	A86	A88	A90	A92	A94	A96	A98	A100

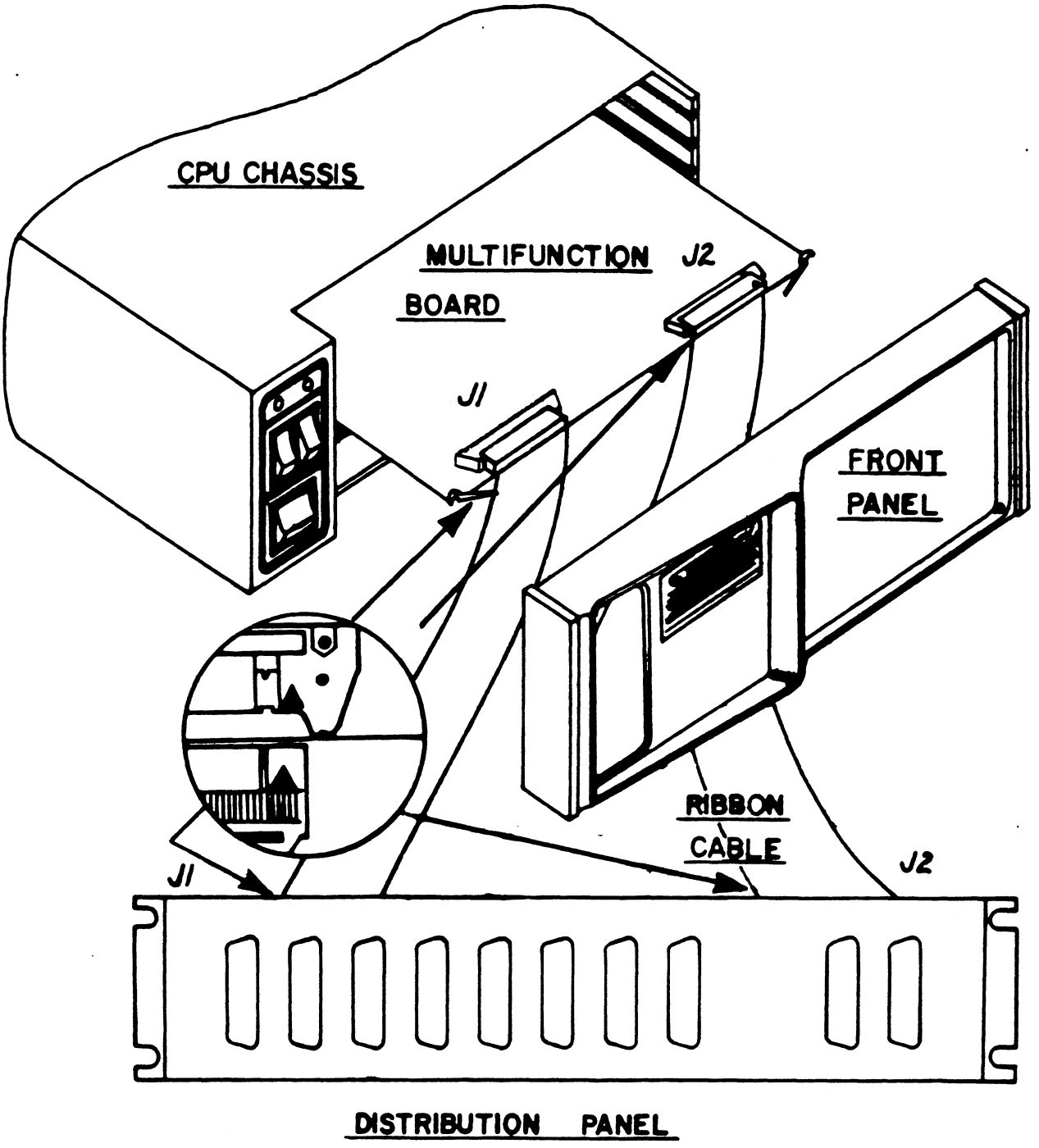


FIGURE 2.1 BOARD INSTALLATION

3.0 CONSOLE DEVICES

3.1 INTRODUCTION

Two console interfaces are available to allow local attachment of TTY style devices (CRT's, Serial Printers, Teletypes, etc.) at standard line rates from 50 to 19,200 baud. Each interface supports a "Clear to Send" hand shake as well as switch selectable RS-232 or current loop interfaces.

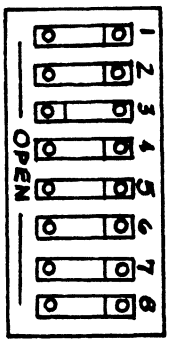
3.2 ADDRESSING

Both console controllers may be configured for any one of 62 legal Device Codes. This allows the user, for example, to set one console to Device Code 17 (octal) for use as a Serial Line Printer Controller, however, the Line Printer Interface would have to be set to a different Device Code to avoid conflicts.

3.2 ADDRESSING

This is accomplished by altering the device select switches at location X2 for the First Console and location W6 for the Second Console. The switches operate as follows:

OFF = 1 ON = 0



SW1 = CONS SEL 0 (Most Significant Bit)
SW2 = CONS SEL 1
SW3 = CONS SEL 2
SW4 = CONS SEL 3
SW5 = CONS SEL 4 (Least Significant Bit)

} CONS SEL 5 assumed i.e. 10/11, 50/51

SW6
SW7 } NOT USED
SW8

DEVICE CODE 10/11 (OCTAL) SHOWN

3.3 OPERATION AND PROGRAMMING

The Console Serial Device Controller is set up to handle full duplex communications with Model ASR-33, KSR-33 or KSR-35 teletypes at a speed of 10 characters per second or a CRT at speeds up to 19.2K baud. Each Serial Device Controller has separate Input and Output functions and is really two distinct Devices. Each has its own device code, BUSY, DONE, and INTERRUPT DISABLE flags.

Output To The Terminal

Output from the computer to the console terminal requires only one I/O instruction. The Device Code is 11 and the Interrupt Priority Mask Bit is 15. A character is transferred to the display terminal with a Data Out A instruction. The ASCII character code is placed in bits 8-15 of the selected accumulator. The START function is used to set BUSY which in turn causes the contents of the controller output buffer to be serially shifted out to the terminal. The terminal displays or prints

the character or performs the indicated control function. Completion of transmission clears BUSY, sets DONE and requests an interrupt if the INTERRUPT DISABLE flag is clear.

Input From The Terminal

Input to the computer from the terminal also uses only one I/O instruction. The Device Code is 10 and the Interrupt Priority Mask Bit is 14. The logic of the input controller is slightly different than other input controllers in that striking a key on the keyboard will cause the code from the terminal to be serially shifted into the controller input buffer. This will occur irrespective of whether the program has previously set the BUSY flag or not.

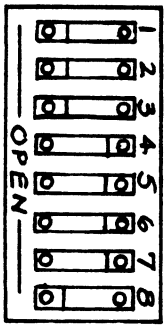
Under normal operation, the BUSY flag is set with a NIOS instruction prior to when data is expected to be received from the terminal. The DONE flag is set, BUSY cleared and an interrupt generated (unless the DISABLE flag is set) when the character has been serially shifted into the teletype controller buffer. The eight bits which comprise the character are brought into the accumulator with a Data In A instruction.

3.4 OPTIONS

Each Console Interface may be configured for different operating characteristics. These include: 16 Baud Rates - 5, 6, 7, or 8 bit word Length - 1 or 2, Stop Bits - Even, Odd or No Parity and RS232 or 20MA Current Loop. These options are selected via a dip switch for each console. The first consoles option switch is at location S5, while the second consoles option switch is at location P5. The switches are configured as follows:

3.4 OPTIONS (continued)

OFF = 1 ON = 0



SW1
SW2 } Baud Rate Selection
SW3 } (See Below)
SW4
SW5 = Character Length Selection
SW6 = Stop Bit Selection
SW7 } Parity Control
SW8 }

SHOWN - 9600 BPS, 7 BITS, 1 STOP BIT, EVEN PARITY

BAUD RATE SELECTION				
SW1	SW2	SW3	SW4	BAUD RATE
0	0	0	0	50
0	0	0	1	75
0	0	1	0	110
0	0	1	1	134.5
0	1	0	0	150
0	1	0	1	300
0	1	1	0	600
0	1	1	1	1200
1	0	0	0	1800
1	0	0	1	2000
1	0	1	0	2400
1	0	1	1	3600
1	1	0	0	4800
1	1	0	1	7200
1	1	1	0	9600
1	1	1	1	19200

3.4 OPTIONS (continued)

SW5 - Character Length Selection

SW5 OFF = 8 Bits/Character

ON = 7 Bits/Character

NOTE: If Jumper J17-1 (Console 1) or J21-1 (Console 2) is in

THEN

SW5 OFF = 6 Bits/Character

ON = 5 Bits/Character

SW6 - Stop Bit Selection

SW6 OFF = 2 Stop Bits

ON = 1 Stop Bit

NOTE: If Character Length is 5 bits

THEN

SW6 OFF = 1 1/2 Stop Bits

ON = 1 Stop Bit

SW7 & SW8 - Parity Control

SW7 OFF = Parity Disabled

ON = Parity Enabled

NOTE: If SW7 Closed

THEN

SW8 OFF = Even Parity

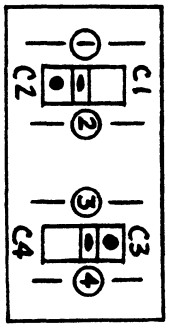
ON = Odd Parity

RS232 vs Current Loop

The consoles interfaces are capable of driving both EIA/RS232 or 20MA Current Loop equipped console devices. A dual switch at location N10 is used to control both console interfaces.

3.4 OPTIONS (continued)

RS232 - CURRENT LOOP



SW1 - 2nd Console (RS232 Selected Shown)

SW2 - 1st Console (Current Loop Selected Shown)

Second Console Mask Bit

The Second Console Mask Bit 15 for TTO (output) may be altered to Bit 12 by removing Jumper J20-1 and inserting J20-2 between G2 and G3.

Disabling Consoles

To disable First Console remove J16-1 and insert J16-2.
To disable Second Console remove J20-3 and insert J20-4.

3.5 INTERFACE

Each console I/F uses 3 signals to communicate with peripherals. These signals are on the backplane and distribution panel.

	NAME	BACKPLANE	TO DIST. PANEL
1st Console:	Serial Data Out (RS232/20MA)	A85	J2-36
	Serial Data In (RS232/20MA)	B69	J2-40
	Clear to Send	A90	J2-6
2nd Console:	Serial Data Out (RS232/20MA)	B13	J1-40
	Serial Data In (RS232/20MA)	B11	J1-36
	Clear to Send	B67	J1-30

4.0 REAL TIME CLOCK

4.1 INTRODUCTION

The Real Time Clock (RTC) is a device which provides the system processor with a time base which is independant of CPU or system timing. The RTC can provide interrupts at any one of four frequencies specified under program control. These frequencies are: 1KHZ, 100HZ, 10HZ and the computers AC power line frequency.

4.2 ADDRESSING

The RTC is accessed via Device Code 14 (octal), which is compatible to Data General's operating software. An alternate Device Code 54 (octal) is available simply by cutting Jumper J22-2 (near location Z7). As in the case of a Nova/4 the RTC device code may be changed or the RTC disabled, (inserting Jumper J22-1 near locations W9) thus inhibiting the RTC from responding to any processor commands.

4.3 OPERATION AND PROGRAMMING

The controller for the Real Time Clock uses the standard clock instruction set as outlined in the Nova Programmers Reference Manual. The Real Time Clock option consists of five frequencies (10, 50, 60, 100, 1000Hz) which are selectable under program control.

The clock frequency to be used is selected via a Data Out A instruction to Device 14 (octal) or 54 (octal). The Interrupt Priority Mask Bit is Data 13. The referenced accumulator will contain the desired frequency in Data Bits 14 and 15 as follows:

AC BITS 14-15	FREQUENCY
00	AC Line Frequency
01	10Hz
10	100Hz
11	1000Hz

4.3 OPERATION AND PROGRAMMING (Continued)

As with most other peripheral controllers, the BUSY flip flop is set by the START signal (NIOS instruction). The next pulse from the selected clock will then set DONE, requesting an interrupt if INTERRUPT DISABLE is clear. A DOA instruction to select the frequency need be given only once; following each interrupt a NIOS sets up the clock for the next pulse.

When BUSY is first set, the first interrupt can come up at any time up to the clock period. But, once one interrupt has occurred, further interrupts are at the clock frequency selected, provided the program always sets BUSY before the next period expires.

The Real Time Clock option is used for low resolution timing compared to processor speed, but it has high long-term accuracy. Power turn on or the RESET function generated by either the program or the minicomputer console will reset the clock to line frequency. Following power turn on, the line frequency pulses are available immediately, but up to a second may elapse before a steady pulse train is available from the crystal for other frequencies.

4.4 INTERFACE

Only one external backplane signal is required for the RTC's operation. That is the AC Line Frequency Input; 50 or 60Hz. The input line is B6, which on some machines has the line frequency present on Pin B6 in the general purpose I/O slot. Otherwise, a backplane jumper wire must be added from the general purpose I/O slot to the slot the Multifunction Interface Controller resides in.

5.0 LINE PRINTER

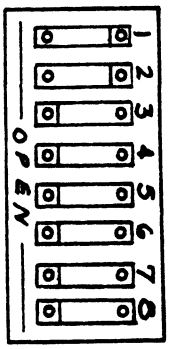
5.1 INTRODUCTION

The Multifunction I/O Controller Line Printer Interface is intended to control most popular Parallel Line Printers. This flexible controller allows the use of "Standard" operating software as well as a variety of hardware options. These hardware options include: Variable Strobe Pulse Width (400 nanoseconds to 3.2 microseconds), Active High or Low Strobe, Active High or Low Data, Line Feed to Carriage Return Translation and Read Printer Status (paper empty, online, etc.)

5.2 ADDRESSING

The Printer Interface may be configured to operate with any of 62 legal Peripheral Device Select Codes. The Standard Primary Device Code is 17 (octal) and Secondary is 57 (octal). The Interrupt Priority Mask Bit is Data 12. The Device Select Switch in location X1 functions as follows:

OFF = 1 ON = 0



SW1 = LPT SEL 0 (most Significant Bit)
SW2 = LPT SEL 1
SW3 = LPT SEL 2
SW4 = LPT SEL 3
SW5 = LPT SEL 4
SW6 = LPT SEL 5 (Least Significant Bit)
SW7 = LF/CR Conversion } See Section 5.4
SW8 = True/False Data }

DEVICE CODE 17 (OCTAL) SHOWN

To Disable LPT SEL remove J18-4 and insert jumper across J18-5.

5.3 OPERATION AND PROGRAMING

Data transfer between a Nova or Eclipse minicomputer and the printer is performed on a character-by-character basis. Programmed output to the controller is generated by a Data Out A and a START command. Bits 8-15 of the selected accumulator contain the ASCII code of the character to be transferred.

The start (bit 9 of the instruction word) must be set on each Data Out instruction. This pulse is used to set the BUSY flag to the "1" state. Upon completion of the transfer or at the end of the printing or function operation, the DONE flag is set and BUSY goes to the zero state. Program control of the interface can use any of the standard Data General I/O instructions:

SKPBN	Skip if BUSY flag is 1
SKPBZ	Skip if BUSY flag is 0
SKPDN	Skip if DONE flag is 1
SKPDZ	Skip if DONE flag is 0

When transfer of each character is complete and if the INTERRUPT logic for the computer has been enabled, the interface will command a standard program interrupt. An INTA (interrupt acknowledge) instruction places the device code of the interrupting device into the selected accumulator. If the device does not need further service at this time, a NIOC instruction to the device clears the DONE flag and prevents further interrupts. If, on the other hand, another character is to be transferred immediately, the CLEAR instruction is not required as a DOAS instruction clears DONE, sets BUSY and transfers the new character. Disabling the interrupt capability for this device can be controlled by a mask instruction with the printer mask bit 12 selected.

Data is transferred to the printer with DOAS instructions at a rate of up to one character every 1.5 microseconds. Status of the printer is read into the computer using a Data In A (DIA) instruction. Bit 15 is a binary one when the printer is ready, on line and has paper.

5.4 OPTIONS

The Line Printer Interface may be configured to control a variety of Parallel Line Printers. These options: LF to CR translator, True or False Data, True or False Strobe, 1 of 4 Selectable Strobe Widths and 2 Active High or Low Printer Status Lines insure compatibility for the user. These options are selected as follows:

Line Feed to Carriage Return Conversion

LPT Device Select Switch (Location X1)

If SW7 = OFF - LF to CR Enabled

ON - LF to CR Disabled

Data Polarity

LPT Device Select Switch (Location X1)

If SW8 = OFF - Invert Data Going to Printer (True Data="0")

ON - Data Passes Unaltered (True Data="1")

Data Strobe Polarity (In Location S-3)

If Jumper J19-5 is:

IN, Then Data Strobe is Active Low

OUT, Then Data Strobe is Active High

Data Strobe Pulse Width (In Location S-3)

There are 4 available pulse widths:

J19-1 IN = 400 nanosec. width and 400 nanosec. set-up

J19-2 IN = 800 nanosec. width and 800 nanosec. set-up

J19-3 IN = 1.6 microsec. width and 1.6 microsec. set-up

J19-4 IN = 3.2 microsec. width and 3.2 microsec. set-up

NOTE: Only one of above Jumpers may be in at any time.

Printer Status Polarity

Printer select or Online or $\overline{\text{Out of Paper}}$

If Jumper J18-1 IN Location Y2 is:

IN, Then Signal is Active High

OUT, Then Signal is Active Low

5.4 OPTIONS (continued)

Paper Empty or $\overline{\text{Ready}}$

If Jumper J18-3 in Location Y2 is:

IN, Then Signal is Active High

OUT, Then Signal is Active Low

Paper Empty can be bypassed by inserting J18-2 (in Location Y2)

5.5 INTERFACE

The Line Printer Controller interfaces to the peripheral with the following I/O Pins:

SIGNAL NAME	I/O PIN NUMBER
Printer Data Ø	B15
Printer Data 1	B19
Printer Data 2	B23
Printer Data 3	B25
Printer Data 4	B27
Printer Data 5	B31
Printer Data 6	B49
Printer Data 7	B51 or B36
Data Strobe	B53
Data Demand	B38
Printer Select Or OUTLINE OR OUT OF PAPER	B54
PAPER EMPTY OR READY	B48 or B40

6.0 PROGRAMMABLE ASYNCHRONOUS MULTIPLEXER

6.1 INTRODUCTION

The I/O Controller's Asynchronous Multiplexer (MUX) is an eight line device which is fully compatible with Data Generals Model 4241 (ULM/5) programming format. This controller will allow the system to interface to and communicate with a wide variety of local and remote serial devices. These devices include: CRT's, Async Communications Lines (via modems), serial printer, plotters, etc.

The Mux sports features which make it ideal for the Communications Systems Designer, such as: Fully Programmable Line Characteristics (including Baud Rate, Word Length, Framing Control all on an individual line basis). Individual Line Section Interrupt Control (Transmitter, Receiver, Modem). Individual Line Interface Selection (20MA or RS232). Single character transmit and receive buffers for each line. In addition, each line also supports half or full duplex operation, character error detection, transmit break, diagnostic loopback and full modem control with an interface to a distribution panel via ribbon cable to solve cabling problems.

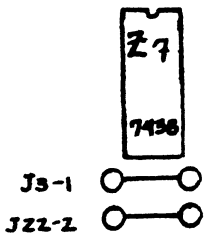
6.2 ADDRESSING

The Mux is addressed with a primary device code of 34 (OCTAL) and a secondary of 44 (OCTAL). The standard interrupt mask bit is Data Bit 8. The Mux is an 8 Channel Device which occupies lines 0-7 in the Data General Communications Software. The Device Code is selected as follows:

If Jumper J3-1 (Near Loc. Z7) is:

IN, Device Code = 34 (OCTAL)

OUT, Device Code = 44 (OCTAL)



(See Mux Options Section 6.5 for Non-Standard Device Codes)

6.3 OPERATION

Each individual line of the mux is broken down into 3 Discrete Sections, the Receiver, the Transmitter and the Modem. Each section may be turned on or off at the users discretion.

The board operates in two modes, on line and off line. In off line, or diagnostic mode, the program provides all timing pulses via an I/O Pulse to the mux. Once the board has been placed on line, the boards crystal oscillator provides all timing pulses.

6.3 OPERATION (continued)

There are six Device Command/Flags that control or indicate conditions on the Mux; these are:

BUSY - Active during initialization of the board, only after a start command or IORESET.

DONE - Active whenever an enabled line section of the board requires service.

F = S - START, sets BUSY ACTIVE, puts board on line, clears DONE and initializes board, then places board off line and clears busy.

F = C - CLEAR, clears DONE, restarts the priority scanner and/or puts board on line.

IORST - IORESET, functions similar to START, however, resets all mux's in system.

The Mux's internal logic requires a scanning method to determine if any sections require service. Each line section takes approximately 3.25 microseconds to scan - requiring up the 52.0 microseconds to find one section requesting service. Specific priorities are assigned to each line sections and dictate the order in which they are scanned. This priority is as follows:

PRIORITY	LINE #	SECTION
TOP	00	ASYNC RECEIVER
	01	ASYNC RECEIVER
	02	ASYNC RECEIVER
	03	ASYNC RECEIVER
	04	ASYNC RECEIVER
	05	ASYNC RECEIVER
	06	ASYNC RECEIVER
	07	ASYNC RECEIVER
	00	ASYNC TRANSMITTER
	00	ASYNC MODEM
	01	ASYNC TRANSMITTER
↓	01	ASYNC MODEM

6.3 OPERATION (continued)

PRIORITY	LINE #	SECTION
↓	02	ASYNC TRANSMITTER
	02	ASYNC MODEM
	03	ASYNC TRANSMITTER
	03	ASYNC MODEM
	04	ASYNC TRANSMITTER
	04	ASYNC MODEM
	05	ASYNC TRANSMITTER
	05	ASYNC MODEM
	06	ASYNC TRANSMITTER
	06	ASYNC MODEM
↓	07	ASYNC TRANSMITTER
BOTTOM	07	ASYNC MODEM

NOTE:

Heavy line activity on a high priority line will exclude other lines from being serviced - since only the highest priority line's address gets returned during a Read Line and Section Requesting Service Instruction.

The DONE flag is set (and an interrupt occurs, if enabled) whenever any of the following conditions exist:

RECEIVER - The receiver is turned on and it has a character in its buffer, (one character time is allowed before an overrun occurs).

TRANSMITTER - The transmitter is enabled and can accept a character and "Clear to Send" is active.

MODEM - The modem is enabled and one of its input status lines has changed state, or, the status line was active when the board was placed on line.

6.3 OPERATION (continued)

INITIALIZATION - Generally, each line is initialized to operating parameters specified by the system. The board is put off line by issuing a START or IORESET. Since all lines on the board are now off line, they should all be initialized together. While the board is busy, it has set it's own default parameters to: "REQUEST TO SEND" = OFF, word length = 7 Bits, Even Parity, 2 Stop Bits, and the Baud Rate specified by the default switches, (See Section 6.5). After all lines are set as desired, a Clear Command will place the current board on line.

RECEIVER - The Receiver does all the conversion from the serial data stream to the CPU's parallel character format. When a character has arrived, a program interrupt is initiated (if the receiver is enabled). The program then executes a Data In A to find which line requires service. If Data Bit 15 is a one, a transmitter requires service. If it is a zero, a receiver or modem requires service. Next, a Data In C is executed to determine which it is. A Zero in Data Bit 15 dictates the receiver has a character, a One means a Modem Input Signal has changed state. The receiver status is contained in Data Bits 12 to 14 and modem status is in Data Bits 11 to 14. If in fact the receiver has a character, it can be read and the interrupt cleared by executing a Data In B Clear, Mux. As an added feature, the receiver baud rate may be jumpered to a separate fixed value. This is to facilitate the use of split frequency modems, (see Section 6.5).

TRANSMITTER - The transmitter handles the serialization of data characters being passed to it by the CPU. If enabled, it will initiate a program interrupt whenever it's transmit holding buffer is empty and "Clear To Send" is active. When connected to a modem the transmitter will not set done until the other end is ready and the modem activates the signal "Clear To Send", (this input will be active if no signal is connected to it - as in current loop). A transmitter done condition is cleared by executing a Transmit Data (DOB) instruction with a clear command appended to it. The transmitter may be disabled by executing a transmit break instruction (DOB) to send all zeros. The break condition is cleared by transmitting another character.

6.3 OPERATION (continued)

MODEM - The modem controls the handshaking and electrical interface to the telephone lines. Modems generally provide four handshake input signals "Data Set Ready", "Carrier Detect", "Ring Indicator" and "Clear to Send". Whenever the modem is enabled and an input signal has changed state or the input is Active when going from off line to on line, the done flag is set. The status is read by the CPU via a read receiver or modem status (DINC) instruction. If a No I/O Clear Mux is executed, the pending interrupt is cancelled. There are also two outputs to tell the modem the multiplexer's condition. These are controlled via a set modem control status instruction. The signal "Data Terminal Ready" is controlled directly by Data Bit 15. The second output "Request To Send", is controlled by Data Bit 14 and may be turned on at any time, but will not turn off unless the transmitter is done transmitting.

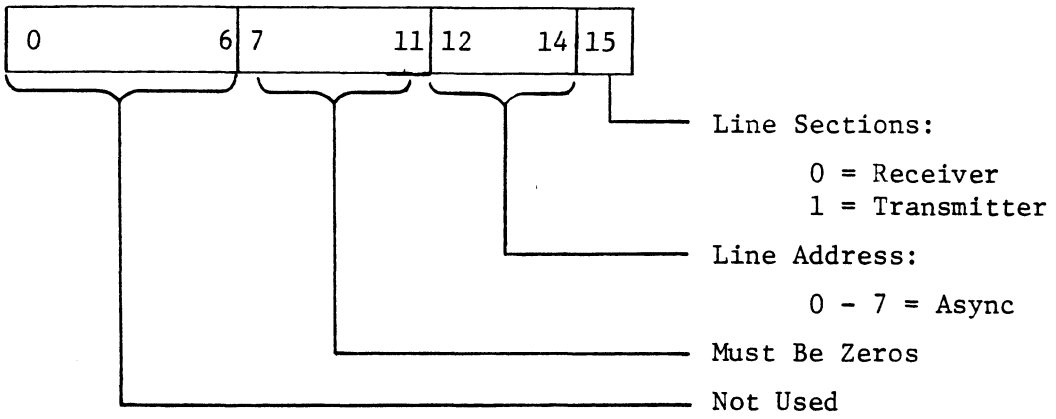
LOOPBACK - Testing of the Async Line is essential to insure Data Integrity. Loopback provides the means to connect the transmitter to the receiver and test data flow (compare Transmit and Receive Data Blocks). Loopback also forces "Clear to Send" active.

6.4 PROGRAMMING

The Programmable Asynchronous Multiplexer will respond to ten instructions which control all functions of asynchronous communications. However, some instructions use the same Data Out command with the contents of the specified accumulator determining how the controller will function. All instructions affect only the "Current Line Address" once it has been specified by a set line and section instruction or a Read Line and section requesting service instruction. The instructions are as follows:

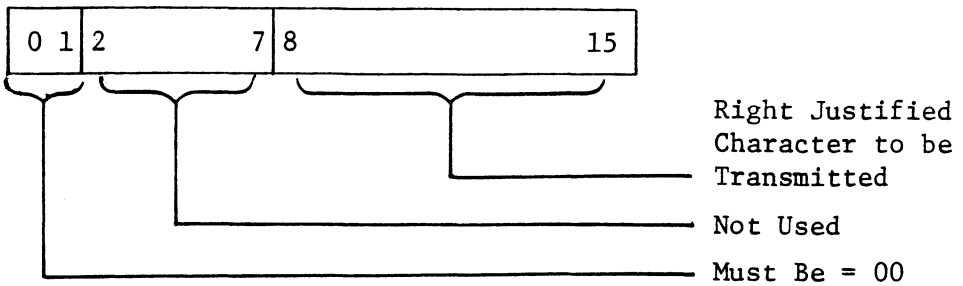
1) Set Line and Section

DOA (f) AC, MUX



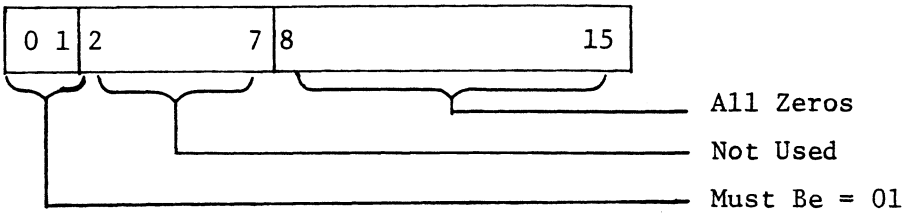
2) Transmit Data

DOB (f) AC, MUX



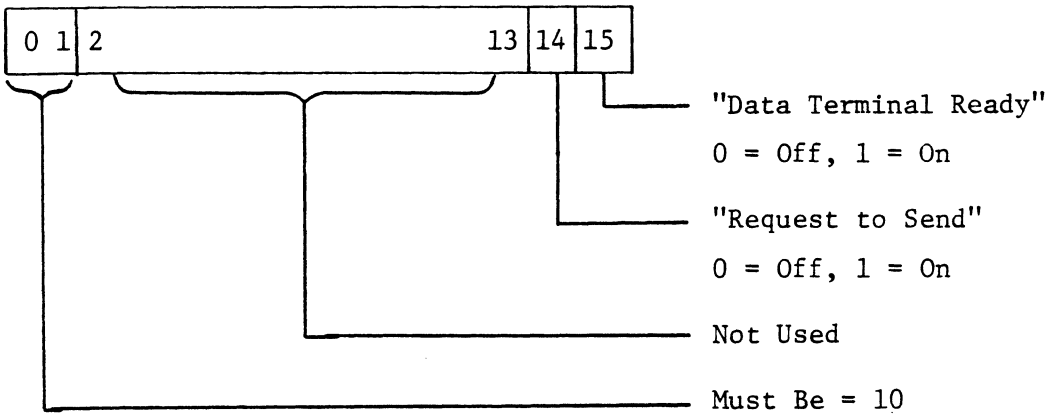
3) Transmit Break

DOB (f) AC, MUX



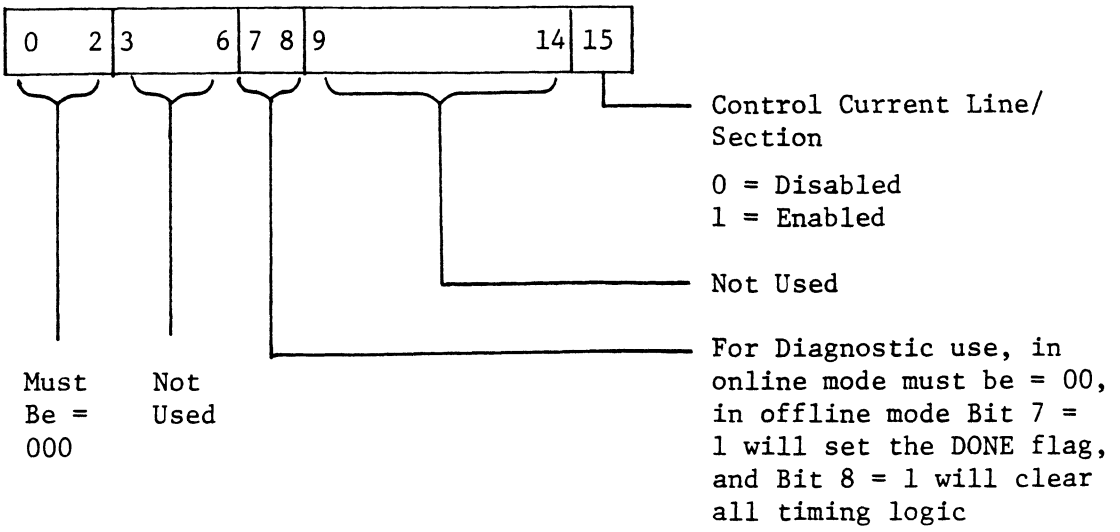
4) Set Modem Control Status

DOB (f) AC, MUX



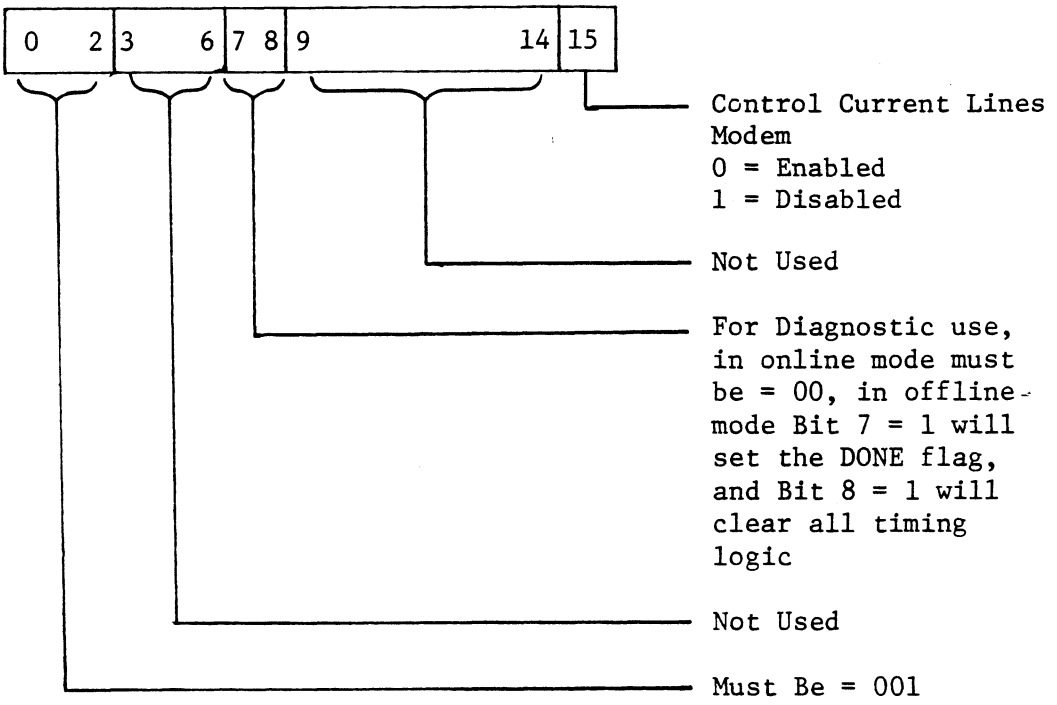
5) Control Line Section

DOC (f) AC, MUX



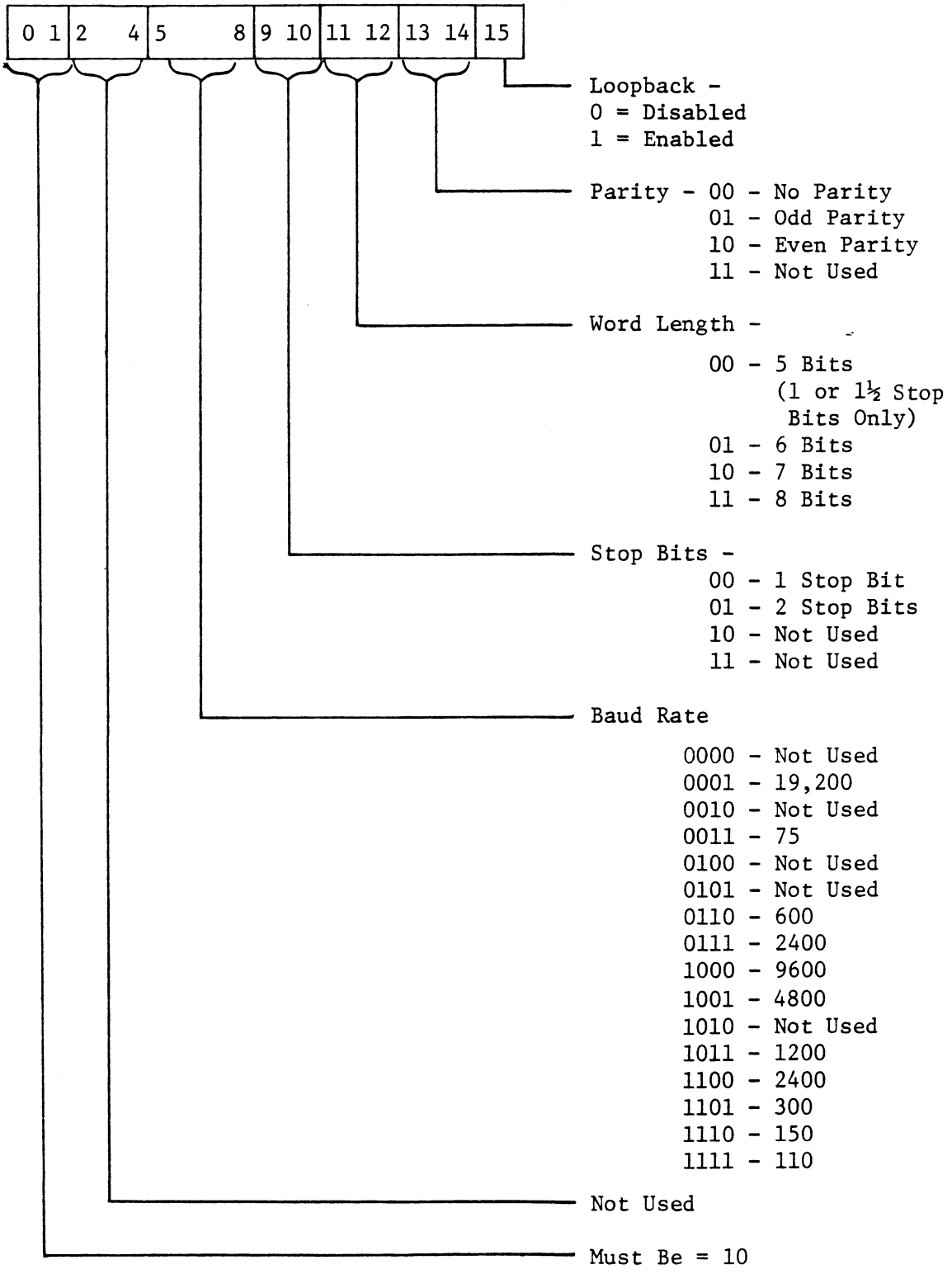
6) Control Modem Section

DOC (f) AC, MUX



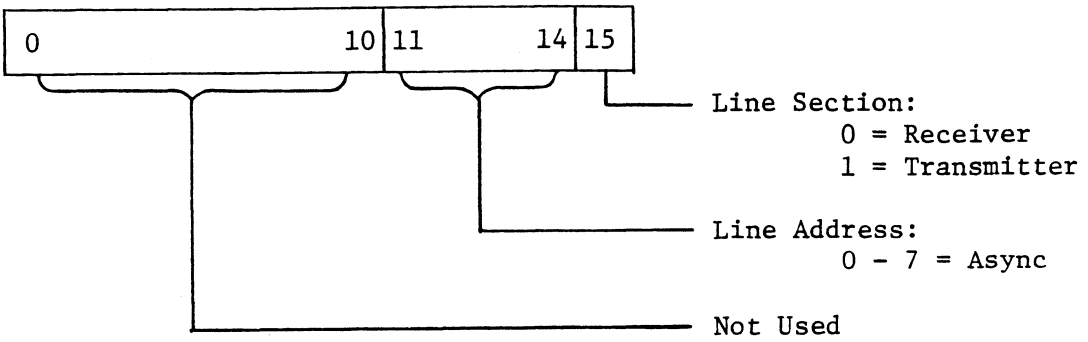
7) Specify Line Characteristics

DOC (f) AC, MUX



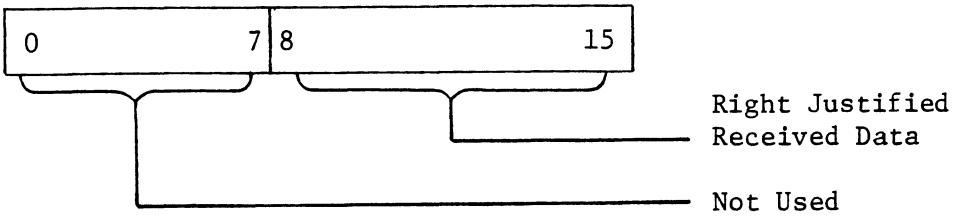
8) Readline and Section Requesting Service

DIA (f) AC, MUX



9) Receive Data

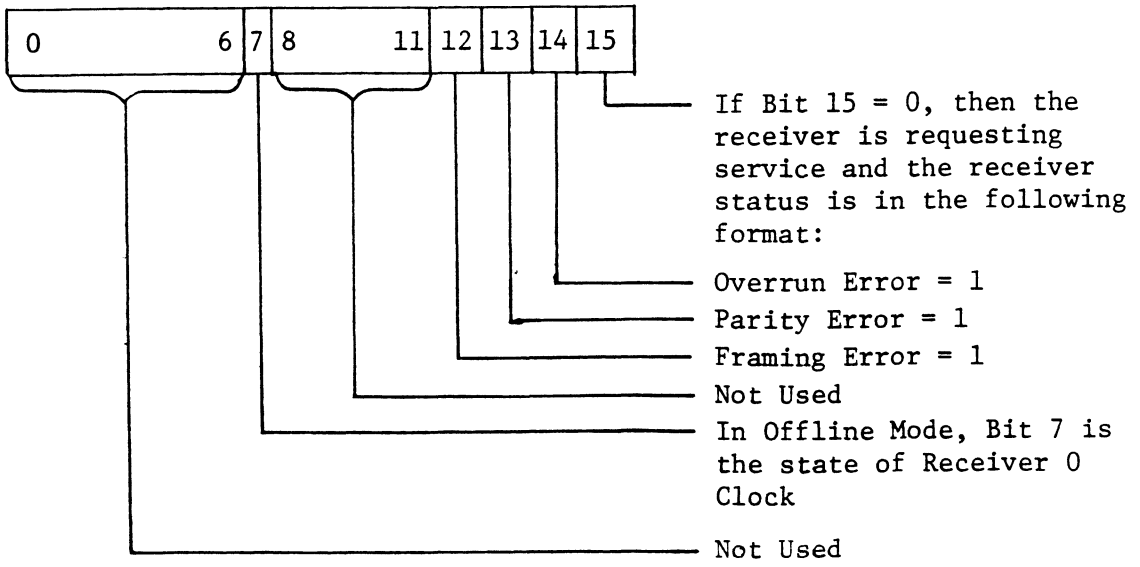
DIB (f) AC, MUX



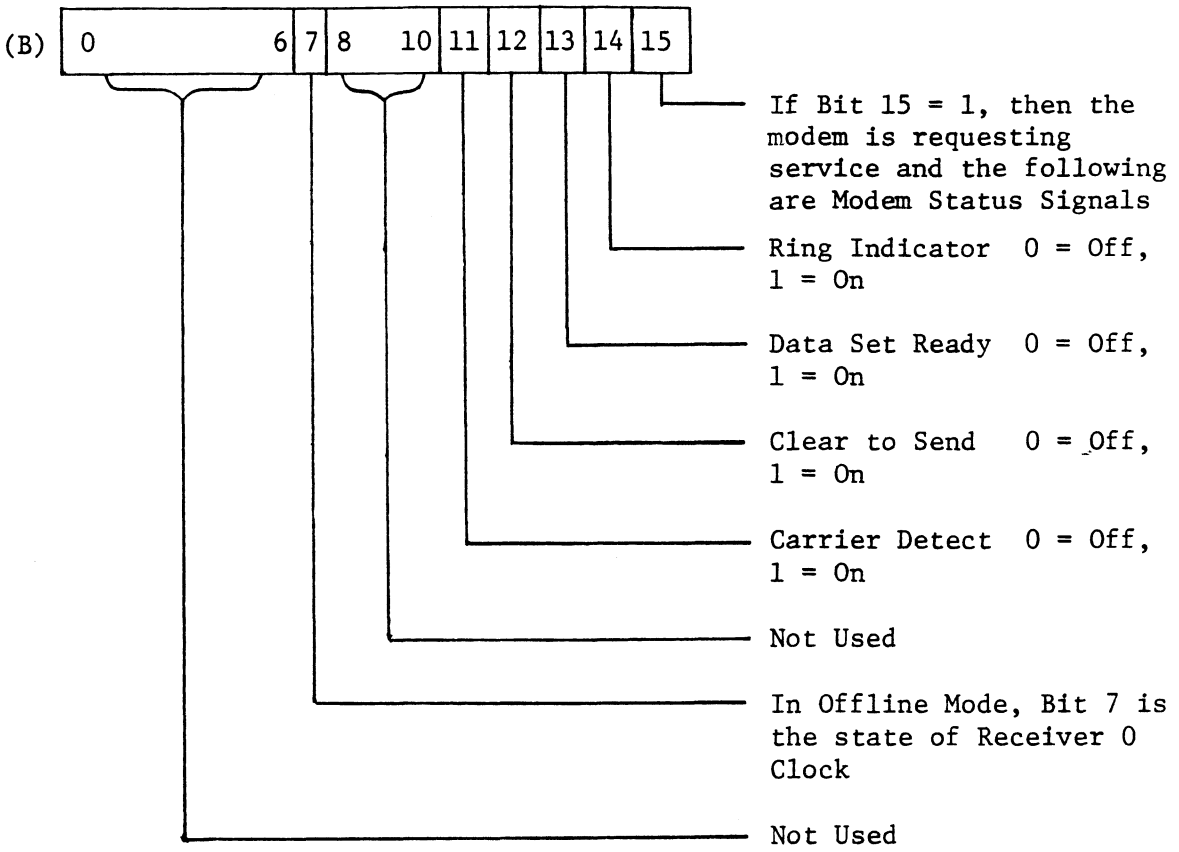
10) Read Receiver or Modem Status

DIC (f) AC, MUX

(A)



10) Read Receiver or Modem Status (continued)



NOTE: Status information is irrelevant if the Current Line Section is a transmitter or if the Current Line Section was set with a Set Line and Section rather than a Read Line and Section requesting service instruction.

6.5 MUX OPTIONS

Line I/F Select

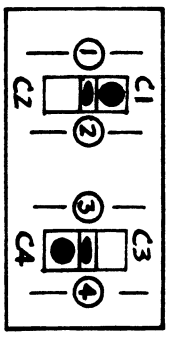
Line Interface Selection is accomplished by setting the respective Lines Interface Select Switch to either EIA position (RS232C) or the Current Loop position (20MA-"Active"-the board supplies the 20MA for the Transmitters and Receivers).

Line 0 & 1 = Location AA11

Line 2 & 3 = Location AA10

Line 4 & 5 = Location AA9

Line 6 & 7 = Location AA8



LINES 0 & 1

Line 0 - Right Side of Switch depressed - Current Loop I/F selected

Line 1 - Left Side of Switch depressed - EIA I/F selected

SHOWN:

Line 0 = 20MA, Line 1 = EIA

NOTE 1:

Even numbered lines on top half of switch, odd numbered lines on bottom half of switch.

NOTE 2:

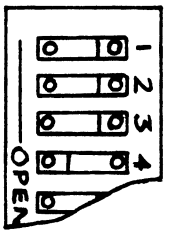
Lines not being used should be set in EIA mode. Since the Current Loop I/F pulls up the Receiver Input causing the Receiver to "See" null characters with framing errors.

Default Baud Rate Select

Since each line is initialized during Busy, the baud rate for all lines may be specified. This is accomplished by setting switches 1-4 on the Dip Switch in Location F4.

6.5 MUX OPTIONS (continued)

Location F4



MSB - SW1
SW2
SW3

LSB - SW4

SHOWN:

DEFAULT - 19.2K Baud
(Enter an 01 for
Default Parameter
in Diagnostic)

0 = ON 1 = OFF				BAUD RATE
SW1	SW2	SW3	SW4	
0	0	0	0	0
0	0	0	1	19.2K
0	0	1	0	19.2K
0	0	1	1	75
0	1	0	0	19.2K
0	1	0	1	19.2K
0	1	1	0	600
0	1	1	1	2400
1	0	0	0	9600
1	0	0	1	4800
1	0	1	0	19.2K
1	0	1	1	1200
1	1	0	0	2400
1	1	0	1	300
1	1	1	0	150
1	1	1	1	110

Baud Rate Strobe Disable

The Baud Rate Strobe can be disabled in cases where all lines are the same speed and never change but line characteristics are altered only. The Default Rate is the only rate programmed.

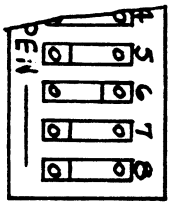
Inserting J11-1 (between AA3 and AA4) will disable any attempts to alter the baud rate.

Split Return Rate

The Split Return Rate option allows connection of the mux to specialized Data Communications equipment which allows a High Transmit Rate and a Low Receive Rate. This enables a user to transmit at say, 1200 baud and receive at 300 baud.

6.5 MUX OPTIONS (continued)

This frequency is selected by setting the remaining four switches of the Dip Switch in Location F4.



SHOWN:

SW5	ON	- 9600 Baud
SW6	ON	- 300 Baud
SW7	ON	- 150 Baud
SW8	ON	- 110 Baud

NOTE: Only one switch closed at any time

RETURN RATE - 300 Baud

To set up a line for Split Return Rate refer to the following table for instructions.

LINE NUMBER	REMOVE JUMPER IN LOCATION B4 BETWEEN PINS	ADD JUMPER TO LOCATION A4 BETWEEN PINS
Line 0	1 and 16	1 and 16
Line 1	2 and 15	2 and 15
Line 2	3 and 14	3 and 14
Line 3	4 and 13	4 and 13
Line 4	8 and 9	8 and 9
Line 5	7 and 10	7 and 10
Line 6	6 and 11	6 and 11
Line 7	5 and 12	5 and 12

+12V Power Source

The 8 Channel Mux requires +12V for proper operation. The source of this 12V depends on the kind of machine being used. On an older machine (NOVA - 1200, 2, 3 etc.) the +12V is regulated down from +V in H (+15V, Pin A10). In a newer machine (NOVA 4, Eclipse S140) +12V is available directly from the backplane on Pin B90, Jumpers J8-1 and J8-2 are used to select between the two (located between X5 and X6).

6.5 MUX OPTIONS (continued)

Jumper J8-1 is a heavy foil already in place - this selects the +15V to be regulated down to +12V.

To switch the +12V source for a NOVA 4 for instance, simply cut the foil labeled J8-1 and insert a jumper (26ga wire) in J8-2.

Sync Priority

When using the 8 Channel Mux with a ULM/5 Sync only board (model 4242) or a ZETACO, Inc. Programmable Sync Interface PSI/1 or 2 at the same device address, a jumper must be added to provide interboard priorities between the Sync board and the Mux. This allows the Sync line to pre-empt the Async Mux if it requires service.

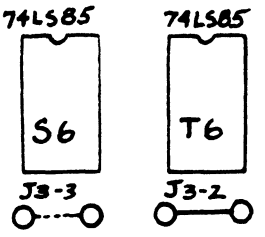
To jumper the priorities into the Mux board, add a backplane jumper from Pin B6 of the ULM/5 board or Pin A83 of a PSI Board to Pin B34 of the Mux Board.

Non-Standard Device Codes

Two Non-Standard Device Codes are available on the 8 Channel Mux. The alternate Primary Device Code is 36 (Octal) and the Secondary Device Code is 46 (Octal). Jumpers J3-2 and J3-3 (near Loc T6 and S6 respectively) are used in conjunction with Jumper J3-1 (see Sec. 6.2) to control the Device Code as follows:

If J3-2 is out (or cut) and J3-3 is in and J3-1 is in then the Device Code is 36 (Octal).

If J3-2 is out (or cut) and J3-3 is in and J3-1 is out then the Device Code is 46 (Octal).



7.0 INTERFACE SIGNALS, I/O PIN ASSIGNMENTS, DISTRIBUTION PANEL

7.1 INTERFACE SIGNALS

SIGNAL NAME	PIN NUMBER
$\overline{\text{DATA 0}}$	B62
$\overline{\text{DATA 1}}$	B65
$\overline{\text{DATA 2}}$	B82
$\overline{\text{DATA 3}}$	B73
$\overline{\text{DATA 4}}$	B61
$\overline{\text{DATA 5}}$	B57
$\overline{\text{DATA 6}}$	B95
$\overline{\text{DATA 7}}$	B55
$\overline{\text{DATA 8}}$	B60
$\overline{\text{DATA 9}}$	B63
$\overline{\text{DATA 10}}$	B75
$\overline{\text{DATA 11}}$	B58
$\overline{\text{DATA 12}}$	B59
$\overline{\text{DATA 13}}$	B64
$\overline{\text{DATA 14}}$	B56
$\overline{\text{DATA 15}}$	B66
CLR	A50
DATIA	A44
DATIB	A42
DATIC	A54

7.1 INTERFACE SIGNALS

SIGNAL NAME	PIN NUMBER
DATOA	A58
DATOB	A56
DATOC	A48
$\overline{\text{DCHP IN*}}$	A94
$\overline{\text{DCHP OUT*}}$	A93
$\overline{\text{DSO}}$	A72
$\overline{\text{DS1}}$	A68
$\overline{\text{DS2}}$	A66
$\overline{\text{DS3}}$	A46
$\overline{\text{DS4}}$	A62
$\overline{\text{DS5}}$	A64
INTA	A40
$\overline{\text{INTP IN}}$	A96
$\overline{\text{INTP OUT}}$	A95
$\overline{\text{INTR}}$	B29
IOPLS	A74
IORST	A70
$\overline{\text{MSKO}}$	A38
$\overline{\text{RQENB}}$	B41
$\overline{\text{SELB}}$	A82
$\overline{\text{SELD}}$	A80
STRT	A52

*Not used but must be jumpered for signal continuity

7.2 I/O PIN ASSIGNMENTS (BACKPLANE)

SIGNAL NAME	PIN NUMBER
FIRST CONSOLE	
S-DATA OUT (EIA/20MA)	A85
S-DATA IN (EIA/20MA)	B69
CLEAR TO SEND (EIA)	A90
SECOND CONSOLE	
S-DATA OUT (EIA/20MA)	B13
S-DATA IN (EIA/20MA)	B11
CLEAR TO SEND (EIA)	B67
REAL TIME CLOCK	
LINE FREQUENCY IN	B6
LINE PRINTER	
STROBE	B53
DEMAND	B38
PAPER EMPTY OR $\overline{\text{READY}}$	B48, B40
$\overline{\text{LPT SELECT}}$, ONLINE OR OUT OF PAPER	B54
PRINTER DATA 0	B15
PRINTER DATA 1	B19
PRINTER DATA 2	B23
PRINTER DATA 3	B25
PRINTER DATA 4	B27
PRINTER DATA 5	B31
PRINTER DATA 6	B49
PRINTER DATA 7	B36, B51
PROGRAMMABLE MULTIPLEXER	
SYNC PRIORITY	B34
$\overline{\text{COMM PRIORITY}}$	A91

7.2 I/O PIN ASSIGNMENTS (BACKPLANE) (continued)

SIGNAL NAME		PIN NUMBER
PROGRAMMABLE MULTIPLEXER		
* XMIT	0	A47
* RCV	0	A49
CTS	0	A57
RTS	0	A7
* XMIT	1	A59
* RCV	1	A61
CTS	1	A63
RTS	1	A11
* XMIT	2	A65
* RCV	2	A67
CTS	2	A69
RTS	2	A19
* XMIT	3	A71
* RCV	3	A73
CTS	3	A75
RTS	3	A21
* XMIT	4	A77
* RCV	4	A79
CTS	4	A81
RTS	4	A23
* XMIT	5	A83
* RCV	5	A87
CTS	5	A89
RTS	5	A27
* XMIT	6	A76
* RCV	6	A78
CTS	6	A84
RTS	6	A29
* XMIT	7	A86
* RCV	7	A88
CTS	7	A92
RTS	7	A39

*Denotes Signal used for both EIA RS232 and 20MA Current Loop.

Replace this pg. for Calma

7.2 I/O PIN ASSIGNMENTS (BACKPLANE) (continued)

SIGNAL NAME		PIN NUMBER
PROGRAMMABLE MULTIPLEXER		
* XMIT	0	A47
* RCV	0	A49
CTS	0	A57
* XMIT	1	A59
* RCV	1	A61
CTS	1	A63
* XMIT	2	A65
* RCV	2	A67
CTS	2	A69
* XMIT	3	A71
* RCV	3	A73
CTS	3	A75
* XMIT	4	A77
* RCV	4	A79
CTS	4	A81
* XMIT	5	A83
* RCV	5	A87
CTS	5	A89
* XMIT	6	A76
* RCV	6	A78
CTS	6	A84
* XMIT	7	A86
* RCV	7	A88
CTS	7	A92

*Denotes Signal used for both
EIA RS232 and 20MA Current Loop.

7.3 DISTRIBUTION PANEL

Shown below are the Signal names and corresponding pins on the Distribution Panel (only Line 0 is shown for the Mux, Lines 1-7 are identical).

SIGNAL NAME	25 PIN EIA CONNECTOR
MUX LINE 0	PIN NUMBER
Transmit Data 0 (EIA/20MA)	2
Receive Data 0 (EIA/20MA)	3
Request to Send 0	4
Clear to Send 0	5
Data Set Ready 0	6
Ground/20MA Transmit Return 0	7
Carrier Detect 0	8
-5V/20MA Receive Return 0	13
Data Terminal Ready	20
Ring Indicator	22
FIRST AND SECOND CONSOLE	CRT 0 & 1
Transmit Data (EIA/20MA)	2
Receive Data (EIA/20MA)	3
Clear to Send	5
Ground/20MA Transmit Return	7
-5V/20MA Receive Return	13

8.0 DIAGNOSTICS AND TESTING

8.1 DIAGNOSTICS

The Multifunction I/O Controller comes with a Diagnostic Tape (400-244-00) containing programs to test out each device on the board. This tape comes in an 800 BPI - 9 track format complete with listings for each program. The Programs may be found on the tape in the following format:

File 0	"TBOOT"	- Bootstrap Loader Program
File 1	DIRECTORY	- List of Programs on Tape
File 2	UMUX DIAG	- ULM Compatible Asynchronous Multiplexer Diagnostic (used for trouble shooting the board)
File 3	UMUX RELI	- ULM Compatible Asynchronous Multiplexer Reliability (for determining the reliability of the data being transmitted and received)
File 4	LPT DIAG	- Line Printer Diagnostic (used to test the line printer controller - "Centronics" type interface)
File 5	RTC DIAG	- Real Time Clock Diagnostic (used to test the Real Time Clock)
File 6	GNST PROGRAM	- General Serial Test Program (used to test the Busy, Done, INTP Logic of the TTO/TTI - obviously, the console interface must be operational to even load from tape. However, this program is useful to test the Second Console)
File 7	UMUX ECHO	- ULM Compatible Echo/Transmit Program used to exercise a Terminal from the Mux
File 8		- Previous save files in a "DUMP" Format for storage on a disk

8.2 TESTING

Console Devices - If the console is not operational, there are two short programs which may be entered through the front panel or via the monitor. The first program will output characters from the panel switches to console device and the second will read a character from the console and echo it back.

8.2 TESTING (continued)

OUTPUT TO CONSOLE

MEMORY LOCATION	OCTAL CODE	INSTRUCTIONS	COMMENTS
100	062677	IORST	
101	060477	Reads 0,CPU	; Get Output Data
102	061111	DOAS 0,TTO	; Output Character
103	063511	SKPBZ TTO	; If Busy then
104	000777	JMP .-1	; Loop, else -
105	000100	JMP 100	; Jump to Start

CONSOLE ECHO

MEMORY LOCATION	OCTAL CODE	INSTRUCTIONS	COMMENTS
100	062677	IORST	
101	060110	NIOS TTI	; Start Input
102	063510	SKPBZ TTI	; If Input = Not Ready
103	000777	JMP .-1	; Then Loop, else continue
104	060410	DIA 0,TTI	; Read Character in AC0
105	061111	DOAS 0,TTO	; Ouput Character
106	063511	SKPBZ TTO	; If Busy then
107	000777	JMP .-1	; Loop, else -
110	000100	JMP 100	; Jump to Start

NOTE: If Second Console is to be tested, alter Device Codes to 50_8 - TTI and 51_8 = TTO.

8.2 TESTING (continued)

General Serial Test - This test resides in File 6 of the Diagnostic Tape. When loaded in memory, it waits for an interrupt from a console device. To initiate the interrupt, simply strike any key on the device being tested. This will cause the following messages to be displayed:

- ....C.S.I..... General Serial Test Rev. 0X
- Device On Line is 10-11
- To select another Device do Control-A, then hit any key on that Device
- To select another test, do Control-C
- Select logic to be tested ("B"USY, "D"ONE, "I"nterrupt)

The program will prompt the operator with a question mark (?) after a B, D or I was entered. Keys may be struck on the console to be sure they are echoed properly. To change tests - do a Control-C. To change devices (to Second Console, for example) do a Control-A and start over.

Real Time Clock - This test resides in File 5 of the Diagnostic Tape. When loaded, it asks for only the device code of the RTC (See Section 4.2) then prints out Pass 1, Pass 2, etc. if it is working properly.

Printer Diagnostic - This test resides in File 4 of the Diagnostic Tape. It requires two questions to be answered. First, the device code of the printer interface (See Section 5.2) and second, the number of columns the printer can print (usually 80-132). This test requires approximately 25 sheets of paper for one pass. The test will start over when one pass is complete.

Async Multiplexer Diagnostic - This program resides in File 2 of the Diagnostic Tape and is called UMUX DIAG. This test may be run in one of two parts. The first is the baud clock testing only,

which tests the timing and baud counters on the mux, the second tests both the baud clocks and the data transmitting and receiving capabilities of the Mux. Once the program is loaded, it comes up with a menu for the operator to satisfy. The questions are shown below, along with the section of the manual where help in answering the questions will be found.

```
From MTO:2

C.S.I... UMUX DIAG Rev. XX
Type 1 for Baud Clock Testing Only,
0 otherwise
 0

Type 2 Digit Device Code of Async UMUX,
then Carriage Return 34                          (Section 6.2)

Type Default Baud-Clock switches in Octal
(SW1=MSB, SW4=LSB)
Bit is 1 if switch is open)                      (Section 6.5)
 01
Type 1 if not using Modems, 0 if testing Modem Signals.
```

NOTE: Test plugs (Model 400T) must be used and plugged into the distribution panel if running the entire diagnostic (not required for baud clock testing only). The test plugs interconnect Lines 0 & 1, Lines 2 & 3, Lines 4 & 5 and Lines 6 & 7.

CAUTION: Before running either the UMUX DIAG or UMUX RELI the user must read the prefix.

Async Multiplexer Reliability Test - This program resides in File 3 of the Diagnostic Tape. The test is a simulation of an actual applications program where blocks of data are transferred and compared and all errors reported. It is generally used to determine if any of the eight communications lines are faulty. It can be set up for all the lines passing random data, or may be set for specific line characteristics where the user has found a single bad line or has detected data dependent errors. The operator must answer the questions in the menu before the test may be executed. These questions are shown below along with the section in the manual which pertains to the question.

From MT0:3

...C.S.I...UMUX RELI Rev. 00

Type 2 digit Device Code of Mux Controller
then Carriage Return 34 (Section 6.2)

Type 1 to specify detailed line characteristics
0 if not 0 Above

Type 1 if using Test Plugs, 0 if not 0

Type lines to be tested in decimal
if none, type N
0/7 (Section 6.2)

NOTE: 1 If test plugs are not being used, the modem control portion will not be tested.

2 If running a Sync Board (PSI or ULM) with the Model 400 on the same address, the interboard priority lines must be jumpered together (see Section 6.5 Sync Priority)

8.2 TESTING (continued)

Current Loop Testing - The Current Loop option of the Asynchronous Multiplexer must be tested under actual conditions. This requires a "Stand Alone" program called UMUX Echo to control a single multiplexer line connected to a Current Loop Terminal (See Section 9.3 for connection information). The program is menu driven and requires the operator to know the Serial Data format requirements of the terminal being interfaced to. These parameters are entered via the console along with the portion of the test desired, either the Transmit Only routine or the Echo Key Strokes Routine. The Transmit Routine simply sends data continuously to the terminal while the Echo Routine accepts key strokes from the terminal and sends them back to be displayed on the screen.

UMUX Echo resides in File 7 of the Diagnostic Tape. Once loaded, it will prompt the operator for the parameters and self start. The program may be controlled with the following key sequences:

Control "R" - Re-enter all program parameters
Control "L" - To change Line Address only
Control "E" - To change to Transmit Data or Echo Keyboard
Control "D" - To change data being transmitted

9.0 APPLICATIONS

9.1 GENERAL

Serial Devices may be attached to the Multifunction I/O Controller via the distribution panel or the backplane. When using the backplane, the customer must supply the wiring harness with the appropriate connectors. Using the distribution panel provides the simpliest solution. Both Current Loop and RS232 Terminals can be attached to the Mux and Console Ports.

9.2 INTERFACING TO CONSOLES

Terminals with an RS232 (EIA) Interface may be attached to the distribution panel, provided Transmit and Receive Data are reversed in the cable. If the distribution panel is not being used, the terminal may be wired directly to the backplane of the computer. These point to point connections are shown below: (Second Console Pin Numbers shown in parenthesis).

SIGNAL NAME AND PIN NUMBER (AT TERMINAL	DIST. PANEL PIN NUMBER	BACKPLANE PIN NUMBER	CONTROLLER BOARD SIGNAL NAME
Transmit Data - 2	→ 3	A85 (B13)	S - Data In (EIA)
Receive Data - 3	→ 2	B69 (B11)	S - Data Out (EIA)
Data Term. RDY - 20	→ 5	A90 (B67)	Clear to Send*
Ground - 7	→ 7	A99	Ground

*If required

Terminals with passive current loop (20MA) interfaces may also be used as consoles. These are attached via the backplane or the distribution panel. The connections are shown below: (Second Console Pin Numbers in parenthesis).

9.2 INTERFACING TO CONSOLES (continued)

SIGNAL NAME AND PIN NUMBER (AT TERMINAL)	DIST. PANEL PIN NUMBER	BACKPLANE PIN NUMBER	CONTROLLER BOARD SIGNAL NAME
Transmit Data - 17	→ 3	A85 (B13)	S - Data In (20MA)
Transmit Return - 24	→ 13	A6	-5V (Rec. Return)
Receive Data - 25	→ 2	B69 (B11)	S - Data Out (20MA)
Receive Return - 23	→ 7	A99	Ground (XMIT Return)

9.3 ATTACHING TERMINALS TO THE MUX

Both RS232 (EIA) and Current Loop (20MA) Terminals may be attached to the Mux in local configurations (without modems). Either the Distribution Panel or the Computer Backplane may be used. When using the Distribution Panel, the Interface Cable going to the terminal must have Transmit and Receive Data reversed. When attaching a terminal via the backplane, the terminal should be wired directly. These point to point connections are shown below for Line 0 only:

RS232 TERMINALS

SIGNAL NAME AND PIN NUMBER (AT TERMINAL)	DIST. PANEL PIN NUMBER	BACKPLANE PIN NUMBER	MUX SIGNAL NAME
Transmit Data - 2	→ 3	A49	RCV 0
Receive Data - 3	→ 2	A47	XMT 0
Data Term. RDY - 20	→ 5	A57	*CTS 0
Ground - 7	→ 7	A99	GND

*If required

9.3 ATTACHING TERMINALS TO THE MUX (continued)

CURRENT LOOP TERMINALS

SIGNAL NAME AND PIN NUMBER (AT TERMINAL)	DIST. PANEL PIN NUMBER	BACKPLANE PIN NUMBER	MUX SIGNAL NAME
Transmit Data - 17	→ 3	A49	RCV 0
Transmit Return - 24	→ 13	A6	-5V (Return)
Receive Data - 25	→ 2	A57	XMIT 0
Receive Return - 23	→ 7	A99	GND

9.4 CONFIGURATION EXAMPLES FOR DATA PRODUCTS AND CENTRONICS LINE PRINTERS

Data Products

Jumper J19-5	Out	+3V True Data Strobe
Switch X1 Pos. 8	Closed	+3V True Data
Switch X1 Pos. 7	Closed	No LF → CR Conversion

Centronics

Jumper J19-5	In	0V True Data Strobe
Switch X1 Pos. 8	Closed	+3V True Data
Switch X1 Pos. 7	Open	LF Converted to CR

ZETA

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