DATA SWITCHING NETWORK

M3212 SYNCHRONOUS/ASYNCHRONOUS MULTIPLEXER

Contents

1. GENERAL

1.01 This section describes how to install and test the Computer Transmission Corporation's (TRAN*) M3212 Synchronous/Asynchronous Multiplexer. GAEL 1695 authorizes the use of this equipment in Pacific Company (PAC).

1.02 It is reissued to:

- Revise the section title.
- Change the use of the section as a cover sheet for the manufacturer's instruction to a regular section.
- Incorporate information from the manufacturer's installation instruction into this section.
- Include current information in the performance of the M3212.

Note: Marginal arrows used to designate changes are omitted.

1.03 The M3212 is used to multiplex and send data characters from remote low speed terminals to the M3201 Data Switch via high speed (4.8, 9.6, 50 or 56 kb/s) common trunks.

References

1.04 Additional information on the Data Switching Network is contained in the 314-900 division-layer.

2. PHYSICAL INSTALLATION

2.01 Check to see that the ac cord is unplugged. Remove louvered cover from top of multiplexer by grasping the louvers and lifting straight up. Ensure that audible alarm is disabled by unhooking the slate wire, tape and store. Remove 4 phillips head screws of fan cover and unplug alarm harness. Lift fan cover by lip assembly at front and rear.

2.02 Determine if multiplexer is equipped with single or dual power supply. Check to see that power supplies are securely fastened and that all electrical harness connections to each TB1 are secure. Remove 4 screws of back plate below power supplies. If equipped distribution buss on left panel, check to see that all electrical harness connections are secure. Ensure that Molex connector to each chassis shelf is securely mated.

2.03 Check to see that cards (shown in Fig. 1) are fully seated. Record module number, serial number, phase letter, and revision number of each card. Verify that LPT switch on 110219 (position J20) or 110338 card (position J19) and CTO DIS switch on 110301 card are off. Also, verify that SGC switch on 110303 is down.

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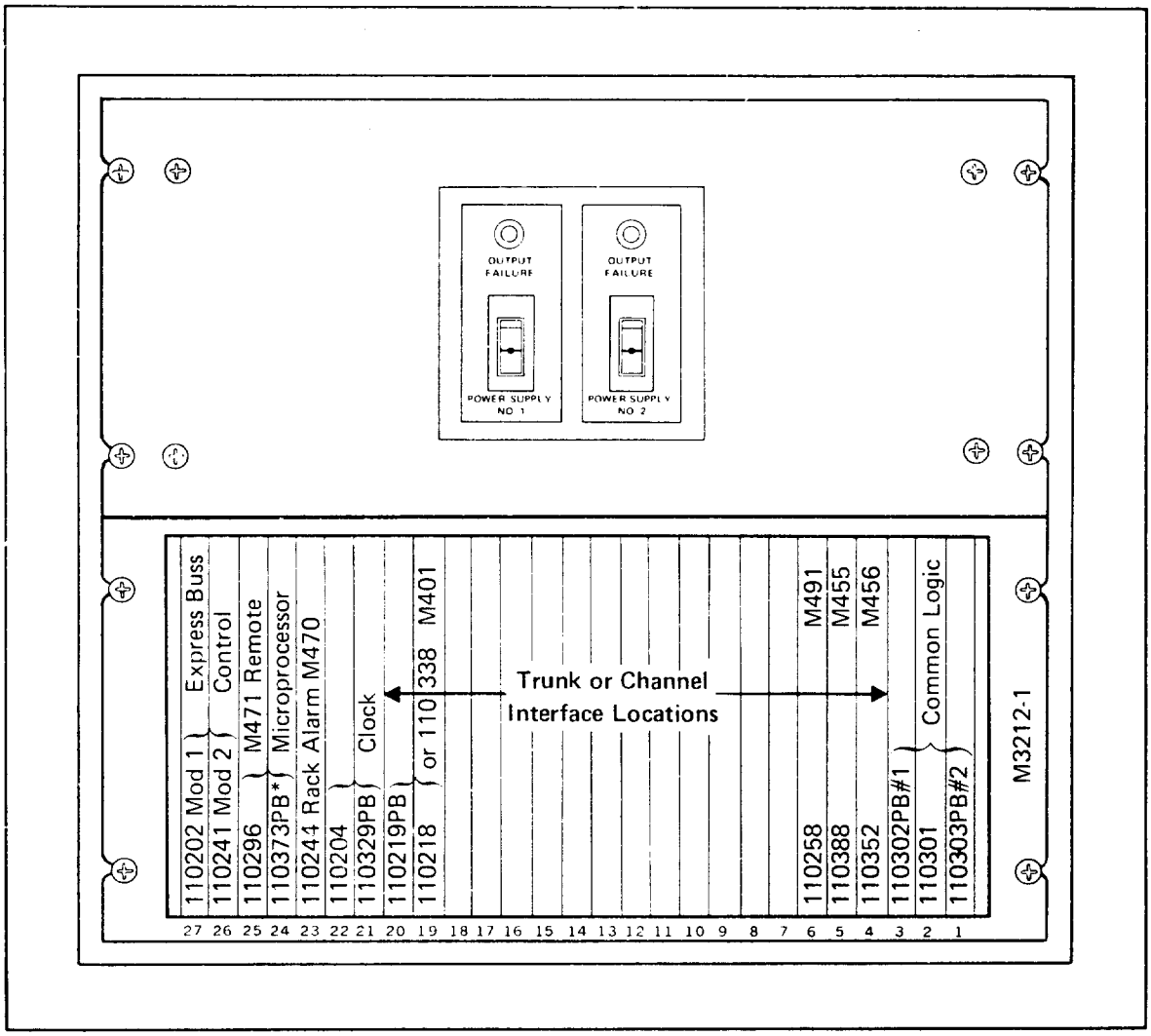
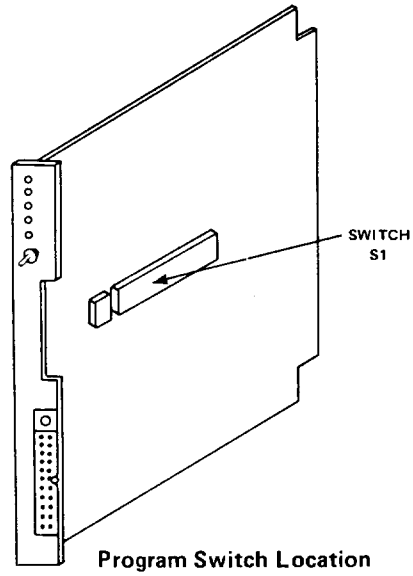


M3212-1 Multiplexer
Fig. 1

2.04 Verify against service order(s) or Network Control Center (NCC) that positions J4 through J18 are equipped with the proper Interface card (refer to Table A). Verify that the Data set/Terminal switch (Fig. 2) is in the proper position per Table A and the connecting equipment (data set or data set simulator versus direct EIA cable to a terminal). Check that BSY switch on faceplate is off. Record module number, phase letter, revision number, and serial number of each Interface card.



Program Switch Location
Fig. 2

TABLE A

USOC CONVERSION TO EQUIPMENT

USOC		DESCRIPTION	MODEL NO.	PART NO.	NOTES
UTILITY	CUSTOMER				
ZZAB3	ZZAB3	MULTIPLEXER	M3212-1	110123	1
ZZAB5	ZZAB4	EXPANSION – CHASSIS	M3204	110107	2
ZZAC2, 4, 6	ZZAC1, – 3 OR 5	ASYNCHRONOUS – I/O	M491	110258	3
ZZAC9	ZZAC9	EIA TRUNK	M401	110338	4
ZZAE3	ZZAE2	CONTROLLED – SYNCHRONOUS	M455	110338	5
ZZAE6	ZZAE4 OR 5	SYNCHRONOUS	M456-1	110352	6
–	ZZAE7	REMOTE TERMINAL INTERFACE	M671	080200	7

Notes:

1. Includes Express Buss Modules, M470, M471 Clock Card and Common Card Assemblies.

2. Includes Shuttle Buss Modules and Common Card Assembly.

3. Switch (S1) IN to connect to a data set and OUT to connect directly to a terminal.

4. Also may be a 110218/110219 older version assembly.

5. Required to remote a ZZAE4 type variable speed synchronous over data sets or to be able to select Batch processors. Requires a ZZAE7 at terminal to work with this module.

6. ZZAE4 verses ZZAE5 is a switch software configuration. Switch (S1) IN to connect directly to a terminal and OUT to connect to a data set.

7. Associated with this unit are billing charges of ZZAE2 and ZZAE5 for switch equipment.

3. POWER SUPPLY – ADJUSTMENT

3.01 Adjustment of the power supply depends upon whether the multiplexer is equipped with a single or a dual power supply. Also, there are two models of the 30 Amp power supply. The early version has adjustments in the rear as shown in Fig. 3. The current version has adjustments at the top as shown in Fig. 4.

A. Single Power Supply

3.02 With top of multiplexer opened per 2.01 and all operating cards installed, the power supply is ready for adjustment.

1. Insert VM-1 module in J4 through J18 of the top chassis (select a vacant slot or remove a card to provide room).
2. Connect a Data Precision Model 245 Digital Voltmeter or equivalent (with at least 3-1/2 digits) to the +5V and GRD test points.
3. Insert ac power cord in outlet and turn on power supply.
4. Check that voltage on top chassis is +5.0± 0.05Vdc. On a multiple chassis multiplexer, check all other chassis' by moving the VM-1 module to each chassis in turn. Verify that all chassis' are +5.0±0.5Vdc. If not, then adjust the +5V power supply control (see Fig. 3 and 4) to bring all chassis' within this range. Record final value.
5. Move voltmeter from +5V to +12V test point.

a. Check all chassis' to be assured of a +12.0±0.1Vdc reading.

b. Adjust power supply as required.

c. Record final value.

6. Move voltmeter from +12V to -12V test point.

Caution: Reverse probe positions between GRD and -12V test points if voltmeter cannot measure negative voltage values.

a. Check all chassis' for a -12.0±0.1Vdc reading.

b. Adjust power supply as required.

c. Record final value.

7. With power supply adjusted, measure voltage values on the power supply directly on TB1.

Caution: Measurements on TB1 are unprotected and the +5V supply can deliver 30 Amps.

Note: These values should not exceed the VM-1 values by 200 mV or poor power harness connections are indicated.

8. Replace fan cover assembly and secure (see 2.01).

9. Reconnect alarm cable connector.

B. Dual Power Supply

3.03 With top of multiplexer opened per 2.01 and all operating cards installed, the power supply is ready for adjustment. (See 3.04.)

1. Insert VM-1 module in J4 through J18 of the top chassis (select a vacant slot or remove a card to provide room).

2. Connect a Data Precision Model 245 Digital Voltmeter or equivalent to the +5V and GRD test points.

3. Turn on both power supplies.

4. Check that voltage on top chassis is +5.0± 0.05Vdc. On a multiple chassis multiplexer, check all other chassis' by moving the VM-1 module to each chassis in turn. Verify that all chassis' are +5.0±0.05Vdc. Also, measure voltage between +5V of each power supply at TB1 to assure that difference in voltage is less than 20 mV dc.

Caution: Measurements on TB1 are unprotected and each +5V supply can deliver 30 Amps.

Note: If any of the conditions in Step 4 are not met, check to determine which power supply is higher potential than the other in reference to the GRD test point. If any chassis voltage is below +4.95Vdc, raise the +5V control of the lower voltage power supply. If all chassis voltages are within limits, but most are at or below +5.0Vdc and the difference in power supply voltages exceed 20 mV, raise the +5V control of the lower supply. However, if any chassis voltage is above +5.05V, or if the difference in power supplies is greater than 20 mV and all chassis' are above +5.0V, reduce the +5V control of the higher power supply. Record the final chassis voltage.

5. Move +5V probe to the +12 test point of the VM-1 module.

a. Verify that all multiplexer chassis' are within +12.0±0.1Vdc and that the difference between the voltages on the power supplies does not exceed 20 mV.

b. Adjust as described in the Note to Step 4 to ensure both requirements are met.

c. Record final values.

6. Measure to be sure the -12V on all multiplexer chassis' are -12V±0.1Vdc and that the difference between the voltages on the power supplies not exceed 20 mV.

a. Adjust as described in the Note to Step 4 to ensure both requirements are met.

b. Record final values.

7. Measure and record the voltages of both power supplies on TB1. These voltages should not be more than 200 mV greater than the voltages on any chassis.

   Note: A power supply set at more than 200 mV above the chassis voltage indicates harness connector problems.

8. Replace fan cover assembly and secure (see 2.01).

9. Replace alarm connector cable.

3.04 If in initial tests, the voltages exceed +5± 0.25 or +12±0.6Vdc, turn power off.

1. Remove power connectors to all but the top chassis.

2. Turn on power supply #1.

3. Adjust to the limits of +5.0 to +5.05Vdc, +12.0 to +12.1Vdc, and -12.0 to -12.1Vdc.

4. Turn off power supply #1.

5. Turn on power supply #2.

6. Adjust chassis voltage to within 10 mV of the previous value but within the absolute range defined.

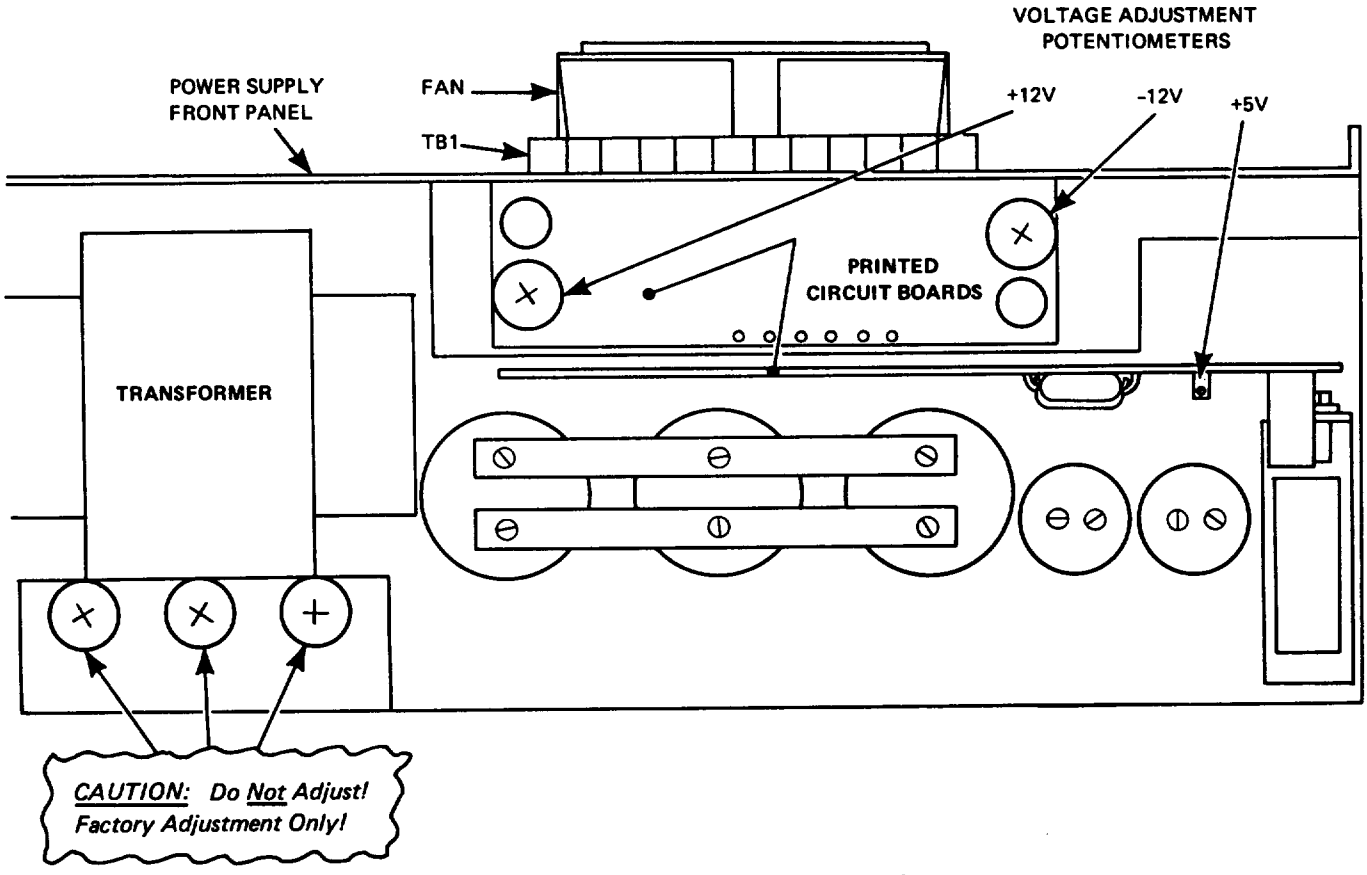
7. Turn off power supply #2.

8. Ensure that both power supplies are off. Reconnect the lower chassis'.

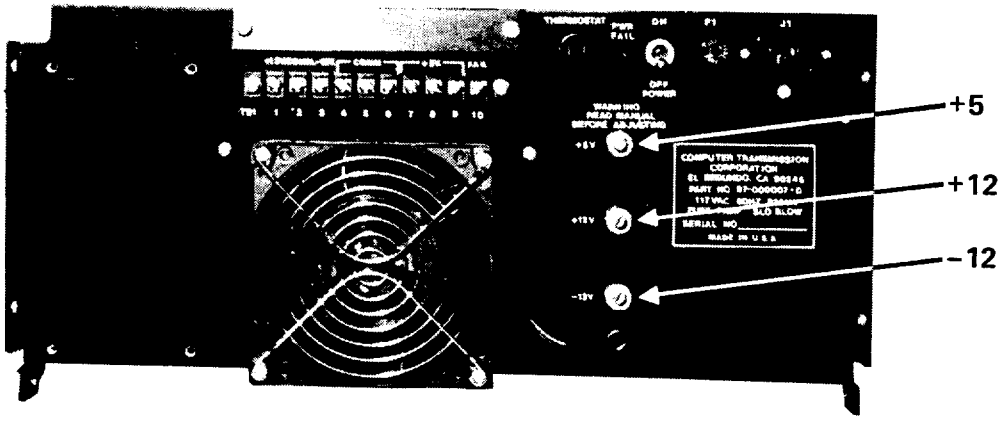
9. Turn on both power supplies.

10. Check all chassis voltage and power supply differences to ensure proper limits.

11. Adjust as required and record final values.



Rear View of Early 30-Amp Power Supply Showing Location of Voltage Adjustment Potentiometers
Fig. 3



New Power Supply
Fig. 4

4. MULTIPLEXER STAND-ALONE TEST

4.01 After the multiplexer is properly equipped and power supplies have been adjusted, the following test can be performed to verify fundamental operation of the multiplexer. No EIA cords should be connected to the rear connectors except the alarm leads to J23. Turn on power to multiplexer. Check the LED (Light Emitting Diode) lamps and displays of the cards after at least 7 seconds as described in the following paragraphs.

4.02 Slots J1 through J3 are cards 110303, 110301, and 110302 respectively of each chassis are called Common Card Assembly. These three cards make a single assembly called the Common card. The 110303 may have an SGC switch which should be in the DOWN position. All LEDs on the 110303 card should appear to be ON with the exception of ADS which should be OFF. The 110302 may have a CTO DIS switch which should be in the OFF position. All LEDs on the 110302 card should appear to be ON with the exception of CTO which should be OFF. The SBY, SRQ, and SBT LEDs on the 110301 card should be OFF.

Note: If the lamps on all three cards cycle ON and OFF together in a rhythmic pattern, replace the Common Card Assembly. If this does not clear the trouble, replace the Remote Diagnostic Modules in J24 and J25 or Buss Modules in J26 and J27.

4.03 The Clock Module is a two card assembly 110204 (position J22) and 110329 (position J21). The cards provide the local master clock for all of the cards in the multiplexer. In the stand-alone state, the clock card operates as an independent master. The MSR LED should be ON. The SMF LED should be flashing at an approximate 5 Hz rate. SY1, SY2, 0LF, and FAL LEDs should be OFF.

4.04 The Trunk Interface Module in J19 is either a 110338 card, or a 110218 with a 110219 in J20. This module provides the multiplexer end of the high speed link to the M3200 Data Switch. With the LPT (Loop) switch OFF, the SYF LED should be ON and the SBT and SBY LEDs should be OFF. Throw the LPT switch ON and observe the SYF LED go OFF. Turn the LPT switch back OFF and observe that the SYF LED returns ON.

4.05 The Remote Diagnostic Module (M471) consists of a two card (110373 or 110297 and 110296) assembly (located in slots J24 and J25 respectively). This module (currently with switch software support) updates the Multiplexer card conditions and checks their status. The 110296 should have the RUN LED ON and the SBT LED OFF. The 110296 has a numeric display (MD0 to MD3) which shows alarms detected, but not acted upon by the switch software. Table B shows the 16 possible states with hexidecimal code equivalent. These LEDs may turn ON in the stand-alone mode with a 0, 5, or B depending upon whether the 7 second turn-on delay of this module, the BUSS Control Cards or the Trunk module are the slowest respectively. These are all common start-up states and will not be cleared without a data link to the switch.

TABLE B

REMOTE DIAGNOSTIC MEMORY DISPLAY

HEX CODE	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
MD3	0	0	0	0	0	0	0	0	●	●	●	●	●	●	●	●
MD2	0	0	0	0	●	●	●	●	0	0	0	0	●	●	●	●
MD1	0	0	●	●	0	0	●	●	0	0	●	●	0	0	●	●
MD0	0	●	0	●	0	●	0	●	0	●	0	●	0	●	0	●
	NO FAULT	SOFTWARE STACK	INTERRUPT OVERFLOW	HARDWARE STACK	I/O TIMEOUT	BUS TIMEOUT	ONE ZERO TEST	TEST BLOCK	TASK QUEUE OVERFLOW	RETRY OVERFLOW	CHECKSUM BAD	BAD TRUNK BANDWIDTH	ALARM OVERRUN	WRONG SIGNATURE	NO PROGRAM INFO	NOT USED

LEGEND

0 = OFF

● = ON

4.06 The Express Buss Control Modules are the 110241 card located in J26 and the 110202 card located in J27. These two cards jointly control the buss activities on the first multiplexer (or switch) chassis and the interchassis Express Buss. All LEDs on these two cards should be OFF.

Note: Power should be turned off before removal of these two modules.

4.07 The Shuttle Buss Control Modules are the 110242 card located in J26 and the 110215 card located in J27 of all expansion chassis of both Multiplexers and Switches. These two cards jointly control the buss activities of the chassis in which they are located and operate on the interchassis Express Buss under control of the Express Buss Control Modules in the first chassis. All LEDs on these two cards should be OFF.

Note: Power should be turned off before removal of these two modules.

4.08 To verify the proper operation of the multiplexer in the stand-alone mode, turn power OFF and back ON. Verify states of modules per 4.02 through 4.07.

5. MULTIPLEXER SYSTEM TESTS

5.01 After verifying that the multiplexer is working in the stand-alone mode (covered in

Part 4), the tests described in the following paragraphs will assure that the multiplexer is working with the M3200 Data Switch.

5.02 The Synchronous Data Set between the multiplexer and the M3200 Data Switch should be optioned to operate full duplex with continuous carrier and external timing. All the installed options should be checked and recorded. While the RJE terminals are operating on Port 2 of the 209 Data Sets, the following options should be applied: Slave IN, Elastic Store Port 2 IN, and Elastic Store Port 1 IN.

5.03 After the data set has been installed and all installation tests completed, the data set should be connected by appropriate EIA cable to the multiplexer. The EIA cable should be checked for continuity of 5 ohms or less between Pin 7 at each end to assure ground continuity. After connection of data set to multiplexer, the signal grounds should be checked to assure essentially no voltage difference. Notify the NCC that the trunk link is established so that they can enable the trunk for downline load by the M3200 Data Switch.

5.04 Observe the Clock Module (110204 and 110329) located in J21 and J22. One of the first actions during an initial downline load (the first downline load after power on or a loss of receive clock) is that MSR LED goes OFF and SY1 LED goes ON. This indicates that the multiplexer is no longer an isolated master (MSR) but is clocking from the 1st priority trunk (SY1). The 0LF LED should come ON and then begin to cycle OFF and ON until it finally stays OFF. This indicates that the multiplexer phase locked loop has acquired the data set clock (0LF ON indicates the phase lock loop is adjusting). The final state of the clock module is with SY1 LED ON, SMF LED flashing (at 5 Hz rate), and SY2, MSR, 0LF and FAL LEDs OFF.

5.05 Any Asynchronous Low Speed Interface cards 110258 (M491) or Synchronous Low Speed Interface cards 110388 (M455) or 110352 (M456) located in J4 through J18 should be cleared of any lights as a result of the downline loading. Thus, ALL LEDs on these cards should be OFF. These cards will be tested individually at a later point in the test.

5.06 The Common Card Assembly 110303, 110301, and 110302 located in J1 through J3, respectively, should be the same as described in 4.02.

5.07 The Express Buss Control Module, 110202 card in J27 of the first chassis, should end the first state of the downline load with the XBT LED ON. All other LEDs on the 110202 and the 110241 in J26 should be OFF. After the switch declares the TRUNK LOADED, the emulator will check status in the multiplexer sampling the XBT status and turning the XBT LED OFF. This will result in a display of 126 in the 110244 (M470) Rack Alarm Module in J23. The MAJ LED on the 110244 (M470) will also be ON. This is normal during any downline load sequence.

5.08 The 110296 card of the Remote Diagnostic Module in J25 should end the first stage of the downline load with MD2 and MD0 ON (HEX 5 from Table B). After the switch has LOADED the TRUNK and after the emulator has reported the XBT, the emulator on the next pass will sample the Remote Diagnostic Module and sample this status clearing MDØ through MD3. This will result in a display of 124 and the MAJ LED ON in the 110244 (M470) Rack Alarm Module in J23. This is normal downline load sequence.

5.09 The Rack Alarm Module 110244 (M470) is located in slot J23. This module interfaces power, fan, and temperature alarms to the multiplexer through its EIA connector at rear (J23). The detected alarms are displayed on this module by chassis and position. This card also contains the driver for the local audible alarm which should be disabled per 2.01. This card also provides a means for disabling local alarms and for reprogramming of individual cards through the thumb wheel dials (chassis and position like the display) and the momentary switch (up for DEL deleting alarm and down for REQ reprogramming a card). The thumb wheel switches should be left in a 000 position to prevent accidental reloads on deletions.

During a normal downline load sequence, the 126 described in 5.07 followed by the 124 described in 5.08 should be displayed on the 110244 (M470) in J23. This should then be followed by a display of 000 and the MAJ, MIN and REQ LEDs OFF. This may take several minutes due to emulator speed.

5.10 *Low Speed Loop (LLP) Test.* The NCC should perform an LLP test on each low

Speed Interface card in the multiplexer. This will result in a distinctive pattern of LEDs DD, RD, and SD flashing on 110258 (M491), 110388 (M455), and 110352 (M456) cards located in J4 through J18 as they are tested. The NCC may request that you verify that LLP tests are being accomplished on individuals or all Low Speed cards.

5.11 *Fan Alarm Test.*

1. Remove louvered cover from top of multiplexer as described in 2.01. The fan cover must be secured and the alarm cable connected.

2. Depress rear plastic vane and observe the 110244 (M470) (slot J23) for a 123 to appear in the numeric display. MAJ LED should be ON.

3. Release and observe alarm clear.

4. Depress front plastic vane and observe 123 alarm.

5. If test in 5.12 does not apply, replace louvered cover.

5.12 *Power Alarm Test* (applies to dual power supplies only). To determine if the multiplexer is equipped with dual power supplies, turn *both* Power Supply switches ON and observe if both LED switches are on. If so, proceed as follows:

1. Remove louvered cover from top of multiplexer as described in 2.01. The fan cover must be secured and the alarm cable connected.

2. Turn Power Supply #1 off and hold rear fan vane up. The FAULT light over the power switch should go ON. The 110244 (M470) Rack Alarm Module (slot J23) should get a MAJ LED ON and a 123 in the numeric display.

3. Turn Power Supply #1 on and observe alarm clear.

4. Turn Power Supply #2 off and hold its fan vane up. The FAULT light over the power switch should go ON. The 110244 (M470) Rack Alarm Module should get a MAJ LED ON and a 123 in the numeric display.

5. Turn Power Supply #2 on and observe alarm clear.

6. Replace louvered cover to multiplexer after test is completed.

Caution: If both FAULT lights go on when one power supply is turned off, STOP TEST.

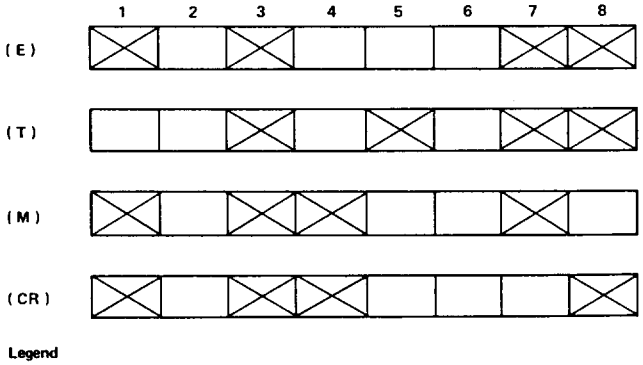
5.13 *Optional Asynchronous Low Speed Tests.* These tests require the availability of a Digitec 2056 Test Set. If this test set is unavailable, omit this test. The 110258 (M491) will be tested with a terminal through the complete connection as described in 6.03.

5.14 The Digitec 2056 should be connected to the EIA cord at the rear of each 110258 (M491) in turn.

- If the 110258 switch is set for Data Set (IN), then the EIA cord should be attached to the TERMINAL plug on the Digitec 2056.
- If the 110258 switch is set for Terminal (OUT), then the EIA cord should be attached to the MODEM plug on the Digitec 2056.

Note: If the EIA connector is incorrectly connected, the FAL LED should light.

5.15 There are 4 sets of Character Programming switches on the Digitec 2056. These should be programmed with the characters E, T, and M; WHERE represents the carriage return character. The bit pattern for these characters set on the 2056 is shown in Fig. 5.



Digitec 2056
Fig. 5

5.16 With the Digitec 2056 connected and programmed, the E character should be selected. The DTR or DSR lead should be turned on by the Digitec 2056. When the corresponding lead is turned on by the 110256 (D/D LED ON), the E character should be sent. When the receive data light indicates characters being delivered by the 110258, the T, M, should be sent. This will result in a Fox message generated by the M3200 Data Switch which can be character by character error checked by the Digitec 2056. If unable to connect, confirm with NCC that station is configured to allow placing calls. To disconnect, the DTR or DSR lead should be turned off by the Digitec 2056.

5.17 *Optional Synchronous Low Speed Test.* Covered in Part 6.

5.18 *Reprogramming Individual Cards* (Optional Multiplexer System Test). Requesting reprogramming of individual cards is the only updating a craftsperson at a multiplexer can accomplish. This should be done for any replaced or reseated cards, to enable a deleted alarm or to expedite the updating.

5.19 Reprogramming is done by dialing the card location (chassis and position) on the thumb wheel switches on the 110244 (M470) Rack Alarm Module located in slot J23. For reprogramming the Common card located in slots J1 through J3 inclusive, dial 102 for the first chassis, 202 for the second chassis, etc. Then press the switch down toward REQ and the REQ LED should light. When the REQ LED goes dark, the requested reprogramming has completed. Normally, reprogramming the Common card will result in a 124 MAJ alarm.

5.20 Reprogramming slots J4 through J18 will update a portion of the Common card associated with that position. Reprogramming the Trunk card (119) will result in a complete downline load with 126 and 124 MAJ alarms. Reprogramming the Clock card (122) will act the same as 119. Reprogramming 123, 124, and 126 or equivalent positions in expansion chassis will have no apparent effect except the temporary on condition of the REQ LED.

5.21 The thumb wheel switches should be restored to a 000 condition to prevent inadvertant reprogramming of the multiplexer.

5.22 *Disabling Alarms* (Optional Multiplexer System Test). Generate a minor alarm by removing a 110258 (M491) card from any slot J4 through J18. This should result in the MIN LED going on the 110244 (M470) Rack Alarm Module in slot J23. The address (chassis and position) of the missing module should appear in the display on the same 110244. To disable the alarm, turn the thumb wheel switches to match the numbers in the display (eg, 118 if the slot J18 card was removed from the top chassis) and push the momentary toggle switch up toward DEL. This should cause the REQ LED to go on followed by both the REQ and MIN LED's going off and the display returning to 000. Pushing the toggle switch to REP without restoring the 110258 should cause the alarm to reappear.

Caution: Replacing the 110258 without pushing the toggle switch will leave the card without diagnostics until the Common card or the multiplexer is reloaded.

Note: The thumb wheel switches should be restored to 000 to prevent inadvertant reprogramming.

6. LOW SPEED INTERCONNECTION

6.01 If service orders are issued to install Bell System data sets behind the 110258 (M491), 110388 (M455), or 110352 (M456) cards, perform the following tests as described.

Note: If no Bell System equipment is installed and connected to the multiplexer, installation is completed and no additional tests are required.

6.02 The Bell System data sets should be installed per the standard installation practice. The options called for in the service order should be installed. These options should also be locally recorded and reported to the NCC. The 110258 (M491), 110388 (M455), or 110352 (M456) should be checked to assure that the Interface switch internally is set to the data set position (see Table A and Fig. 2). An EIA cable of sufficient length to reach from the data set cabinet to the multiplexer should have been furnished on the job. This cable should be checked to see that the resistance between Pin 7 of each end is less than 5 ohms.

This EIA cable can then be installed. The signal grounds should be checked between the multiplexer and the data set to assure that the voltage is essentially zero. The 110258 (M491), 110388 (M455), or 110352 (M456) should be checked to see that the FAL LED is OFF (an ON condition may indicate that the Interface switch is in the wrong position).

6.03 Asynchronous Interface/Data Set Tests should be performed after installation is complete. If the data set is a private line type, the tests should be performed by the terminal connected at the other end or by the control testboard if equipped with compatible data set and terminal. If the data set is a 113B type, the tests should be performed by a dial-up terminal or the NCC.

Note: This may require that an outside test line be patched the 113B data set. However, the local switch connection to the 113B data set must then be separately checked.

With the above terminals, an E character should be typed (if a HI RES: message does not automatically appear on the terminal). This should elicit a HI RES: or a HI PW: response. If you receive HI PW: an appropriate pass-word must be obtained from the NCC to access the system which will elicit RES: when entered. With the RES: message, type IDENT↵ (where ↵ represents carriage return) which will produce a response: 2/ 1, 5, 9 : 0, 9.

This response identifies the none (2) chassis (1) and positions trunk (9) of the 110258 (M491) card in the system. You will obtain a new RES:. To this respond 1NC ↵ which will result in a connection to the NCC test terminal. Alternately, an input of TM ↵ or TMSG ↵ will result in a FOX message from the switch. Also a CMSG ↵ will produce a U* pattern from the switch. Finally an input of ECHO ↵ will produce a echoing of received characters at the switch to the terminal. These last three can only be released by disconnecting the dial-up connection or turning the private line set RTS off (going local or turning power off should do it). The NCC can issue a clear command (CLR) also to disconnect.

These tests should demonstrate satisfactory operation of the Asynchronous Data Input to the ATSS/DS system.

7. MAINTENANCE

7.01 Field repairs that involve replacement of components on modules are not recommended.

7.02 Return all defective units to the NCC for further testing, disposition, and inventory control. The NCC will make a "like-for-like" exchange with the Maintenance Center.

7.03 If equipment design and/or manufacturing problems should occur, refer to Section 010-700-010PT for procedures on how to file an Engineering Complaint.