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Networks · Communication

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Communications Options Minireference Manual

Volume 1 **General Information and Communications Options**

Digital Equipment Corporation

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- Class A Computing Devices:

Notice: This equipment generates, uses, and may emit radio frequency energy. The equipment has been type tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such radio frequency interference when operated in a commercial environment. Operation of this equipment in a residential area may cause interference in which case the user at his own expense may be required to take measures to correct the interference.

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RSX
UNIBUS
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VMS
VT
Work Processor

CONTENTS

CONTENTS (Cont)

CONTENTS (Cont)

CHAPTER 1
INTRODUCTION

The Communications Options Minireference series of manuals provide Field Service personnel, TRAINED in Digital Equipment Corporation communications options, DEC modem products and ETHERNET products with easy-to-use references that zero in on essential installation and maintenance procedures.

This series of manuals is a replacement and supersedes the *Communication Options Minireference Manual* (EK-CMINI-RM). All of the information that was contained in the *Communication Options Minireference Manual* is included. Information concerning most of Digital Equipment Corporation new communication options and modem products has also been included. These manuals will be updated as new communication options and modem products are produced.

To effectively use these reference manuals and to quickly locate the desired information, it is important that the user be aware of the organization and content of the various manuals. Volume one contains generic communications information such as: Cables, Test Connectors and Terminators, Special Test Programs, Special Tools and Equipment. Volume one also contains information concerning installation and maintenance of some of the options. Volume two contains only communications options. Communications options are presented in alphanumerical order beginning in Volume one and flowing into Volume two. Volume three contains information concerning Digital Equipment Corporation Modem Products. Volume four contains information concerning installation and maintenance of ETHERNET products.

In volume one and two, option specific data is presented by option designation; that is, DH11 followed by DHU11, DHV11 through DZV11.

With the advent of new FCC regulations, Digital Equipment Corporation established the Qualified Module Assembly Project to modify some of it's older communication options. Information which reflects the modifications is indicated by QMA as part of the title of each applicable page.

Also, for consistency and familiarity, the material contained in each option specific section is organized and presented in the same format and sequence; installation data (which includes installation flowcharts, module outline drawings, device/vector address selection, and various other switch/jumper selectable options) is presented first. This material is followed by cabling diagrams, diagnostics (PDP-11, VAX-11 or both), maintenance aids, register bit assignments, and Tech-Tip/FCO index.

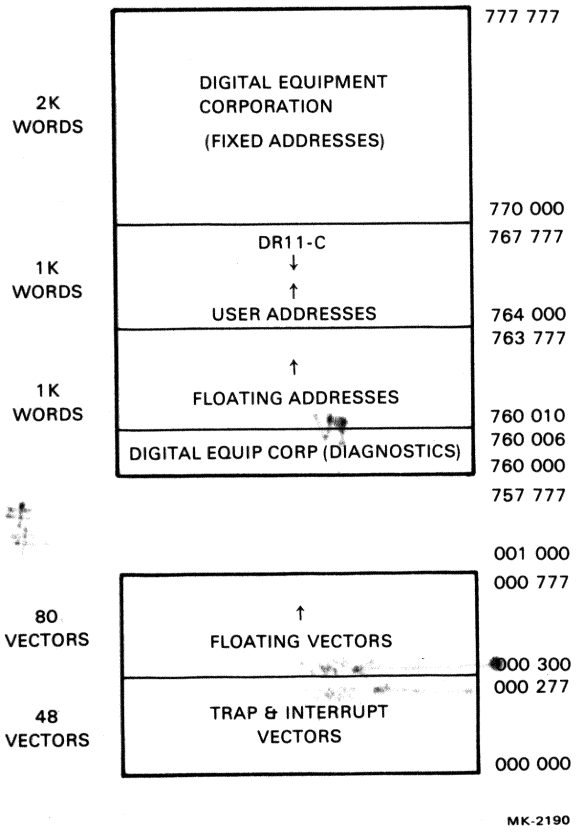
CHAPTER 2
FLOATING DEVICE ADDRESSES AND VECTORS AND DIAGNOSTIC SUMMARY CHARTS

2.1 FLOATING DEVICE ADDRESSES

UNIBUS addresses 760010 (160010) through 763776 (163776) are designated as floating device addresses (see the following figure). These are used as register addresses for communications devices and other devices interfacing with the PDP-11, LSI-11, and VAX-11.

NOTE

Some devices are not supported by LSI-11 and VAX-11; however, the same scheme applies – that is, gaps are provided as appropriate. The convention for assigning these addresses is as follows:



A gap of 10_8 must be left between the last address of one device type and the first address of the next device type. The first address of the next device type must start on a module 10_8 boundary. The gap of 10_8 must also be left for devices that are not installed but are skipped over in the priority ranking list. Multiple devices of the same type must be assigned contiguous addresses. Reassignment of device types already in the system may be required to make room for additional ones.

Table 2-1 Floating CSR Address Devices

Rank	UNIBUS Option	LSI-11 Option	Decimal Size	Octal Modules
1	DJ11		4	10
2	DH11		8	20
3	DQ11		4	10
4	DU11	DUV11	4	10
5	DUP11		4	10
6	LK11A		4	10
7	DMC11/DMR11*		4	10
8	DZ11† DZ32, DZS11	DZV11	4	10 (DZ11 Before DZ32)
9	KMC11		4	10
10	LPP11		4	10
11	VMV21		4	10
12	VMV31		8	20
13	DWR70		4	10
14	RL11	RLV11	4	10‡
15	LPA11-K		8	20‡
16	KW11-C		4	10
17	Reserved		4	10
18	RX11/RX211	RXV11 RXV211	4	10‡
19	DR11-W		4	10
20	DR11-B		4	10**
21	DMP11		4	10
22		DPV11	4	10
23	ISB11		4	10
24		DMV11	8	20
25	DEUNA		4	10‡
26	UDA50		2	4‡
27	DMF32		16	40
28	KMS11 (DMS)		6	20
29	VS100		8	20
30	Reserved		2	4
31	KMV11	KMV	8	20
32	DHV11/DHU11	DHV	8	20
33	DMZ32		16	40

* DMC11 before DMR11
** After second device.
† DZ11E and DZ11F are dual DZ11s and are treated by the algorithm as two DZ11s.
‡ Extra devices only.

2.2 FLOATING VECTOR ADDRESSES

Vector addresses, 300 through 777, are designated as floating vectors. These are used for communications and other devices that interface with the PDP-11, LSI-11, and VAX-11. The LSI-11 floating vector area is limited to a starting address of 300 through 376. The area from 400 to 450 is reseved for LSI-11 devices ADV11-A, IBV11-A, and KWV11-A with additional space available above 450 to 777.

NOTE

Some devices are not supported by LSI-11 and VAX-11; however, the same scheme applies. Vector size is detemined by the device type.

There are no gaps in floating vectors unless required by physical hardware restrictions (in data communications devices, the receive vector must be on a zero boundary and the transmit vector must be on a 4_8 boundary).

Multiple devices of the same type would be assigned vectors sequentially. Table 2-3 shows the assignment sequence.

Table 2-2 Floating Interrupt Vector Devices

Rank	UNIBUS Option	LSI-11 Bus Option	Decimal Size	Octal Modules
1	DC11		4	10
1	TU58‡‡		4	10
2	KL11 (extra)		4	10*
2	DL11-A (extra)	DVL11-F	4	10*
2	DL11-B (extra)	DLV11-J	4	10
3	DP11		4	10
4	DM11-A		4	10*
5	DN11		2	4
6	DM11-BB/BA		2	4
7	DH11 modem control		2	4
8	DR11-A	DRV11-B	4	10*
9	DR11-C	DRV11	4	10*
10	PA611 (reader)		4	10*
10	PA611 (punch)		4	10*
11	LPD11		4	10
12	DT07		4	10*
13	DX11		4	10*
14	DL11-C		4	10*
14	DL11-D		4	10*
14	DL11-E	DLV11-E	4	10*
15	DJ11		4	10*

* The vector for the device of this type must always be on a 10_8 boundary.

** After the first.

† These devices can have either a M7820 or M7821 interrupt control module. However, it should always be on a 10_8 boundary.

‡‡ There is no standard configuration for systems with both DC11 and TU58.

Table 2-2 Floating Interrupt Vector Devices (Cont)

Rank	UNIBUS Option	LSI-11 Option	Decimal Size	Octal Modules
16	DH11		4	10†
17	GT40		8	10
17	VSV11		8	10
18	LPS11		12	10*
19	DQ11		4	10†
20	KW11-W	KWV11	4	10
21	DU11	DUV11	4	10*
22	DUP11		4	10*
23	DV11		4	10*
23	DV modem control		2	4
24	LK11-A		4	10
25	DWUN		4	10
26	DMC11/DMR11		4	10*
27	DZ11	DZV11	4	10*
	DZS11			‡
	DZ32			
28	KMC11		4	10
29	LPP11		4	10
30	VMV21		4	10
31	VMV31		4	10
32	VTV01		4	10
33	DWR70		4	10*
34	RL11	RLV11	2	4**
35	TS11, TU80		2	4**
36	LPA11-K		4	10
37	IP11/IP300		2	4
38	KW11-C		4	10
39	RX11/RX211	RXV11	2	4**
		RXV211		
40	DR11-W		2	4
41	DR11-B		2	4**
42	DMP11		4	10
43		DPV11	4	10
44	ML11		2	4††
45	ISB11		4	10
46		DMV11	4	10
47	DEUNA		2	4**
48	UDA50		2	4**

* The vector for the device of this type must always be on a 10_8 boundary.
** After the first.
† These devices can have either a M7820 or M7821 interrupt control module. However, it should always be on a 10_8 boundary.
‡ DZ11 before DZ32
†† MASSBUS device.

Table 2-2 Floating Interrupt Vector Devices (Cont)

Rank	UNIBUS Option	LSI-11 Option	Decimal Size	Octal Modules
49	DMF32		16	4
50	KMS11		6	10
51	PCL11-13		4	10
52	VS100		2	4
53	RESERVED		2	4
54	KMV11		4	10
55	Reserved		4	10
56	Reserved		4	10
57	DHU11	DHV11	4	10
58	DMZ32		12	4

Table 2-3 Link Test/DECX11 Diagnostic Index

Device Option	DCLT PDP-11	DCLT VAX-11	ITEP Overlay	DECX/11
DH11	N/A	N/A	DZDHL	CXDHA
DHU11	N/A	N/A	N/A	CXDU
DHV11	N/A	N/A	N/A	CXDHV
DL11-E	N/A	N/A	N/A	CXDLA
DL11-W	N/A	N/A	N/A	CXDLA
DLV11	N/A	N/A	N/A	CXDLA
DMC11	CZCLK	EVDMC	DZDMO	CXDMC
DMF32	NONE	EVDLF	NONE	NONE
DMP11	CZCLM	EVDMD	N/A	CXDMD, CMDME
DMR11	CZCLK	EVDMC	DZDMO	CXDMR
DMV11	CZCLM	N/A	N/A	CXDMD, CXDME
DMZ32	NONE	NONE	NONE	NONE
DPV11	CZCLH	N/A	N/A	CXDPV
DQ11	N/A	N/A	DZDQO	CXDQA
DU11	N/A	N/A	DZDUO	CXDUA
DUP11	CZDCL	N/A	DZDPF	CXDPB
DUV11	N/A	N/A	N/A	N/A
DV11	N/A	N/A	DZDVO	CXDVA
DZ11	N/A	N/A	DZDZB	CXDZA
DZ11-X	N/A	N/A	DZDZB	CXDZA
DZ32	N/A	N/A	N/A	N/A
DZV11	N/A	N/A	N/A	CXDZB

N/A = Not available

Table 2-4 General Purpose/Functional Diagnostic Index

Option	PDP-11 Systems	VAX-11 Systems	Level
DH11	CZDHM,CZDHN,DZDHK	None	
DHU11	CZDHU,CZDHV,CZDHW	EVDAH	2R
	CZDHX	EVDAI	3
DHV11	CVDHA,CVDHB,CVDHC	NONE	
DL11-E	DZDLA	NONE	
DL11-W	DZDLA,DZDLD	NONE	
DLV11	DVDVA,DVDVC	NONE	
DMC11	CZDMC	EVDXA	3
	CZDME	EVDBA	3
	CZDMH	EVDBB	3
		EVDCA	2R
		EVDMC	2
DMF32	NONE	EVDLA	2R
		EVDLB	3
		EVDLC	3
		EVDLD	3
DMP11	CZDMP	EVDXA	3
	CZDMT	EVDMA	3
		EVDMB	2R
DMR11	CZDMP.	EVDXA	3
	CZDMS	EVDCA	2R
	CZDMI	EVDMC	2
		EVDMA	3
DMV11	CVDMA,CVDME,CVDMT	NONE	
DMZ32	NONE	EVDAE	3
		EVDAF	2R
DPV11	CVDPV	NONE	
DQ11	DZDQA,DZDQF	NONE	
DU11	DZDUA,DZDUF	NONE	
DUP11	DZDPB	EVDCA	2R
	DZDPF	EVDUP	3
		EVDUQ	3
DUV11	DZDUQ,DZDUV	NONE	
DV11	DZDVA	EVDEA	2
	DZDVF	EVDEB	3
		EVDEC	3
		EVDED	3
		EVDEE	3
		EVDEF	3
		EVDEG	3
DZ11,	DZDZA	EVDAA	3
DZ11-X		EVTAA	2R
		EVTBA	2R
DZ32	NONE	EVDAB	3
		EVDAC	2R
DZV11	DVDZA,DVDAB	NONE	

CHAPTER 3
CABLES

CABLES

This chapter contains a line drawing of each cable needed to configure any of the device options contained in Volumes One and Two of these manuals.

Table 3-1 can be used to quickly identify which cables are used with each option.

Cables are placed in alphanumeric order for speedy reference.

Table 3-1 Communication Options Cables

CABLES	OPTIONS	DH11	DHU11	DHV11	DL11E	DL11W	DLV11	DMC11	DMF32	DMP11	DMR11	DMV11					
BC01R-XX		X															
BC03M-XX								X									
BC03N-XX								X									
BC05C-XX		X			X	X	X	X									
BC05D-XX		X								X	X	X					
BC05L-XX			X	X													
BC05M-XX							X										
BC05Z-XX								X		X	X	X					
BC06R-XX									X								
BC08R-XX		X															
BC08S-XX		X						X		X	X	X					
BC17E										X							
BC55A-XX										X	X	X					
BC55B-XX										X	X	X					
BC55C-XX										X	X	X					
BC55D-XX										X	X	X					
BC55F												X					
BC55H												X					
BC55J										X							
BC55M-XX								X		X	X	X					
BC55N-XX								X		X	X	X					
BC55R-XX										X	X						
7008360					X	X											
7008519					X	X											

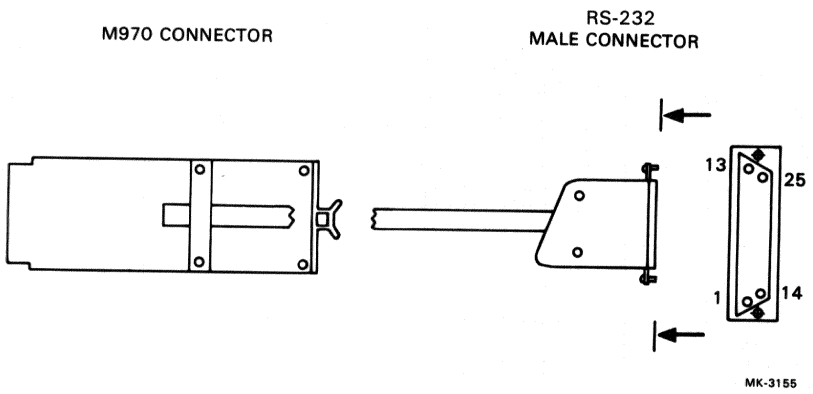
MKV84-0784

Table 3-1 Communication Options Cables (Cont)

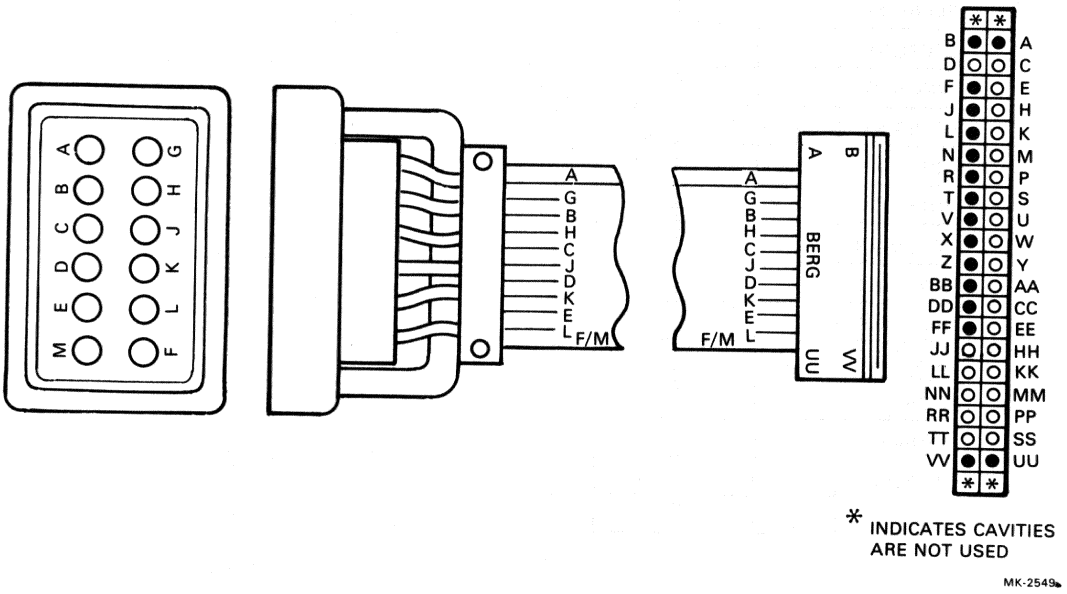
CABLES \ OPTIONS	DMZ32	DPV11	DQ11	DU11	DUP11	DUV11	DV11	DZ11	DZ11-X	DZ32	DZV11
BC01R-XX			X								
BC01W-XX			X	X							
BC02C-XX					X						
BC02D-XX					X						
BC03M-XX								X		X	X
BC03P-XX								X			X
BC04R-XX								X			
BC05C-XX			X	X	X	X					
BC05D-XX		X					X	X		X	
BC05W-XX								X		X	
BC06K-XX								X			
BC06L-XX								X		X	
BC08R-XX							X				
BC08S-XX			X		X		X	X			
BC11U-XX											X
BC18L-XX	X										
BC18M-XX	X										
BC20R-XX									X		
BC20S-XX									X		
BC22N-XX	X										
BC26L-XX		X									
7016428									X		
7018209		X									

MKV84-0785

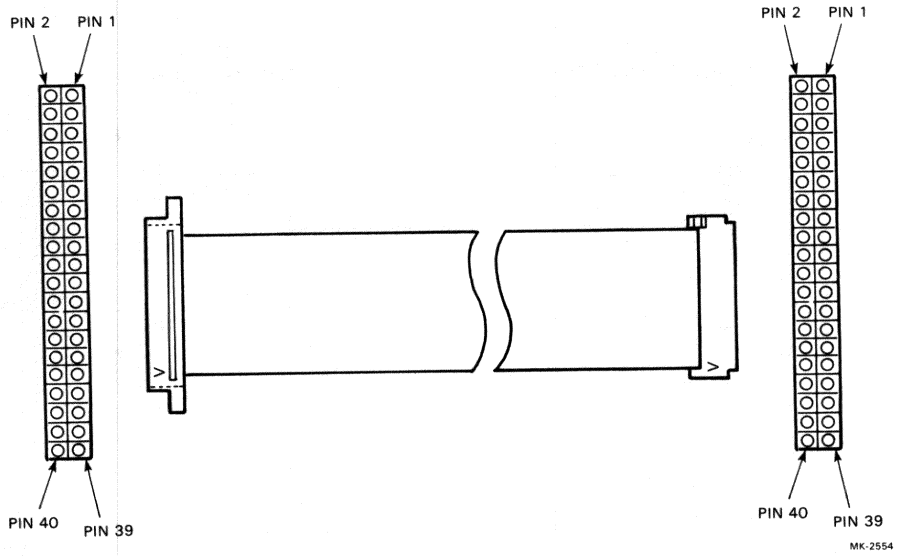
BC01R


M970 CONNECTOR
RS-232
MALE CONNECTOR
13
25
1
14
MK-3155

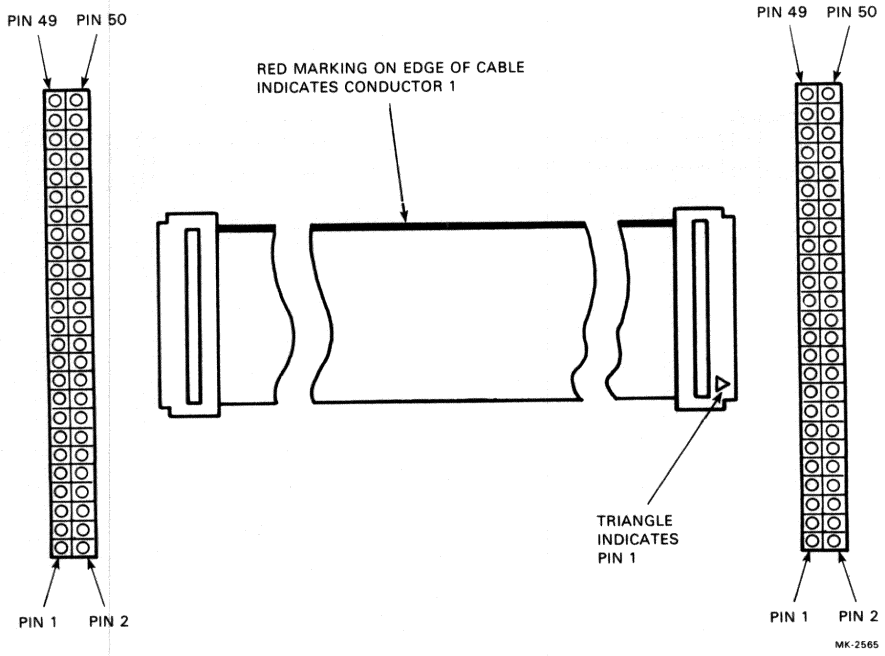
BC01W


A B C D E F G H J K L M
A G B H C J D K E L F/M
BERG
F/M
B D F J L N R T V X Z BB DD FF JJ LL NN RR TT VV
A C E H K M P S U W Y AA CC EE HH KK MM PP SS UU
* INDICATES CAVITIES ARE NOT USED
MK-2549

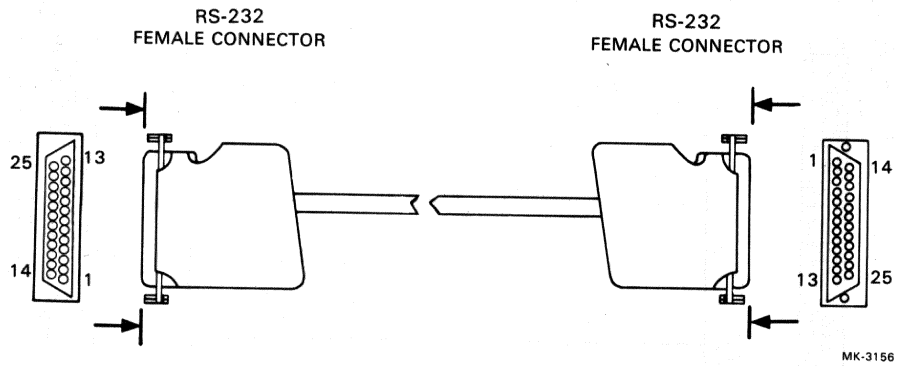
BC02C


PIN 2
PIN 1
PIN 40
PIN 39
PIN 2
PIN 1
PIN 40
PIN 39
MK-2554

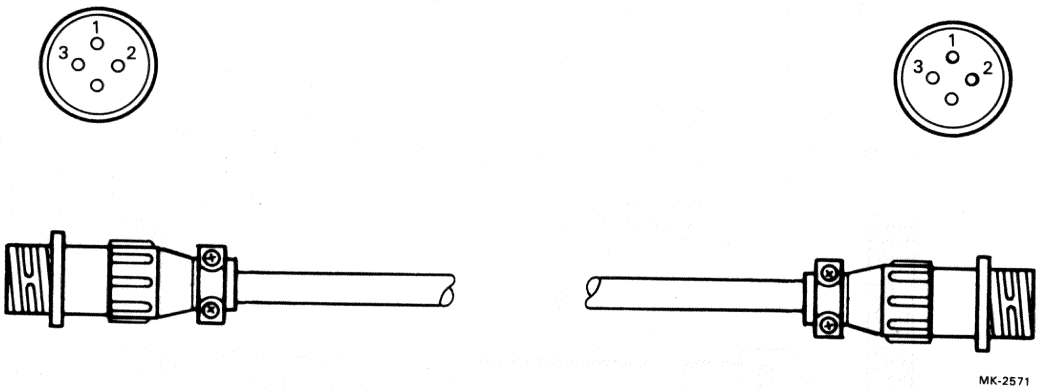
BC02D


PIN 49
PIN 50
RED MARKING ON EDGE OF CABLE
INDICATES CONDUCTOR 1
TRIANGLE
INDICATES
PIN 1
PIN 49
PIN 50
PIN 1
PIN 2
PIN 1
PIN 2
MK-2565

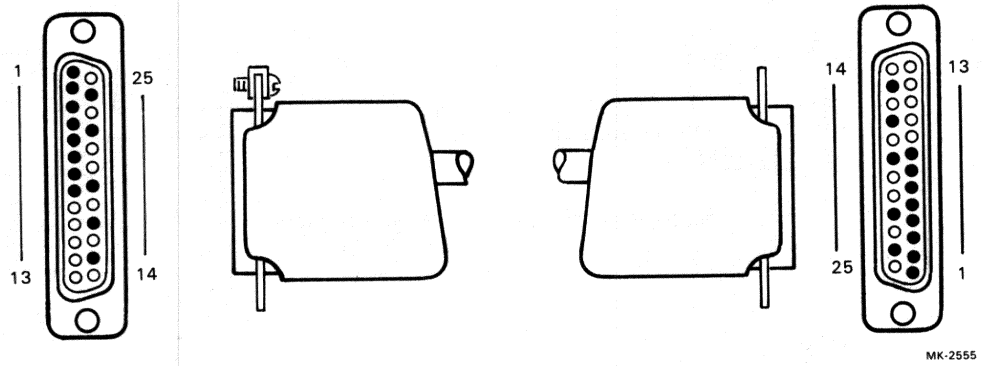
BC03M


RS-232
FEMALE CONNECTOR
RS-232
FEMALE CONNECTOR
25
13
14
1
1
14
13
25
MK-3156

BC03N

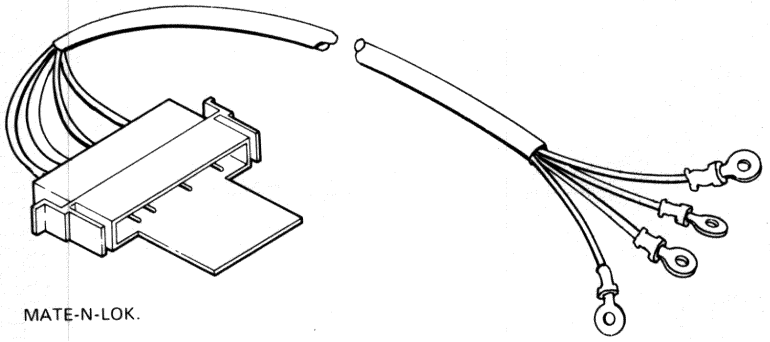

1
3
2
1
3
2
MK-2571

BC03P



MK-2555

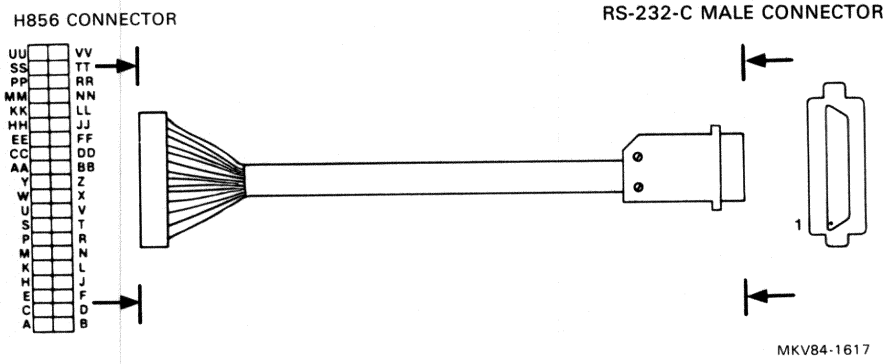
BC04R



MATE-N-LOK.

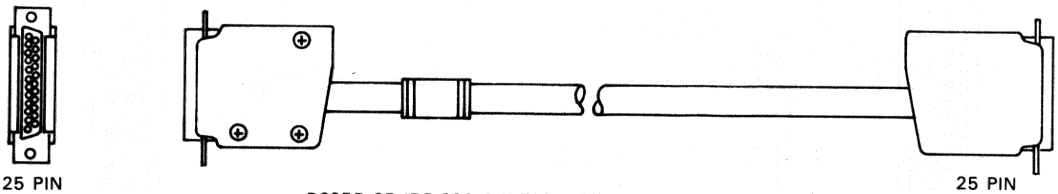
MK-2842

BC05C



MKV84-1617

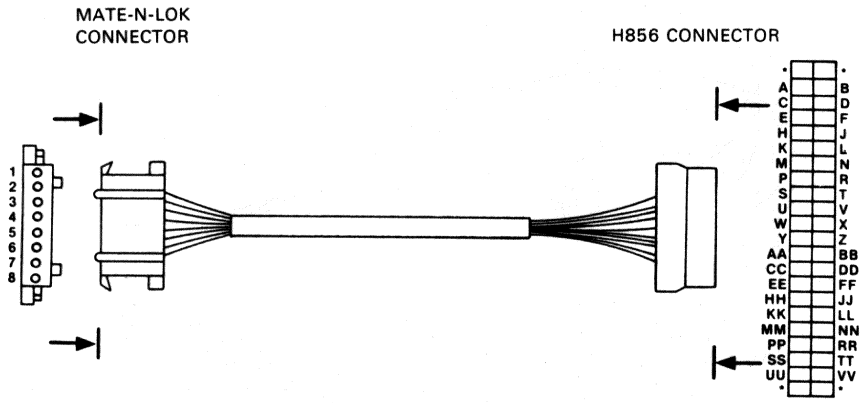
BC05D



BC05D-25 (RS-232-C INTERFACE) MODEM CABLE

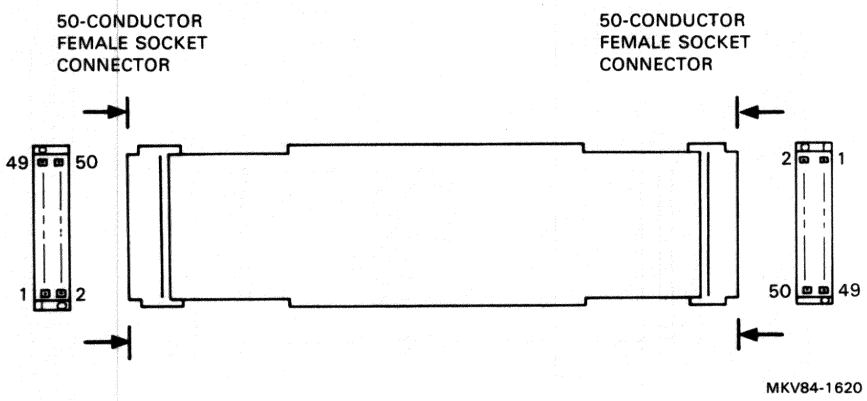
MKV84-1618

BC05M

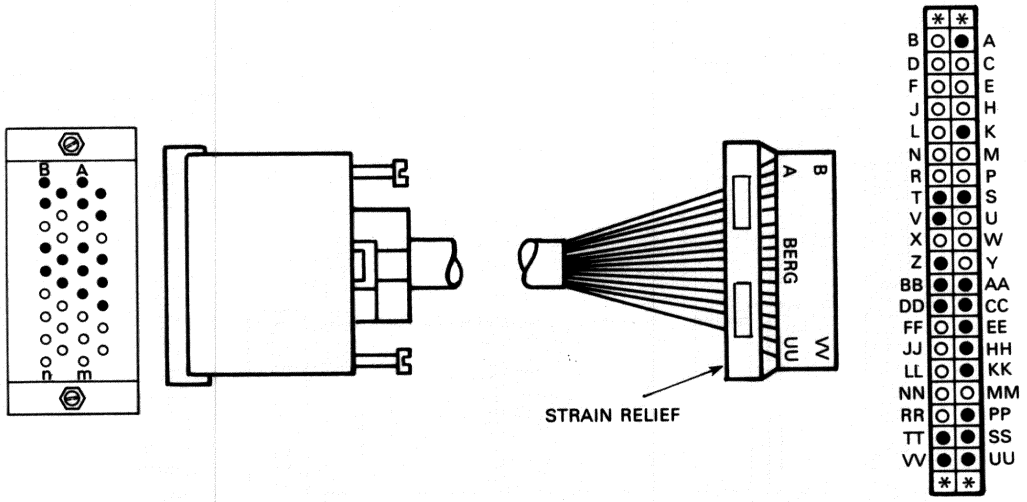


MKV84-1619

BC05W



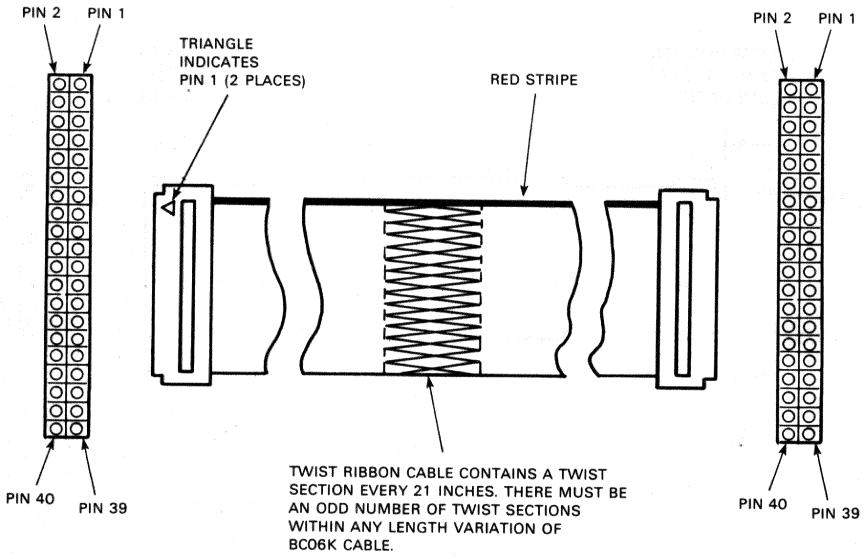
BC05Z



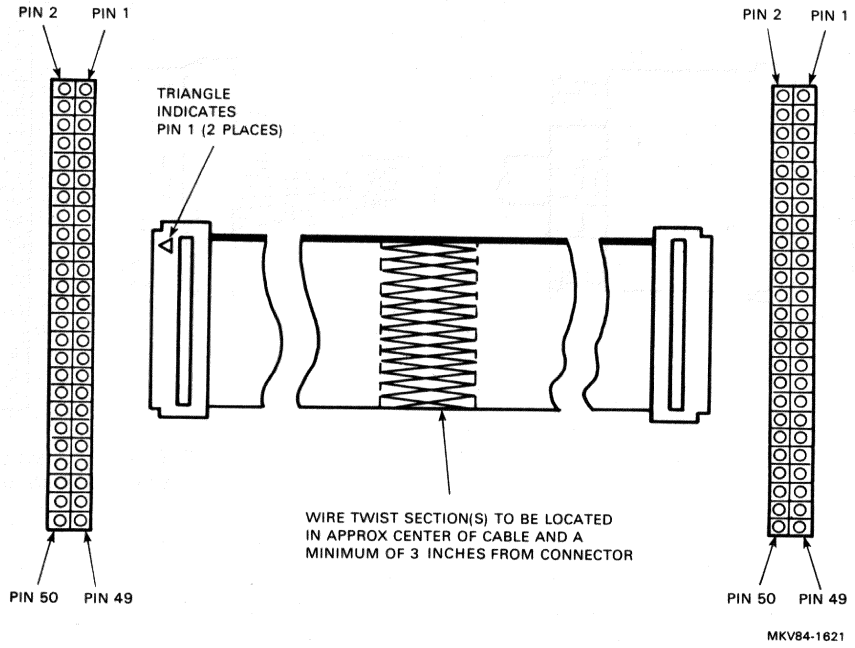
* INDICATES CAVITIES USED TO MOUNT STRAIN RELIEF

MK-2550

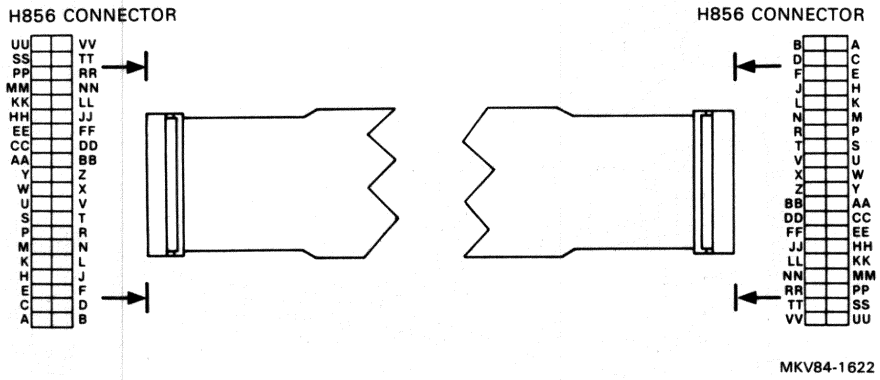
BC06K


PIN 2
PIN 1
TRIANGLE INDICATES PIN 1 (2 PLACES)
RED STRIPE
PIN 2
PIN 1
PIN 40
PIN 39
TWIST RIBBON CABLE CONTAINS A TWIST SECTION EVERY 21 INCHES. THERE MUST BE AN ODD NUMBER OF TWIST SECTIONS WITHIN ANY LENGTH VARIATION OF BC06K CABLE.
PIN 40
PIN 39
MK-2567

BC06L

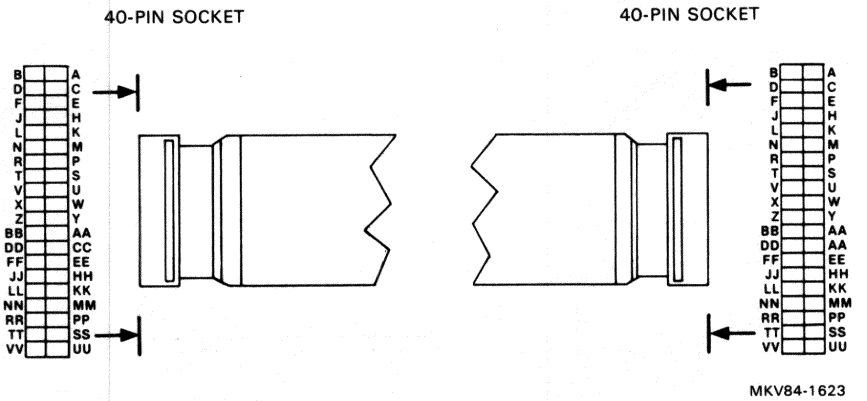

PIN 2
PIN 1
TRIANGLE INDICATES PIN 1 (2 PLACES)
PIN 2
PIN 1
WIRE TWIST SECTION(S) TO BE LOCATED IN APPROX CENTER OF CABLE AND A MINIMUM OF 3 INCHES FROM CONNECTOR
PIN 50
PIN 49
PIN 50
PIN 49
MKV84-1621

BC08R



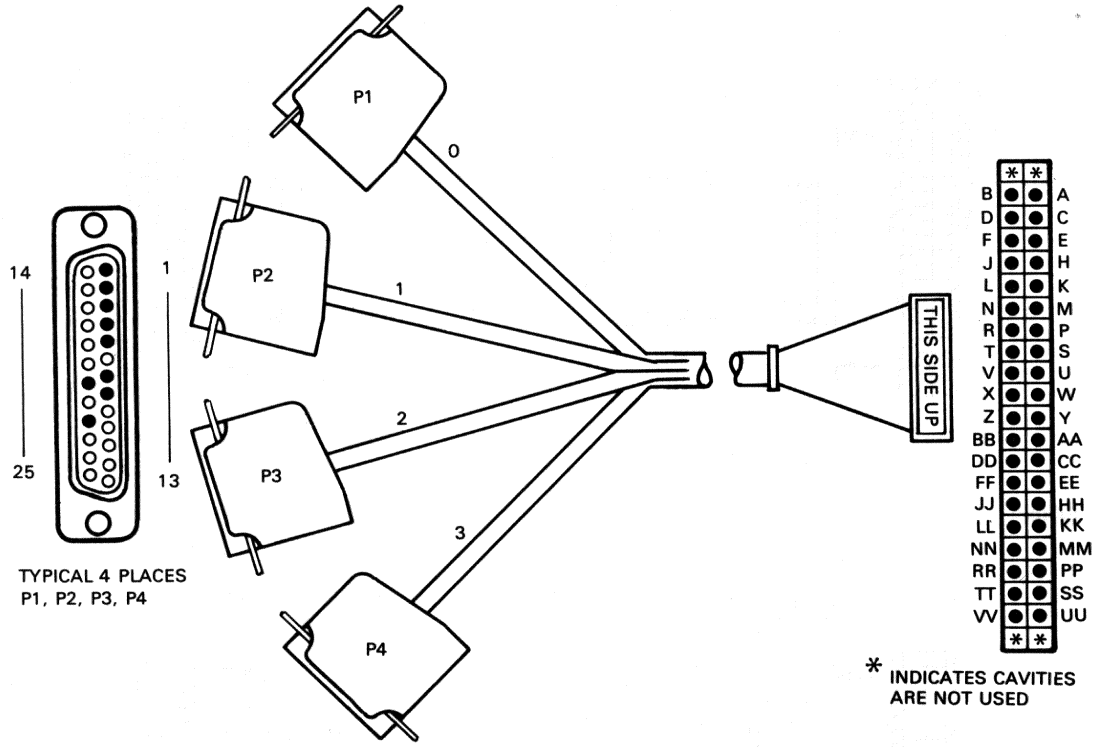
MKV84-1622

BC08S

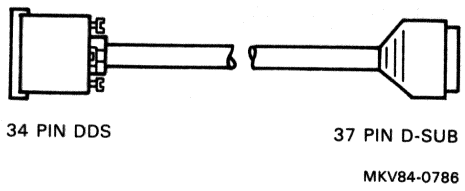


MKV84-1623

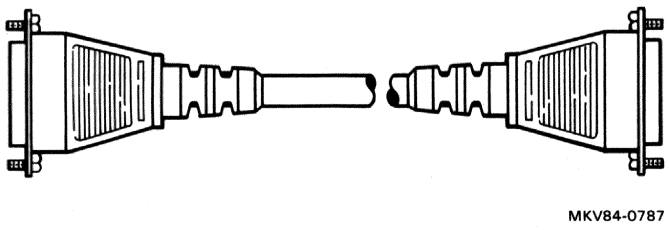
BC11U



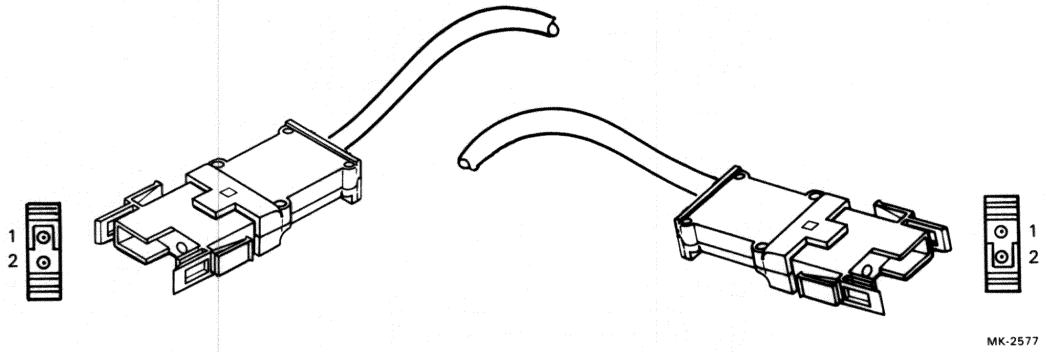
BC17E-25



BC18L/M

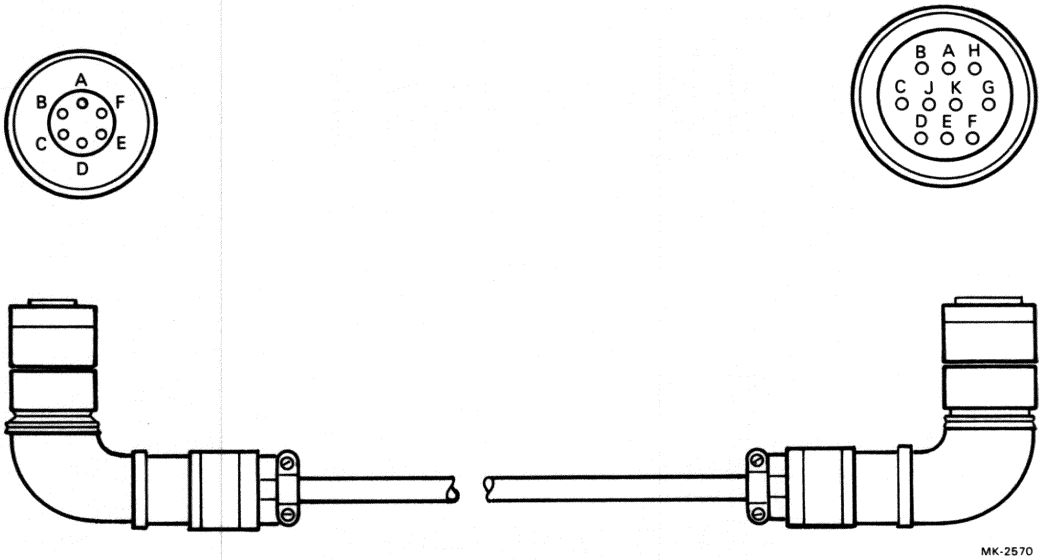


BC20R



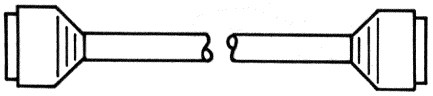
MK-2577

BC20S



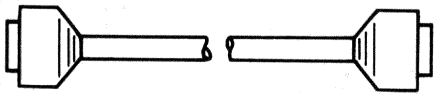
MK-2570

BC22D-**



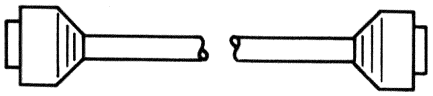
25 PIN D-SUB

BC22E-**



25 PIN D-SUB

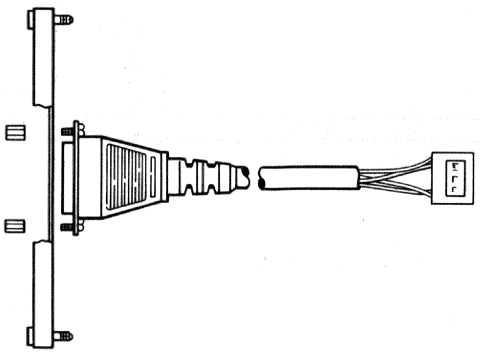
BC22F-**



25 PIN D-SUB

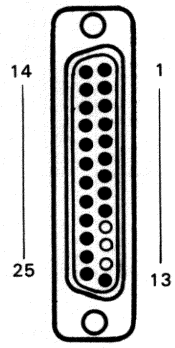
MKV84-0788

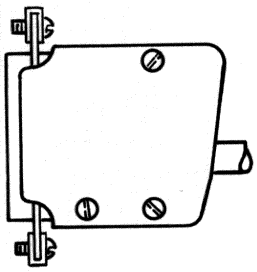
BC22N-**

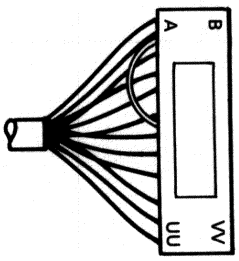


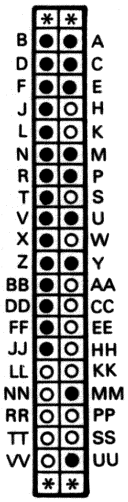
MKV84-0797

BC26L







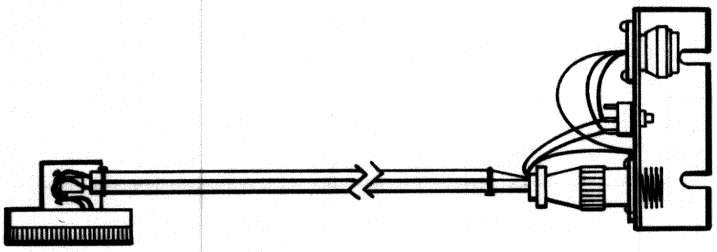


* INDICATES CAVITIES ARE NOT USED

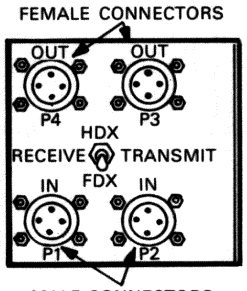
MK-2551

BC55A

Appropriate terminator connectors H3257 or H3258 must be used.



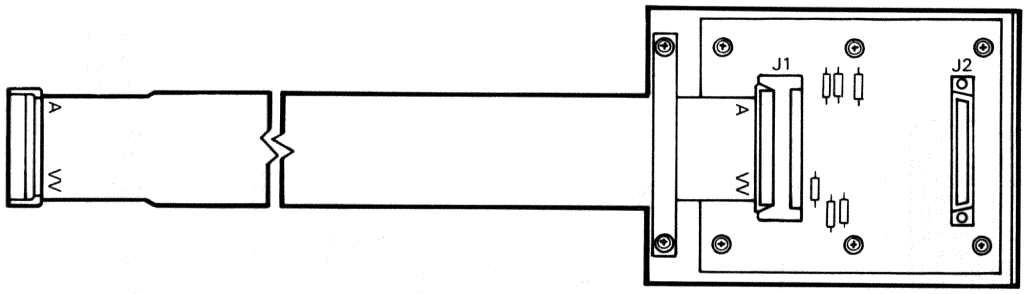
BC55A-10 (INTEGRAL MODEM) PANEL CABLE



CONNECTOR PANEL (FRONT VIEW)

MKV84-1624

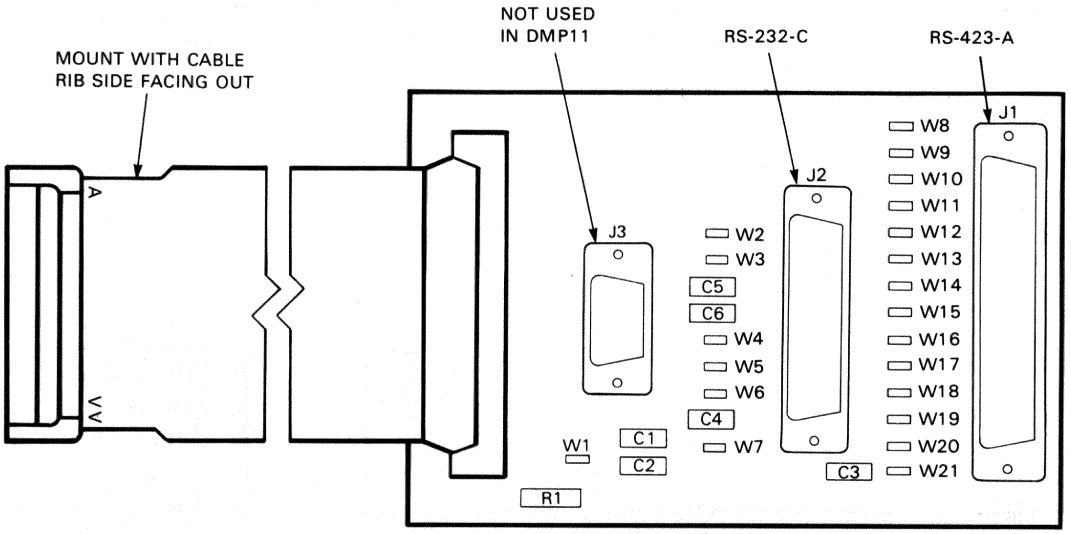
BC55B



BC55B-10 (RS-422-A INTERFACE) PANEL CABLE

MKV84-1625

BC55C



BC55C-10(RS-232-C/RS-423-A) INTERFACE PANEL CABLE

MKV84-1626

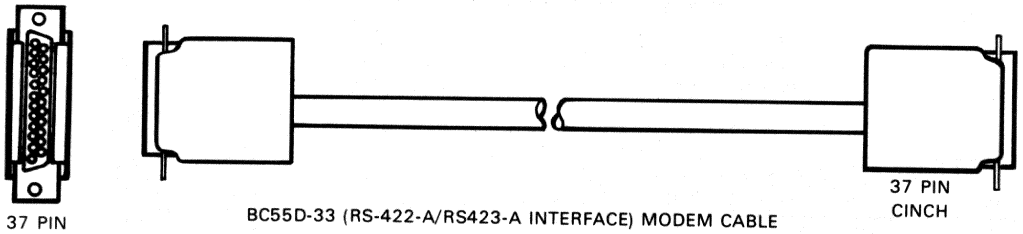
Table 3-2 Modem Option Jumper Functions

J2 PIN	JUMPER	RS-232-C	BELL 208B	BELL 209	DATA 2400	DATEL 4800	CCITT V.23	CCITT V.26 BIS	CCITT V.27 TER	ISO 2110-1972	FUTURE D	EIA RS-232	EIA RS-449	CCITT V.24
1	W1	IN	IN	IN	IN	IN				IN		AA		101
	W7													
2												BA	SD	103
3												BB	RD	104
4	W19	IN	IN	IN	IN	IN	IN	IN	IN	IN		CA	RS	105
5												CB	CS	106
6												CC	DM	107
7												AB	SG	102
8												CF	RR	109
9														
10														
11	W14									IN			SF	126
12	W3	IN			IN	IN	IN	IN	IN	IN		SCF	SRR	122
13	W2	IN			IN		IN	IN	IN	IN		SCB	SCS	121
14	W6	IN			IN	IN	IN	IN	IN	IN		SBA	SSD	110
15	W20	IN	IN	IN	IN	IN	IN	IN	IN	IN		DB	ST	114
16	W5	IN			IN	IN	IN	IN	IN	IN		SBB	SRD	119
17	W18	IN	IN	IN	IN	IN	IN	IN	IN	IN		DD	RT	115
18	W17												LL	141
19	W4	IN			IN	IN	IN	IN	IN	IN		SCA	SRS	120
20												CD	TR	108
21	W16	IN		IN								CG	SQ	110
	W13												RL	140
22												CE	IC	125
23	W21	IN			IN	IN	IN	IN	IN	IN		CH	SR	111
	W12											CI	SF	112
24	W15				IN								SS	116
	W10	IN	IN	IN		IN		IN	IN			DA	TT	113
25	W11				IN								SB	117
	W9												TM	142
	W8											MAKE BUSY		

*RS-232-C DEFINES BOTH SIGNALS FOR THIS PIN
† CCITT MODEM A ONLY

MKV84-0789

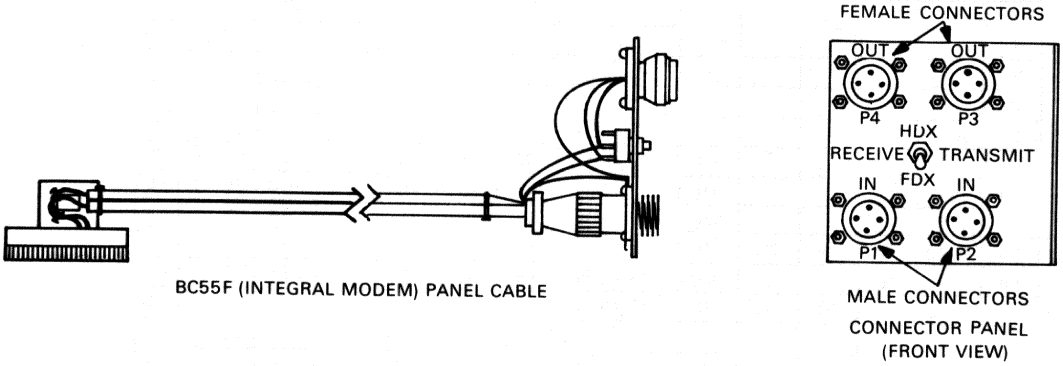
BC55D



BC55D-33 (RS-422-A/RS423-A INTERFACE) MODEM CABLE

MKV84-1627

BC55F

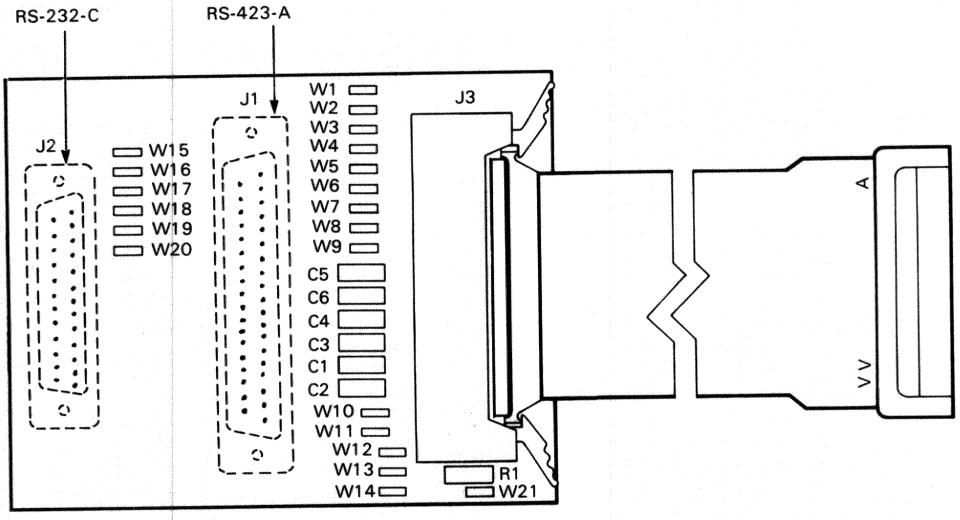


BC55F (INTEGRAL MODEM) PANEL CABLE

MKV84-0790

NOTE

The BC55F cable is very similar to the BC55A. The only difference is in the connector panel configuration (see BC55A).



BC55H-3 (RS-232-C/RS-423-A) INTERFACE PANEL CABLE

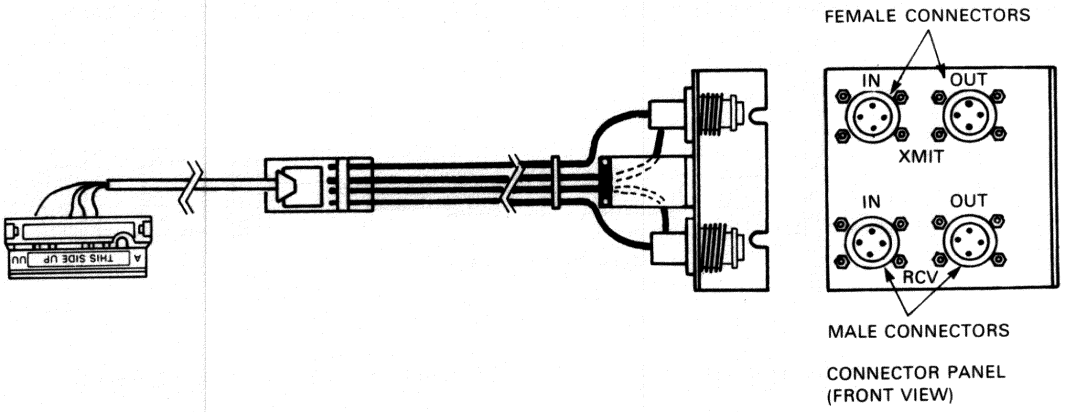
MKV84-1628

Table 3-3 BC55H Modem Option Jumper Functions

J2 PIN	JUMPER	RS-232-C	BELL 103J	BELL 208B	BELL 209	DATEL 200	DATEL 600	DATEL 2400	DATEL 4800	CCITT V.21	CCITT V.23	CCITT V.26B	CCITT V.27T	ISO2110-1972 (FUTURE D)	ISO2110.2 (X.21BIS)	ISO2110.2 (X.20BIS)	EIA RS-232-C	EIA RS-449	CCITT V.24
23	W1	IN					IN	IN	IN		IN	IN	IN	IN	IN		CH	SR	111
21	W2	IN			IN												CG	SQ	110
11	W3					IN				IN				IN				SF	126
23	W4																CI	SF	112
16	W5	IN					IN	IN	IN		IN	IN	IN	IN	IN	IN	SBB	SRD	119
14	W6	IN					IN	IN	IN		IN	IN	IN	IN	IN	IN	SBA	SSD	118
12	W7	IN					IN	IN	IN		IN	IN	IN	IN	IN	IN	SCF	SRR	122
21	W8									IN					IN	IN		RL	140
4	W9	IN		IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	CA	RS	105
15	W10	IN		IN	IN			IN	IN		IN	IN	IN	IN	IN		DB	ST	114
17	W11	IN		IN	IN			IN	IN		IN	IN	IN	IN	IN		DD	RT	115
18	W12									IN					IN	IN		LL	141
19	W13	IN					IN	IN	IN		IN	IN	IN	IN	IN	IN	SCA	SRS	121
	W14								NOT NORMALLY INSTALLED										
25	W15									IN					IN	IN		TM	142
24	W16	IN		IN	IN				IN			IN	IN		IN	IN	DA	TT	113
25	W17							IN										SB	117
24	W18							IN										SS	116
13	W19	IN					IN	IN	IN		IN	IN	IN	IN	IN	IN	SCB	SCS	121
25	W20																MAKE BUSY		
1	W21	IN	IN	IN	IN	IN	IN	IN	IN					IN			AA		101
2																	BA	SD	103
3																	BB	RD	104
5																	CB	CS	106
6																	CC	DM	107
7																	AB	SG	102
8																	CF	RR	109
20																	CD	TR	108
22																	CE	IC	125

MKV84-1629

BC55J

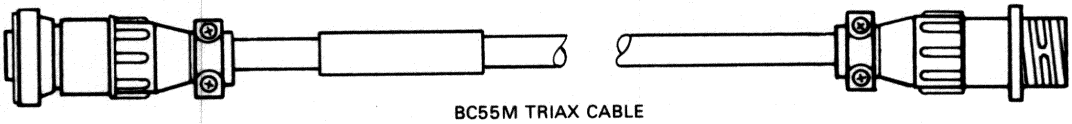


MKV84-1630

BC55M

Cable is used for the same purpose as the BC55N, but for data rates above 56K b/s.

USES: BELDEN 8232 – UP TO 4.3 KM (14K FEET)*
BELDEN 8233 – UP TO 6.0 KM (18K FEET)*



BC55M TRIAX CABLE

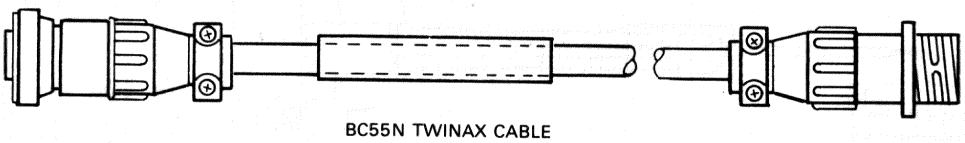
*MAXIMUM DISTANCE IS DEPENDENT ON SPEED.
REFER TO M8203 TECHNICAL MANUAL, EK-M8203-TM FOR DETAILS.

MK-3605

BC55N

Cable is used to interconnect local (integral) configurations for a selected data rate of 56K b/s.

USES: BELDEN 9272

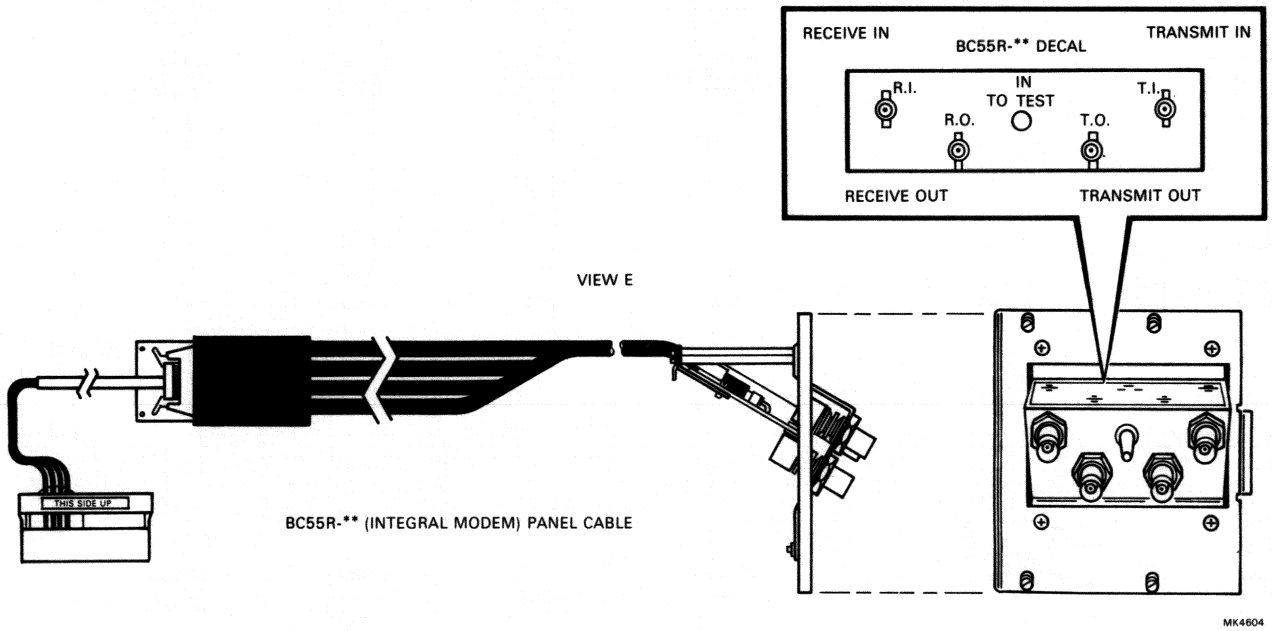


BC55N TWINAX CABLE

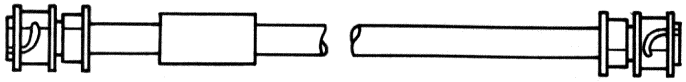
MK-3606

Recommended connector hardware for building BC55 type cables in excess of 30 m (98 feet):

Component	DIGITAL Part Number	AMP Part Number
Small cable clamp	12-11430-00	206062-1
Large cable clamp	12-11430-01	206358-1
Male housing	12-12527	206153-1
Male pin	12-12001	66589-2
Female housing	12-12526	206060-1
Female pin	12-12000	66590-2
14 ga male pin	12-12001-1	66587-2

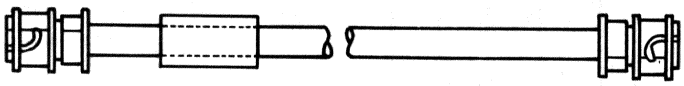

RECEIVE IN
TRANSMIT IN
BC55R-** DECAL
R.I.
IN
TO TEST
T.I.
R.O.
T.O.
RECEIVE OUT
TRANSMIT OUT
VIEW E
THIS SIDE UP
BC55R-** (INTEGRAL MODEM) PANEL CABLE
MK4604

BC55S TRIAXIAL CABLE*



*FOR SPEEDS UP TO:
500K bits/s (FULL DUPLEX)
1M bits/s (HALF DUPLEX)

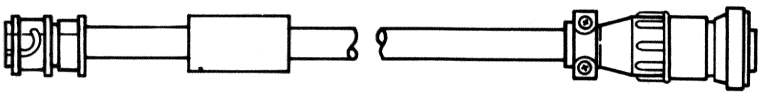
BC55T TWINAX CABLE*



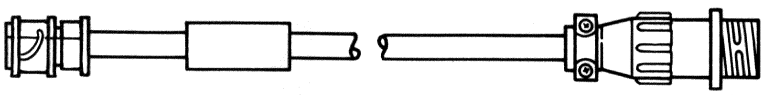
*FOR SPEEDS UP TO 56K bits/s

MKV84-0791

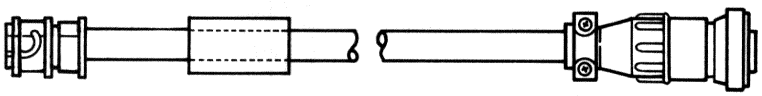
BC56A TRIAXIAL ADAPTOR CABLE*



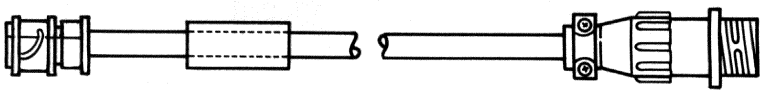
BC56B TRIAXIAL ADAPTOR CABLE*



BC56D TWINAX ADAPTOR CABLE*



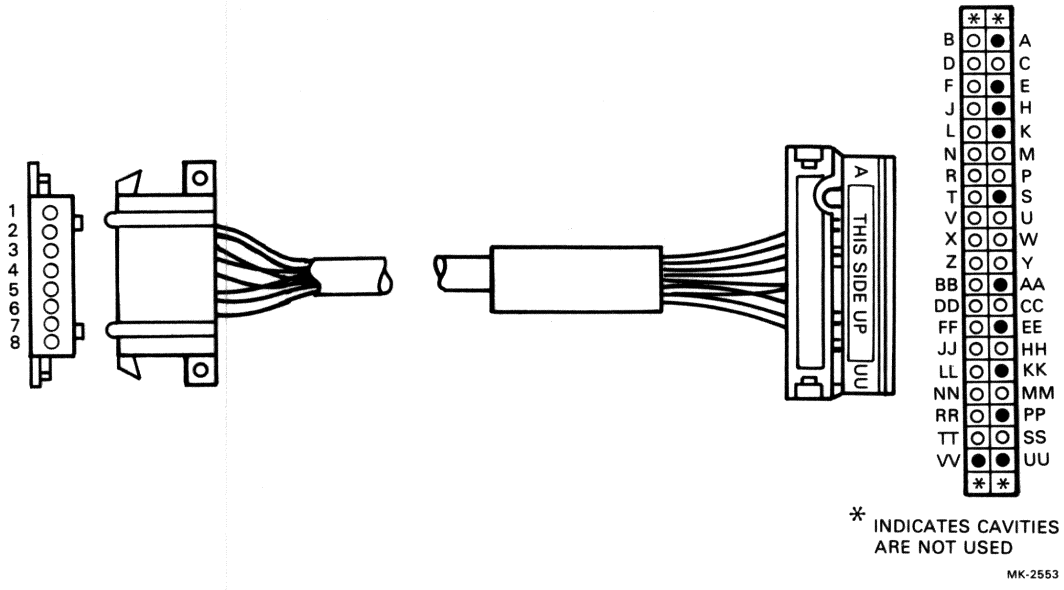
BC56E TWINAX ADAPTOR CABLE*



*USE ADAPTOR CABLES WHEN CONNECTING BC55R INTEGRAL MODEM PANEL/CABLE TO OLDER STYLE NETWORKS USING BC55A OR BC55J INTEGRAL MODEM PANEL/CABLES.

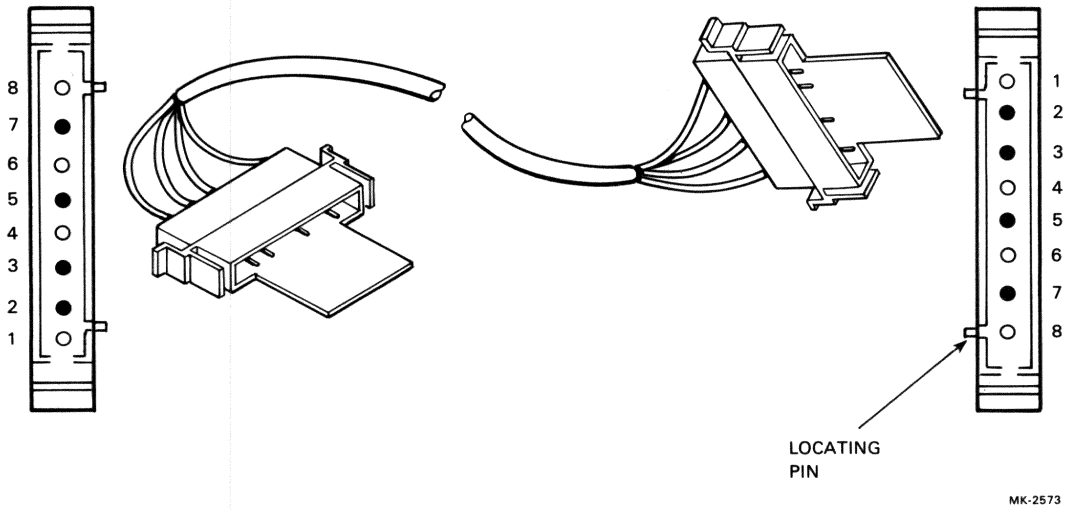
MKV84-0792

70-08360



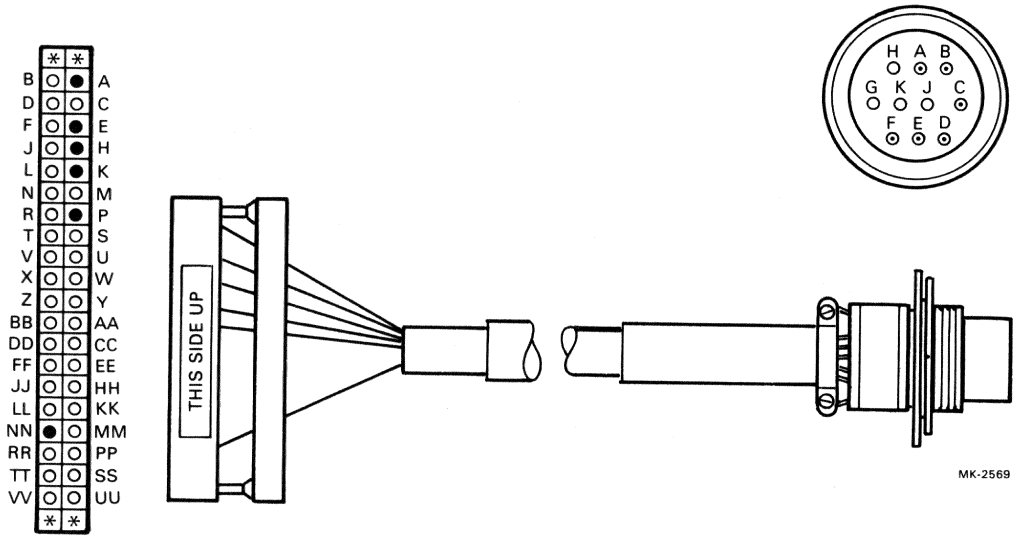
MK-2553

70-08519



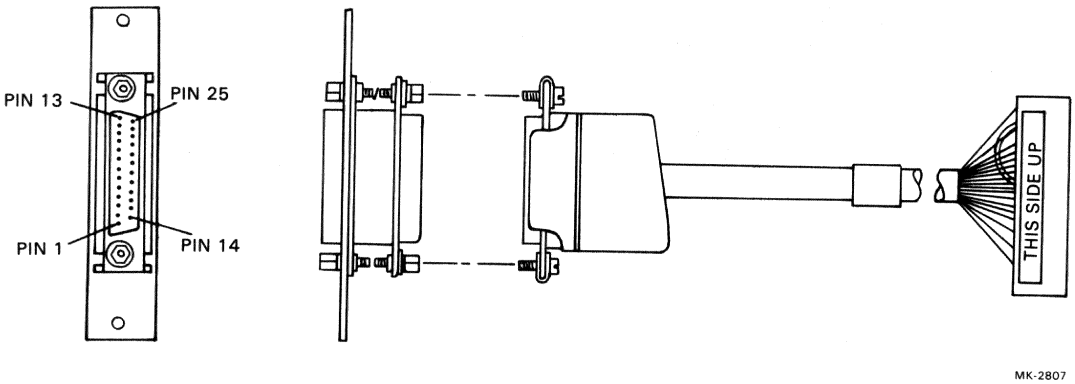
MK-2573

70-16428



* INDICATES CAVITIES ARE USED TO MOUNT STRAIN RELIEF

70-18209



CHAPTER 4
TEST CONNECTORS AND TERMINATORS

TEST CONNECTORS AND TERMINATORS

This chapter contains a line drawing of each of the test connectors and terminators needed to test any of the device options described in Volume One and Two of these manuals.

Table 4-1 can be used to quickly identify which test connectors and terminators are used with each communication device.

Test connector drawings are placed in alphanumeric order for speedy reference.

Terminator drawings follow test connector drawings.

Most test connectors and terminators are used with more than one device option.

Table 4-1 Test Connectors and Terminators for Communication Options

CONNECTORS / OPTIONS		DH11	DHU11	DHV11	DL11/E/W	DLV11	DMC11	DMF32	DMP11	DMR11	DMV11					
H315		X			X	X										
H325			X	X			X		X	X	X					
H861C		X														
H3248								X								
H3249								X								
H3250							X		X	X	X					
H3251									X	X	X					
H3254									X	X	X					
H3255									X	X	X					
H3276										X						
H3277			•	X												
H8568										X						
H8611		X														
M974		X														
12-12528							X									
TERMINATORS																
H3257									X	X	X					
H3258									X	X	X					
H8570									X	X	X					

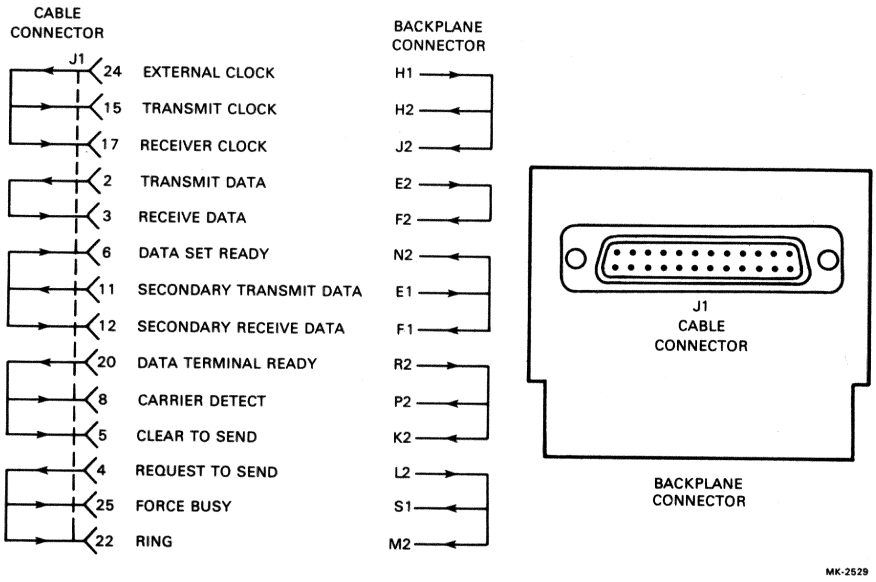
MKV84-0775

Table 4-1 Test Connectors and Terminators for Communication Options (Cont)

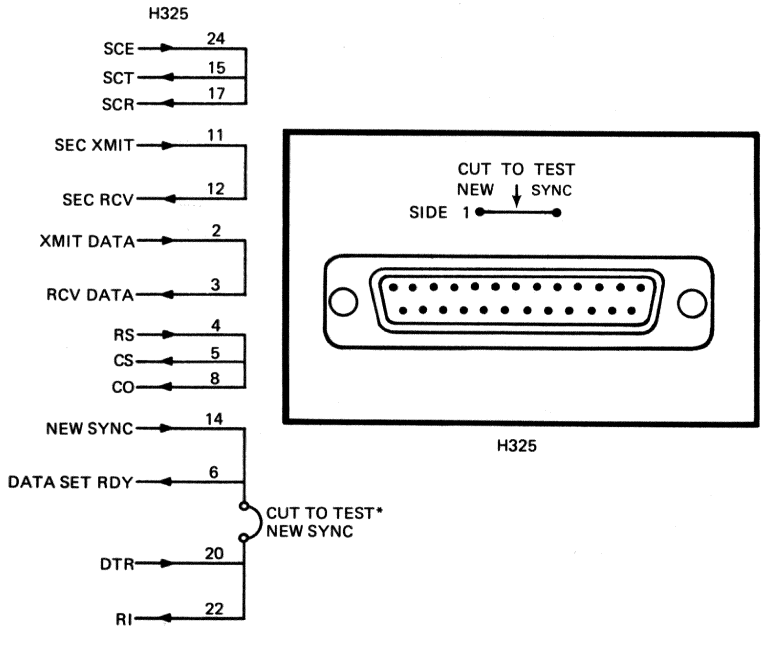
CONNECTORS / OPTIONS	DMZ32	DPV11	DQ11	DU11	DUP11	DUV11	DV11	DZ11	DZ11-X	DZ32	DZV11				
H315			X	X		X									
H325					X		X	X			X				
H327								X							
H329											X				
H861							X								
H3027	X														
H3028	X														
H3190								X							
H3248	X														
H3259		X								X					
H3260		X													
H3271								X	X						
H3272										X					
H3273									X						
H3274									X						
H8612								X							
29-24929-00	X														
TERMINATORS															

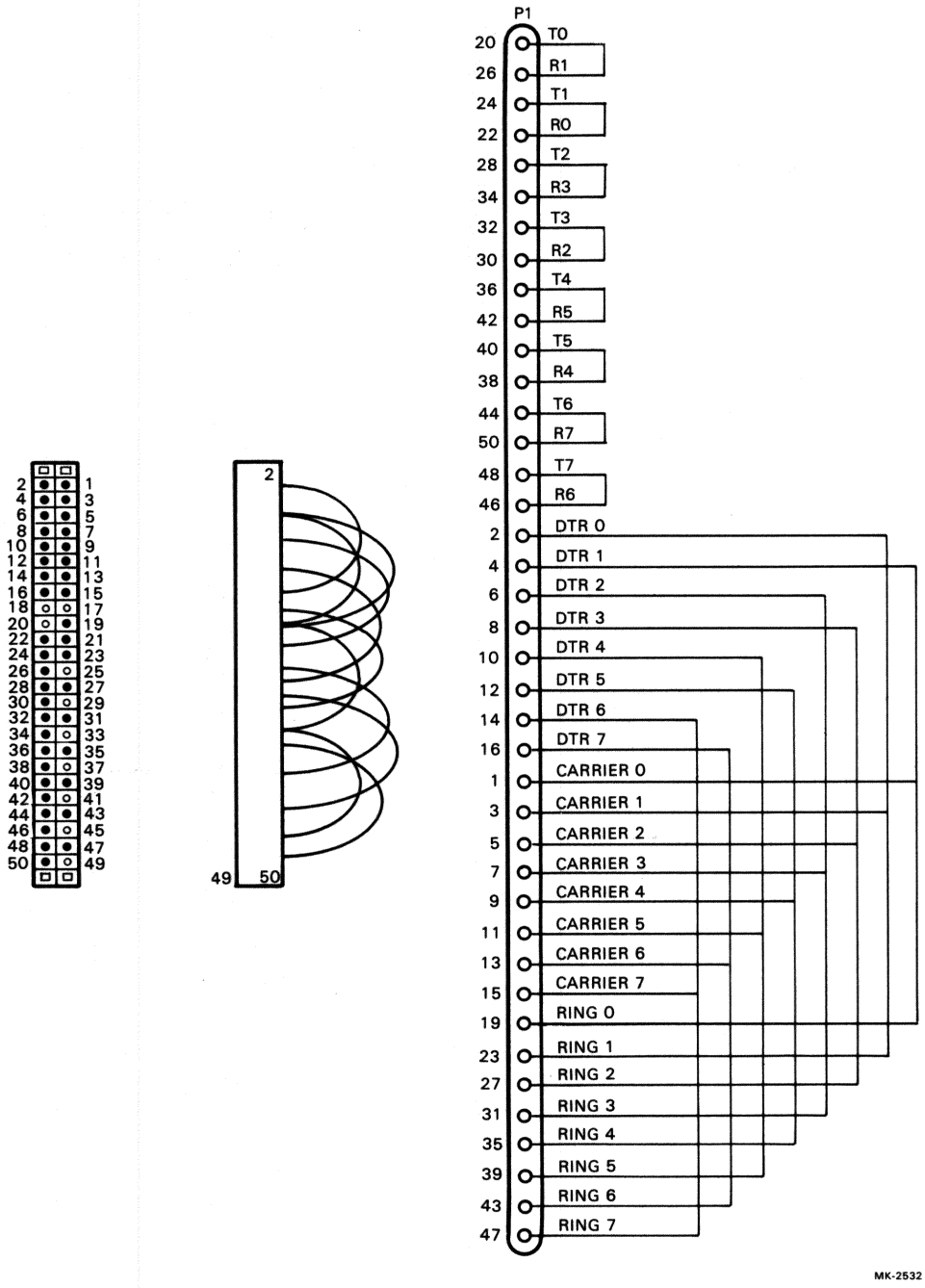
MKV84-0776

H315

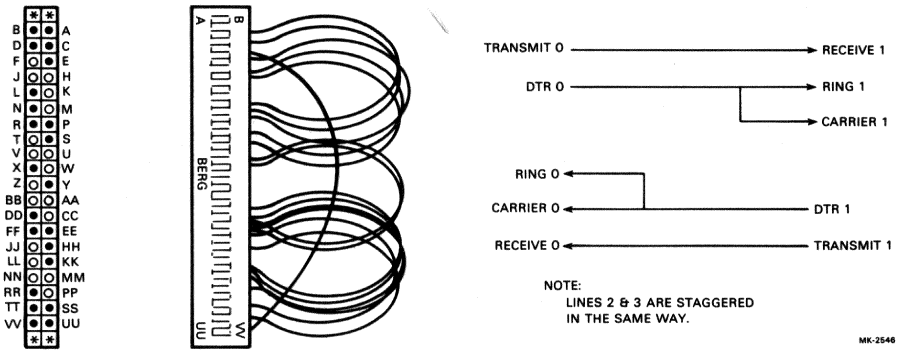

CABLE CONNECTOR
J1
24 EXTERNAL CLOCK
15 TRANSMIT CLOCK
17 RECEIVER CLOCK
2 TRANSMIT DATA
3 RECEIVE DATA
6 DATA SET READY
11 SECONDARY TRANSMIT DATA
12 SECONDARY RECEIVE DATA
20 DATA TERMINAL READY
8 CARRIER DETECT
5 CLEAR TO SEND
4 REQUEST TO SEND
25 FORCE BUSY
22 RING
BACKPLANE CONNECTOR
H1
H2
J2
E2
F2
N2
E1
F1
R2
P2
K2
L2
S1
M2
J1
CABLE
CONNECTOR
BACKPLANE
CONNECTOR
MK-2529

H325


H325
SCE 24
SCT 15
SCR 17
SEC XMIT 11
SEC RCV 12
XMIT DATA 2
RCV DATA 3
RS 4
CS 5
CO 8
NEW SYNC 14
DATA SET RDY 6
CUT TO TEST*
NEW SYNC
DTR 20
RI 22
CUT TO TEST
NEW SYNC
SIDE 1
H325
MKV84-0782

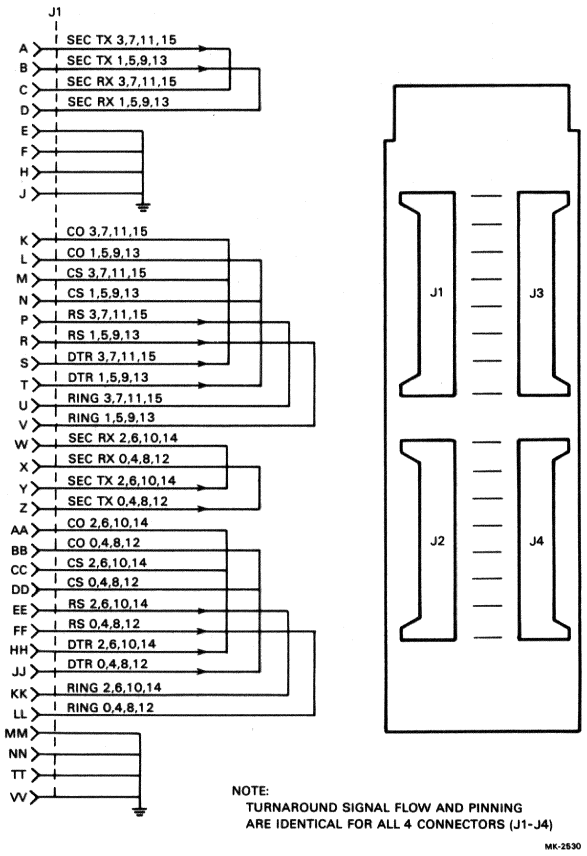

P1
20 T0
26 R1
24 T1
22 R0
28 T2
34 R3
32 T3
30 R2
36 T4
42 R5
40 T5
38 R4
44 T6
50 R7
48 T7
46 R6
2 DTR 0
4 DTR 1
6 DTR 2
8 DTR 3
10 DTR 4
12 DTR 5
14 DTR 6
16 DTR 7
1 CARRIER 0
3 CARRIER 1
5 CARRIER 2
7 CARRIER 3
9 CARRIER 4
11 CARRIER 5
13 CARRIER 6
15 CARRIER 7
19 RING 0
23 RING 1
27 RING 2
31 RING 3
35 RING 4
39 RING 5
43 RING 6
47 RING 7
2 1
4 3
6 5
8 7
10 9
12 11
14 13
16 15
18 17
20 19
22 21
24 23
26 25
28 27
30 29
32 31
34 33
36 35
38 37
40 39
42 41
44 43
46 45
48 47
50 49
2
49 50
MK-2532

H329



* INDICATES CAVITIES ARE NOT USED

H861

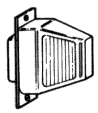


NOTE:
TURNAROUND SIGNAL FLOW AND PINNING
ARE IDENTICAL FOR ALL 4 CONNECTORS (J1-J4)

MK-2530

H3027

PIN NUMBER	SIGNAL NAME (REFERENCED TO H3027)
1	DATA OUT A (+
2	CHASSIS GROUND
3	DATA IN A (+)
4	CHASSIS GROUND
5	UNUSED
6	UNUSED
7	UNUSED
8	UNUSED
9	DATA OUT B (−)
10	UNUSED
11	DATA IN B (−)
12	UNUSED
13	SIGNAL GROUND
14	UNUSED
15	UNUSED



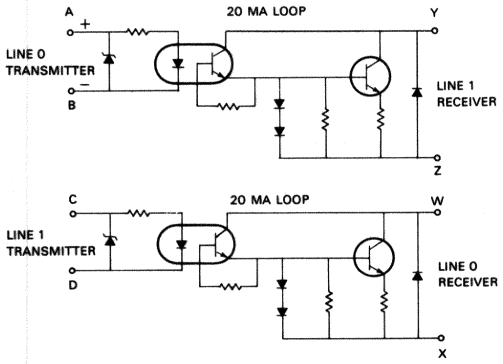
MKV84-0777

H3028

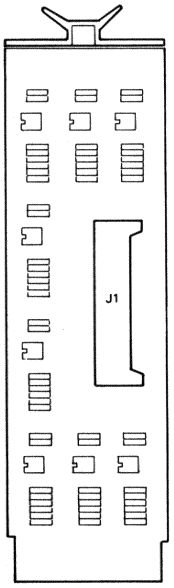
J1 PIN NUMBER	SIGNAL NAME
1	DATA IN A (+)
2	DATA IN B (−)
3	SIGNAL GROUND
4	UNUSED
5	UNUSED
6	UNUSED
7	UNUSED
8	UNUSED
9	DATA OUT A (+)
10	DATA OUT B (−)

MKV84-0778

H3190

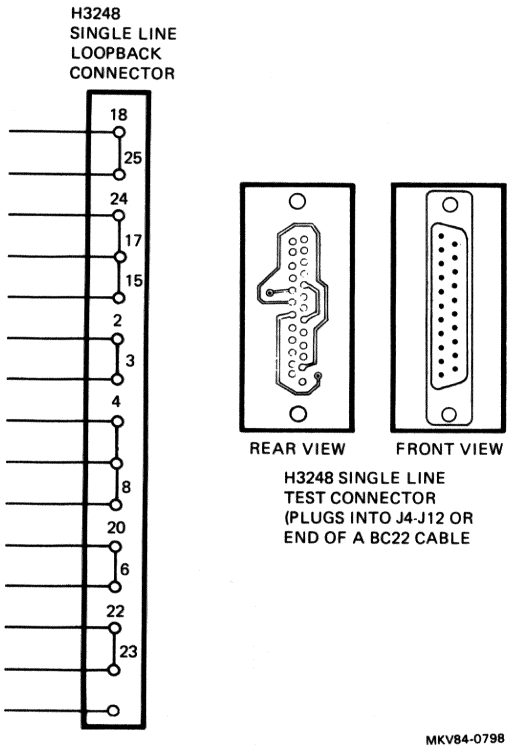


LINES 283, 485 AND 687 ARE STAGGERED THE SAME WAY

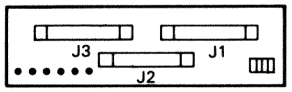


MK-2547

H3248



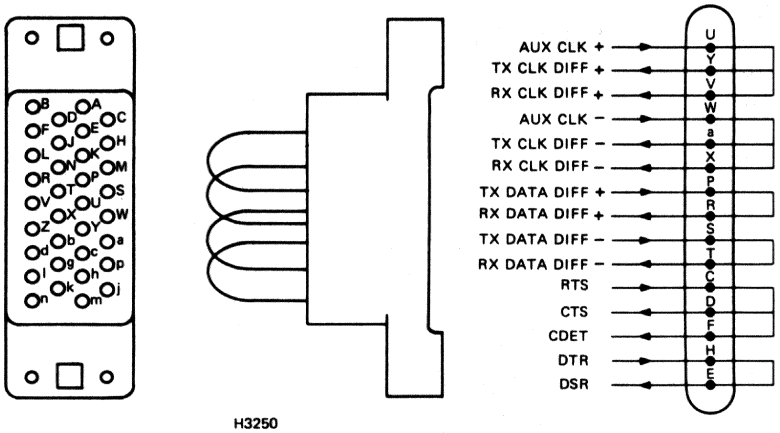
H3249

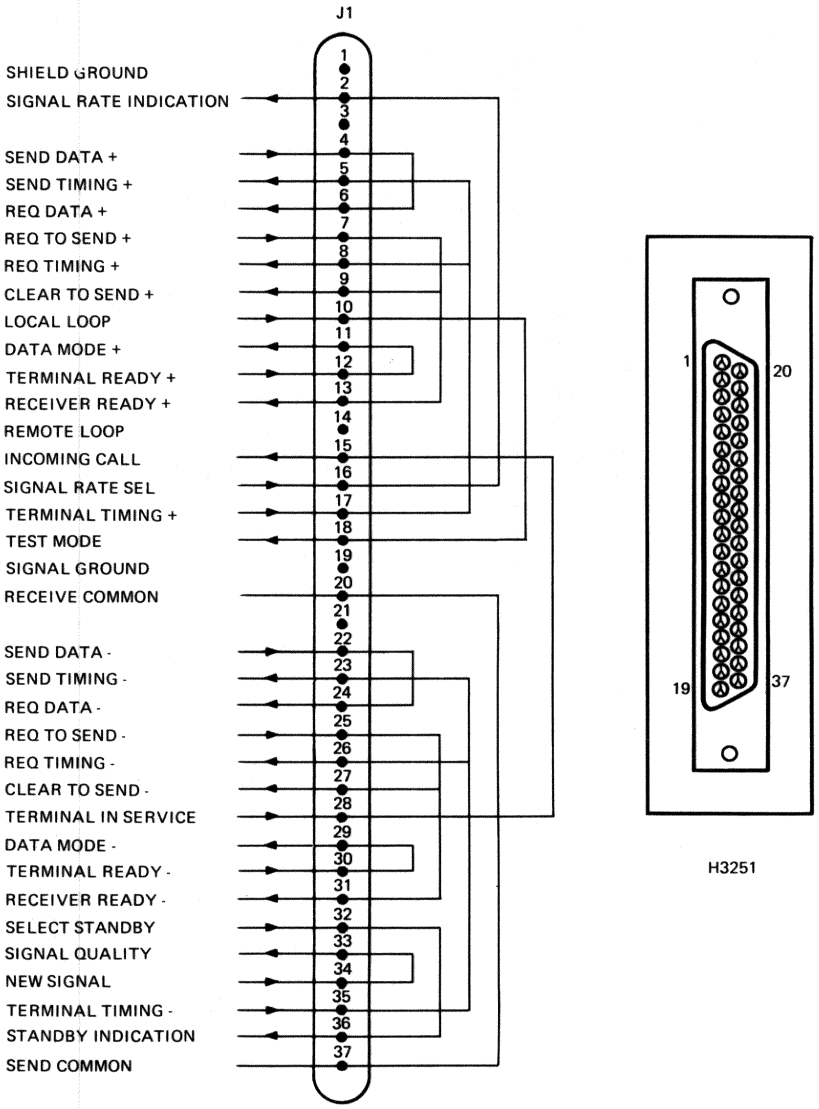


H3249 STAGGERED
TEST CONNECTOR
(USED IN PLACE
OF DISTRIBUTION
PANEL)

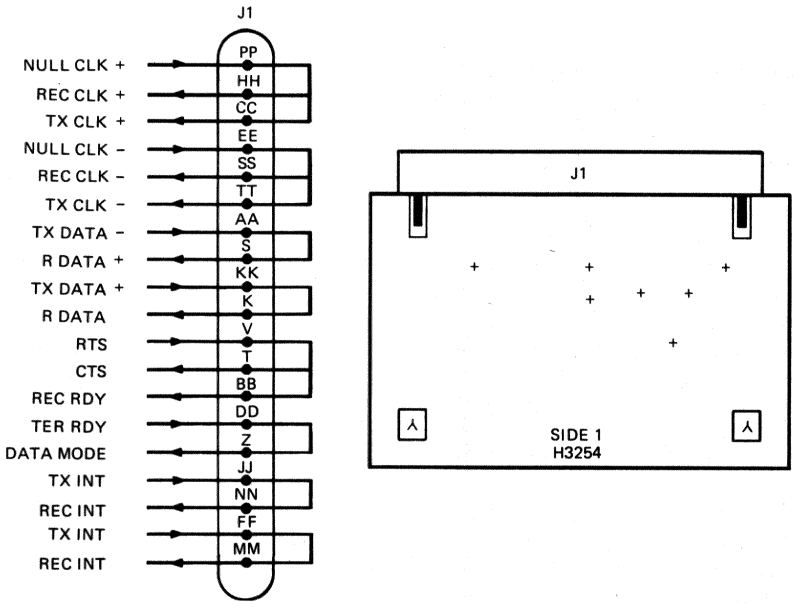
MKV84-1655

H3250

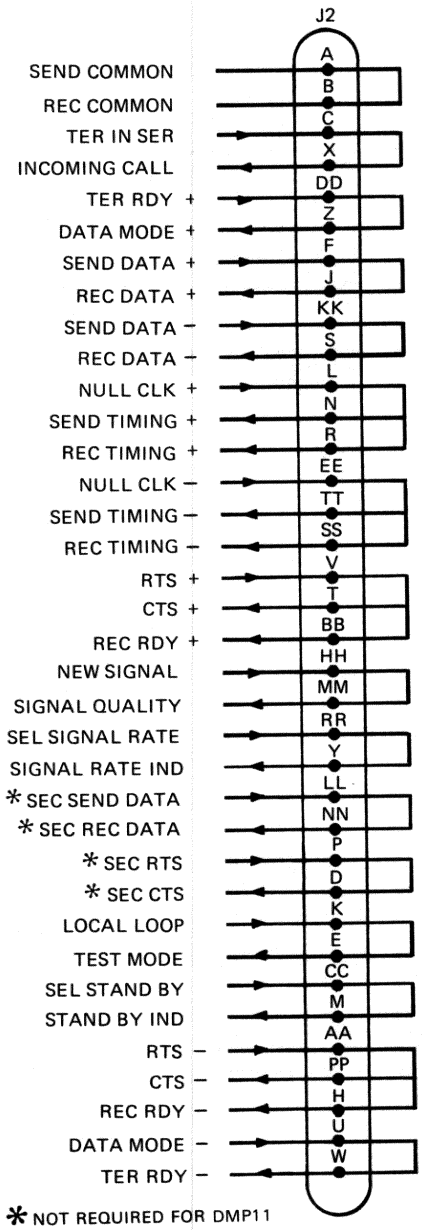


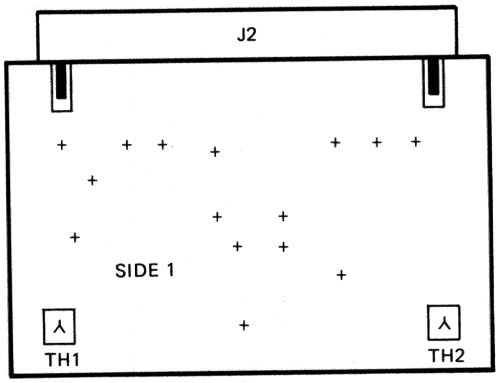

J1
SHIELD GROUND
SIGNAL RATE INDICATION
SEND DATA +
SEND TIMING +
REQ DATA +
REQ TO SEND +
REQ TIMING +
CLEAR TO SEND +
LOCAL LOOP
DATA MODE +
TERMINAL READY +
RECEIVER READY +
REMOTE LOOP
INCOMING CALL
SIGNAL RATE SEL
TERMINAL TIMING +
TEST MODE
SIGNAL GROUND
RECEIVE COMMON
SEND DATA -
SEND TIMING -
REQ DATA -
REQ TO SEND -
REQ TIMING -
CLEAR TO SEND -
TERMINAL IN SERVICE
DATA MODE -
TERMINAL READY -
RECEIVER READY -
SELECT STANDBY
SIGNAL QUALITY
NEW SIGNAL
TERMINAL TIMING -
STANDBY INDICATION
SEND COMMON
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
1
20
19
37
H3251
MKV84-0799

H3254


J1
NULL CLK +
REC CLK +
TX CLK +
NULL CLK –
REC CLK –
TX CLK –
TX DATA –
R DATA +
TX DATA +
R DATA
RTS
CTS
REC RDY
TER RDY
DATA MODE
TX INT
REC INT
TX INT
REC INT
PP
HH
CC
EE
SS
TT
AA
S
KK
K
V
T
BB
DD
Z
JJ
NN
FF
MM
J1
SIDE 1
H3254
MKV84-0800

H3255



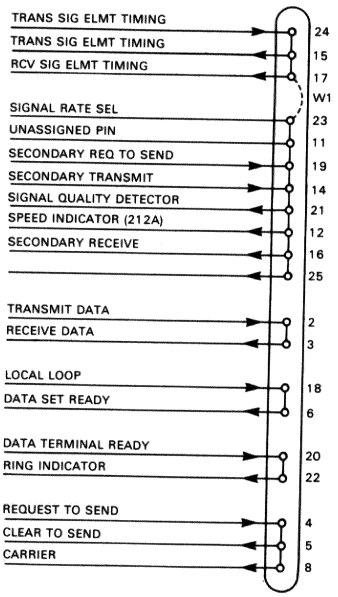


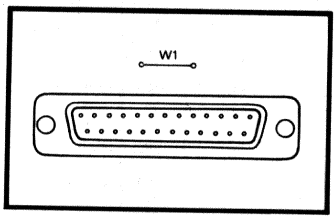
H3255

MKV84-1274

H3259

SIGNAL FLOW

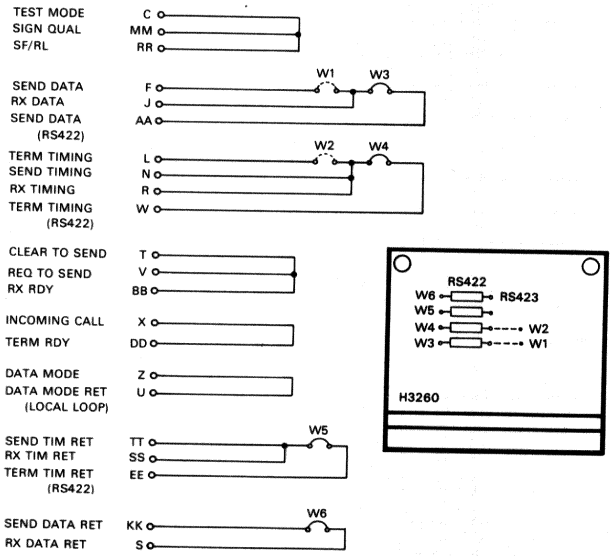




TEST CONNECTOR OUTLINE

MKV84-1275

H3260

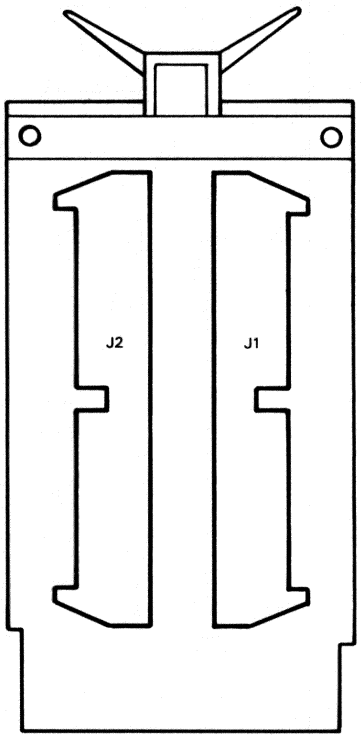


NOTE: 1. W1 & W2 IN, W3–W6 OUT } RS-423-A TESTING

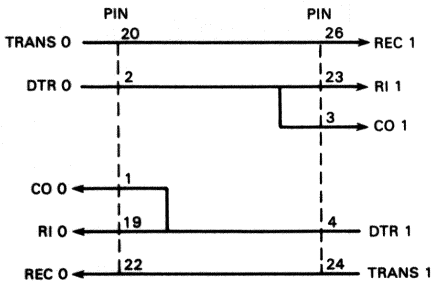
2. W1 & W2 OUT, W3–W6 IN } RS-422-A TESTING

MKV84-1276

H3271

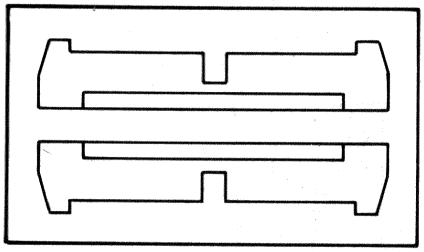


H3271



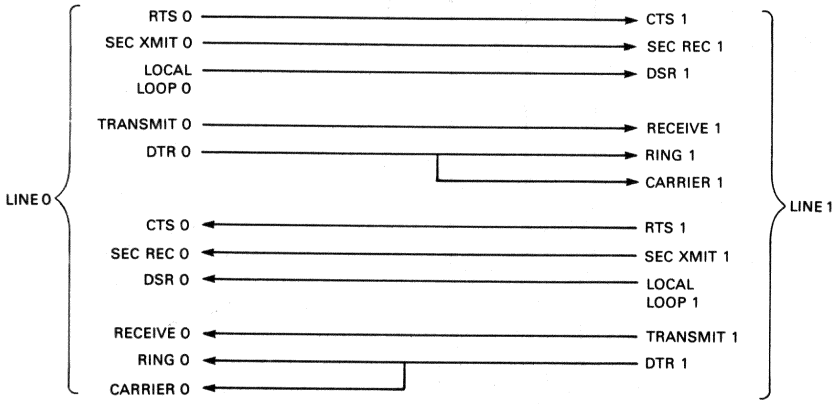
NOTE
LINES 2 & 3, 4 & 5 AND 6 & 7 ARE STAGGERED THE SAME WAY

MK-2548



H3272

TEST CONNECTOR
OUTLINE

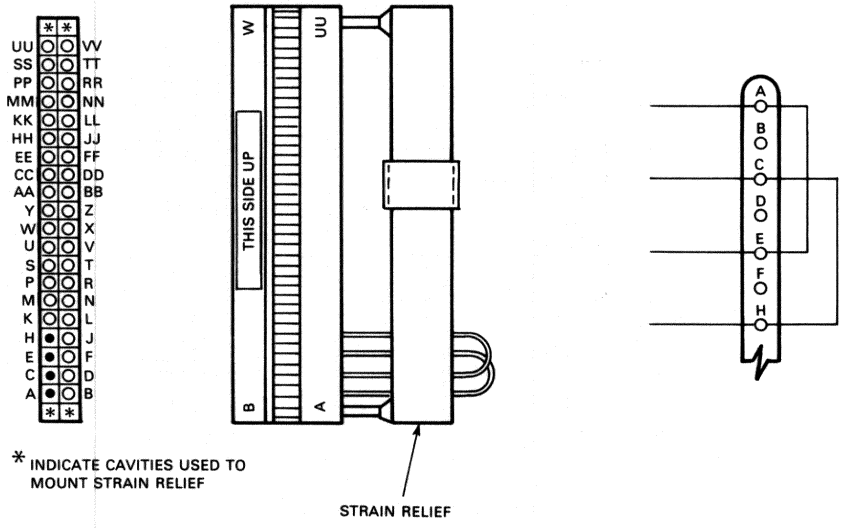


NOTE: LINES 2 & 3, 4 & 5, 6 & 7 ARE STAGGERED IN THE SAME WAY.

SIGNAL FLOW

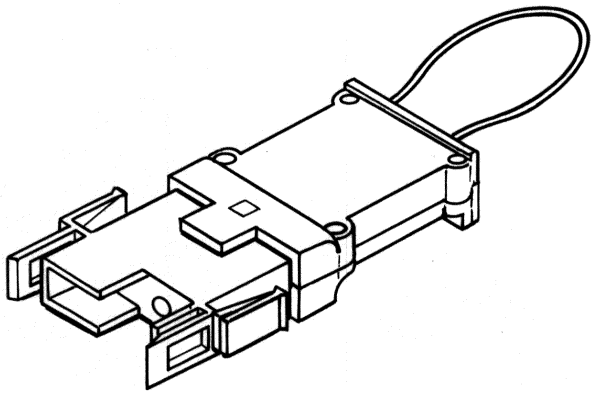
MK-1824

H3273

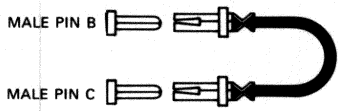


MK-2542

H3274



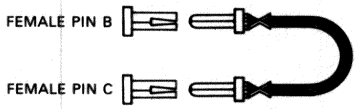
70-17029



(1) 70-17028-00 IS INSTALLED ONTO PINS B AND C OF THE MIL188 I/O CONNECTOR ON THE VT100 XA OR XB

(2) ALSO INSTALLED ONTO PINS B AND C OF 70-16428 CABLE

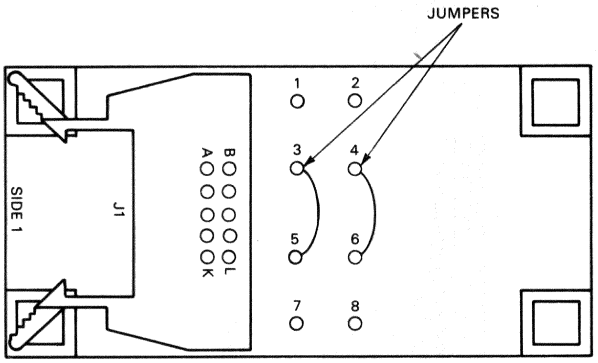
70-17028



70-17029-0-0 IS INSTALLED INTO PINS B AND C OF THE BC2OS CABLE

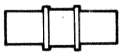
MK-2574

H3276



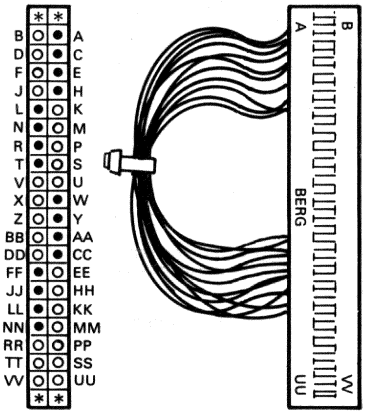
MKV84-0780

H8568

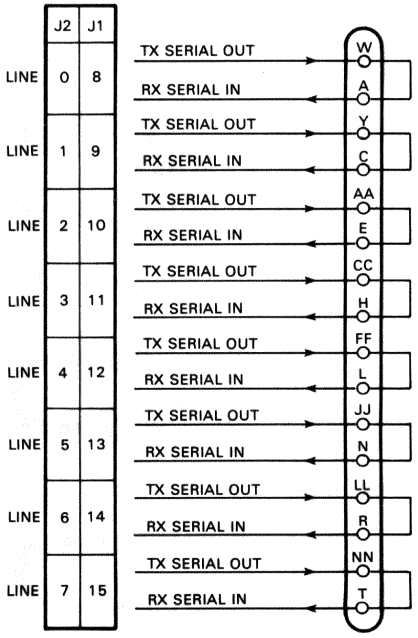


MKV84-0783

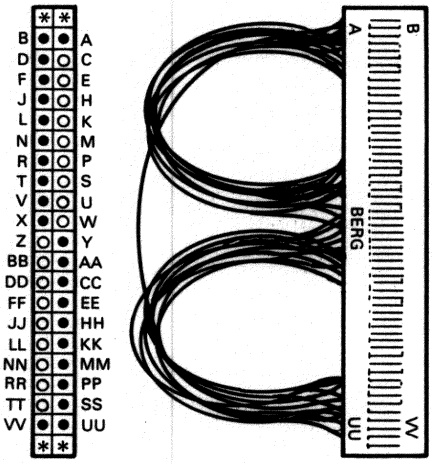
H8611



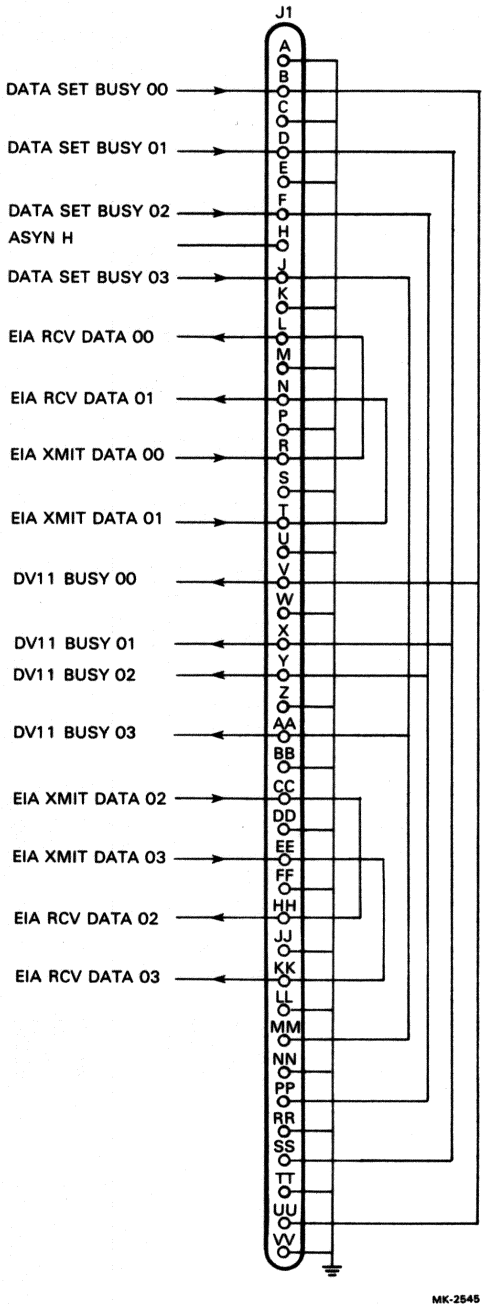
* INDICATES CAVITIES ARE NOT USED



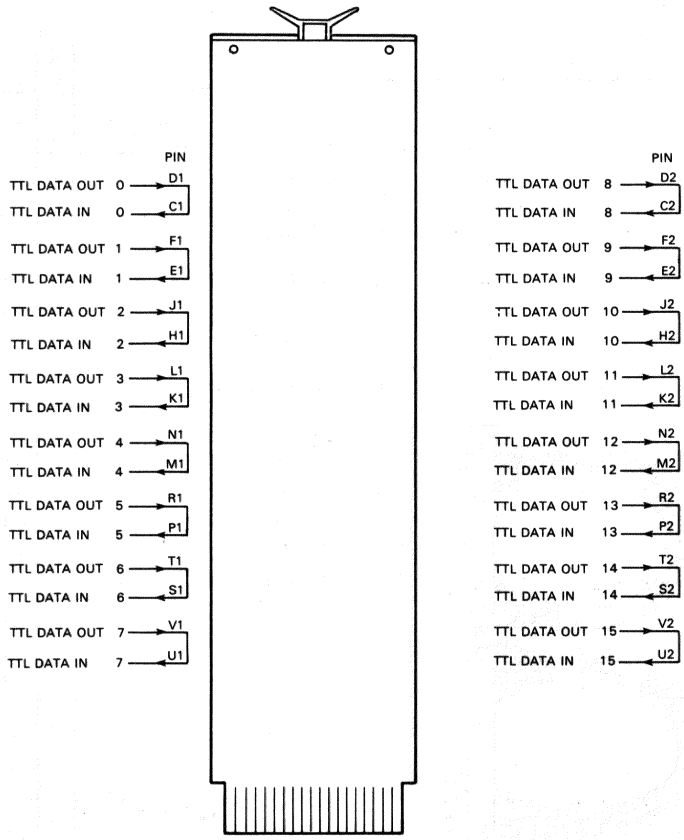
MK-2544



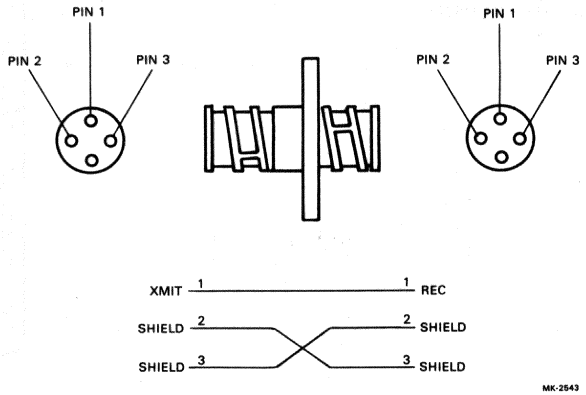
* INDICATES CAVITIES ARE NOT USED



M974



12-12528



29-24929-00

TX DATA (n) → RX DTA (n+1)

RST (n) → CTS (n+1), CARRIER (n+1)

DTR (n) → DSR (n+1)

LOCAL LOOP (n) → TEST MODE (n+1)

DATA RATE SELECT (n) → RING (n+1)

TX DATA (n+1) → RX DATA (n)

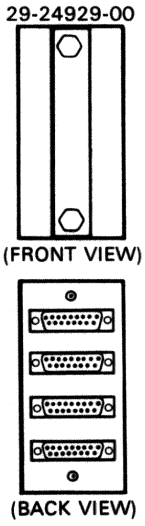
RTS (n+1) → CTS (n), CARRIER (n)

DTR (n+1) → DSR (n)

LOCAL LOOP (n+1) → TEST MODE (n)

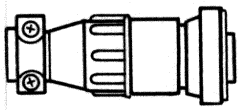
DATA RATE SELECT (n+1) → RING (n)

(n) WHERE n EQUALS THE LINE NUMBER.

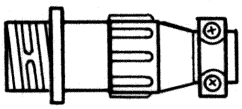


MKV84-0781

H3257/H3258

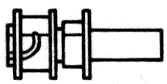


H3258
TERMINATOR
(FEMALE)



H3257
TERMINATOR
(MALE)

MK-2244



H8570
TERMINATOR (M)

MKV84-1277

CHAPTER 5
SPECIAL TEST PROGRAMS

5.1 INTRODUCTION

This section includes a brief description of the diagnostic packages that typically test intersystem communication links such as the Data Communications Link Test (DCLT) and the Interprocessor Test Program (ITEP).

Both DCLT and ITEP contain special expanded command features which are device dependent (for example, printing the base table under DMR/DCLT). Other variations in features and functionality (such as the HELP files for each specific DCLT) are also device dependent.

5.2 DATA COMMUNICATIONS LINK TEST (DCLT)

DCLT programs provide Field Service personnel with a tool to verify communications links for many of the options contained in this *Minireference Manual*. DCLT programs also provide the coverage necessary to isolate faults in the following areas:

- Communications interface program functionality
- Communication modem
- Communication cabling and installation, and
- Physical link/network.

DCLT programs allow testing between nodes with different hardware interfaces implementing the same or compatible protocol. The DCLT program can be exercised under normal maintenance loopback tests:

- Internal TTL loopback
- Hardware loopbacks:
  - module test connectors, or
  - cable test connectors
- Manual controlled local modem analog and digital loopback functions (full-duplex mode)
- Programmable controlled local modem analog loopback (RS-449 only and full-duplex mode)
- Programmable controlled remote modem digital loopback (full-duplex mode).

5.2.1 Hierarchy Prerequisites

Before using DCLT to test the communications link it is important to verify that the CPUs line clocks are operational. In addition, it is important to verify that the devices at each end of the link have previously been tested by device specific diagnostics and found to be in working order.

Prior to analyzing any data, the user should have a thorough understanding of the protocol formats applicable to the system under test.

5.2.2 System Requirements

To run the DCLT program, the following minimum hardware/software is required:

- PDP-11 or VAX-11 CPU
- Minimum memory requiremments:
  - 28K words for PDP-11 systems
  - 512 K bytes for VAX-11 systems
- Any supported XXDP+ load media
- A working line or real-time clock
- Diagnostic supervisor
- A communications device to test.

5.2.3 Program Structure

The DCLT program is written to be used with the diagnostic supervisor. Some communications options are supported by a DCLT program designed to test the communications link for that option. For each individual program, hardware and/or software P (Parameters) Tables are available to establish certain conditions. All DCLT programs use a command line interpreter (CLI) that may utilize any one of three DCLT command types:

- Run Commands – (detailed in Tables 5-1 and 5-2)
- Message Commands – (detailed in Table 5-3)
- Statistical/Utility Commands – (detailed in Table 5-4).

Any DCLT command may be followed by its associated switch and/or qualifier. In the event of an illegal command, the program will output an error message to the console.

Six sequential subroutines are normally peformed during the normal DCLT run command operation:

- Device Initialization
- Mode Set-Up (set FLAG word)
- Receive Buffer QUE/START
- Transmit Buffer Que/START
- Data Comparison (only if data check has been enabled)
- Program PASS Completion.

Along with these six subroutines the DCLT program can also perform special routines which may be device specific:

- DCLT down-line load test (only if supported by the device being tested)
- Talk/Listen Mode:
  - Talk/Listen mode is used for operator communication requiring line turnaround in half duplex
  - Talk mode allows the user to type his own message of up to 72 characters
  - Listen mode allows the user to look for receive data and display up to 72 characters on the console
  - If the first four characters of message are "EXIT", the program will switch to the other mode automatically at both ends of the link.

Table 5-1 RUN Command

Run Command

Function – Command name RUN (R) – used to execute the DCLT program. The run command requires a mandatory mode (M) type; it may use optional qualifiers.

Command Format: R M = Run Mode

where: R M = [Mode Type] / [Optional Qualifiers]

Check (CH); No Check (NOCH)
Status (S); No Status (NOS)
Echo (E); No Echo (NOE)

Modem (M); No Modem (NOM)
Pass (P)=#
Loopback (L) = type

See Table 5-2 for detailed descriptions.

MKV84-1322

Type	Description	Default Qualifiers
Active(A)	Transmit one message from list; monitors receiver for incoming data until list is empty. For full-duplex and local testing.	/NoEcho/NoLooping
Passive(P)	Monitors receiver for incoming messages; then transmits a message from the list until the list is empty. For half-duplex testing, one node must be active; the other passive.	/NoLooping
Transmit(TR)	Transmit one message from the list; repeats until list is empty.	/NoEcho/NoLooping /NoCheck
Receive(R)	Receive incoming messages; repeat, unless checking is enabled. Compares receive data to expect list data.	/NoEcho/NoLooping
Talk(TA)	Prints a prompt TLK on the console allowing operator to input up to 72 characters transmission. Receive node must be in Listen mode. Program will switch to Listen mode if first four characters are EXIT.	/NoEcho/NoLooping /NoCheck

Table 5-1 RUN Command (Cont)

Type	Description	Default Qualifiers
Listen(L)	Prints a prompt LIS> and monitors receiver for data. Message is printed on the console when it is received. If first four received characters are EXIT, the program switches to Talk mode.	/NoEcho/NoLooping /NoCheck
Downline(D) Load	Issues Maintenance Oriented Protocol (MOP) sequences for devices that support this feature.	/NoEcho/NoLooping /NoCheck

Run Command Examples:

Format	Description
1. R M=A/S/CH/L=C/P=5	Program runs in Active mode, allows status printouts, does data comparisons, loop data at cable (test connector required), and does 5 complete passes before completing test.
2. R M=A/S/M/L=I/P=2	Program runs in Active mode, allows status printouts, loops data internally, and makes 2 passes.
3. R M=P/NOCH/S/NOE/NOM/ L=C/P=2	For half-duplex, one node must be active and the other passive. Set the passive node first as shown in the example. The active node can then be set up, as shown above.

NOTE
Command strings must be single line.

4. R M=A/S/CH/L=C/P=1	Program runs in active mode, allows status printouts, does data comparisons, loops data at the cable (test connector required), and makes continuous passes until a control C is typed by the user.

If no entry is made for a certain qualifier function (such as NO CHECK qualifier in Example 3) in the command strip, the default is the previously-entered qualifier for that function. In Example2, data comparisons would be done because the CHECK function (as opposed to NOCHECK) was previously established in Example 1. When that qualifier function is changed, it becomes the default entry for subsequent command strings when no entry is made.

Table 5-2 DCLT Run Command Optional Qualifiers

Type	Description	Format
Check(CH)	Enables byte by byte comparison of receive buffer against list buffer. If CHECK is enabled, the fol-lowing receive error messages are possible: Data Comparison Error(CMD): Data Comparison Error total mismatches: Data Comparison Late Error (CML).	
No Check (NOCH)	Disables data checking.	
Status(S)	Enables printing of operator status messages on console such as: TXQ MSC TXC CMP RXQ CML ERR CMD INI EOP	Refer to Table 5-6 (DCLT Event Log Messages)
No status (NOS)	Disables printing of operator status messages.	
Echo(E)	Used in passive mode only; forces trans-mit list to be the same as received data.	
No Echo(NOE)	Disables Echo.	
PASS(P=)		PASS=N, where: N=Total number of passes desired before returning to DCLT prompt: Enter −1=infinite loop until CNTL C
Loopback Type (L=)	Allows program selection of various maintenance loopback test configura-tions in active mode only. 4 Loopback Types: TTL Loopback within module	L = Type, where N= 1 for INTERNAL

Table 5-2 DCLT Run Command Optional Qualifiers (Cont)

Type	Description	Format
	External cable test (Any external loopback including test connector, manual Modem loopback or remote system-to-system loopback).	C for CABLE
	Program selection of local loopback (analog loopback) in RS-449 modems.	L for LOCAL MODEM
	Program selection of remote loopback (digital loopback) in RS-449 modems.	R for REMOTE MODEM
Modem(M)	Enables modem interrupt testing, but only on devices that support modem transition interrupts.	
No Modem (NOM)	Disables modem interrupt testing.	
Protocol	Enables running DDCMP Protocol for devices which do not support DDCMP in firmware.	P

Table 5-3 Message Commands

Message Commands

Function – allows the user to assign, clear, or show transmit or expect (data comparison) messages within each transmit or expect list buffer area. maximum buffer area for each is 512 bytes.

Message Command Types:

1. Clear Command (C) — Used to clear associated buffer area and preset the list with an ITEP message.

   Command Format: — CT = Clear Transmit List and
   CE = Clear Expect List

Examples:

Simply enter C E or C T at the DCLT> prompt.

```
DCLT> C E
```

Message Commands

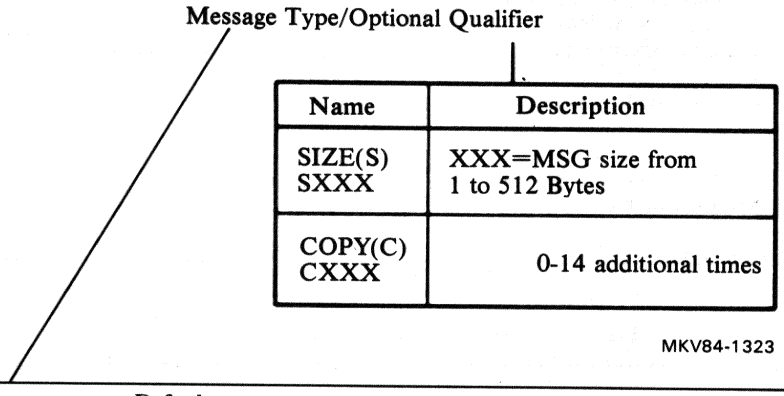
2. Set Command (SE) — Used to assign transmit or expect messages.

Command Format:

SE T for Set Transmit and
SE E for Set Expect
or
SE E = T for Set Expect equal to Transmit

where:

SE T or
SE E = Message Type/Optional Qualifier



MSG Type	Default Buffer Length (Bytes)	Description
(Z)ZEROS	64	All zeros (000)
(O)ONES	64	All ones (1111))
(1)1ALT	64	Alternating one/zero (101010)
(0)0ALT	64	Alternating zero/one (010101)
(C)CCITT	64	512 CCITT Bit Pattern (Random)
(A)ALPHA	65	ALPHA/Numerics (#$!"&'()*EH+,–0123456789;:<=>? @ABCDEFGHIJKLMNOPQRSTUVWXYZ/[']\^ _%
(I)ITEP	58	"Interprocessor Test Program(ITEP)" message I(DPI:) (<177><177>/$A THE QUICK BROWN FOX JUMPED OVER THE LAZY DOG.<15><12><001><177><177><177><177>
MSG DATA	72	Operator typed data to include only A-Z, 0-9, SPACES, TABS" Delimited by quotes: Example:"HELLO"

Table 5-3 Message Commands (Cont)

Message Commands	
Example of Set Command:	
Example:	
Format	**Description**
SE T=I/S=50/C=4	Assigns 5 copies (original + 4 copies) of ITEP message (size = 50 bytes each to the transmit buffer list (250 bytes now assigned).
SE E=Z/S=30/C=4	Assigns 5 copies (original + 4 copies) of all ZEROS. MSG size is 30 bytes.
SE T=A/S=64	Assigns 1 message, 64 bytes long.

A typical command string would be:

```
DCLT>(A)?CE                          Clear Expect Buffer
DCLT>(A)?CT                          Clear Transmit Buffer

DCLT>(A)?SE T=Z/S=30/C=2

DCLT>(A)?SE T=C/S=64/C=2

DCLT>(A)?SE T=A/S=128

DCLT>(A)?SE T=I/S=45/C=1


DCLT>(A)?SE E=Z/S=30/C=2

DCLT>(A)?SE E=C/S=64/C=2

DCLT>(A)?SE E=A/S=128

DCLT>(A)?SE E=I/S=45/C=1

or

DCLT>(A)?SE E=T
```

Table 5-3 Message Commands (Cont)

Message Commands		
3.	Show Command (SH)	Used to print out the status of associated buffer area.
	Command Format:	SH T to Show Transmit List and SH E to Show Expect List

Examples:

```
DCLT><A>?SH T

MSG:TYPE=ZEROES/SIZE=30
MSG:TYPE=ZEROES/SIZE=30
MSG:TYPE=ZEROES/SIZE=30
MSG:TYPE=CCITT/SIZE=64
MSG:TYPE=CCITT/SIZE=64
MSG:TYPE=CCITT/SIZE=64
MSG:TYPE=ALPHA/SIZE=128
MSG:TYPE=ITEP/SIZE=45
MGS:TYPE=ITEM/SIZE=45
MODE=ACTIVE/PASS=00000
/STATUS/CHECK/NOECHO/NOMODEM

DCLT>(A)?SH E

MSG:TYPE=ZEROES/SIZE=30
MSG:TYPE=ZEROES/SIZE=30
MSG:TYPE=ZEROES/SIZE=30
MSG:TYPE=CCITT/SIZE=64
MSG:TYPE=CCITT/SIZE=64
MSG:TYPE=CCITT/SIZE=64
MSG:TYPE=ALPHA/SIZE=128
MSG:TYPE=ITEP/SIZE=45
MGS:TYPE=ITEM/SIZE=45
MODE=ACTIVE/PASS=00000
/STATUS/CHECK/NOECHO/NOMODEM
```

Table 5-4 Statistical/Utility Commands

Command Functions:

Allows special utility routines to be executed. Four basic commands are available, listed as follows for both PDP-11 and VAX-11 unless otherwise noted.

Command Types	Description	
HELP(H or ?)	Used to print a summary of DCLT commands on the console.	
PRINT (P)*	Enters a DCLT sub-level routine called REPORT (RPT>) where various commands are available to print statistical data. Some commands are common to all devices, others are device specific (see Table 5-5).	
	HELP OR ?	Prints HELP information for RPT>.
	LOG	Prints the DCLT event log.
	BASE/FULL	Prints entire base table.
	BASE/ERROR	Prints only error counters in base table.
	BASE/OFFSET=NNN	Prints single location (NNN) in base table.
	EXIT	Returns to the previous level (DCLT> or DR>/DS).
	TRIBUTORY STATUS SLOT NNN/SW	Prints tributary status slot data where NNN is the decimal tributary address and SW is one of the following switches:
	ERROR	Only error slots are printed.
	FULL	All tributary slots are printed.
	OFFSET = NN	Only tributary status slot whose offset is NN is printed.
	GLOBAL STATUS/SW	Prints global status information. Switches are the same as for TSS.

*The PRINT command is also available on PDP-11s at the DR> level. Also, a similar command called SUMMARY (SUM) is available on VAX-11s at the DS> level. SUM performs the same function as PRINT, accessing the RPT> sub-level routine.

DUMP(D) PDP-11 ONLY	Prints contents of memory locations specified on console from starting address (SSSSSS) up to ending address (EEEEEE).
	Optional switch/B may be used to print in BYTE format.
EXIT(E)	Returns to previous program level.

Table 5-4 Statistical/Utility Commands (Cont)

Examples of Statistical Commands

DCLT> (A)?H or (?) Prints HELP information for DCLT>.

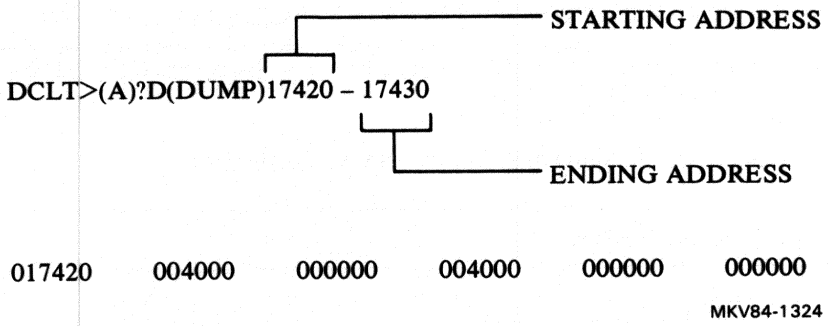
```
COMMAND HELP FILE

DCLT CMDS:
CLEAR OR SHOW EXPECTLIST OR TRANSMITLIST
PRINT
DUMP START-END/B
EXIT
SET EXPECTMSG OR TRANSMITMSG=TYPE/SIZE=N OR /COPY=N
SET EXPECT=TRANSMIT
TYPE=ONES,ZEROES,1ALT,OALT,ITEP,CCITT,ALPHA
OR "OPR SPCD=A,-Z,SP,TAB,0-9, IN QUOTES"
RUN MODE=MTYP/LOOP=LTYP/CHECKS,STATUS,ECHO,PASS=N
MTYP=TRAN,REC,ACT,PAS,TAL,LIS,DOWN
LTYP=INT,CAB,LOC,REM
```

```
DCLT>(A)?P

TYPE H OR ? FOR HELP
RPT>(A)? B/E

LOCATION CONTENTS DESCRIPTION

7373        004          NAKS-MSG NO BUFFERS CUMUL
  :          :                    :
17402       007          REPS RECD CUMUL
```

```
RPT>(A)?B/O=27

LOCATION  CONTENTS    DESCRIPTION
17417     006         STREAMING TIME OUT COUNT

RPT>(A)?H

DCLT REPORT CMDS:
LOG - PRINT DCLT EVENT LOG
EXIT - EXIT REPORT LEVEL
HELP - PRINT THIS MESSAGE
BASE/ERROR - PRINT ONLY ERRORS
BASE/FULL - PRINT ENTIRE TABLE
BASE/OFFSET=NNN - PRINT SINGLE LOCATION
```

The command list is device dependent. Example shown is for DMC/DMR.

Table 5-4 Statistical/Utility Commands (Cont)



NOTE
This command is for PDP-11s only. For VAX-11 use SET BASE or EXAMINE commands.

Table 5-5 Report Commands/Device Matrix

RPT>COMMAND	DMC	DMR	DMP	DMV	DPV	DUP11
LOG(L)	X	X	X	X	X	X
EXIT(E)	X	X	X	X	X	X
HELP(H or ?)	X	X	X	X	X	X
BASE/ERROR(B/E)	X	X				
BASE/FULL(B/F)	X	X				
BASE/OFFSET=NNN (B/O=NNN)	X	X				
TRIBUTARY STATUS SLOT NNN/SW (TSS NNN/SW)			X	X		
GLOBAL STATUS/SW (GSS/SW)			X	X		

5.2.4 Event Log Overview

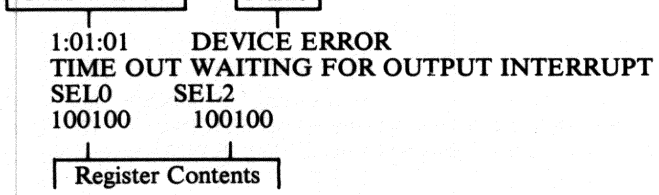
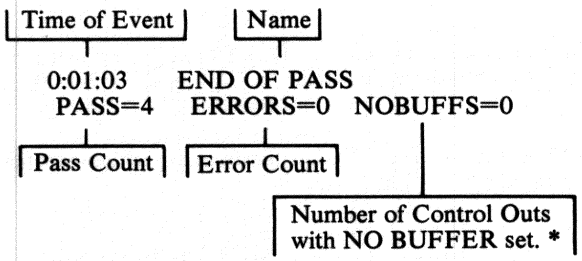
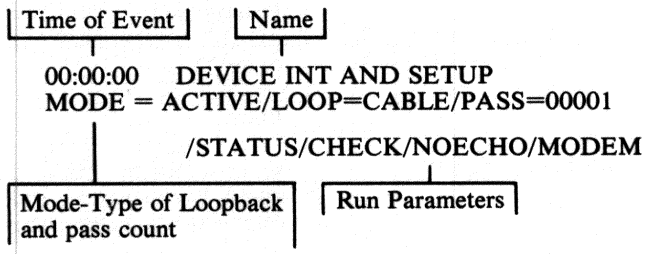
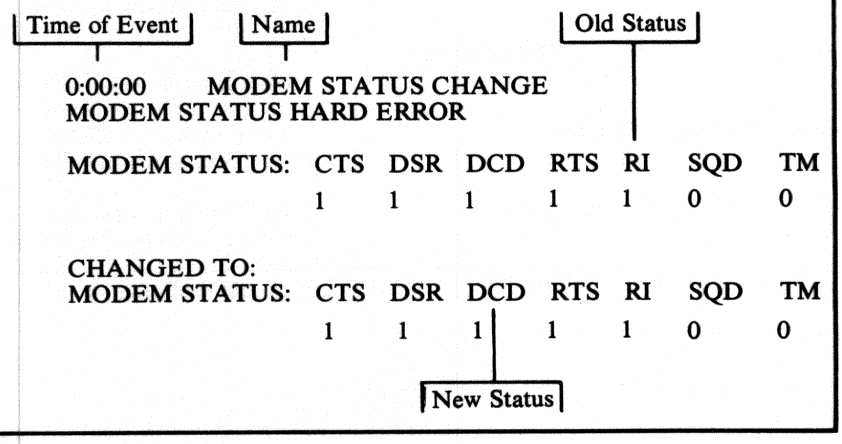
Significant events thatoccur during program execution are logged into the EVENT LOG. The most recent 45 events can be printed by executing a PRINT command at the DCLT> prompt level. For VAX-11 it is also possible to obtain the error log at the DS> prompt level by typing SUMMARY (SUM). Typical event log messages are shown in Table 5-6.

Table 5-6 DCLT Event Log Messages

Type	Example Format
TXQ	Time of Event / Name / Number of Bytes 0:01:27 TRANSMIT MSG QUEUED ADDR OF MSG=004312 BYTE COUNT=12 MODEM STATUS: CTS DSR DCD RTS RI SQD TM 1 1 1 1 1 0 0 First Byte Address / Modem Status
TXC	Same format as TXQ, except for name change: Transmit Message Complete.
RXQ	Same as above, except for name change: Receive Space Queued.
RXC	Same as above, except for name change: Receive Message Complete.
CMP	Time of Event / Name 0:0:02 DATA COMPARISON STARTED ADDR OF MSG=004326 RX BYTES=512 COMPARE BYTES=512 First Byte Address / Number of Bytes / Bytes Expected
CML	Same format as CMP, except for name change: Data Comparison Length Error
CMD	Time of Event / Name 0:14:44 DATA COMPARISON DATA ERROR ADDR OF MSG=004604 BYTE COUNT=58 NO. OF CMP ERRS=50 First Byte Address / Number of Bytes / Number of

MKV84-1325

Table 5-6 DCLT Event Log Messages (Cont)

Type	Example Format
ERR	
EOP	
INI	
MSC	

* The NOBUFFS function is for DMC/DMR only. This feature is device dependent and varies.

MKV84-1326

5.2.5 Running PDP-11/DCLT

When the DCLT program is started, the diagnostic supervisor will prompt the user for hardware information by typing:

CHANGE HW (L)?

The "L" in brackets indicates the type of response required, "L" indicates that a logical answer ("Y"for yes or "N" for no) is needed. In this case, the user must respond with a "Y" after a start command unless the hardware information has been "preloaded" using the SETUP utility. Next, the supervisor will prompt:

#UNITS (D)?

The "D" indicates that a decimal response is needed. The DCLT program will not use more than one unit and therefore will not accept any response greater than "1". Typical PDP-11/DCLT procedures are provided in Table 5-7.

This example is typical for DMC/DMR; however, P table questions are option-dependent and may differ. Refer to option specific section in Chapter 2 for details.

Table 5-7 Typical PDP-11/DCLT Diagnostic Parametters

Question	Description
CHANGE HW(L)?	Enter Y
#UNITS(D)?	Enter 1
UNIT FULL DUPLEX OPERATION:(L)Y?	Enter <CR> for Full-Duplex; Enter NO followed by <CR> if Half-Duplex. To use default values, enter Control Z (^Z).
DEVICE CSR ADDRESS:(O) 160170?	Requires OCTAL response; input correct CSR address followed by <CR>.
INTERRUPT VECTOR ADDRESS:(O) 300?	Enter <CR> if vector is 300. If different, enter correct vector followed by <CR>.
INTERRUPT PRIORITY:(O) 5?	Enter <CR> for BR5. If different, enter correct value followed by <CR>.
DEVICE OPTION TYPE: (if applicable)	Input correct octal number corresponding to the user's application followed by CR

END OF DCLT P TABLE QUESTIONS - START DCLT RUN MODE

THIS IS DCLT.TYPE"H"OR"?"FOR DETAILS
MODE=ACTIVE/PASS00001
/NOSTATUS/CHECK/NOECHO/NOMODEM
DCLT>(A)?

5.2.6 Running VAX-11/DCLT

The VAX-11 Data communication Link Test (DCLT) Programs are level 2 programs that execute either under VMS (on-line) or in standalone mode. The DCLT programs require the standard VAX-11 system attaching for the device to be tested. Table 5-8 details typical VAX-11 DCLT program operation. Hardware device parameters are required after the device is attached (refer to the Typical VAX-11 DCLT Hardware parameters. Table 5-9). The event flags utilized by the DCLT program help to describe the internal configuration of the hardware and/or special program functions. These event flags are dependent on the specific device and are listed in a device specific DCLT table.

NOTE

The prompt DS> indicates a VAX-11 Diagnostic Supervisor Command is required.

Table 5-8 Typical VAX-11 DCLT Program Operation

	Command Function	Example
1.	ATTACH the UNIBUS interface (UBA or UBI) to the system.	DS>ATT DW780 SBI DW0 3 4 or DS>ATT DW750 CMI DW0 bus, or DS>ATT DW730 HUB DW0
2.	Load appropriate DCLT program.	DS>LOAD EVDMC (Example shown is
3.	ATTACH the device to the system.	DS>ATT DMC11 DMC/DMR)
	NOTE **This command now enters the hardware parameter information for the device (refer to the Table 5-9 for Typical Hardware Parameters). When the various hardware parameters are qualified, the program returns to the supervisor level of operation and the following steps must be followed:**	
4.	SELECT the devices that have been attached to the system.	DS>SELECT ALL or DS>SELECT DW0 and DS>SELECT XM0
5.	SET the appropriate event flags	DS>SET EVENT 1
6.	Now the program may be started by the START command.	DS>START

Table 5-9 Typical VAX-11 DCLT Hardware Parameters

Questions		Description
1.	DEVICE LINK?	: Link the option to the UNIBUS interface by entering the logical name of the interface (this is, DW0).
2.	DEVICE NAME?	: Establish a logical device name (this is, XM0). The logical name is generally the same one used by the operating system and the actual unit number (this is, 0-7 or A-Z).
3.	CSR?	: Enter the device CSR address.
4.	VECTOR?	: Enter the device Vector address.
5.	BR?	: Enter the correct device priority level (normally BR 5).

NOTE
The command Line Interpreter (CLI) format for the device also can be linked together on one line as shown in the attached command for the UNIBUS interface above.

5.2.7 Interfacing DCLT Node-to-ITEP Node

When DCLT is used to communicate with ITEP, both nodes must be in compatible modes as listed in Table 5-10.

Table 5-10 DCLT-to-ITEP Compatible Mode

ITEP Node	DCLT Node
ONE-WAY-OUT	RECEIVE OR LISTEN
ONE-WAY-IN	TRANSMIT OR TALK
INTERNAL LOOP	ACTIVE
EXTERNAL LOOP	ACTIVE OR PASSIVE

The following conditions also apply:

- Be sure to set the Tx Buffer at both nodes to the same value
- Do not send ITEP message 3 to the DCLT node if it is in the LISTEN mode
- Be sure to set the ITEP node SWR 4=0.

5.3 INTERPROCESSOR TEST PROGRAM (ITEP)

ITEP is a software tool to test the communications link between two devices. To run ITEP on any of the supported devices, the ITEP Monitor DZITA must be loaded along with the correct ITEP overlay (device specific).

ITEP features:

- Communications between two devices over remote or local links
- Interfaces with Merrimack turnaround system
- Uses programmed or operator generated messages
- Monitors transmitted and/or received messages with optional print capability
- Operates in one of four basic modes:

One Way In	Receive only
One Way Out	Transmit only
Internal Loopback	Receive followed by Transmit
External Loopback	Transmit then idle Receive.

Table 5-11 lists each of the overlays currently available to support the options indicated. Table 5-12 details the switch register options which select specific operational variations available with ITEP.

Table 5-11 ITEP Overlays

Program Designation	Description
MAINDEC-11-DZITA	ITEP Monitor
MAINDEC-11-DZDCO	DC11 Overlay
MAINDEC-11-DZDHL	DH11 Overlay
MAINDEC-11-DZDJD	DJ11 Overlay
MAINDEC-11-DZDLO	DL11 Overlay
MAINDEC-11-DZDPO	DP11 Overlay
MAINDEC-11-DZDQO	DQ11 Overlay
MAINDEC-11-DZDUO	DU11 Overlay
MAINDEC-11-DZDVO	DV11 Overlay
MAINDEC-11-DZDPF	DUP11 Overlay
MAINDEC-11-DZDZB	DZ11 Overlay
MAINDEC-11-DZDMO	DMC11/DDMR11 Overlay
MAINDEC-11-CZKMO	KMC11/DMC11 L/U Overlay

Table 5-12 ITEP Switch Register Selections

ITEP Operational Switch Settings

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Halt on Error	Single Pass (Has no effect if SW4=0, See SW4)	Inhibit Error Typeouts	Inhibit All Type-outs Except Errors If SW12=0 SW4=1, then: End Pass is typed. 2. TXed/ RXed Data is Typed	Use previously specified data	Data Select: 10 9 *0 0* = Get data from operator (enter your own message) 0 1 = Test MSG/1 $A Quick Brown Fox 1 0 = Test MSG/2 $B 01234 56789 1 1 = Test MSG/3 $C *In this case: The program will type a request for data. Data may be entered as: 1. ASCII <CR> 2. Octal code <CR> (000-377) For example: ABCD 1000 123 3771 EFG <CR>		Send RXed DATA (Internal Loopback Mode) Note: Overrides SW 10,9 in internal loop-back mode	DO NOT TEST RXed Data (Test RXed data against pre-selected data from SW10, 9)	Monitor TXed Data on Console TTY Note In many cases, not all data will appear on console TTY. This is especially true when the comm interface is running at faster baud than the console. Even at equal or slower bauds, all characters may not appear on the console.	Monitor RXed Data on Console TTY	Return to Monitor for End Pass If SW4=0 (SW14 no effect) program loops in the overlay never returning to monitor and conference to TX/RX data. If SW4=1 and SW14=0, the overlay will return to the monitor and type "End Pass". IF SW4=1 and SW14=1, the program will require new interface params after one pass of the selected test mode.	Internal Loopback Mode Idle RX TX	External Loopback Mode TX Idle RX	One-Way In Mode Idle RX	One-Way Out Mode TX

MKV84-1327

5.3.1 Using ITEP

- SW paramters must be identical in both systems
- Load/Start receive system first
- Enable modem auto answer (if available)
- Load/Start transmit system.

Table 5-13 Typical Load/Parameter Input Procedure

Procedure/Parameter	Description
L ZITAD?	Load ITEP monitor
R XXXX?	Enter and run selected overlay where: XXXX = overlay mnemonic Example: DH11 = ZDHL
INTERFACE TYPE XXX?	Enter <CR> (except for DN11 or DH11), see program document for details. XXX = OPTION SELECTED
BUS ADDRESS - 176510?	Enter <CR> for default or appropriate address followed by <CR>
VECTOR ADDRESS = 000300?	Enter <CR> for default or appropriate address followed by <CR>
PRIORITY = 000200?	Enter <CR> for default or appropriate value followed by <CR> 000200 = BR4 (DEFAULT) 000240 = BR5 000300 = BR6
PARAMS #1 000000? PARAMS #2 000000? PARAMS #3 000000?	Enter <CR> for default value or enter desired parameter value in each case, followed by <CR>. Refer to Table 5-14 for parameter summary. Some parameters are not used on some options.
SET SWITCHES	Set up Switch Registers as desired (see Table 5-12) followed by <CR>.
PLEASE MAKE CONNECTION (DIAL NUMBER)	Confirm that link is established.

Table 5-14 ITEP Parameter Summary

Interface	PARAMETER #1	PARAMETER #2	PARAMETER #3	Comments
DN11	Not used.	Not used.	**Phone number** the DN will Dial	Must terminate the **#** with end of number CHAR (:) If no auto-handshaking feature in modem.
DM11-BB	Loaded into CSR of DMB. PARAM #1<3:0> = Line select in octal* PARAM #1<15:4>Must be 0s	Not used.	Not used.	
DH11	Loaded into SCR Default <3:0> = Line select Line 0 (0000)	Loaded into LPR Default <1:0> = CHAR length 8 bits (11) <2> = Stop Bits 2 stop bits (1) <4> = Parity ENAB (1) No (0)** <5> = Odd Parity (1) No (0)** <9:6> = RCVer Speed 110 Baud (0011) <13:10> = Xmitter Speed 110 Baud (0011) <14> = HDX (1) FDX (0) Typically (Note FDX)00 6307 (Default) 15 14 13 12 | 11 10 9 | 8 7 6 | 5 4 3 | 2 1 0 0 0 0 0 1 1 0 0 1 1 0 0 0 1 1 1 FDX 110 baud 110 baud NO 8 bits* (TX speed) (RX speed) Parity 2 stop	Not used (177777)	DH11 Restrictions: If DM11-**BB** is in the system with **DH11** being tested, but modem control not desired and DMB not initialized by ITEP, the program (ISR) will hang in the DM11 TX INIT routine. Correction Location Load DMBB An ADDR that will time out In CREF (012722) (No SSYNC response)
DL11	PARAM #1 = Must be all 0s	<0> = HDX/FDX Default = 1 FDX = 0 HDX HDX (0) <15:1> = must be 0 Typically: Set to 1 (FDX) (Bell 103)	Not used (177777)	
DU11	<7:0> (Lowbyte) loaded into TXCSR <3> = HDX(1) Default <15:8> (Highbyte) loaded into RXCSR <8> = STRIP sync (1) Default Typically: 000410 (Default) (HDX)	Loaded into PARCSR Default <7:0> = Sync CHAR 26 (26) <8> = Parity sense select No (0) <11:10> = Word length 8 bits (11) <13:12> = Mode select Internal sync (11) Typically: 036026 (Default)	Not used (177777)	
DZ11	Loaded into the DZLPR register Default <2:0> = Line used 000 (Line 0) <4,3> = CHAR length 11 (8 bits) <5> = STOP bit count 1 (2 stop) <7,6> = Parity Enab/Set 00 (no parity) <11:8> = Speed Select 0010 (110 baud) <12> = RCVer ON 1 (always)	Not used at this time.	Not used (177777)	

MKV84-0795

Table 5-14 ITEP Parameter Summary (Cont)

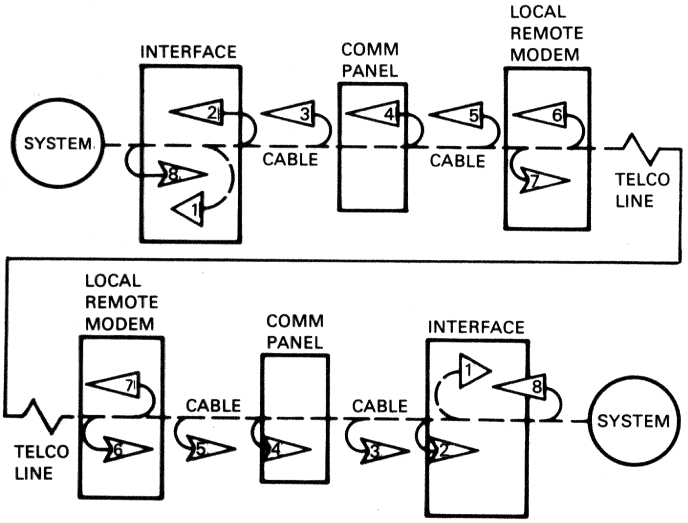
Interface	PARAMETER #1	PARAMETER #2	PARAMETER #3	Comments
DUP11	PARAM #1 (Low byte) loaded into the TXCSR: <3> = 1 HDX (Default) 0 FDX PARAM #1 (Highbyte) loaded into the RXCSR: <8> = 1 Strip synch (default)	PARAM #2 loaded into the TXDBUF: <7:0> = Sync char, default = 26 <8> = TSOM, default = 1	PARAM #3 loaded into the PARCSR <7:0> = Sync char, default = 26 <15> = DECmode select, default = 1 <9> = CRC inhibit, default = 1	
DMC11	1. Link Test: Not used (0). 2. Secondary Mode Test: Not used (0). 3. Bootstrap Test: <8> = 1 Bootstrap test <10> <9> Mode and station select 0 0 Originating station – Automatic mode 0 1 Boot station – Automatic mode 1 0 Originating station – Manual mode 1 1 Boot station – Manual mode <7:0> – Switch PAC setting of boot station DMC-11 DDCMP line # (Used as Password in MOP message)	FDX/HDX Selection: <0> = 1 FDX (Default) = 0 HDX Secondary mode test selection: <0> = 0 HDX (Must be 0 for this test) <1> = 1 Secondary mode test (Must be 1) <2> = 0 Primary station = 1 Secondary station Not used (0). Must watch SW PAC #2 which cannot contain 377 for this bootstrap test.	Not used (177777). Not used (177777). Not used (177777).	1. DMC ITEP is an on-line link test only between two DMCs. 2. DMC is a DMA device and therefore the TX and RX data cannot be monitored on a per character basis. Thus, SWG and SWS have no effect.
DQ11	Not used (0).	PARAM #2 (Low byte): <0> = 0 HDX (Default) = 1 FDX <1> = 0 Normal (Default) = 1 HI-Baud (Only Software flags (Not loaded into DQ registers)) PARAM #2 (High byte) loaded into the Sync register: <15:8> = Synch char, default = 26	Not used (177777).	
DV11	PARAM #1 is used to determine the line numbers for TX and RX. <11:8> = RX line number, default = 0 <3:0> = TX line number, default = 0	PARAM #2 contains specific line information <15:8> = Sync code, default = 26 <1> = 0 Use sync A (Default) = 1 Use sync B <0> = 0 HDX (Default) = 1 FDX	Not used.	If a DM11-BB is in the system with DV11 being tested, but modem control not desired and DM11-BB not initialized by ITEP, the program will hang in the DV11 TX INIT routine. Correction: Location: "DMBB" (In CREF) Load: An address that will time out. (No SSYNCH response)

MKV84-0796

5.4 LINK TESTING

The following figure provides a graphic overview of a general application flowchart for link testing.

Link Testing Flowchart (Sheet 1 of 4)

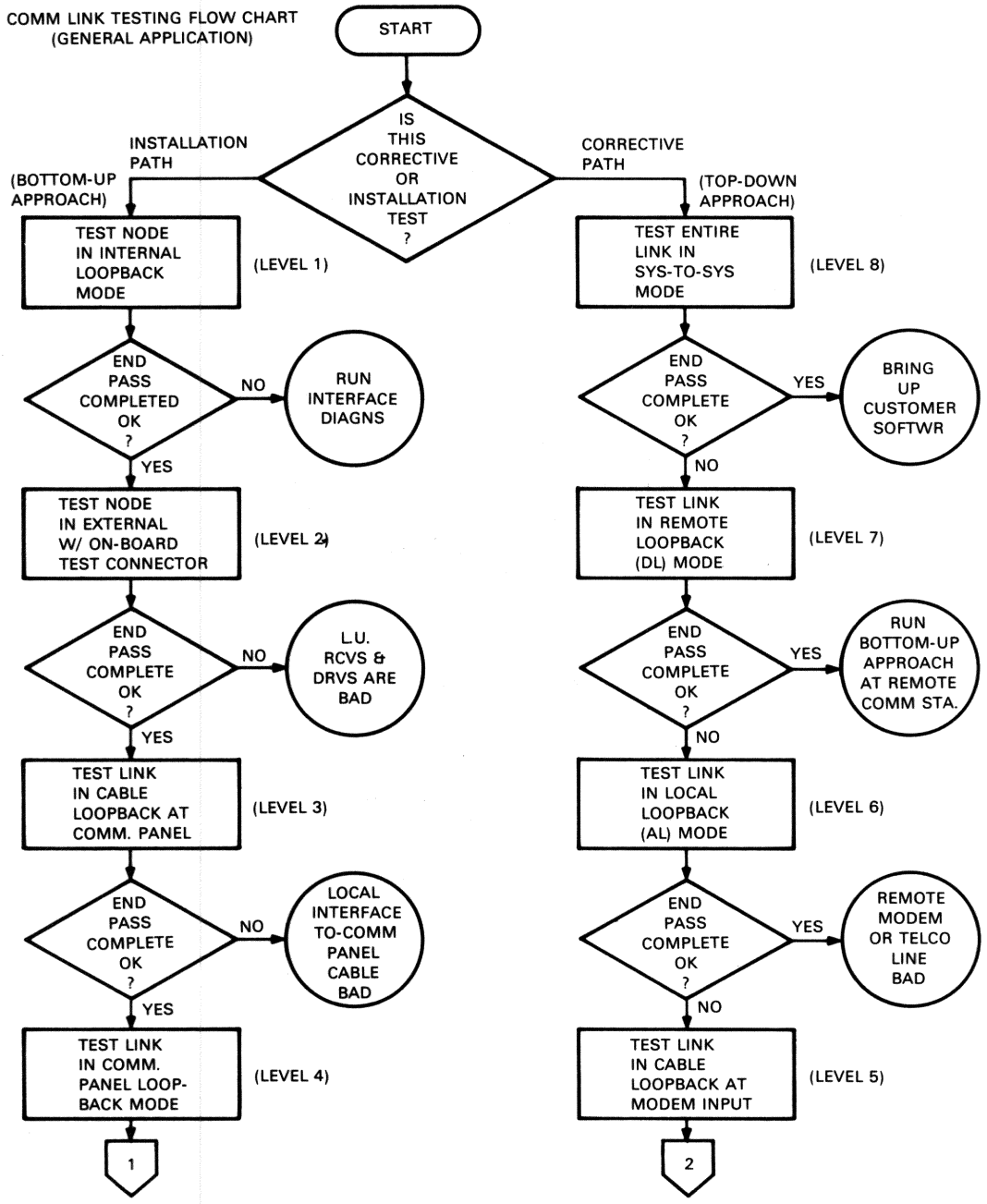


POINT-TO-POINT LINK

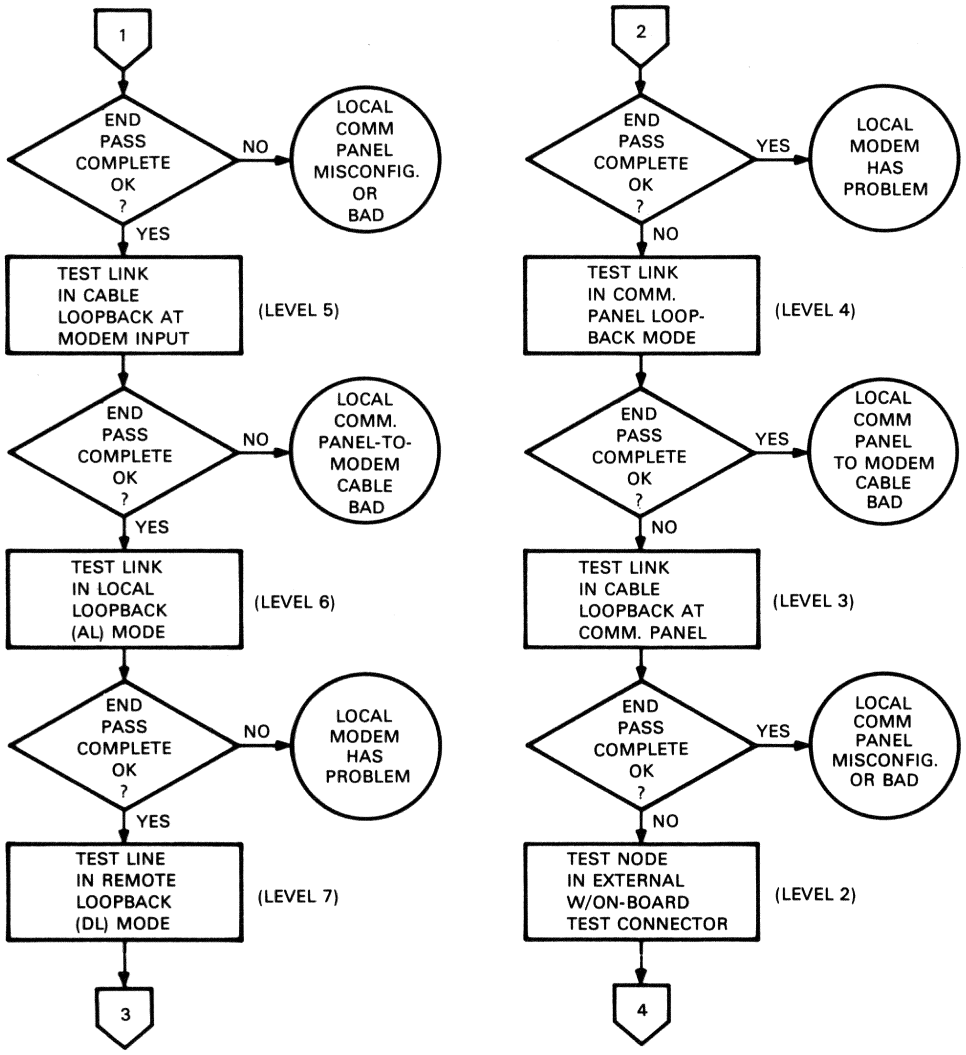
1. INTERNAL (MAINTENANCE) LOOPBACK LEVEL
2. ON-BOARD LOOPBACK W/ PORT TEST CONNECTOR
3. CABLE LOOPBACK PRIOR TO COMM PANEL
4. COMM. PANEL LOOPBACK
5. CABLE LOOPBACK AT MODEM INPUT
6. ANALOG LOOPBACK MODE IN LOCAL MODEM
7. DIGITAL LOOPBACK MODE IN REMOTE MODEM
8. SYSTEM LOOPBACK FROM END NODE

MK-2803A

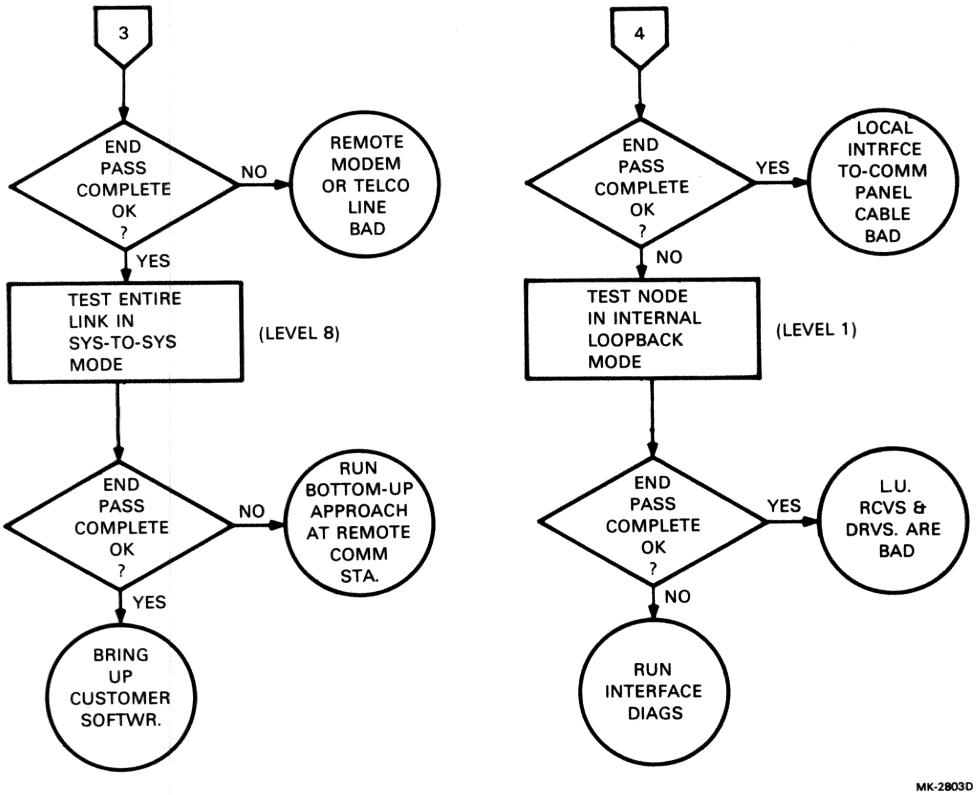
Link Testing Flowchart (Sheet 2 of 4)



Link Testing Flowchart (Sheet 3 of 4)



Link Testing Flowchart (Sheet 4 of 4)



CHAPTER 6
SPECIAL TOOLS AND EQUIPMENT

6.1 INTRODUCTION

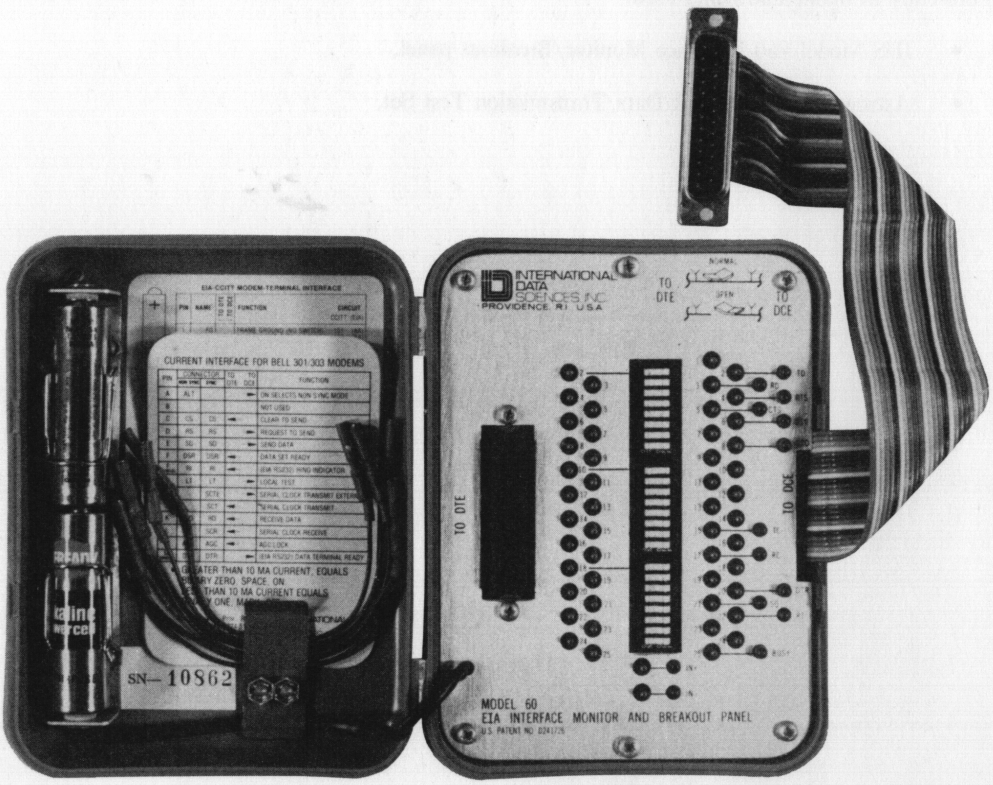
This chapter provides brief descriptions of various special tools and test equipment available to aid in troubleshooting and testing Digital Equipment Corporation Communications configurations. The following are presently available and being used:

- IDS Model #60 Interface Monitor/Breakout panel.
- Astrocom™, Minicheck Data Transmission Test Set.

6.2 BREAKOUT PANEL

The Model 60 Breakout Panel is a multipurpose tester that provides access to RS-232-C signals. It features:

- Switchpacks and patchable jumper pins (one for each line) allowing signal interruption and/or rerouting;
- 12 LED's to monitor certain key functions; and
- Two additional LEDs to check voltage levels greater than ±3.5 V at any line (jumper selectable).

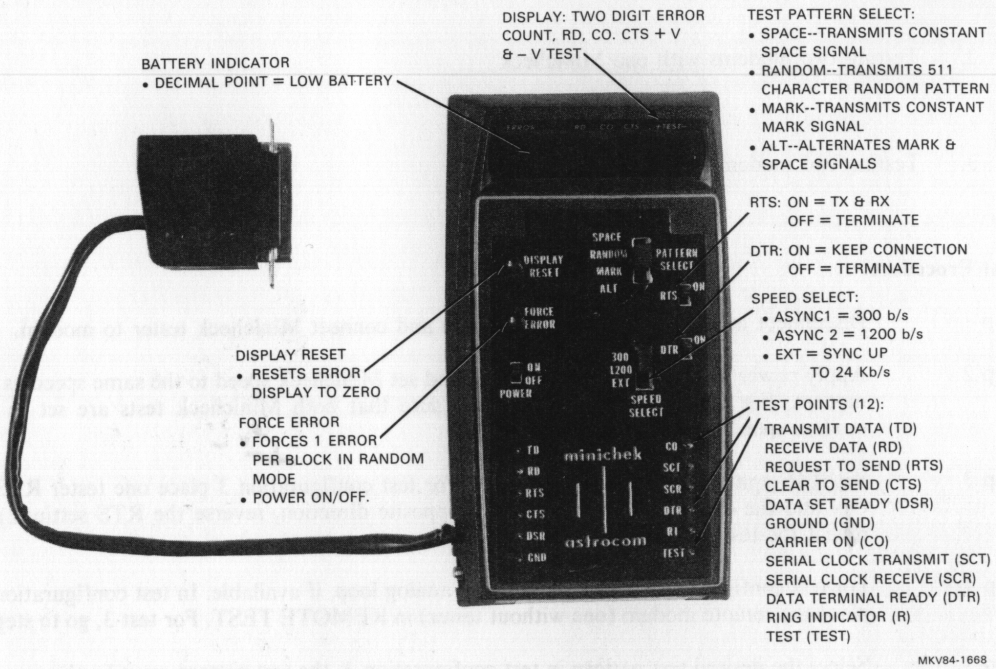


MKV84-1669

Model 60 Breakout Box

6.3 MINICHECK

The Minicheck tester generates four patterns, checks for errors, displays number of errors, and displays the status of the RS-232-C interface signals.



Minicheck Tester

6.3.1 Operational Tests

There are three basic test configurations and one Minicheck self-test procedure, specified as follows:

1. Testing one modem with one Minicheck

2. Testing two modems with one Minicheck

3. Testing two modems using two Minichecks

Test Procedure

Step 1 — Disconnect modem from operating device and connect Minicheck tester to modem.

Step 2 — Apply power to Minicheck and modem, and set Minicheck speed to the same speed as the modem. For test configuration 3, make sure that both Minicheck tests are set to the modem speed.

Step 3 — Set RTS and DTR to the ON position. For test configuration 3 place one tester RTS to ON and the other to OFF. To test the opposite direction, reverse the RTS settings and repeat the test procedure.

Step 4 — For test configuration 1, place modem in analog loop, if available. In test configuration 2, place the remote modem (one without tester) in REMOTE TEST. For test 3, go to step 5.

Step 5 — Select the desired test pattern in test configuration 3, the test pattern must be the same at both testers.

6.3.2 Test Results

Configuration 1 and 2.

1. CO and CTS indicators should be ON.

2. RD indicator should be:

   a. ON for MARK pattern,
   b. OFF for SPACE pattern,
   c. Dimly lighted for ALT pattern,
   d. Flickering for RANDOM pattern.

3. Error count after initial synch should be stable.

4. Check status of interface leads by:

   a. Using an Oscilliscope, or

   b. Connecting the TEST lead to the desired interface lead. Results are indicated in the + TEST − area of the displays (plus sign lighted for MARK: minus lighted for SPACE).

Configuration 3

1. Minicheck with RTS ON:

   a. CTS and RD indicators ON,
   b. CO indicator OFF,
   c. Error count free running unless SPACE pattern selected,
   d. Check interface signal status (see test results, configuration 1 and 2, step 4).

2. Minicheck with RTS OFF:

   a. CTS indicator OFF,
   b. CO indicator ON,
   c. RD indicator should be:

      1) ON for MARK pattern
      2) OFF for SPACE pattern
      3) Dimply lighted for ALT pattern
      4) Flickering for RANDOM pattern.

   d. Error count after initial sync should be stable.
   e. Check interface signal status (see test results, configuration 1 and 2, step 4).

6.3.3 Minicheck Self-Test Procedure

1. Connect test points RD to TD, DTR to CO and RTS to CTS.
2. Apply power to the tester and place RTS and DTR to the ON position.
3. Set speed-select to 1200 (ASYNC 2).
4. Select desired test pattern.

Test Results

Same as Configuration 1 and 2, steps 1 through 3.

CHAPTER 7
EIA/CCITT DATA

7.1 INTRODUCTION

This chapter provides a summary listing of each of the signal functions associated with each of the EIA and/or CCITT standards which are supported by the communications devices contained in this manual. The connector pin assignments (at the modem) for each signal are also included. Table 7-5 provides a cross reference showing the relationship between each of the supported standards.

Table 7-1 RS-232-C Interface Pin/Signal Designations

Pin	Circuit	Direction	Function	CCITT Circuit Equivalent
1	AA		Protective Ground	101
2	BA	To Modem	Transmitted Data	103
3	BB	From Modem	Received Data	104
4	CA	To Modem	Request to Send	105
5	CB	From Modem	Clear to Send	106
6	CC	From Modem	Data Set Ready	107
7	AB	———	Signal Ground	102
8	CF	From Modem	Data Carrier Detector	109
9	—	(From Modem)	(Positive DC Test Voltage)	
10	—	(From Modem)	(Negative DC Test Voltage)	
11	—	———	Unassigned	
12	SCF	From Modem	Secondary Carrier Detector	122
13	SCB	From Modem	Secondary Clear to Send	121
14	SBA	To Modem	Secondary Transmitted Data	118
15	DB	From Modem	Transmitter Clock (Internal)	114
16	SBB	From Modem	Secondary Received Data	119
17	DD	From Modem	Receiver Clock	115
18		To Modem	Receiver Dibit Clock	
19	SCA	To Modem	Secondary Request to Send	120
20	CD	To Modem	Data Terminal Ready	108.2
21	CG	From Modem	Signal Quality Detector	110
22	CE	From Modem	Ring Indicator	125
23	CH/CI	To Modem	Data Rate Selector	111/112
24	DA	To Modem	External Transmitter Clock	113
25	CN	To Modem	Force Busy	

RS-232-C Voltage Standards

Measured at the Receiver Circuit:
Data:

−25V<LOGICAL / 1<−3V(MARK)
+25V>LOGICAL / 0>+3V(SPACE)

Control:

−25V<LOGICAL / 0<−3V(NEGATION)
+25V>LOGICAL / 1>+3V(ASSERTION)

Table 7-2 RS-422-A/RS-423-A Interface Pin/Signal Designations

Pin	Circuit	Direction	Function	Circuit Equivalents RS-232	CCITT
1	SHIELD		Protective Ground		
2	SI	From Modem	Signal Rate Indicator	CI	112
3	SPARE				
4	SD	To Modem	Send Data (+)	BA	103
5	ST	From Modem	Send Timing (+)	DB	114
6	RD	From Modem	Receive Date (+)	BB	104
7	RS	To Modem	Request to Send (+)	CA	105
8	RT	From Modem	Receive Timing (+)	DD	115
9	CS	From Modem	Clear to Send (+)	CB	106
10	LL	To Modem	Local Loop		141
11	DM	From Modem	Data Mode (+)	CC	107
12	TR	To Modem	Terminal Ready (+)	CD	108.2
13	RR	From Modem	Receiver Ready (+)	CF	109
14	RL	To Modem	Remote Loop		140
15	IC	From Modem	Incoming Call	CE	125
16	SF/SR	To Modem	Select Frequency		126
			Signal Rate Select	CH	111
17	TT	To Modem	Terminal Timing (+)	DA	113
18	TM	From Modem	Test Mode		142
19	SG	To Modem	Signal Ground	AB	102
20	RC	From Modem	Receive Common		102b
21	SPARE				
22	SD	To Modem	Send Data (−)		
23	ST	From Modem	Send Timing (−)		
24	RD	From Modem	Receive Data (−)		
25	RS	To Modem	Request to Send (−)		
26	RT	From Modem	Receive Timing (−)		
27	CS	From Modem	Clear to Send (−)		
28	IS	To Modem	Terminal in Service		
29	DM	From Modem	Data Mode (−)		
30	TR	To Modem	Termonal Ready (−)		
31	RR	From Modem	Receiver Ready (−)		
32	SS	To Modem	Select Standby		116
33	SQ	From Modem	Signal Quality	CG	110
34	NS	To Modem	New Signal		
35	TT	To Modem	Terminal Timing (−)		
36	SB	From Modem	Standby Indication		117
37	SC	To Modem	Send Common		102a

Table 7-3 CCITT/V.35 Interface Pin/Signal Designations

Pin	CCITT Circuit	Direction	Function	Circuit Equivalents RS-232	Circuit Equivalents RS-449
A	101		Protective Ground		
B	102		Signal Ground	AB	SG
C	105	To Modem	Request to Send	CA	RS
D	106	From Modem	Ready for Sending	CB	CS
E	107	From Modem	Data Set Ready	CC	DM
F	109	From Modem	RCV Line Signal Det	CF	RR
H	108/1	To Modem	Connect Data Set		
	108/2	To Modem	Data Terminal Ready	CD	TR
J	125	From Modem	Calling Indicator	CE	IC
R	104	From Modem	Received Data A	BB	RD
T	104	From Modem	Received Data B		RD
V	115	From Modem	Receive Timing A	DD	RT
X	115	From Modem	Receive Timing B		RT
Y	114	From Modem	Transmit Timing A	DB	ST
AA	114	From Modem	Transmit Timing B		ST
P	103	To Modem	Transmit Data A	BA	SD
S	103	To Modem	Transmit Data B		SD
U	113	To Modem	Terminal Timing A	DA	TT
W	113	To Modem	Terminal Timing B		

Table 7-4 RS-366 ACU Interface Pin/Signal Designations

Pin	Direction	ACU Designation	Function
1		FGD	Frame Ground
2	To ACU	DPR	Digit Present
3	From ACU	ACR	Abandon Call, Retry
4	To ACU	CRQ	Call Request
5	From ACU	PND	Present Next Digit
6	From ACU	PWI	Power Indicator
7		SGD	Signal Ground
8			Not Used
9	From ACU		+ DC Test Voltage
10	From ACU		– DC Test Voltage
11			Not Used
12			Not Used
13	From ACU	DSS	Data Set Status
14	To ACU	NB1	Number Bit Weight 1
15	To ACU	NB2	Number Bit Weight 2
16	To ACU	NB4	Number Bit Weight 4
17	To ACU	NB8	Number Bit Weight 8
18			Not Used
19			Not Used
20			Not Used
21			Not Used
22	From ACU	DLO	Data Line Occupied
23			Not Used
24			Not Used
25			Not Used

Table 7-5 EIA/CCITT Standards Equivalency

EIA Electrical Characteristic Standard	EIA Interchange Circuit Definition Standard (DCE to DTE) with Connector	CCITT Electrical Characteristic Standard	CCITT Interchange Circuit Definition Standard (DCE to DTE) With out Connector	Recommended CCITT Interchange Connector
RS-232-C	RS-232-C	CCITT V.28	CCITT V.24	ISO 2110
RS-423-A	RS-449	CCITT V.10/X.26	CCITT V.24	ISO 4902
RS-422-A	RS-449	CCITT V.11/X.27	CCITT V.24	ISO 4902
N/A	N/A	CCITT V.35	CCITT V.24	ISO 2593

CHAPTER 8
VENDOR MODEM PRODUCTS

8.1 INTRODUCTION

This chapter contains a summary of the operational characteristics of some of the more commonly used modems and the option variations available with each of them.

Also included is the DIGITAL recommendation for configuring each of the options for optimum performance.

Table 8-1 Characteristic Summary for Selected Modems

Device Type	Speed	Auto Answer	Auto Dial	Remote Testing	Line	Operation
103J	0-300 b/s (ASYNC)	Yes	With 801 ACU	Yes	Switched	Half-Duplex or Full-Duplex (2 Wire)
108	0-300 b/s (ASYNC)	No	No	No	Series 2000 or 3002	Full-Duplex (2 Wire)
113	0-300 b/s (ASYNC)	Yes	No	Yes	Switched	Half-Duplex or Full-Duplex (2 Wire)
113A	0-300 b/s (ASYNC)	No	No	Yes	Switched	Manual Originate Full-Duplex (2 Wire)
201C	2400 b/s (SYNC)	Yes	With 801 ACU	Yes	Switched or 3002 Private Channel	Half-Duplex (2 Wire) Full-Duplex (4 Wire)
202S	1200 b/s NO CONDITIONING 1800 Bits/SC2 CONDITIONING (ASYNC)	Yes	With 801 ACU	Yes	Switched Series 2000 or Private Line Series 3000	HDX (2 Wire)

Table 8-1 Characteristic Summary for Selected Modems (Cont)

Device Type	Speed	Auto Answer	Auto Dial	Remote Testing	Line	Operation
202T	Same as 202S	No	No	Yes	2 or 4 Wire Series 3000 Private Line	HDX (2 Wire) FDX (4 Wire)
208A	4800 b/s (SYNC)	No	No	Yes	4 Wire 3002 Private Line	FDX (4 Wire)
208B	4800 b/s (SYNC)	Yes	With 801 ACU	Yes	Switched	HDX (2 Wire)
209A	1-9600 b/s Channel, or 1-7200 b/s and 1-2400 b/s Channels or 2-4800 b/s Channels or 4-2400 b/s Channels (SYNC)	No	No	Yes	3002 with D1 Conditioning	FDX (4 Wire)
212A	0-300 Bits/S ASYNC or 1200 Bits/S CHAR ASYNC or 1200 Bits/S Bit SYNC	Yes	With 801 ACU	Yes		FDX (2 Wire)
402C	0-600 Bits/S	Yes	With 801 ACU	Yes	Switched 2000 or 3002 Private Line	HDX (2 Wire) or FDX (4 Wire)
500A DSU	2.4K, 4.8K 9.6K, 56K SYNC	No	No	Yes	4 Wire DDS	FDX, HDX
501A DSU	9.6K, 56K SYNC	Yes	Yes	Yes	4 Wire DDS	FDX, HDX
510A DSU	2.4K, 4.8K	No	No	Yes	4 Wire DDS Multiport	FDX, HDX

Table 8-1 Characteristic Summary for Selected Modems (Cont)

Device Type	Speed	Auto Answer	Auto Dial	Remote Testing	Line	Operation
550A CSU	56K SYNC	No	No	N/A	4 Wire DDS	ANALOG
551A CSU	56K SYNC	No	No	N/A	4 Wire DDS	ANALOG

Table 8-2 Modem Options

Modem	Option	Designation	DIGITAL Recommendation
103J	Receive Space Disconnect	V	Yes
	Send Space Disconnect	T	Yes
	Loss of Carrier Disconnect	R	No
	CC Indication	ZD	Early
	CB and CF Indications	B	Separate
	CC Indication for Analog Loop	ZF	On
	Auto Answer	ZH	Yes
	Failsafe State of CN Circuit	J	Off
	Tip/Ring Make Busy	E	No
	Ground	Q	Common
108	To Be Supplied		
113B	Common Ground	V	In
	CB/CF Indication	W	Out
	CN Control	X	In
	Tip/Ring Force Busy	Y	Out
	Data Terminal Control of Disconnect	Z	In

Table 8-2 Modem Options (Cont)

Modem	Option	Designation	DIGITAL Recommendation
201C	Ground	YK	Common
	Transmitter Timing	YC	Internal
	Auto Calling	By ACU	As required
	Auto-Answer	YF	Under DTR control
	Ring Indication	YG	EIA RS-232 on pin 22
	Line Interface	XA	4 wire private (FDX)
	Carrier Control	XA	Switched, 7 ms delay
	New Sync	YA	Not used
	Carrier Detector Sensitivity	ZU ZV	−24 dbm private wire −44 dbm switched net
202S	Receive Data Squelch	R	156 ms
	Soft Carrier Turnoff	R	24 ms
	Clear to Send Delay	G	180 ms
	Fast Carrier Detection	N	Out (23 ms)
	Received Data Clamp	F	In (required)
	Local Copy Primary Channel	ZB	Out
	Reverse Channel	ZC ZD	As required (In or out)
	Local Copy Reverse Channel	ZF	Out
	Auto-Answer	B	In
	Transmit Only	YH	Out
	CC Indicator In Analog Loopback	YJ	Off
	Ground	ZG	Common

Table 8-2 Modem Options (Cont)

Modem	Option	Designation	DIGITAL Recommendation
	801 ACU	–	As required
202T	4 Wire Full-Duplex	ZK	Full-duplex
	2 Wire Half-Duplex	See Reverse Channel Below	Half-duplex only recommended with controller with full modem with 2780 software package.
	Receive Data Squelch	R	156 ms
	Soft Carrier Turnoff	R	24 ms
	Clear to Send Delay	G	180 ms
	Fast Carrier Detection	N	Out (23 ms)
	Received Data Clamp	F	In (required)
	Local Copy Primary Channel	ZB	Out
	Reverse Channel	ZC ZD ZK	In (as required) Out 4 Wire operation
	Local Copy Reverse Channel	ZF	Out
	Carrier Detector Reset	ZM	Out
	Continuous Carrier	ZO	Out
	Compromise Equalization	ZU ZV	Maximum (determined by installer) Minimum (to match channel character-istics)
	Ground	ZG	Common
	Alternate Voice	A B	Out (as required) In

Table 8-2 Modem Options (Cont)

Modem	Option	Designation	DIGITAL Recommendation
208A	Transmitter Timing	YC	Modem Provides transmitter clock
	Carrier Control	XB	Continuous carrier (as required)
		XA	Switched carrier
	Request to Send	YS	Continuous RTS (as required)
		YT	Switched RTS
	One Second Holdover	YX	Enabled (recommended for use with continuous carrier, selected above)
		YW	Disabled (recommended for use with multipoint master station)
	New Sync	YA	Not used
	CC Condition in Analog Loopback	YM	DSR asserted in Analog loopback
	Alternate Voice	YI	Data auxiliary set installed
		YJ	No data auxiliary set
	Automatic Retrain	YU	Must be installed
	Compromise Equalizer	YQ	Must be disabled
208B	Transmitter Timing		Internal
	Auto Call		As required
	CC Condition in Analog Loopback		CC on when analog loopback button is pressed
	Auto Answer		Yes
209A	Transmitter Timing Provided		Internal
	Carrier Control		Switched

Table 8-2 Modem Options (Cont)

Modem	Option	Designation	DIGITAL Recommendation
	Request to Send Control		Switched
	Elastic Store		Out
	Slaved Transmitter Timing		Out
	Data Set Ready (CC) Condition in AL Mode (Form Use in Test 4)		CC On
	Grounding		AA not connected to AB
212	Tip/Ring Make Busy	E	Out
	CC Indication Analog Loop	ZF	On
	CN Circuit	YF	Out
	Transmitter Timing	YC	Internal
	1200 Baud Operation	YG	ASYNC/Start-Stop
	Character Length	YJ	10 Bit
	Receiver Respond Digital Loop	YK	In
	Loss of Carrier Disconnect	S	Out
	Receive Space Disconnect	V	In
	CB and CF Indications	B	Separate
	Send Space Disconnect	T	In
	Auto-Answer	ZH	In
	Answer Mode Indication	W	Off

Table 8-2 Modem Options (Cont)

Modem Option	Designation	DIGITAL Recommendation
Speed Mode	YP	Dual
Interface Speed Indication	YQ	In
Signal Ground to Frame Connect	Q	In

801-C AUTO CALLING UNIT

TYPE: DUAL FREQUENCY (TOUCH TONE) OR DIAL PULSE
LINE: VOICE GRADE SWITCHED
CONDITIONING: ANY
SPEED: DIALS AT UP TO 10 DIGITS/SECOND
INTERFACE: RS366

Table 8-3 801-C ACU Options

Option	Designation	DIGITAL Recommendation
Call Termination	Z or A G or ZD	After DSS via CRQ or After DSS via data set
ACR Timer	R	Stop timer when DSS sets
DSS Transfer	B	Answer tone detection or at 'EON' code
Answer Detection	W X S T	Detect end of answer tone Detect beginning of answer tone Detect 2025 tone Detect 2225 tone
Ground Start	V Y	In Out
Data Set Answer Detection	E	Without 'EON'
Circuit	ZH ZJ ZK	2 wire 4 wire loop start 4 wire ground start
DLO Lead	ZM ZL	801 only control 801 and dataset control

CHAPTER 9
DATA COMMUNICATIONS TROUBLESHOOTING

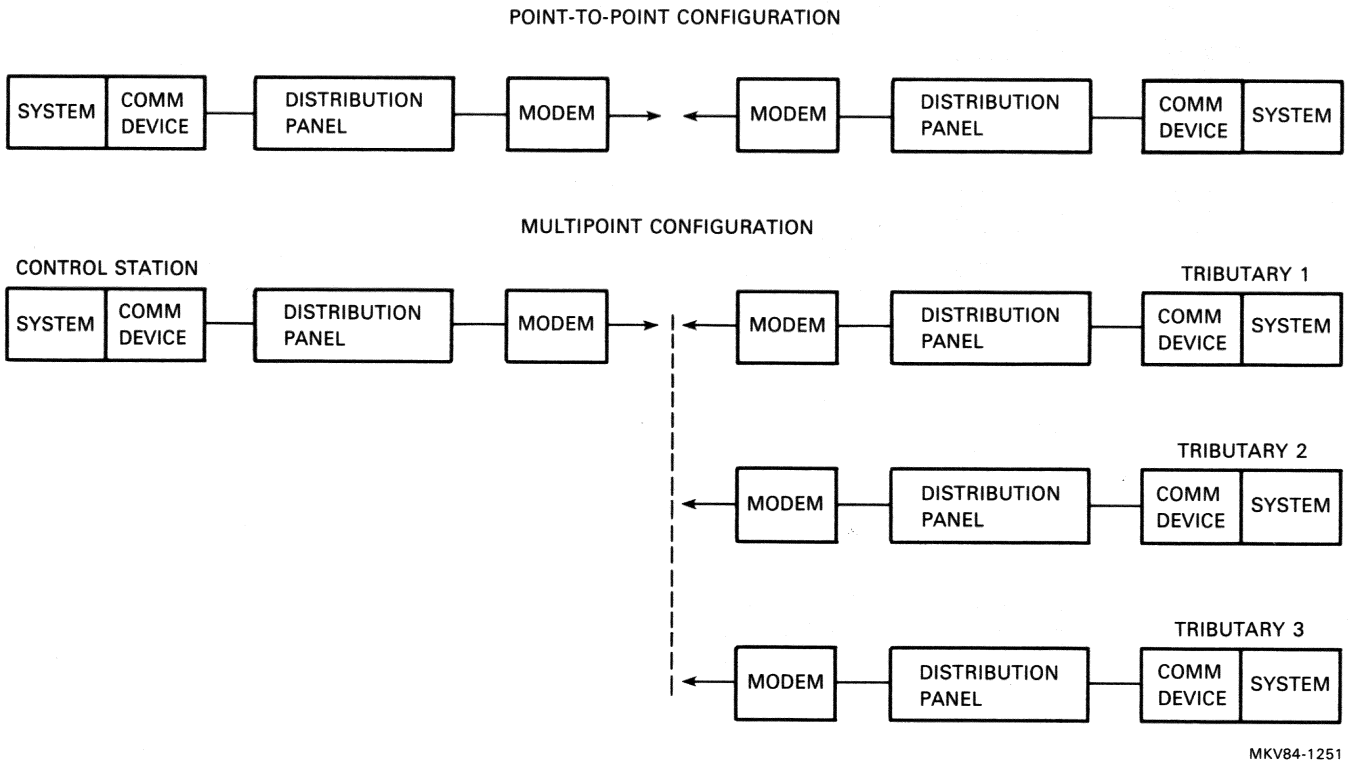
DATA COMMUNICATIONS TESTING WITH "DCLT" A COOKBOOK APPROACH

The typical Wide Area Network configuration is shown below. This may also be a Short Haul Network when the systems are connected together via integral modem devices (DMR11, DMP11, DMV11), in which case the distribution panels will be connected via coax cable rather than modems. Modem eliminators (and modem splitters for multipoint) are also commonly used interconnecting devices.

The Data Communications Link Test (DCLT) is a high level diagnostic and is not intended to diagnose a specific failing module, DCLT will allow diagnosis of a specific component in the network (Comm interface, cable, distribution panel or modem). For example; DCLT will not isolate which of the two modules of a DMR/C/P11 is bad, but it will indicate that the option is bad. Module swap or run the repair level diagnostics to determine which FRU is the failure.

Some tests (digital loopback and the link test) will require a person at both ends of the link and coordination between them regarding DCLT run parameters/data and test sequences.

The following is a cookbook approach to diagnosing networks using DCLT.


POINT-TO-POINT CONFIGURATION
SYSTEM
COMM DEVICE
DISTRIBUTION PANEL
MODEM
MODEM
DISTRIBUTION PANEL
COMM DEVICE
SYSTEM
MULTIPOINT CONFIGURATION
CONTROL STATION
SYSTEM
COMM DEVICE
DISTRIBUTION PANEL
MODEM
MODEM
DISTRIBUTION PANEL
TRIBUTARY 1
COMM DEVICE
SYSTEM
MODEM
DISTRIBUTION PANEL
TRIBUTARY 2
COMM DEVICE
SYSTEM
MODEM
DISTRIBUTION PANEL
TRIBUTARY 3
COMM DEVICE
SYSTEM
MKV84-1251

SYSTEM PREPARATION FOR TESTING

In the PDP11 environment DCLT is a standalone Diagnostic Supervisor based diagnostic, and thus requires shut-down of the customer's operating system. Run the appropriate PDP11 DCLT diagnostic and answer the questions regarding: device address, vector, BR level and mode of operation. Once this is complete, the operation will be under the DCLT> prompt.

In the VAX/VMS environment, DCLT is a Level 2 diagnostic and can run online. In most cases the problem communications device will be running under DECnet. This means the device is allocated to DECnet and not available to the Diagnostic Supervisor for testing. The problem device must be deallocated from DECnet. This will shut down the customer's communications link. In the multipoint environment this could effect many systems (not all of which may have a problem). Make sure the customer is aware of your intentions and the ramifications. The following procedure can be used to deallocate the defice from DECnet:

```
$ MCR NCP
NCP> SHOW KNOWN CIRCUITS              !This will show all the CIRCUITS,
                                      !select the appropriate one.

NCP> SET CIRCUIT XXX-N STATE OFF
NCP> SHOW KNOWN LINES                 !This will show all the LINES,
                                      !select the appropriate one.

NCP> SET LINE XXX-N STATE OFF
NCP> CLEAR CIRCUIT XXX-N ALL
NCP> CLEAR LINE XXX-N ALL
NCP> EXIT
$                                     !The device is now deallocated
                                      !from DECnet and the Diagnostic
                                      !Supervisor/DCLT can be run.
```

WHERE: XXX = DEVICE TO BE TESTED (DMC -A DMR11 is also called DMC, DMP, DMF)

N = DEVICE NUMBER TO BE TESTED. In the multipoint environment there will generally be several circuits present, one for each tributary. These will be in the form of XXX-N,Z (where N = DEVICE NUMBER TO BE TESTED and Z = TRIBUTARY CIRCUIT NUMBER).

NOTE

In the Multipoint environment where the DMP11 is used as the Control Station there can be several circuits assigned to it (DMP-N,Z), one for each tributary. All of the circuits must be set OFF and CLEARED.

The appropriate VAX Diagnostic Supervisor should be run, the necessary ATTACH commands answered, and EVENT FLAGS set for the communications device (and mode) to be tested. Use HELP files as necessary. SELECT the device to be tested and RUN the appropriate DCLT diagnostic for that device. Once started, operation will be under the DCLT> prompt.

The following commands will restore the operation for the device under DECnet VMS:

```
$ MCR NCP
NCP> SET CIRCUIT XXX-N ALL            !Repeat this for all circuits
                                      !that were cleared.
NCP> SET LINE XXX-N ALL               !Repeat this for all lines that
                                      !were cleared.

NCP> EXIT
$
```

POINT-TO-POINT NETWORK PROBLEM ISOLATION
A BOTTOM UP APPROACH

The following diagrams indicate the level of network function being tested and any necessary loopback connectors or test buttons that need to be used. The DCLT command string given, will execute the required test.

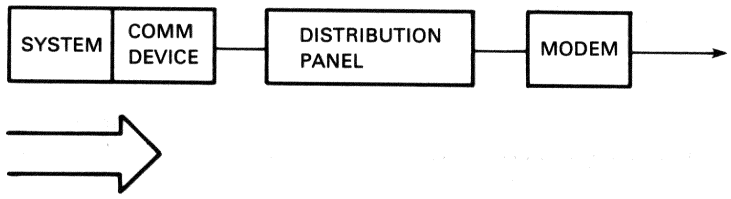
For DOWNLINE LOAD testing insure that all module switch and jumper settings (and M9312 where applicable) are correct. There are several TECH TIPS that address this area as well as the option User's Guides.

NOTE

The following test sequences should be performed on each system until the problem area is located. In the DCLT command strings the /PASS= can be given any desired value. A value of −1 loops forever).

The following tests require full-duplex mode of operation.

INTERNAL LOOPBACK

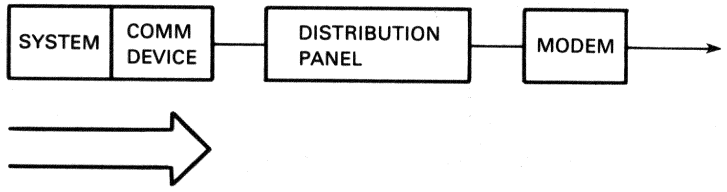


DCLT> R M=A/L=I/CH/PASS=10

(INCLUDE THE /PROTOCOL (/P) SWITCH FOR THE DUP11 AND DPV11)

MKV84-1252

MODULE "EIA" LOOPBACK



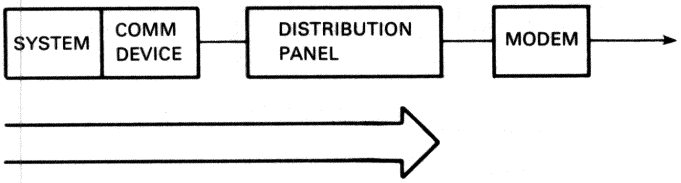
(INSTALL MODULE LOOPBACK CONNECTOR)

DCLT> R M=A/L=C/CH/PASS=10

(INCLUDE THE /PROTOCOL (/P) SWITCH FOR THE DUP11 AND DPV11)

MKV84-1253

PANEL LOOPBACK



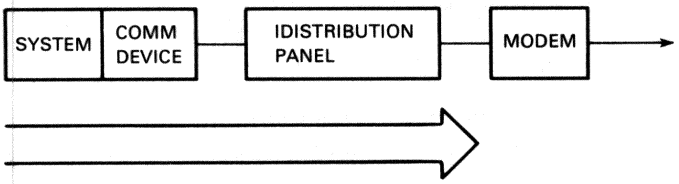
DCLT> R M=A/L=C/CH/PASS=10

(INCLUDE THE /PROTOCOL (/P) SWITCH FOR DUP11 AND DPV11)

(INSTALL CABLE TEST CONNECTOR)
ON DISTRIBUTION PANEL, FOR
INTEGRAL MODEM (COAX CABLES) PUT
PANEL IN "HDX" OR DEPRESS TEST
BUTTON.)

MKV84-1254

CABLE LOOPBACK



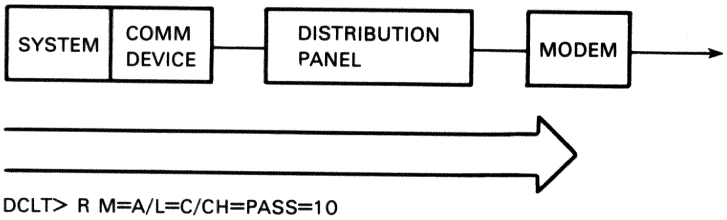
DCLT> R M=A/L=C/CH/PASS=10

(INCLUDE THE /PROTOCOL (/P) SWITCH FOR THE DUP11 AND DPV11)

(CONNECT THE APPROPRIATE CABLE LOOPBACK CONNECTOR
TO THE END OF THE CABLE. FOR COAX CABLE LINKS,
CONNECT THE TWO REMOTE ENDS TOGETHER, PROVIDED THAT
THE MAX CABLE LENGTH IS NOT EXCEEDED)

MKV84-1255

ANALOG LOOPBACK



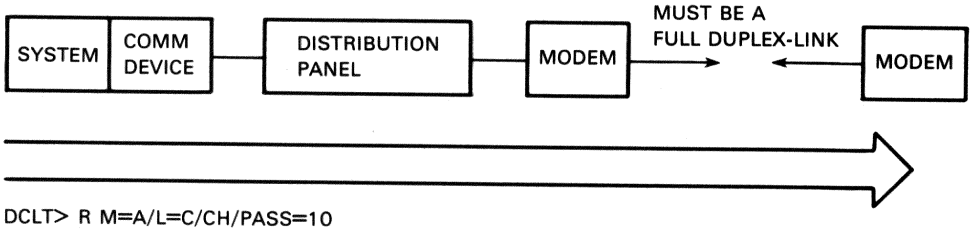
DCLT> R M=A/L=C/CH=PASS=10

(INCLUDE THE /PROTOCOL (/P) SWITCH FOR THE DUP11 AND DPV11)

(THIS TEST IS NOT APPLICABLE TO COAX CABLE LINKS.
PLACE MODEM INTO "ANALOG LOOPBACK" MODE, BE
SURE THE MODEM ASSERTS "DATA SET READY" WHEN
IN THIS MODE.)

MKV84-1256

DIGITAL LOOPBACK



DCLT> R M=A/L=C/CH/PASS=10

(INCLUDE THE /PROTOCOL (/P) SWITCH FOR THE DUP11 AND DPV11)

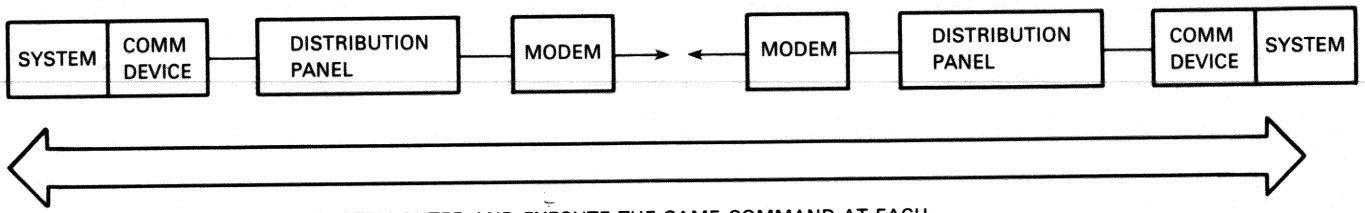
(THIS TEST IS NOT APPLICABLE TO COAX CABLE LINK,
THE MODEM LINK "MUST" BE FULL DUPLEX FOR THIS TEST.
PLACE THE REMOTE MODEM INTO "DIGITAL LOOPBACK"
MODE.)

MKV84-1257

NOTE

Up to this point, DCLT has been run in the FULL DUPLEX (FDX) mode. The next two tests will allow communication between two systems in a manner similar to their normal customer application. Thus, it may be REQUIRED that DCLT be reset to run in the HALF DUPLEX (HDX) mode, if that is the actual physical communication link mode of operation. On a PDP/LSI-11 this will require a complete restart of DCLT. On VAX systems EVENT FLAG #1 must be changed.

LINK TEST



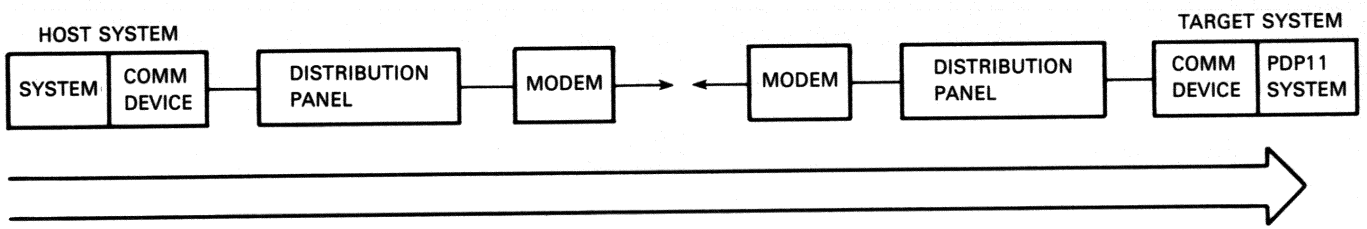
WITH DCLT RUNNING IN BOTH SYSTEM ENTER AND EXECUTE THE SAME COMMAND AT EACH

DCLT> R M=A/CH/PASS=10

(INCLUDE THE /PROTOCOL (/P) SWITCH FOR THE DUP11 AND DPV11)

MKV84-1258

DOWN LINE LOAD



DCLT> R M=D !ANSWER QUESTION ABOUT PASSWORD

(INCLUDE THE /PROTOCOL (/P) SWITCH FOR THE DUP11 AND DPV11)

MKV84-1259

MULTIPOINT NETWORK PROBLEM ISOLATION

Isolation of MULTIPOINT problems can be very difficult. Begin from a NETWORK wide picture. Are ALL the tributaries down? If YES, then it would likely be a problem at the Control Station system. It could also be due to any one of the tributaries hogging the network (asserting constant carrier). The latter problem will require a check at each system to see if its modem is asserting carrier, or by reconnecting coax cables to bypass individual systems. If only one tributary is down then the problem is likely at that particular system. If several tributaries are down then the interconnecting medium may be suspect. In all cases the communications link medium may be suspect. In all cases the communications link medium (modems, telephone system, coax cables) should be suspected as a potential problem until proven otherwise. See chapter 6 of the *DMP11 Synchronous Controller Technical Manual* for a multipoint troubleshooting flow chart.

If the problem has been isolated to an individual system, that system is investigated as though it were an individual node in a point-to-point network. Taken as such, the tests described in the previous section (Point-To-Point Network Problem Isolation) can be used to isolate the problem area. The INTERNAL LOOPBACK through the ANALOG LOOPBACK tests are the valid ones to run. It would also be valid to run the LINK TEST in point-to-point mode between the Control Station and one of the tributaries.

The following describes the DCLT commands needed to run a multipoint link test. This will check out the integrity of the network. If the individual systems functioned when tested as described above, then running the DCLT multipoint link test can help show problems related to the modems and telephone system or long runs of coax cable. This type of testing will require someone be present at all the systems to run DCLT and coordinate the test parameters and results. The person at the Control Station must coordinate/assign ADDRESS for the tributaries and provide them to the people who will be running DCLT on those systems. It may be convenient to use the same tributary addresses the customer has assigned.

If not already done, follow the procedure outlined in the System Preparation For Testing section. Answer the DCLT initialization questions which will be a multipoint network. The particular system is or is not the Control Station, as appropriate.

DCLT MULTIPOINT UNIQUE COMMAND SUMMARY

Command	Description
TRIB EST=x,y,z (T E=)	Establish list of tributary address to be tested (where x, y, z are the tributary address numbers).
TRIB SHOW (T S)	Show list of Established tributaries.
TRIB KILL=x (T K=)	Delete an address from the list of tributaries to be tested (where x is the tributary address to be deleted.

Once DCLT has been initialized to the multipoint Control Station or Tributary mode, execute the following commands as appropriate:

CONTROL STATION COMMAND SEQUENCE

```
DCLT> TRIB SHOW          !No tributaries should be established,
                         !if so kill them.
DCLT> TRIB EST=x,y,z     !Establish all tributaries to be tested
                         !at RUN time.
```

TRIBUTARY STATION(S) COMMAND SEQUENCE

```
DCLT> TRIB SHO          !No tributaries should be established,
                        !if so kill them.
DCLT> TRIB EST=x        !Establish ONLY the single address of
                        !this tributary.
```

The RUN command to be executed on all systems after the TRIB EST commands have been executed.

```
DCLT> R M=A/L=C/CH/PASS=10
```

The /PASS= switch can be given any desired number (−1 is continous). Use the /PROTOCOL switch for the DUP11 and DPV11.

ADDITIONAL DCLT FUNCTIONALITY

The following is not a complete list of all available DCLT commands. Those previously shown and those which follow are the most commonly used. Refer to the individual diagnostic listings for more complete DCLT command descriptions and examples.

MESSAGE SIZE AND TYPE COMMANDS

The default DCLT message size is 58 bytes long and is the QUICK BROWN FOX message (ITEP type). Both the message size (length) and type can be changed. The message length can be a maximum of 512 bytes long. The message types are summarized below.

Type	Default Length	Description
ZEROS (Z)	64	ALL ZEROS (000000000 .....)
ONES (O)	64	ALL ONES (1111111111 .....)
1ALT (1)	64	ALTERNATING ONE/ZERO (101010101010101..)
0ALT (0)	64	ALTERNATING ZERO/ONE (010101010101010..)
CCITT (C)	64	512 CCITT RANDOM BIT PATTERN
ALPHA (A)	65	ALL THE ALPHA/NUMERIC CHARACTERS
ITEP (I)	58	QUICK BROWN FOX ..... MESSAGE

The ZEROS and ONES message types are useful to detect problems when modems and/or telephone systems are sensitive to data patterns and as a result loose sync. The ALPHA and ITEP messages are useful when using a data scope to look for dropped characters/bytes, as these are easily followed patterns. Also using the maximum buffer size (512) so as to send/receive a larger message can be a help in finding problems. When trying to troubleshoot the DECnet DAP CRC error problems, the use of a 512 byte buffer and use of the /CHECK (/CH) switch (described below) is necessary. Expect to see DATA COMPARISON errors as a symtom.

To change the message size and type use the following commands:

Command	Description
SHOW T	SHOW the current message buffer characteristics for the Transmit (T) and Expected (E) SHOW E buffers. The Expected buffer is the message the DCLT expects to receive.
CLEAR T CLEAR E	CLEAR will reset the contents to the TRANSMIT (T) and EXPECTED (E) message buffers to default condition (58 byte ITEP message).
SET T=m/S=l SET E=m/S=l	SET will define the contents of the Transmit (T) and Expected (E) message buffers. Where M is the message type as decribed above, and L is the message length (from 1 to 512).
SET E = T	SET the Expected (E) buffer equal to the Transmit (T) buffer.

NOTE

The first time a SET command is given after a CLEAR command or when DCLT is first run, the new message type and size will OVERWRITE the default message. SET commands given thereafter will add the new message into the buffer along with the existing one(s).

It is recommended that the Expected buffer and the Transmit buffer message type and size always be equal to each other in all systems under test, especially when doing link tests and multipoint. When executing any type of loopback test (internal, cable, etc.) both message buffers must be the same. Buffers made up of several messages of the same or different type and size do not provide greater testing ability. After a Clear T or a Clear E the default condition of the buffers is the 58 byte ITEP message.

RUN MODE COMMAND SWITCHES

Switch	Description
/CHECK (/CH)	Enables a byte-for-byte comparison for the actual received data against the Expected list.
/NOCHECK (/NOCH)	Disables received data comparison.
/STATUS (/S)	Prints a status message which indicates the current DCLT operation while the RUN command string is executing. Use of this function slows the activity on the link being tested. If this switch is added to the RUN command strings used in the troubleshooting examples in previous sections a typical error free status message is: INI RXQ TXQ TXC CMP EOP (repeated until pass count = 0). Where: INI – DEVICE INITIALIZATION (only occurs once)

RXQ - INITIALIZE RECEIVE DATA BUFFER

TXQ - INITIALIZE TRANSMIT DATA BUFFER

TXC - TRANSMIT DATA BUFFER COMPLETELY SENT

CMP - ACTUAL RECEIVED DATA COMPARED AGAINST EXPECTED DATA

EOP - END OF PASS

/NOSTATUS (NOS) — Disasbles status messages.

/MODEM (/M) — Prints modem signal change interrupt messages.

/NOMODEM (/NOM) — Stopps printing modem signal change interrupt messages.

/LOOP=x (/L=x) — Selects the type of loopback method to be used. Where X can be:

I - INTERNAL

C - CABLE (or another system running DCLT)

/PROTOCOL — Use only for those devices not supporting (/P) DDCMP protocol in microcode (DUP11, DPV11). This switch causes DCLT to simulate DDCMP protocol in software. When using the DMF32, DDCMP protocol is used by default and can NOT be disabled. Because of the enhanced error reporting/logging of DDCMP it should be used in all cases.

/NOPROTOCOL (/NOP) — Disables the use of DDCMP protocol only for those devices that do not support it in microcode (DUP11, DPV11).

/DOWNLINE Line (/D) — Will cause a downline load of a program that will print the QUICK BROWN FOX ..... message on the remote systems terminals. Refer to the various TECH TIPS and the device Users Guides for the special device and boot rom setups necessary for downline loading.

PRINTING THE ERROR COUNTERS (DDCMP ERROR COUNTERS)

DCLT records the DDCMP protocol error counters. This information can be very useful while troubleshooting. Because DDCMP provides automatic retry and recovery from errors on the communications physical link (modems, telephone system, and coax cables) many problems will be transparent. However, by looking at the DDCMP ERROR COUNTERS after what may appear to be an error free run of DCLT, problems on the physical link (modems, telephone system, coax cables) may show up. Generally a coax cable link will be error free. While modem/telephone based system links can vary dramatically in error rate, especially on dial-up links. The overall effect of large numbers of DDCMP level errors is reduced network throughput.

Type the following to get a printout of the DDCMP counters.

```
DCLT> PRINT                    !Give the PRINT command to DCLT.
```

```
DO YOU WANT DDCMP ERROR SUMMARY
[(NO), YES]
                                    !Answer YES to get the DDCMP
                                    !error summary.
```

A DCLT EVENT SUMMARY printout can also be set. This information is not useful for general troubleshooting. Use CTRL C to get out of the EVENT SUMMARY printout if desired.

DATA COMMUNICATIONS TROULBESHOOTING USING DECnet

DECnet has some very powerful troubleshooting features and capabilities. DECnet can be used online to isolate problems regardless of the operating system. In many cases the communications link can be tested while the customer is using DECnet, and possibly even using the very same link to be tested. Troubleshooting online with DECnet uses the actual application software to verify link operation. Online troubleshooting with DECnet is more accurate than off line diagnostics. Another advantage is the user will only have to know how to use a single program and set of commands to test any of the DECnet supported devices, regardless of whether they are asynchronous, synchronous, Ethernet, point to point, or multipoint.

DECnet is a high level tool, and does not have the ability to provide fault isolation to the FRU. DECnet can isolate failing components in the network (interface, cables, distribution panel, modems, software installation, etc.).

Detailed information on all DECnet features, commands and error messages will not be presented here. Only those commonly used for troubleshooting are presented. For more detailed information refer to the *DECnet System Manager's Guide* for the appropriate operating system.

The DECnet prompt is NCP>, the Network Control Program.

DECnet DEVICE NAMING CONVENTIONS

DECnet CIRCUIT AND LINE DEVICES

Mnemonic	**Description**
DL	DL11-C,E and DL-11-W Single line asynchronous interfaces
DLV	DLV11E Single line asynchronous interface for Q-BUS Systems
DMC	DMC11, DMR11 Synchronous interprocessor link interfaces
DMF	DMF32 Synchronous line port
DMP	DMP11 Synchronous interprocessor link interface
DMV	DMV11 Synchronous interprocessor link interface for Q-BUS Systems
DUP	DUP11 Synchronous line interface
DZ	DZ11 Asynchronous multi-line multiplexer interface
UNA	DEUNA ETHERNET communications link interface

LINE IDENTIFIER CONVENTIONS
Line identification takes on one of the following formats:

DEV-c or DEV-c-u

WHERE:

DEV – device mnemonic as described above.

c – a decimal number (0, 1, 2, etc.) designating the devices hardware controller.

u – decimal unit or line number (0, 1, 2, etc.) to be used if the device is a multi-line controller (DZ11 for example).

EXAMPLES: DMC-0, DMF-2, DMP-1, UNA-0

CIRCUIT IDENTIFIER CONVENTIONS
CIRCUIT identification takes on one of the following formats:

DEV-c, DEV-c-u, DEV-c.t or DEV-c-u.t

WHERE:

DEV – device mnemonic as described above.

c – a decimal number (0, 1, 2, etc.) that designates the hardware controller

u – a decimal unit or CIRCUIT number (0, 1, 2, etc.) that is used with multi-line controllers (DZ11 for example)

t – a decimal number (0, 1, 2, etc.) that identifies an individual tributary on a multipoint circuit (do not confuse this with the tributary address) (DMC-1, DMV-0, DMP-0.1, DMV-1.1, UNA-0 for example)

NOTE

Throughout the rest of this document DEV-c will be used in examples of DECnet command strings. In actual use, substitute an identifier as required.

EXECUTOR, CIRCUIT, LINE STATES AND CHARACTERISTICS
It is important to know the state and characteristics for the DECnet link being tested. This information is useful even if not using DECnet. It will be useful for other diagnostics such as DCLT or NIE. The following is not a complete list and description of all the EXECUTOR, CIRCUIT and LINE PARAMETERS that may be used under DECnet. The following is a list of those parameters which will generally be useful to the troubleshooting/testing process. Refer to the *DECnet System Manager's Guide* for complete information.

NOTE

Get the customer's approval before using DECnet for troubleshooting and testing the network.

Get the following information before beginning troubleshooting and testing with DECnet.

Information Needed			WHY
LINE	STATE	–	to be sure DECnet knows it exists
		–	to see if the link is possibly active with a customer application
	DUPLEX	–	to determine what kind of test to run and any necessary changes that may need to be made before testing is possible (half duplex lines must be changed to full duplex to do loopback testing).
	PROTOCOL	–	to see what type and running mode the link is (multipoint, point to point, ETHERNET).
		–	if this is a multipoint control station testing may effect a LARGE number of other systems, be sure the customer is aware.
		–	if this is a multipoint tributary change the mode to point to point before doing loopback testing.
CIRCUIT	STATE	–	to be sure DECnet knows the CIRCUIT exists
		–	to determine the current operational state to determine if customer activity exists.
	ADJACENT NODE	–	to get node addresses/names through which to loop data during testing.
EXECUTOR NODE		–	get node address/name for testing use.
	STATE	–	to determine if DECnet is enabled, and thus testing can be done.

CIRCUIT LINE STATES AND SUBSTATES

State	Substate	Description
OFF	NONE	the CIRCUIT/LINE exists, but is not enabled for use.
ON	ONE	the CIRCUIT/LINE exists and is available for normal use.
ON	SYNCHRONIZING	the CIRCUIT/LINE is in the hardware initialization cycle.
ON	STARTING	the CIRCUIT/LINE is in the protocol startup sequence.
ON	REFLECTING	the CIRCUIT/LINE is in use for passive loopback testing.
ON	AUTOLOADING	a downline load has been requested by a remote system.
ON	LOADING	a manual downline load of a remote system has been started by the host system.
SERVICE	NONE	CIRCUIT/LINE is reserved for service functions.

LINE CHARACTERISTICS

Parameter		Meaning
CONTROLLER		
	NORMAL	device is in the normal DECnet operational mode
	LOOPBACK	the device internal hardware loopback is enabled (valid for devices, DMC, DMF, UNA)
DUPLEX	HALF	the device is in the HALF DUPLEX (HDX) mode
	FULL	the device is in the FULL DUPLEX (FDX) mode
PROTOCOL		
	DDCMP CONTROL	this is a multipoint control station
	DDCMP DMC	this is a point to point line emulating a version of DDCMP compatable with DMC11s
	DDCMP POINT	this is a point to point DDCMP link
	DDCMP TRIBUTARY	this is a tributary station in a multipoint network
	LAPB	this is an X.25 level 2 protocol link
	ETHERNET	this link is a connection to an ETHERNET
HARDWARE ADRS		valid for ETHERNET devices only – ETHERNET hardware device physical address

CIRCUIT CHARACTERISTICS

Parameter	Description
STATE	ON – CIRCUIT available for normal use or service operations
	SERVICE – CIRCUIT available only for service operations
	OFF – CIRCUIT is disabled for all operation
TRIBUTARY	adrs – hardware address of a tributary station (must the if LINE PROTOCOL is point to point)
ADJACENT NODE	node # (name) – address and name of system on other end of the link (all nodes are adjacent on an ETHERNET)

EXECUTOR CHARACTERISTICS

Parameter	Description
NODE	node # (name) – address and name of node
STATE	ON – DECnet enabled for normal use
	OFF – DECnet disabled for all usage
PHYSICAL ADDRESS	adrs – valid only when ETHERNET link(s) in use – this is the ETHERNET address of this system.

NCP COMMANDS

Show Command String	Shows
NCP> SHOW KNOWN LINES	!status of all lines known to DECnet
NCP> SHOW LINE DEV-c	!status of only one particular line
NCP> SHOW KNOWN LINE CHARACTERISTICS	!characteristics of all lines known to !DECnet
NCP> SHOW KNOWN LINE DEV-c CHARACTERISTICS	!characteristics of only one !particular line
NCP> SHOW KNOWN CIRCUITS	!status of all CIRCUITS known to !DECnet
NCP> SHOW CIRCUIT DEV-c	!status of only one particular line
NCP> SHOW KNOWN CIRCUIT CHARACTERISTICS	!characteristics of all circuits known !to DECnet
NCP> SHOW CIRCUIT DEV-c CHARACTERISTICS	!characteristics of only one !particular CIRCUIT
NCP> SHOW EXECUTOR STATUS	!show status of the EXECUTOR node

DECnet ERROR LOGGING

DECnet has an error log (ERROR COUNTERS) which records information concerning DDCMP level errors, process errors, etc. Proper use and understanding of the DECnet error logging system is crucial to effective troubleshooting and testing. The counters log information in four (4) categories; CIRCUIT, LINE, EXECUTOR, and NODE. the CIRCUIT and LINE counters are the generaly the most useful in troubleshooting. The error counters should be zeroed before each test is executed and examined at the completion of each test. Examination of the error counters should provide an indication of the cause of the problem and its location. The following describes the various error counters that are most useful, and lists those command strings used to examine and zero the counters. For a complete description of the error counters refer to the *DECnet System Manager's Guide.*

CIRCUIT COUNTERS

CIRCUIT DOWN	Indicates the number of circuit failures. These can be caused by a hardware problem, communications equipment problem (modem, telephone system, etc) or the CIRCUIT or LINE being manually shut down by the operator.
INITIALIZATION FAILURE	Indicates the number of times the circuit failed to initialize with the remote systems routing software (a SHOW CIRCUIT DEV-c would indicate it as ON if successful and ON - STARTING if it had not initialized yet).
BYTES RECEIVED	A count of the number of bytes of data received by the local node over the circuit.
BYTES SENT	The number of bytes of data sent by the local node over the circuit.
DATA ERRORS OUTBOUND **	A count of the number of errors that normally result from the data sent by the local node being received in error at the remote node. This counter is a count of all the DDCMP NAK messages received from the remote node.
DATA ERRORS INBOUND **	A count of the number of errors that result from data being sent from the remote node and being received in error at the local node. This counter is a count of DDCMP NAK messages sent by the local node to the remote node. This counter may include the following specific qualifiers if they contribute the errors: NAKs sent, header block check error NAKs sent, data field block check error
LOCAL BUFFER ERROR	This counter indicates the number of local buffer errors that normally result when the local buffer is too small for the received message or no buffer is available to store the message.
REMOTE BUFFER ERROR	This counter indicates the number of times the remote node buffer is too small or unavailable for the message sent by the local node.
LOCAL REPLY TIMEOUTS **	This is a count of the number of timeouts at the local node due to a failure of the communication link while data is being sent, or timeout of the local node's reply timer. This is a count of DDCMP REP messages sent by the local node.
REMOTE REPLY TIMEOUTS**	This counter indicates the number of timeouts that normally result from a loss of communications and the remote node having data to send or the remote nodes reply timer expiring. This is a count of DDCMP REP messages received from the remote node.

SELECTION INTERVALS ELAPSED

This counter is valid only for half duplex (HDX) and multipoint links. This is a count of the number of times a multipoint station is selected or the number of times an HDX link has been turned around.

SELECTION TIMEOUTS

This counter indicates the number of selection timeouts that normally result from:

Loss of communication with a remote node

Data errors to or from that remote node

Inappropriate value for the select timer

Use the SELECTION INTERVALS ELAPSED counter as a statistical base when evaluating this counter.

NOTE

These errors generally indicate a problem on the communications medium (coax cables, modems, telephone lines, etc.). Note if the errors occur in both directions or just one. On multipoint links all associated circuit counters must be examined to isolate the problem. If multipoint link is via a telephone network it would be useful to have access to a telephone circuit map to isolate various locations.

LINE COUNTERS

REMOTE PROCESS ERRORS

This counter records the number of DDCMP R errors that occurred at the remote system and resulted in a DDCMP error message (NAKS for header or data CRC errors) received at the local node. Selection Address Errors and Streaming tributary are also included.

LOCAL PROCESS ERRORS

This is a count of the number of DDCMP errors that have occured at the local system and have resulted in a DDCMP error message sent to the remote system.

BLOCKS SENT, INITIALLY DEFERRED

For ETHERNET links only. This is the total number of times that a frame was deferred on its first transmission attempt.

BLOCKS SENT, MULTIPLE COLLISIONS

For ETHERNET links only. A count of the number of times a frame was successfully transmitted on the third or later attempt after normal collisions on the previous attempts.

BLOCKS SENT, SINGLE COLLISIONS

For ETHERNET links only. A count of the number of times a message was successfully transmitted on the second attempt after a normal collision on the first attempt.

COLLISION DETECT CHECK FAILURE

For ETHERNET links only. Indicates the approximate number of times that a collision detect was not sensed after a transmission.

DATA OVERRUN	Indicates the number of times the hardware lost a frame because it was unable to keep up with the data rate.
SYSTEM BUFFER UNAVAILABLE	Indicates the number of times that no system buffer was available for an incoming message.

Command Strings	**Description**
NCP> ZERO KNOWN CIRCUIT COUNTERS	!Zeroes (clears) all the CIRCUIT !counters known to DECnet.
NCP> ZERO CIR DEV-c COUNTERS	!Zeroes (clears) the CIRCUIT counters !for DEV-c only.
NCP> ZERO KNOWN LINE COUNTERS	!Zeroes (clears) all the LINE counters !known to DECnet.
NCP> ZERO LINE DEV-c COUNTERS	!Zeroes (clears) the LINE counters for !DEV-c only
NCP> SHOW KNOWN CIRCUIT COUNTERS	!Shows the CIRCUIT counters for all !circuits known to DECnet.
NCP> SHOW CIR DEV-c COUNTERS	!Shows the circuit counters for DEV-c !only.
NCP> SHOW KNOWN LINE COUNTERS	!Shows the counters for all LINES !known to DECnet.
NCP> SHOW LINE DEV-c COUNTERS	!Shows the LINE counters for DEV-c !only.

CHANGING CIRCUIT AND LINE MODES OF OPERATION

Sometimes it is necessary to change the mode (DUPLEX, PROTOCOL, CONTROLLER) of operation of the line and circuit. If the line is in Half Duplex (HDX) mode and loopback testing is desired, (internal, cable, modem analog loop) the mode must be changed to Full Duplex (FDX). The operator can not do a modem digital loop on an HDX link. If the line and circuits are in the Multipoint Tributary mode (DDCMP TRIBUTARY) and loopback is desired, change the mode of the line and circuit to point to point (DDCMP POINT). CONTROLLER LOOPBACK mode (device internal loopback) is valid ONLY for device type: DMC, DMV, DMP, DMF, UNA.

The following command strings may be used to make necessary changes, and then return the system to normal conditions.

NOTE

Ensure that the "DECnet Permanent Data Base" contains all the correct operating parameters that the customer needs for his application to function properly! If it does not, then do not to make any changes without consent.

To change the Line Mode to Full-Duplex, type the following: (does not apply to device type UNA)

```
NCP> SET LINE DEV-c                 !Turn LINE DEV-c off
     STATE OFF

NCP> SET LINE DEV-c                 !Set the LINE to full duplex and
     DUPLEX FULL STATE ON           !turn it back on

NCP> SHOW LINE DEV-c                !Verify that full duplex is set by
     CHARACTERISTICS                !looking at the LINE characteristics
```

To change line mode to full duplex, type the following: (RSX DECnet only)

```
NCP> SET LINE DEV-c STATE OFF
NCP> SET CIRC DEV-c STATE OFF
NCP> CLEAR LINE DEC-c ALL
NCP> SET LINE DEV-c DUPLEX FULL
```

To return to Half-Duplex mode, type the following:

```
NCP> SET LINE DEV-c                 !Turn LINE DEV-c off
     STATE OFF
NCP> SET LINE DEV-c DUPLEX          !Restore the LINE to half duplex and
     HALF STATE ON                  !turn it back on.
NCP> SHOW LINE DEV-c                !Verify that the LINE is set to half
     CHARACTERISTICS                !duplex.
```

To change the protocol from Multipoint to Point-to-Point type the following: (Not possible for RSX)

```
NCP> SET CIR DEV-c.t                !Set the multipoint CIRCUITS of OFF.
     STATE OFF                      !If this is a multipoint control
                                    !station then repeat this command as
                                    !necessaay for all the CIRCUITS
                                    !(tributaries) for DEV-c.

NCP> CLEAR CIR DEV-c.t ALL          !Clears out the circuit parameters.
                                    !If this is a multipoint control
                                    !station then repeat this command as
                                    !necessary for all the circuits
                                    !(tributaries) for DEV-c. Be sure to
                                    !keep track of which circuits (the "t"
                                    !numbers) are cleared so they can
                                    !later be restored.

NCP> SET LINE DEV-c STATE           !Turn the LINE off.
     OFF

NCP> SET LINE DEV-c                 !Change the LINE mode to point to
PROTOCOL DDCMP POINT STATE          !point and turn the LINE back on. If
ON                                  !this is an HDX LINE and loopback
                                    !tests are desired then it can also be
                                    !changed to FDX as well at this time.
```

```
                                    !Use the following command string
                                    !instead: NCP> SET LINE DEV-c DUPLEX
                                    !FULL PROTOCOL DDCMP POINT STATE ON

NCP> SET CIRCUIT TRIBUTARY          !Create a point to point circuit.
     1 COST 1 STATE ON

NCP> SHOW LINE DEV-c                !Verify that the correct duplex and
     CHARACTERISTICS                !protocol are set.

NCP> SHOW CIRCUIT DEV-c             !Verify that the TRIBUTARY address
     CHARACTERISTICS                !is "1"
```

To set protocol back to Point-to-Point, type the following:

```
NCP> SET LINE DEV-c                 !Turn the line off.
     STATE OFF

NCP> SET CIRCUIT DEV-c              !Turn the circuit off..
     STATE OFF

NCP> CLEAR CIRCUIT DEV-c            !Clear out the old circuit parameters.
     ALL

NCP> CLEAR LINE DEV-c ALL           !Clear out the old line parameters.

NCP> SET LINE DEV-c ALL             !Restore the original line parameters.

NCP> SET CIRCUIT DEV-c.t            !Restore the original circuit
     ALL                            !parameters. If this is a multipoint
                                    !control station, then repeat this
                                    !command as necessary to restore all
                                    !the circuits (tributaries) that were
                                    !initially cleared in the above
                                    !procedure.
```

To put the line device into "Controller Loopback", type the following: (Valid only for device types DMC, DMF, DMP, and UNA) (If RSX must be version 4 or higher).

```
NCP> SET LINE DEV-c                 !Turn the LINE off.
     STATE OFF

NCP> SET LINE DEV-c                 !Enable CONTROLLER LOOPBACK mode and
     CONTROLLER LOOPBACK            !turn the line back on. Note that if
     STATE ON                       !the line is not FDX then it will have
                                    !to be made so at this time as well.
                                    !Use the following command instead:

                                    NCP> SET LINE DEV-c DUPLEX FULL CONTROL-
                                    LER LOOPBACK STATE ON

NCP> SHOW LINE DEV-c                !Verify that the LINE is in CONTROLLER
     CHARACTERISTICS                !LOOPBACK.
```

To return to normal operation, type the following:

```
NCP> SET LINE DEV-c                !Turn the line off.
     STATE OFF

NCP> SET LINE DEV-c                !Return device to normal operation and
     CONTROLLER NORMAL             !turn the LINE back on. Note that if
     STATE ON                      !the line was originally HDX then it
                                   !will have to be returned to that mode
                                   !as well at this time. Use the
                                   !following command instead:

                                   NCP> SET LINE DEV-c DUPLEX HALF
                                   CONTROLLER NORMAL STATE ON

NCP> SHWO LINE DEV-c               !Verify that the line is in
     CHARACTERISTICS               !CONTROLLER NORMAL.
```

CREATING A PSEUDO NODE

A PSEUDO node is a logical representation of a system, not a physical system. The PSEUDO node is a necessary tool for loopback operations (controller internal, cable, modem analog/digital loop, etc). When testing a system in this manner it is no longer connected to another system (node). By creating a PSEUDO node on the system that is in the loopback mode, the operator now has another logical system (node) to which to send and receive data. To create a PSEDUO node type the following:

```
NCP> SET NODE name                 !Creates a PSEUDO node called Name on
     CIRCUIT DEV-c                 the designated CIRCUIT Name can be what ever is
                                   desired, such as TEST NCP> SET NODE TEST CIR-
                                   CUIT DEV-c.

NCP> SHO CIRCUIT DEV-c             This will show the status for CIRCUIT DEV-c and the
                                   PSEUDO node name should show up under the Loopback
                                   Name column.
```

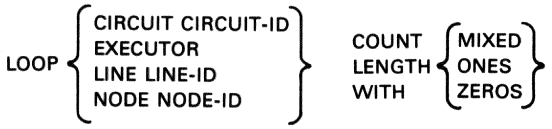
To delete a PSEUDO node, type the following:

```
NCP> CLEAR NODE name ALL           !Clears out the PSEUDO node called
                                   !name.
```

DECnet TEST COMMANDS

DECnet testing (provided the LINE and CIRCUIT modes are correct) consists of using the various forms of the LOOP command. The following outlines the more commonly used forms of the LOOP command and provide some examples. Refer to the *DECnet System Manager's Guide* for complete information.

FORMAT



MKV84-1260

WHERE

circuit-id, line-id	As described in the "DECNET DEVICE NAMING CONVENTIONS" section.
COUNT	Specifies the number of blocks to be sent (from 1 to 65,535). If the parameter is omitted only one (1) block is sent.
LENGTH	Specifies the length (in bytes) of the block to be sent. This parameter must be less than 50 for a device type of DMC. If this parameter is omitted, a block length of 128 bytes is used.
WIDTH	Specifies one of three types of binary information to be sent; MIXED – alternating ones and zeros ONES – all ones (1) ZEROS – all zeros (0) If omitted, a combination of ones and zeros (MIXED) is sent.

EXAMPLE COMMANDS

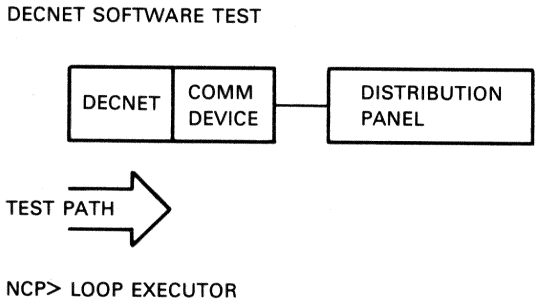
NCP>	LOOP EXECUTOR COUNT 10 !Tests the local DECnet software for !10 passes.
NCP> LOOP NODE name COUNT 5 LENGTH 50 WITH ONES	!Loops 5, 50 byte, all ones messages !through node name.
NCP> LOOP CIRCUIT DEV-c	!Loops the default message across the !CIRCUIT through a loopback device !(another node, test connector, modem !in analog loop, etc.)

DECnet TESTING PROCEDURES

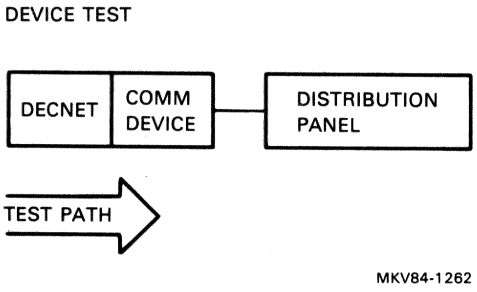
The following outlines a bottom up approach to testing a DECnet communications problem. Each test is standalone and does not rely on any previous or following tests. Thus, the operator may begin anywhere appropriate to the problem and fall back or proceed forward as necessary. The examples shown use the default test message conditions, refer to the DECnet TEST COMMANDS section to see how to alter the default message. The tests are a list of procedures which will make use of the information and command examples provided in previous sections. In some cases the actual DECnet (NCP) command will be shown. If a failure occurs while testing, take the appropriate corrective maintenance action based on where the failure occurs.

Examine the error counters after testing. They should generally be zero. If the communication medium is via modems or the telephone network is dial up lines, some errors should be expected. The operator should consider the number of bytes sent/received against the number of errors logged and determine if there is a problem with the telephone line and/or modem. Bear in mind that on dial up lines the number of error conditions will vary each time the connection is made.

Test the local DECnet software. No communications hardware is tested here.



Test the communications hardware interface (device). This is a test of the device up to point just before the interface external receivers and drivers.



1. Set this line to controller loopback. Insure that is also full duplex.
2. Zero the error counters for this circuit.
3. Show status for this circuit. The State should be ON and the Adjacent Node column should indicate the name of this node.
4. Examine the error counters for this circuit. They should be zero. If this passes, the device is operational.
5. Create a PSEUDO node for this circuit.
6. Use the name selected for the PSEUDO node:

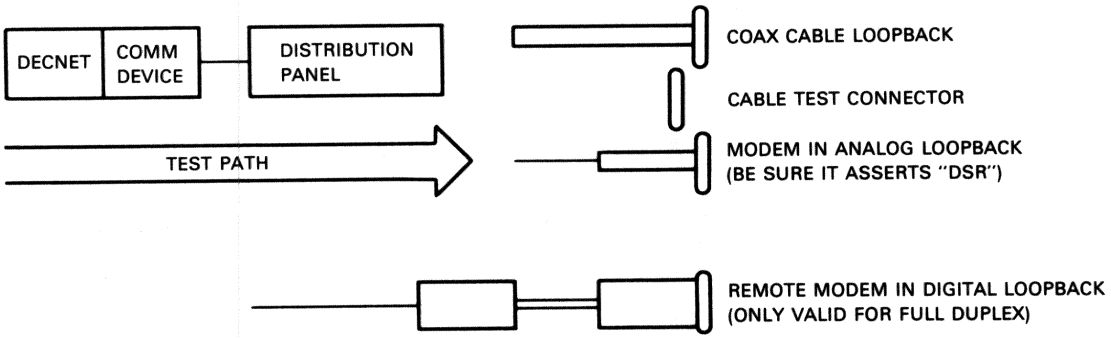
   NCP> Loop Node name
7. Examine the error counters for this circuit. They should still be zero. Repeate steps 6 – 7 if necessary.

8. Return the line to its normal operating mode. See step #1.

9. Clear out the PSEUDO node that was created.

The following procedure tests the EIA receivers and drivers, distribution panel, I/O cable and local modem.

SYSTEM LOOPBACK TEST



1. Ensure the line is in full duplex mode.

2. Install the appropriate test connector (or depress the loopback/test switch) on the distribution panel.

3. Zero the error counters for this CIRCUIT.

4. Show status for this circuit. The State should be ON, and the adjacent node column should indicate the Name of this node.

5. Examine the error counters for this circuit. They should be zero.

6. Create a PSEUDO node for this circuit.

7. Use the Name selected for the PSEUDO node:

   NCP> Loop Node name

8. Examine the error counters for this circuit. They should still be zero.

9. Proceed to the next stage of loopback as appropriate:

   a. Loop the coax cable back on itself.

   b. Install the cable loopback/test connector on the end of the cable that plugs into the modem.

10. Repeat steps #7 and #8. If testing a coax cable link or a modem eliminator proceed to the next test. If testing modems then continue with the next step.

11. Set the local modem to analog loopback mode. Insure that it still asserts DSR.

12. Repeat steps #7 and #8. If the modem link is full duplex then proceed. If not go to the next test procedure.

13. Set the remote modem to digital loopback mode. The local modem should be in its normal mode.

14. Execute the process in steps #7 and #8.

15. Clear the PSEUDO node that was created.

The following test procedure checks the DECnet to DECnet communications path between two systems. The diagram shows a point to point system, but this test is still applicable for:

- A multipoint control station to a multipoint tributary.
- A multipoint tributary to another multipoint tributary.
- Any two nodes on a ETHERNET.

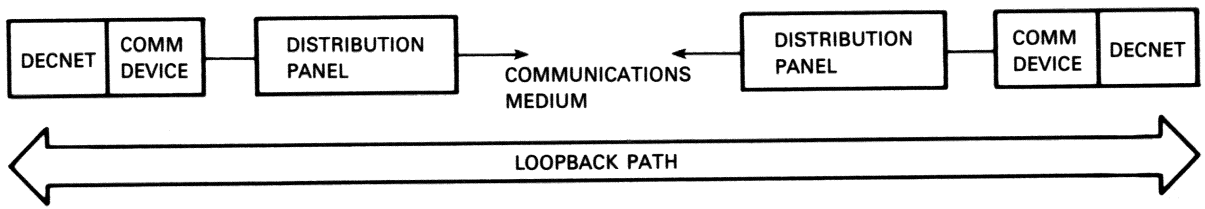
1. Show status for this CIRCUIT TO INSURE THAT THE LINK IS OPERATIONAL BETWEEN THE TWO NODES (STATE = NO).

2. ZERO the error counters.

3. NCP> LOOP NODE name !name is the name or node address of !the adjacent node.

4. Examine the error counters, they should be zero.

SYSTEM TO SYSTEM LOOPBACK PATH



MKV84-1264

DH11 INSTALLATION

DH11 OPTION

DH11 General Description

The DH11 is a 16 line asynchronous multiplexer that interfaces the PDP-11 UNIBUS to up to 16 serial lines, each operating with individual parameters.

DH11 Features

- Program selectable speeds up to 9600 b/s;
- Programmable character lengths, stop bits, and parity;
- Half- or full-duplex;
- Full modem control; and
- EIA RS-232-C, and/or 20 mA operation.

DH11 Reference Documentation

Refer to following documents if the level of content in this section is insufficient:

- *QMA DH11 Asynchronous 16-Line Multiplexer Technical Manual* – EK-DHQMA-TM
- *DM11-BB Modem Control User's Manual* – EK-DM11B-OP
- *DH11 Engineering Prints* – B-D-DH11-O-N.

QMA DH11 Components List

Table DH-1 QMA Components List

Option/Parts List	Description
Factory Installed Options (See Note 1)	
DH11-AP/DP	
Field Upgrade Options (See Note 2)	
DH11-M	RS-232-C Interface
1 - G727	Grant Continuity Card
1 - H8611	Berg™ Test Connector
1 - M796	UNIBUS Master Control Module
1 - M920	Internal Bus Connector
1 - M4540	Crystal Clock Module
1 - M5906	Priority Sel. and EIA Conv. Module
1 - M7147	Modem Control Module
1 - M7277	Current Address and Address Sel.
1 - M7278	Registers and Byte Control Module
1 - M7279	FIFO Buffer Module (Silo)
2 - M7280	Multiple UART Modules
1 - M7288	Line Parameter Control Module
1 - M7289	System Control and Receiver Scan Mod
1 - M7807	EIA Level Convert Module
2 - M7821	Interrupt Control Modules
1 - 1318784	Resistance Network
1 - 7009180	9-Slot Wired Backplane Assembly
1 - 7009561	Power Harness
DH11-N	20 mA Interface
Sames as DH11-M without M7147 and M7807	

NOTE

1. **Factory installed options may only be obtained when the system is being originally configured.**

2. **Upgrade options require a base option and cabinet kit.**

Table DH-2 DH11 Cabinet Kit Contents

CONTENTS \ CABINET KIT	CK-DH11-AD	CK-DH11-AE	CK-DH11-A1	CK-DH11-A2	CK-DH11-DD	CK-DH11-DE	CK-DH11-D1	CK-DH11-D2
BC08S-07		6				6		
BC08S-10	6		6		6		6	
BC08S-15				2				
BC08R-15								
H315	1	1	1	1		1	1	1
H317-B				1	1			1
H861	1	1	1	1	1	1	1	1
H3007	2	2	2		2	2	2	
H9544-SJ			1				1	

MKV84-1306

Table DH-3 QMA DH11 Power Requirements/UNIBUS Loading

Option	Voltage Rating Volts	Amps	Maximum Voltage	Minimum Voltage	Backplane Pin No.	UNIBUS Loading
DH11-M	+5.0	10.8*	+5.25	+5.00	C9A2	3 DC
	+15.0	.400	+15.75	+14.75	A7B1	13 AC
	−15.0	.645	−15.75	−14.75	C9B2	
DH11-N	+5.0	8.600	+5.25	+5.00	C9A2	2 DC
	+15.0	.100	+15.75	+14.75	A7B1	13 AC
	−15.00	.340	−15.75	−14.75	C9B2	

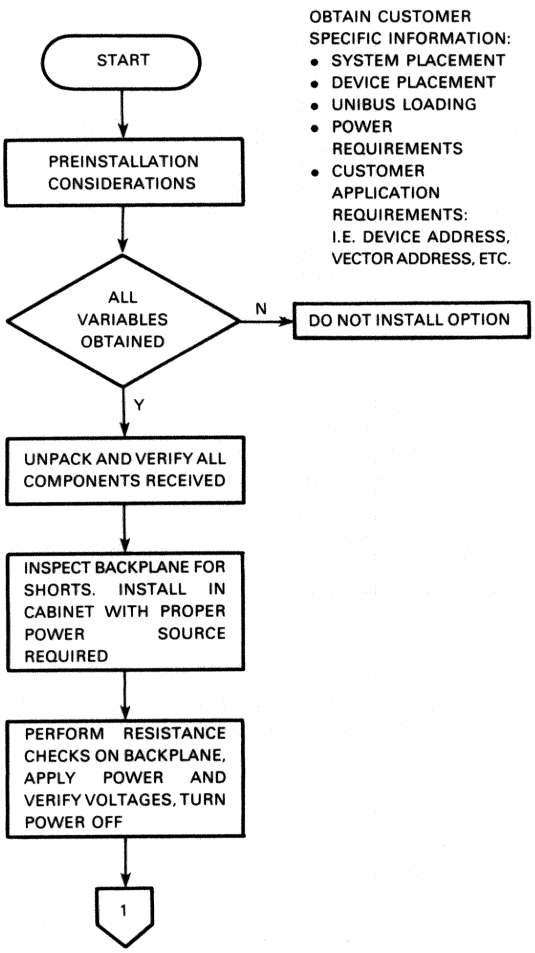
* Add 0.2A if last option on UNIBUS (UNIBUS terminator consumes 0.2 A)

Table DH-4 Power/UNIBUS Loading

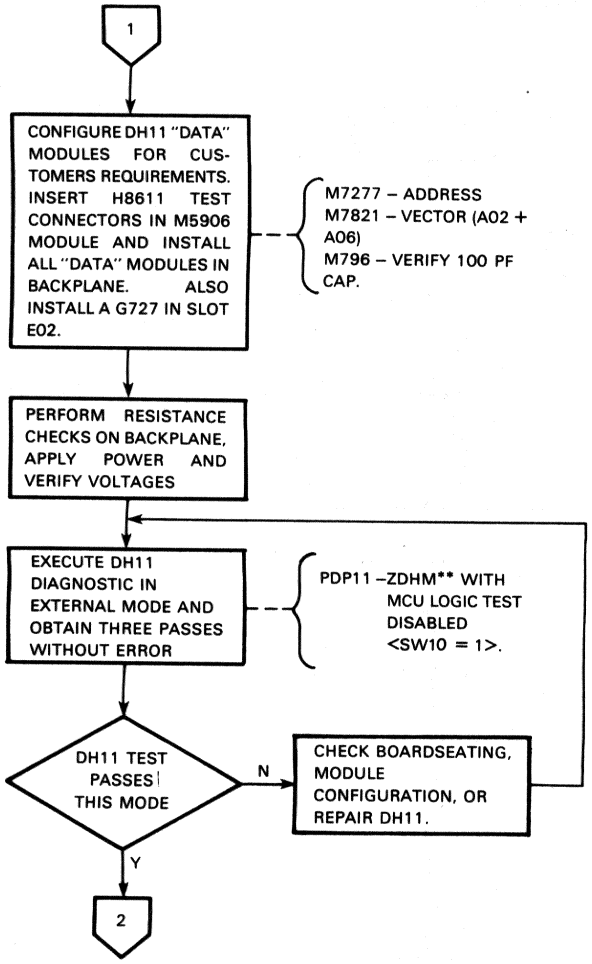
Option	Voltage Rating (Approximate Values)	Maximum Voltage	Minimum Voltage	Back-plane Pin No.	UNIBUS Loading
DH11-AA,AB,AC	+5 Vdc@8.4 A*	+5.25	+5.0	C9A2	
Without DM11-BB	+5 Vdc@11.2 A*	+5.25	+5.0	C9A2	3 UNIBUS Loads
With DM11-BB	-15 Vdc@240 MA	−15.75	−14.75	C9B2	(2 UNIBUS Loads without DM11-BB
DH11-AD	+5 Vdc@10.8 A*	+5.25	+5.0	C9A2	
With Modem	+15 Vdc@400 mA	+15.75	+14.75	A7B1	
Control	-15 Vdc@645 mA	−15.75	−14.75	C9B2	3 UNIBUS Loads
DH11-AE	+5 Vdc@8.6 A*	+5.25	+5.0	C9A2	
Without Modem	+15 Vdc@100 mA	+15.75	+14.75	A7B1	2 UNIBUS Loads
Control	-15 Vdc@340 mA	−15.75	−14.75	C9B2	
DM11-AA	+5 Vdc@4.0 A	+5.25	+5.0	A4A2	
Distribution	+15 Vdc@2.0 A	+15.75	+14.75	A4N2	NO UNIBUS
Panel	-15 Vdc@2.0 A	−15.75	−14.75	A4B2	Loads

*Add 0.2 A if last option on UNIBUS (UNIBUS Terminator consumes 0.2 A).

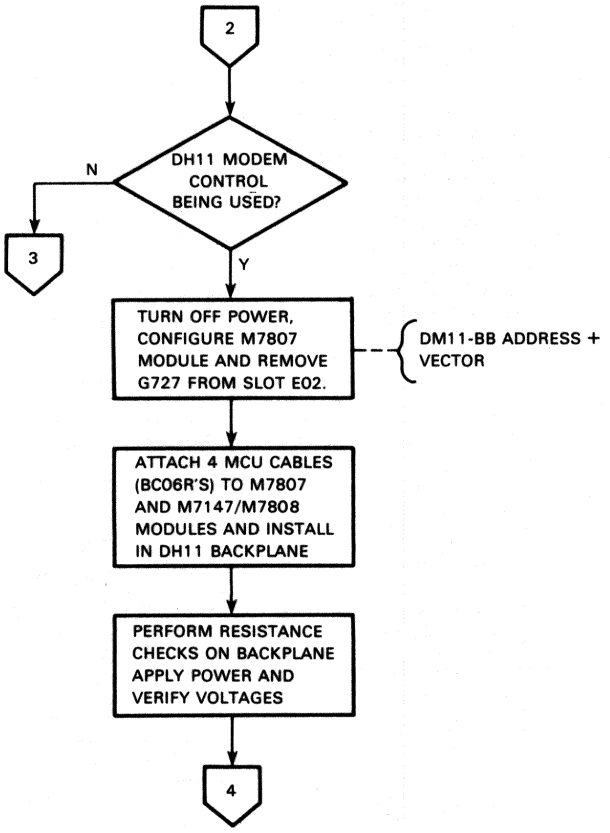
QMA DH11 Installation Flowchart



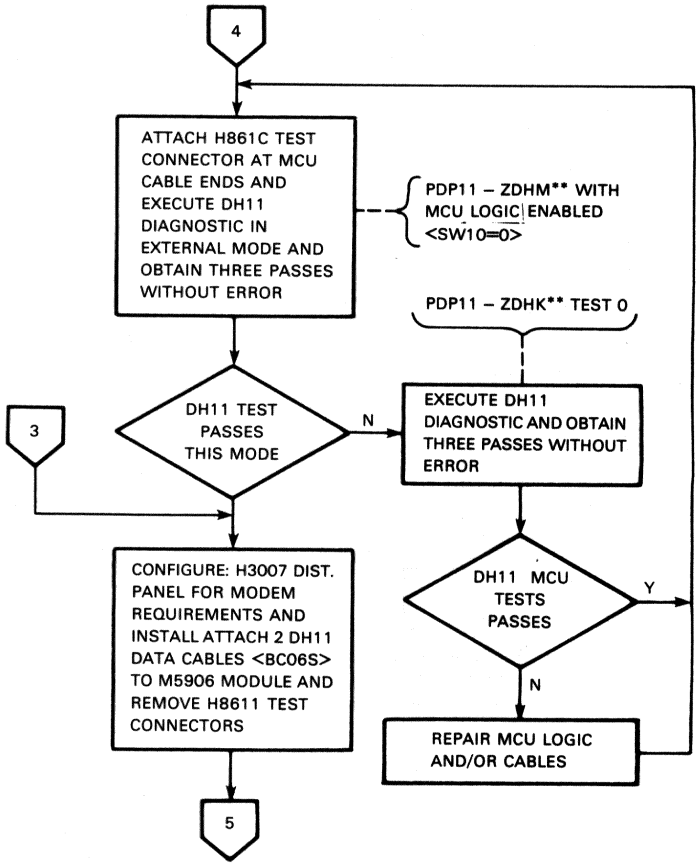
MKV84-1307


1
CONFIGURE DH11 "DATA" MODULES FOR CUSTOMERS REQUIREMENTS. INSERT H8611 TEST CONNECTORS IN M5906 MODULE AND INSTALL ALL "DATA" MODULES IN BACKPLANE. ALSO INSTALL A G727 IN SLOT E02.
M7277 – ADDRESS
M7821 – VECTOR (A02 + A06)
M796 – VERIFY 100 PF CAP.
PERFORM RESISTANCE CHECKS ON BACKPLANE, APPLY POWER AND VERIFY VOLTAGES
EXECUTE DH11 DIAGNOSTIC IN EXTERNAL MODE AND OBTAIN THREE PASSES WITHOUT ERROR
PDP11 –ZDHM** WITH MCU LOGIC TEST DISABLED <SW10 = 1>.
DH11 TEST PASSES THIS MODE
N
CHECK BOARDSEATING, MODULE CONFIGURATION, OR REPAIR DH11.
Y
2

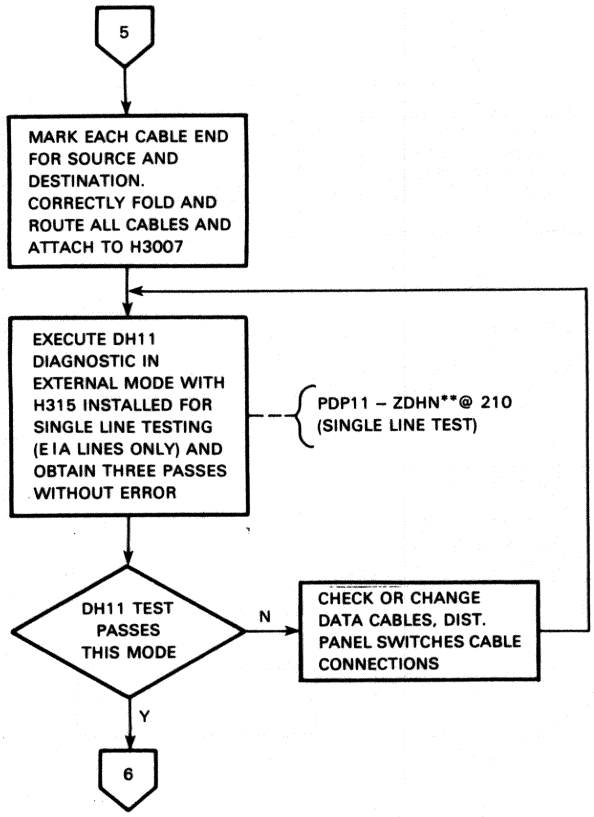
MKV84-1308


2
DH11 MODEM CONTROL BEING USED?
N
3
Y
TURN OFF POWER, CONFIGURE M7807 MODULE AND REMOVE G727 FROM SLOT E02.
DM11-BB ADDRESS + VECTOR
ATTACH 4 MCU CABLES (BC06R'S) TO M7807 AND M7147/M7808 MODULES AND INSTALL IN DH11 BACKPLANE
PERFORM RESISTANCE CHECKS ON BACKPLANE APPLY POWER AND VERIFY VOLTAGES
4

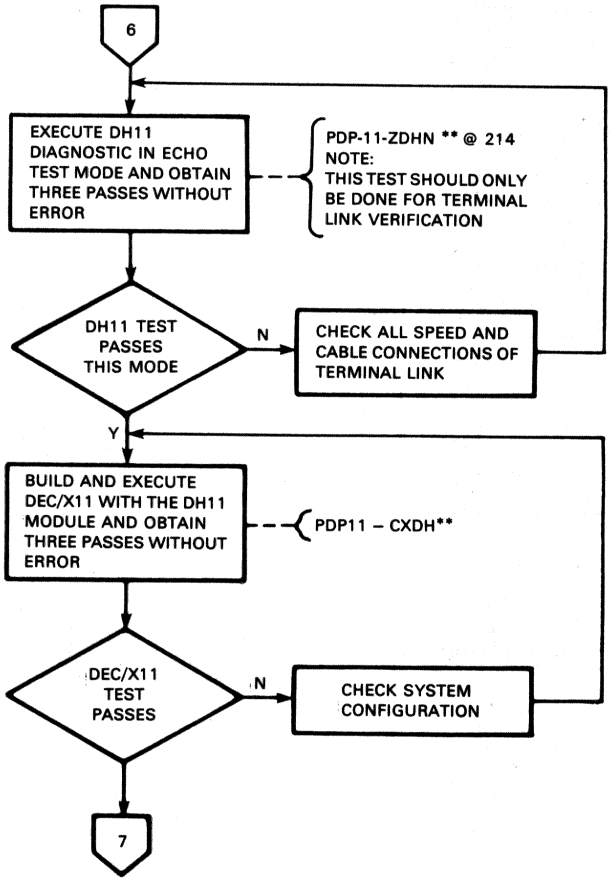
MKV84-1309


4
ATTACH H861C TEST CONNECTOR AT MCU CABLE ENDS AND EXECUTE DH11 DIAGNOSTIC IN EXTERNAL MODE AND OBTAIN THREE PASSES WITHOUT ERROR
PDP11 – ZDHM** WITH MCU LOGIC ENABLED <SW10=0>
PDP11 – ZDHK** TEST 0
3
DH11 TEST PASSES THIS MODE
N
EXECUTE DH11 DIAGNOSTIC AND OBTAIN THREE PASSES WITHOUT ERROR
DH11 MCU TESTS PASSES
Y
N
CONFIGURE: H3007 DIST. PANEL FOR MODEM REQUIREMENTS AND INSTALL ATTACH 2 DH11 DATA CABLES <BC06S> TO M5906 MODULE AND REMOVE H8611 TEST CONNECTORS
REPAIR MCU LOGIC AND/OR CABLES
5

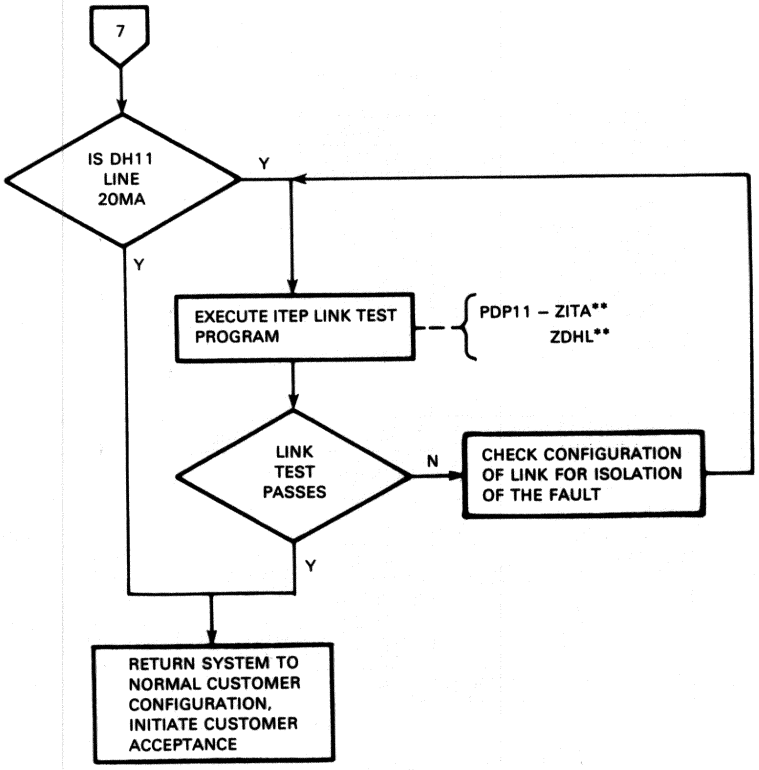
MKV84-1310


5
MARK EACH CABLE END FOR SOURCE AND DESTINATION. CORRECTLY FOLD AND ROUTE ALL CABLES AND ATTACH TO H3007
EXECUTE DH11 DIAGNOSTIC IN EXTERNAL MODE WITH H315 INSTALLED FOR SINGLE LINE TESTING (EIA LINES ONLY) AND OBTAIN THREE PASSES WITHOUT ERROR
PDP11 – ZDHN**@ 210 (SINGLE LINE TEST)
DH11 TEST PASSES THIS MODE
N
CHECK OR CHANGE DATA CABLES, DIST. PANEL SWITCHES CABLE CONNECTIONS
Y
6

MKV84-1311

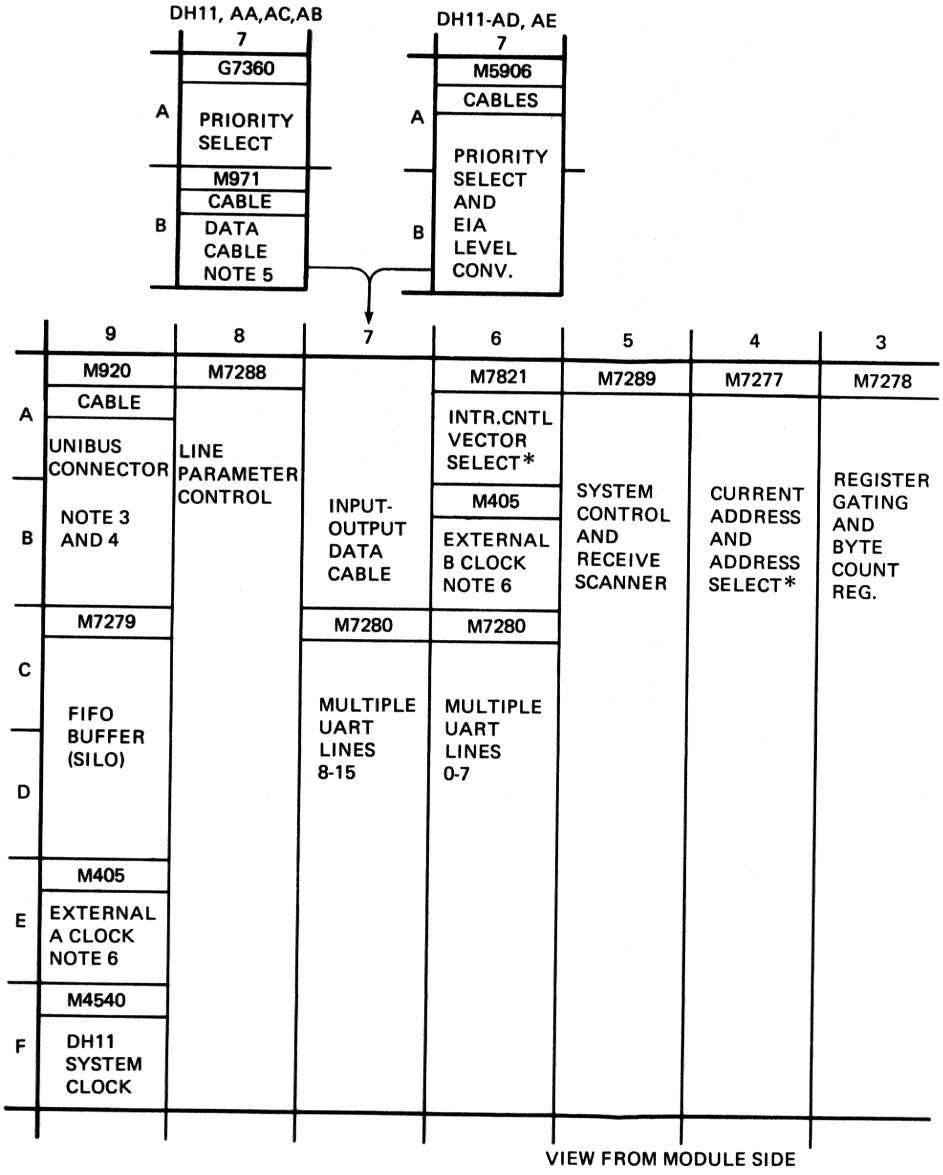

6
EXECUTE DH11 DIAGNOSTIC IN ECHO TEST MODE AND OBTAIN THREE PASSES WITHOUT ERROR
PDP-11-ZDHN ** @ 214
NOTE:
THIS TEST SHOULD ONLY BE DONE FOR TERMINAL LINK VERIFICATION
DH11 TEST PASSES THIS MODE
N
CHECK ALL SPEED AND CABLE CONNECTIONS OF TERMINAL LINK
Y
BUILD AND EXECUTE DEC/X11 WITH THE DH11 MODULE AND OBTAIN THREE PASSES WITHOUT ERROR
PDP11 – CXDH**
DEC/X11 TEST PASSES
N
CHECK SYSTEM CONFIGURATION
7

MKV84-1312

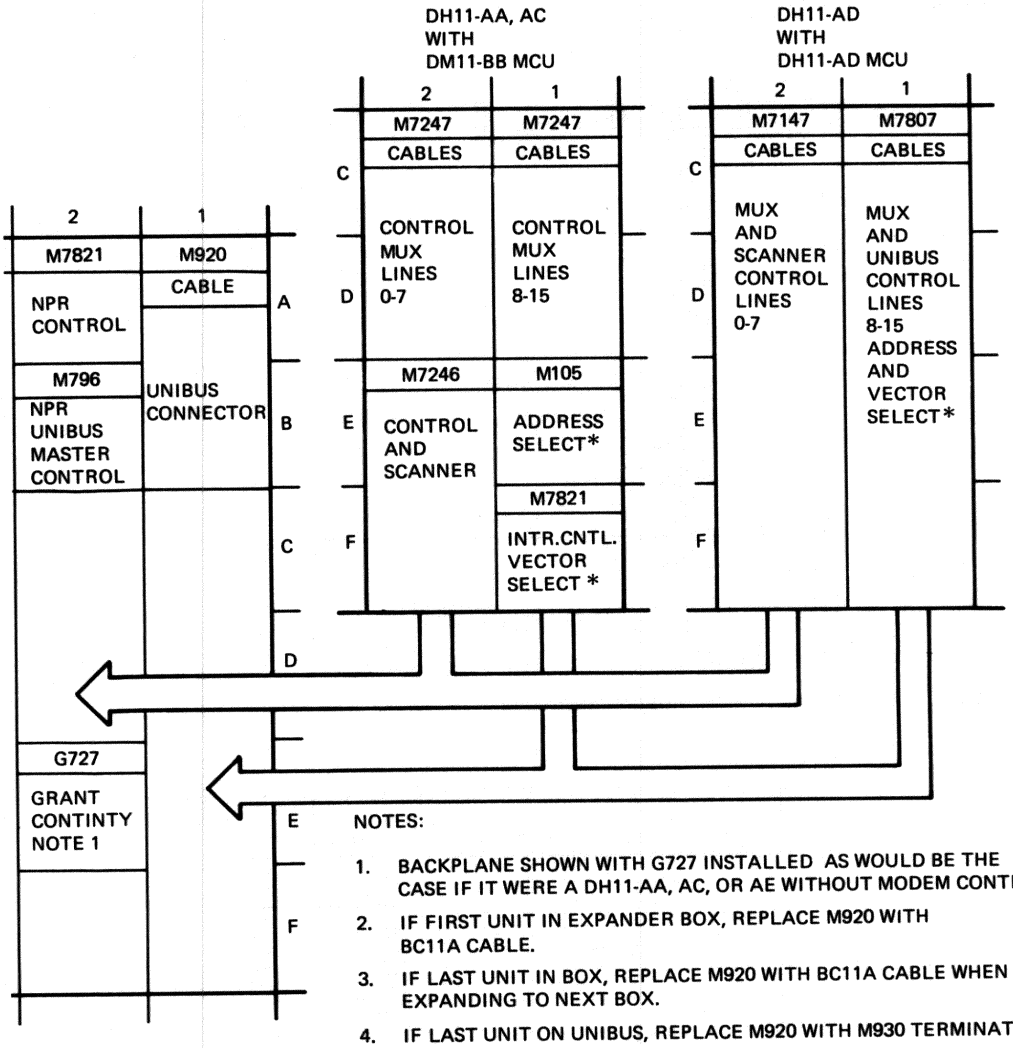

7
IS DH11 LINE 20MA
Y
Y
EXECUTE ITEP LINK TEST PROGRAM
PDP11 – ZITA**
ZDHL**
LINK TEST PASSES
N
CHECK CONFIGURATION OF LINK FOR ISOLATION OF THE FAULT
Y
RETURN SYSTEM TO NORMAL CUSTOMER CONFIGURATION, INITIATE CUSTOMER ACCEPTANCE

MKV84-1313

DH11 Backplane Module Placement



* REQUIRES JUMPER SELECTION



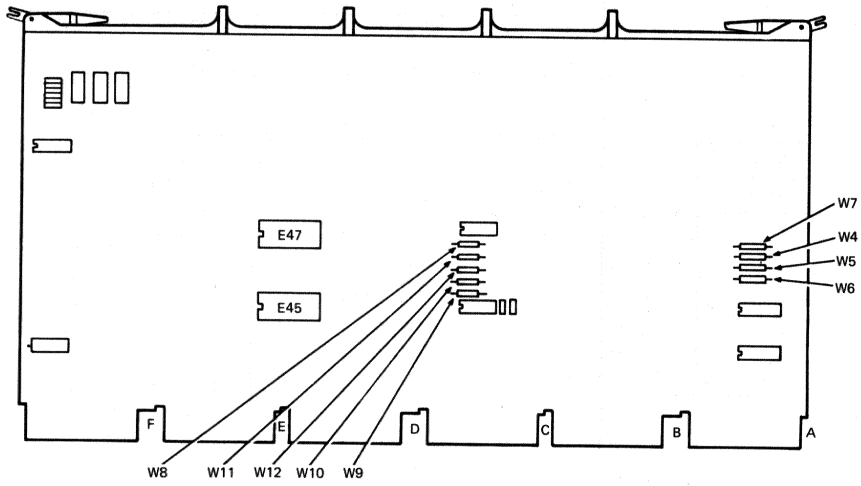
NOTES:

1. BACKPLANE SHOWN WITH G727 INSTALLED AS WOULD BE THE CASE IF IT WERE A DH11-AA, AC, OR AE WITHOUT MODEM CONTROL.
2. IF FIRST UNIT IN EXPANDER BOX, REPLACE M920 WITH BC11A CABLE.
3. IF LAST UNIT IN BOX, REPLACE M920 WITH BC11A CABLE WHEN EXPANDING TO NEXT BOX.
4. IF LAST UNIT ON UNIBUS, REPLACE M920 WITH M930 TERMINATOR.
5. FOR DIAGNOSTIC CHECKOUT OF DH11-AA, AB, AC, REPLACE M971 (B07) WITH M974 TURNAROUND MODULE.
6. MODULE SLOTS PROVIDE FOR ADDITIONAL CLOCK RATES.

MK-2612

M7277 Module:

- Slot 4



- Resides In Floating Address Space **(See Chapter 2)**
- Device Address Ranks 2

DH11 Data Control Device Address Jumper Selection

MSB															LSB
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1	1	1	← JUMPERS →									0	0	0	0

JUMPER NUMBERS	W12	W11	W10	W9	W8	W7	W6	W5	W4	DEVICE ADDRESS
										760000
									OUT	760020
								OUT		760040
								OUT	OUT	760060
							OUT			760100
							OUT		OUT	760120
							OUT	OUT		760140
							OUT	OUT	OUT	760160
						OUT				760200
						OUT			OUT	760220
						OUT		OUT		760240
						OUT		OUT	OUT	760260
						OUT	OUT			760300
										- - - -
					OUT					760400
										- - - -
					OUT		OUT			760500
										- - - -
					OUT	OUT				760600
										- - - -
					OUT	OUT	OUT			760700
										- - - -
				OUT						761000

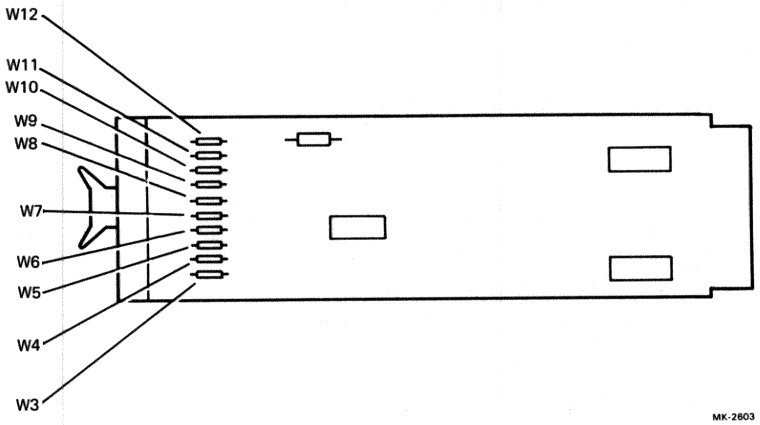
NOTE: JUMPER OUT RESPONDS TO LOGICAL ONE ON THE UNIBUS.

MK-2598

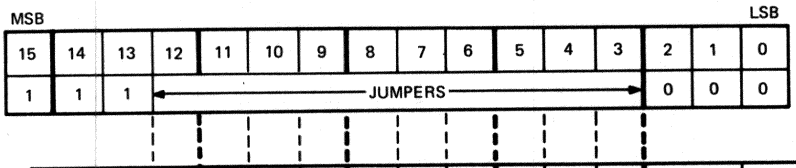
DM11-BB Modem Control Device Address Jumper Selection

M105 Module:

- Slot E1
- The DM11-BB Resides In Fixed Address Space Starting At 770510.



Jumper Selection



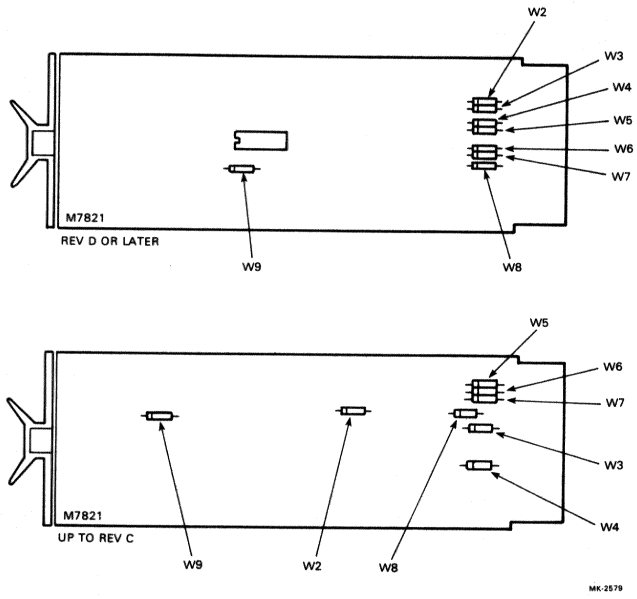
JUMPER NUMBER	W12	W11	W10	W9	W8	W7	W6	W5	W4	W3	DEVICE ADDRESS	NUMBER OF UNIT
	OUT				OUT		OUT				770500	1ST
	OUT				OUT		OUT			OUT	770510	2ND
	OUT				OUT		OUT		OUT		770520	3RD
	OUT				OUT		OUT		OUT	OUT	770530	4TH
	OUT				OUT		OUT	OUT			770540	5TH
	OUT				OUT		OUT	OUT		OUT	770550	6TH
	OUT				OUT		OUT	OUT	OUT		770560	7TH
	OUT				OUT		OUT	OUT	OUT	OUT	770570	8TH
	OUT				OUT	OUT					770600	9TH
	OUT				OUT	OUT				OUT	770610	10TH
	OUT				OUT	OUT			OUT		770620	11TH
	OUT				OUT	OUT			OUT	OUT	770630	12TH
	OUT				OUT	OUT		OUT			770640	13TH
	OUT				OUT	OUT		OUT		OUT	770650	14TH
	OUT				OUT	OUT		OUT	OUT		770660	15TH
	OUT				OUT	OUT		OUT	OUT	OUT	770670	16TH
												MAX #/SYS.

NOTE: JUMPER OUT RESPONDS TO LOGICAL ONE ON THE UNIBUS.

MK-2604

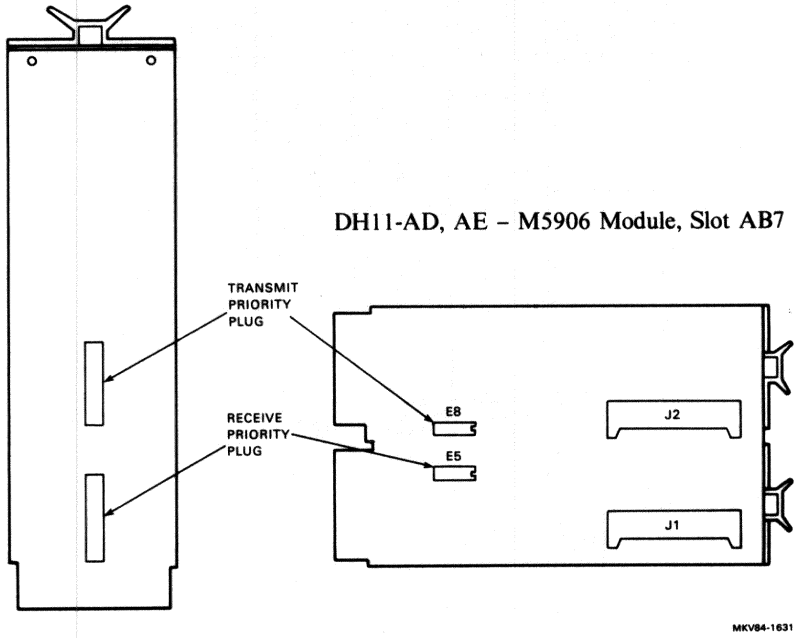
DH11 Data Control/DM11-BB Modem Control Vector Address Jumper Selection M7821:

- Slot A6 For Data Control
- Slot F1 For DM11-BB Modem Control
- W9 – Normally In, Except For PDP11/15s or 20s.



Priority Plug Placement

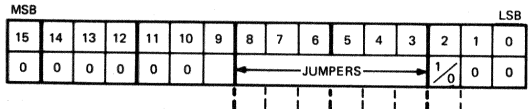
DH11-AA, AB or AC – G7360 Module, Slot A 7



DH11-AD, AE – M5906 Module, Slot AB7

Data Control Vector Selection

M7821 Module, Slot A6



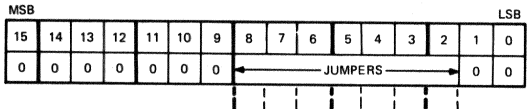
JUMPER NUMBER	W8	W7	W6	W5	W4	W3	W2	VECTOR ADDRESS
		IN	IN				IN	300
		IN	IN			IN	IN	310
		IN	IN		IN		IN	320
		IN	IN		IN	IN	IN	330
		IN	IN	IN			IN	340
		IN	IN	IN		IN	IN	350
		IN	IN	IN	IN		IN	360
		IN	IN	IN	IN	IN	IN	370
	IN						IN	400
								- - -
	IN		IN				IN	500
								- - -
	IN	IN					IN	600
								- - -
	IN	IN	IN				IN	700
								- - -

* W2 MUST ALWAYS BE IN: XX0 = RECEIVE / XX4 = TRANSMIT
NOTE: JUMPER INSTALLED PRODUCES LOGICAL ONE ON THE UNIBUS.

MK-2597

DM11-BB Modem Control Vector Selection

M7821 Module, Slot F1



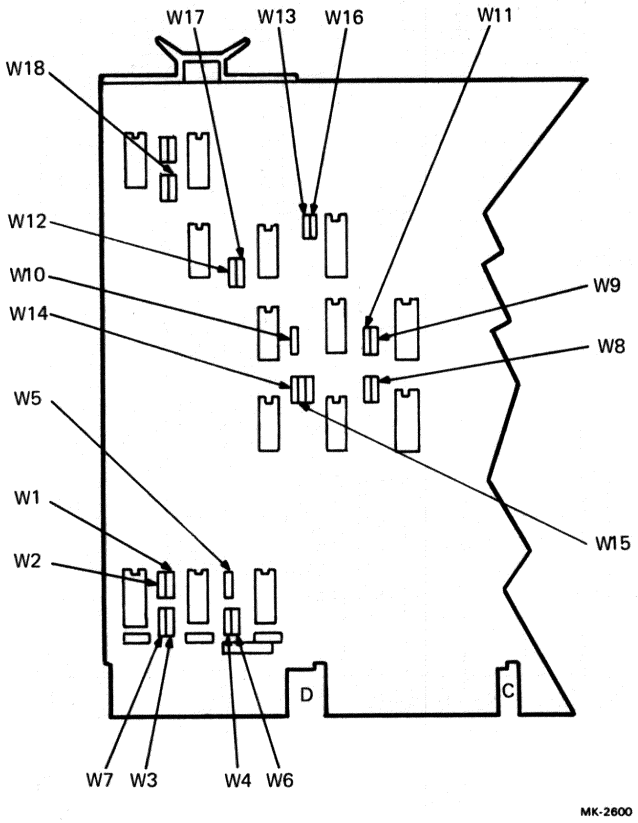
JUMPER NUMBER	W8	W7	W6	W5	W4	W3	W2	VECTOR ADDRESS
		IN	IN					300
		IN	IN				IN	304
		IN	IN			IN		310
		IN	IN			IN	IN	314
		IN	IN		IN			320
		IN	IN		IN		IN	324
		IN	IN		IN	IN		330
		IN	IN		IN	IN	IN	334
		IN	IN	IN				340
		IN	IN	IN			IN	344
		IN	IN	IN		IN		350
		IN	IN	IN		IN	IN	354
		IN	IN	IN	IN			360
		IN	IN	IN	IN		IN	364
		IN	IN	IN	IN	IN		370
		IN	IN	IN	IN	IN	IN	374
	IN							400
								- - -
	IN		IN					500
								- - -
	IN	IN						600
								- - -
	IN	IN	IN					700

NOTE: JUMPER INSTALLED PRODUCES LOGICAL ONE ON THE UNIBUS.

MK-2605

DH11-AD Modem Control Device/Vector Address Jumper Selection

M7808 Module, Slot CDEF 1



M7807 Device Address Jumper Selection

MSB LSB

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1	1	1	← JUMPERS →										0	0	0

JUMPER NUMBER	W8	W14	W11	W9	W10	W17	W16	W13	W12	W15	DEVICE ADDRESS	NUMBER OF UNIT
	OUT						OUT				770500	1ST
	OUT				OUT		OUT			OUT	770510	2ND
	OUT				OUT		OUT		OUT		770520	3RD
	OUT				OUT		OUT		OUT	OUT	770530	4TH
	OUT				OUT		OUT	OUT			770540	5TH
	OUT				OUT		OUT	OUT		OUT	770550	6TH
	OUT				OUT		OUT	OUT	OUT		770560	7TH
	OUT				OUT		OUT	OUT	OUT	OUT	770570	8TH
	OUT				OUT	OUT					770600	9TH
	OUT				OUT	OUT				OUT	770610	10TH
	OUT				OUT	OUT			OUT		770620	11TH
	OUT				OUT	OUT			OUT	OUT	770630	12TH
	OUT				OUT	OUT		OUT			770640	13TH
	OUT				OUT	OUT		OUT		OUT	770650	14TH
	OUT				OUT	OUT		OUT	OUT		770660	15TH
	OUT				OUT	OUT		OUT	OUT	OUT	770670	16TH
												MAX #/SYS.

NOTE: JUMPER OUT RESPONDS TO LOGICAL ONE ON THE UNIBUS.

MK-2[illegible]

M7807 Vector Address Jumper Selection

MSB LSB

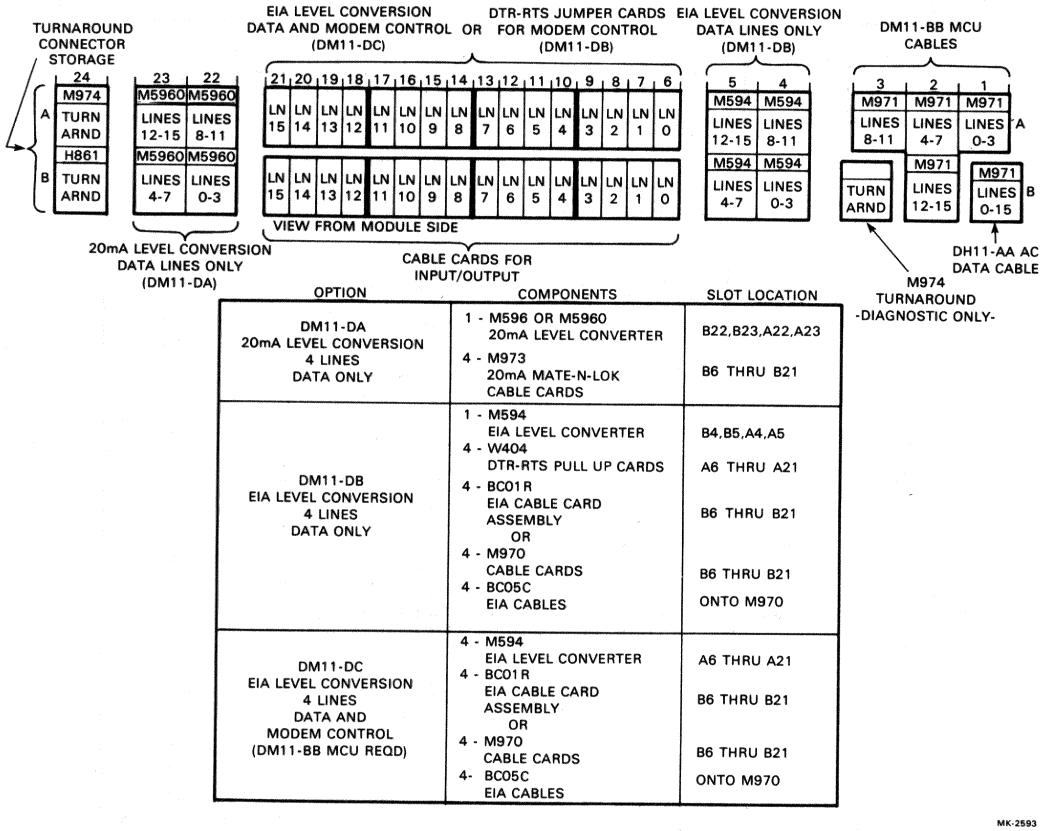
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	0	0	0	0	← JUMPERS →							0	0

JUMPER NUMBER	W1	W5	W4	W6	W7	W3	W2	VECTOR ADDRESS
		IN	IN					300
		IN	IN				IN	304
		IN	IN			IN		310
		IN	IN			IN	IN	314
		IN	IN		IN			320
		IN	IN		IN		IN	324
		IN	IN		IN	IN		330
		IN	IN		IN	IN	IN	334
		IN	IN	IN				340
		IN	IN	IN			IN	344
		IN	IN	IN		IN		350
		IN	IN	IN		IN	IN	354
		IN	IN	IN	IN			360
		IN	IN	IN	IN		IN	364
		IN	IN	IN	IN	IN		370
		IN	IN	IN	IN	IN	IN	374
	IN							400
								- - -
	IN		IN					500
								- - -
	IN	IN						600
								- - -
	IN	IN	IN					700

NOTE: JUMPER INSTALLED PRODUCES LOGICAL ONE ON THE UNIBUS.

MK-2606

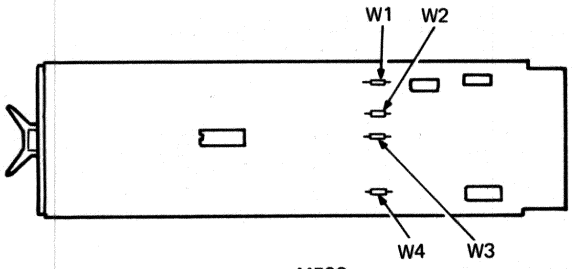
DM11-AA Distribution Panel Module Placement



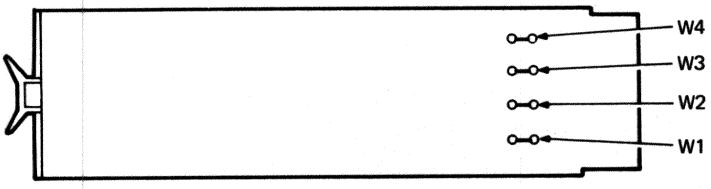
OPTION	COMPONENTS	SLOT LOCATION
DM11-DA 20mA LEVEL CONVERSION 4 LINES DATA ONLY	1 - M596 OR M5960 20mA LEVEL CONVERTER 4 - M973 20mA MATE-N-LOK CABLE CARDS	B22,B23,A22,A23 B6 THRU B21
DM11-DB EIA LEVEL CONVERSION 4 LINES DATA ONLY	1 - M594 EIA LEVEL CONVERTER 4 - W404 DTR-RTS PULL UP CARDS 4 - BC01R EIA CABLE CARD ASSEMBLY OR 4 - M970 CABLE CARDS 4 - BC05C EIA CABLES	B4,B5,A4,A5 A6 THRU A21 B6 THRU B21 B6 THRU B21 ONTO M970
DM11-DC EIA LEVEL CONVERSION 4 LINES DATA AND MODEM CONTROL (DM11-BB MCU REQD)	4 - M594 EIA LEVEL CONVERTER 4 - BC01R EIA CABLE CARD ASSEMBLY OR 4 - M970 CABLE CARDS 4- BC05C EIA CABLES	A6 THRU A21 B6 THRU B21 B6 THRU B21 ONTO M970

MK-2593

M596/M5960 Jumper Selections



M596



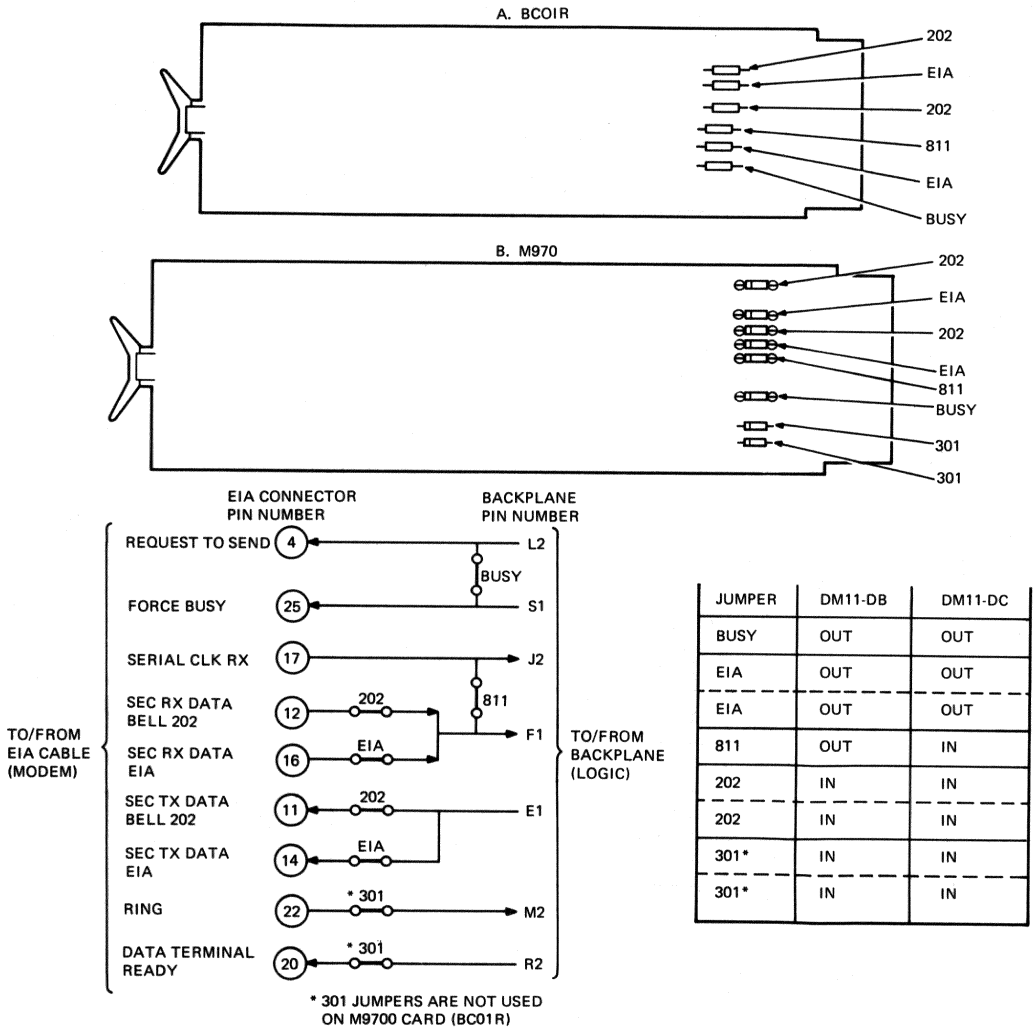
M5960

	SLOTS				JUMPERS	
	B22	B23	A22	A23	M596	M5960
LINES	0	4	8	12	W4	W2
	1	5	9	13	W2	W4
	2	6	10	14	W1	W3
	3	7	11	15	W3	W1

REMOVE JUMPER FOR SPEEDS ABOVE 150 BPS ON THE ASSOCIATED LINE

MK-2608

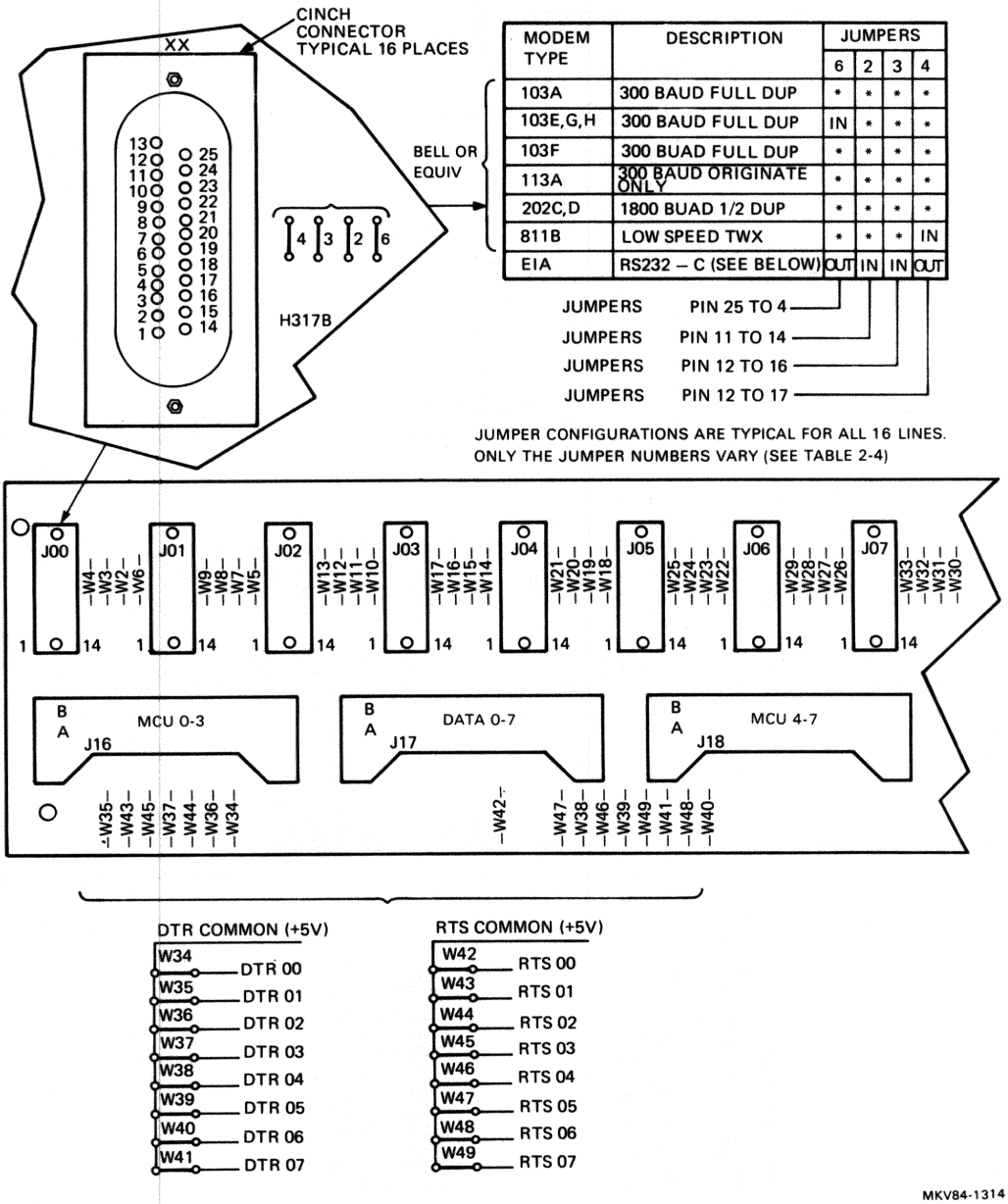
BC01R/M970 Modem Control Jumper Selection



JUMPER	DM11-DB	DM11-DC
BUSY	OUT	OUT
EIA	OUT	OUT
EIA	OUT	OUT
811	OUT	IN
202	IN	IN
202	IN	IN
301*	IN	IN
301*	IN	IN

MK-2609

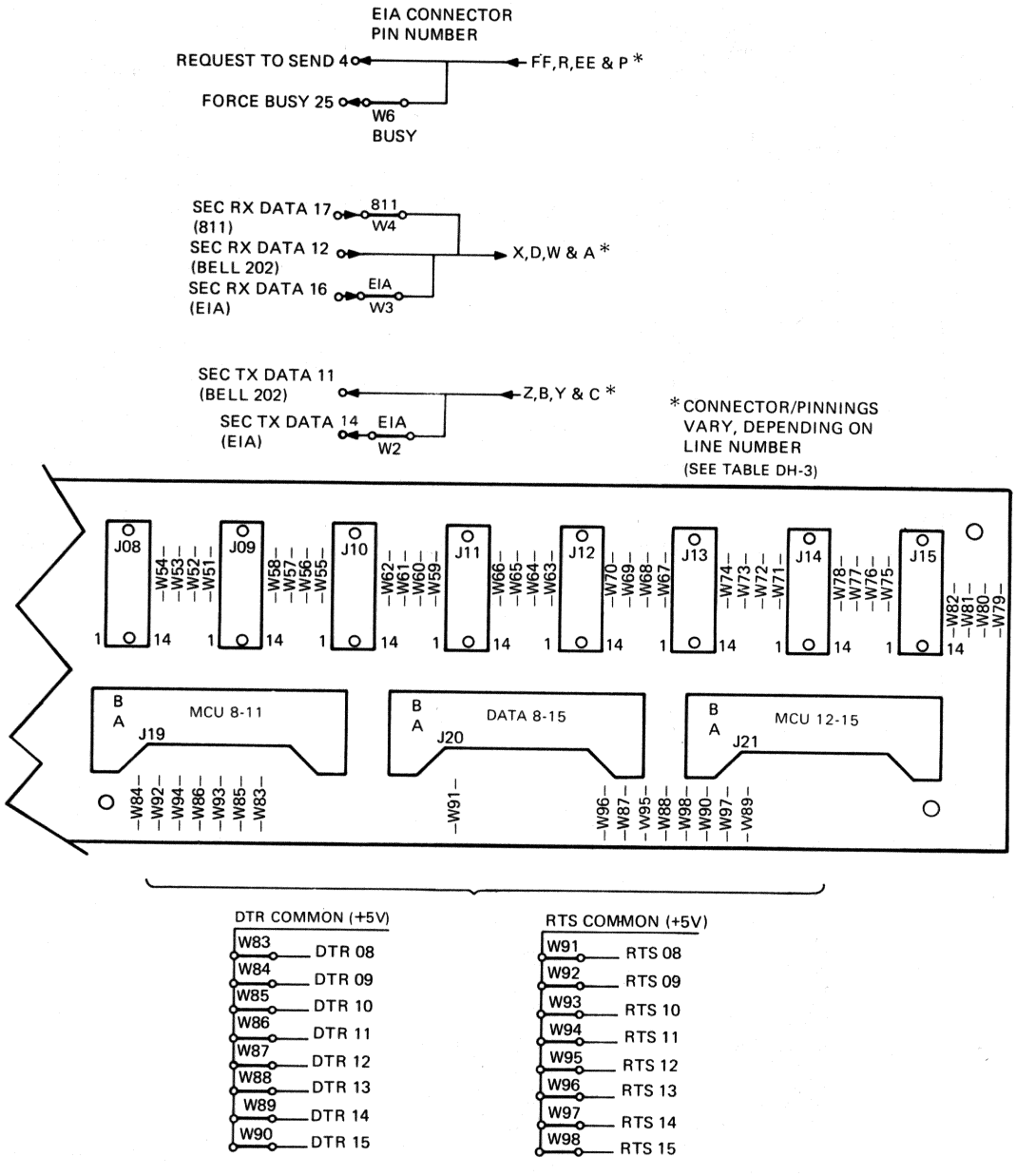
H317-B Distribution Panel Jumper Configuration



MODEM TYPE	DESCRIPTION	JUMPERS			
		6	2	3	4
103A	300 BAUD FULL DUP	*	*	*	*
103E,G,H	300 BAUD FULL DUP	IN	*	*	*
103F	300 BUAD FULL DUP	*	*	*	*
113A	300 BAUD ORIGINATE ONLY	*	*	*	*
202C,D	1800 BUAD 1/2 DUP	*	*	*	*
811B	LOW SPEED TWX	*	*	*	IN
EIA	RS232 – C (SEE BELOW)	OUT	IN	IN	OUT

MKV84-1314

H317-B Distribution Panel Jumper Configuration (Cont)



H317-B Modem Signal Jumper Selection

Table DH-5 H317-B Modem Signal Jumper Reference

Modem Signal	Request to Send (Pin 4)		EIA Secondary Receive (Pine 16)		Distribution Panel Connector
Line #	Connector Pin No.	Jumper No.	Connector Pin No.	Jumper No.	
00	FF	W6	X	W3	
01	R	W5	D	W8	J16
02	EE	W10	W	W12	
03	P	W14	A	W16	
04	FF	W18	X	W20	
05	R	W22	D	W24	J18
06	EE	W26	W	W28	
07	P	W30	A	W32	
10	FF	W51	X	W53	
11	R	W55	D	W57	J19
12	EE	W59	W	W61	
13	P	W63	A	W65	
14	FF	W67	X	W69	
15	R	W71	D	W73	J21
16	EE	W75	W	W77	
17	P	W79	A	W81	
00	X	W4	Z	W2	
01	D	W9	B	W7	J16
02	W	W13	Y	W11	
03	A	W17	C	W15	
04	X	W21	Z	W19	
05	D	W25	B	W23	J18
06	W	W29	Y	W27	
07	A	W33	C	W31	
10	X	W54	Z	W52	
11	D	W58	B	W56	J19
12	W	W62	Y	W60	
13	A	W66	C	W64	
14	X	W70	Z	W68	
15	D	W74	B	W72	J21
16	W	W78	Y	W76	
17	A	W82	C	W80	

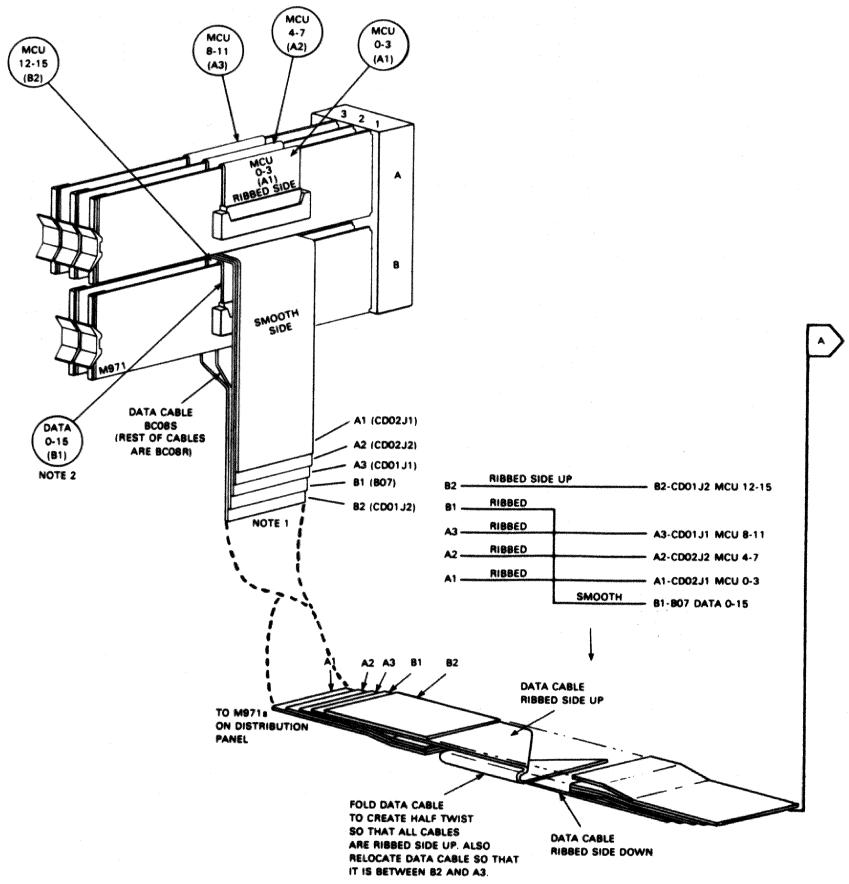
DH11 Cabling

This section contains cabling diagrams for DH11-AA or AC with DM11-BB Modem Control and the DH11-AD, AE with DH11-AD Modem Control. These diagrams also show correct test connector placement. Details of each DH11 cable are provided in Chapter 3; test connector information is included in Chapter 4.

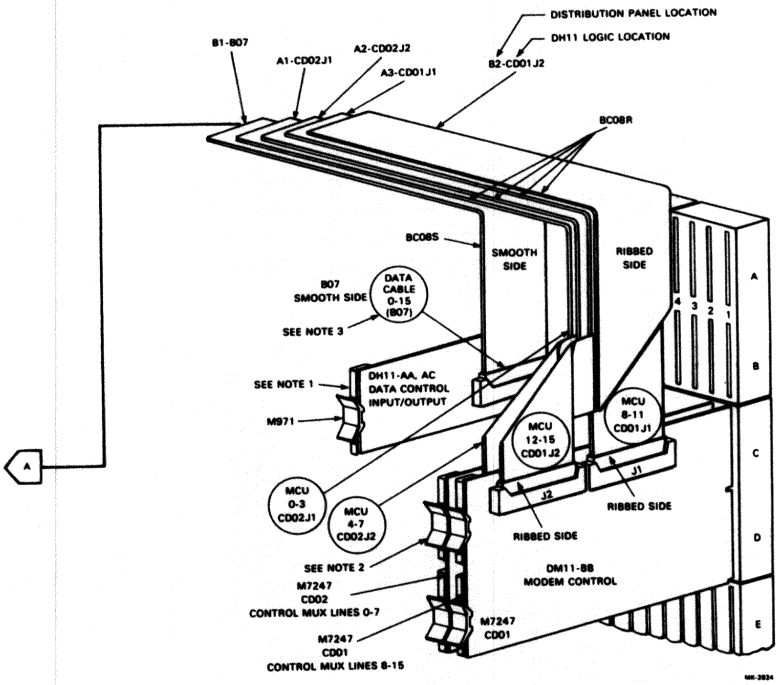
NOTE

Refer to Tech-Tip #11 for Diagnostic testing and cabling.

DH11-AA, AC/DM11-BB Cabling

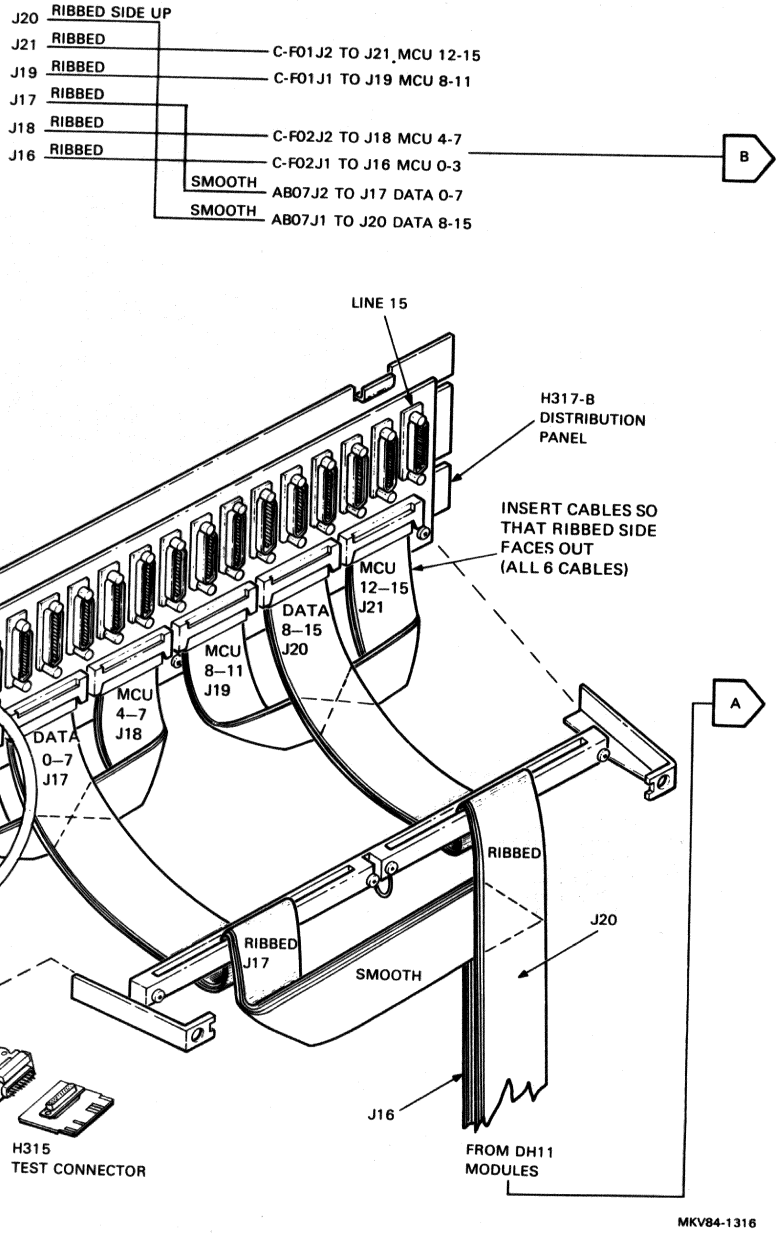


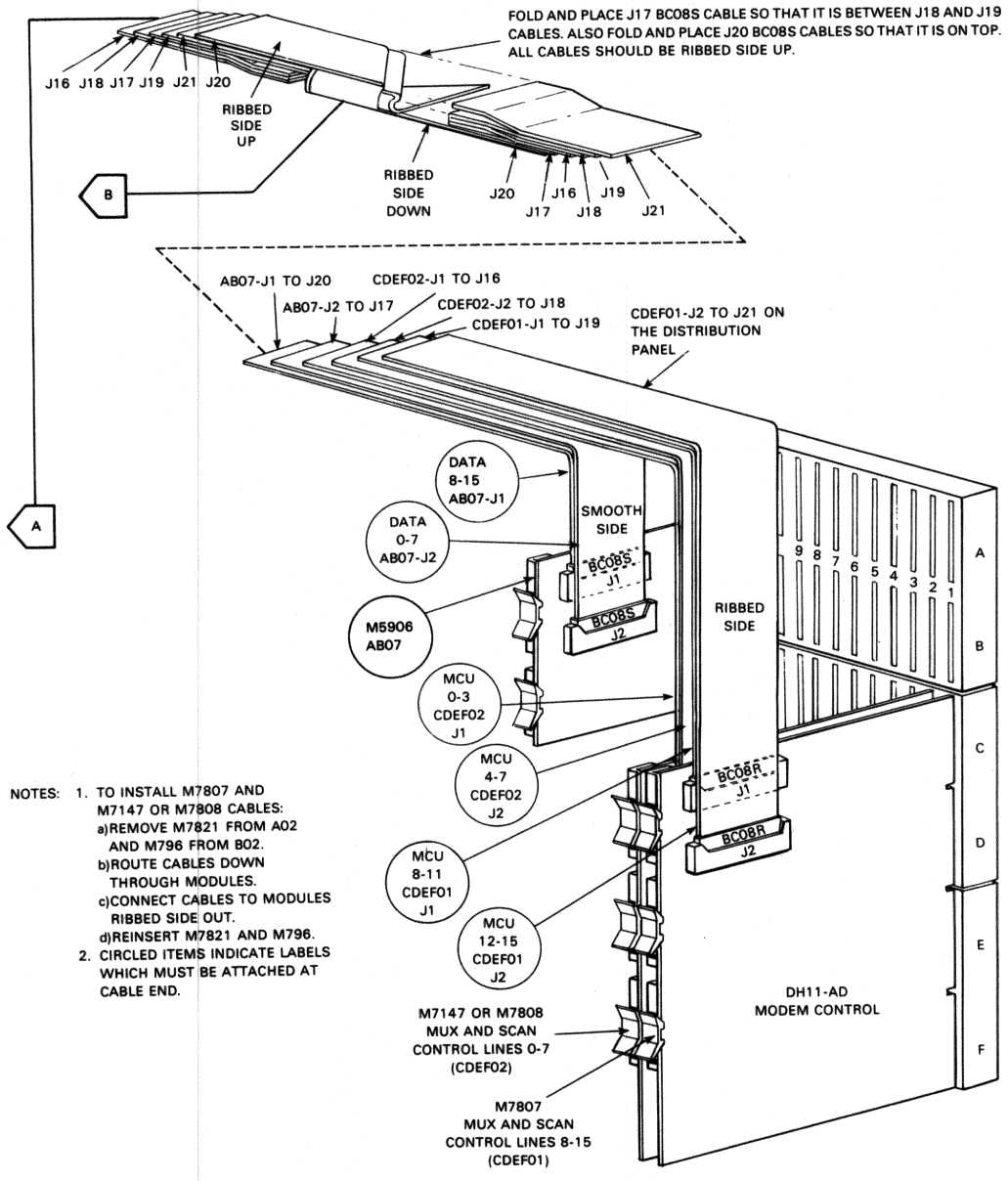
MKV84-1633



NOTES:
1. TO INSTALL BC08S CABLE TO M971-B07:
   a) REMOVE G7360-A07 AND M7821-A08.
   b) ROUTE CABLE DOWN THRU MODULES
   c) CONNECT CABLE TO MODULE WIRE SIDE AGAINST BOARD.
   d) REINSTALL MODULES REMOVED.
2. TO INSTALL BC08R CABLES TO M7247's CD01 & CD02:
   a) REMOVE M7821-A02 & M786-B02.
   b) ROUTE CABLES DOWN THRU MODULES.
   c) CONNECT CABLES TO MODULES, SHIELD SIDE AGAINST BOARD.
   d) REINSTALL MODULES REMOVED.
3. CIRCLED ITEMS INDICATE LABELS WHICH MUST BE ATTACHED AT CABLE END.

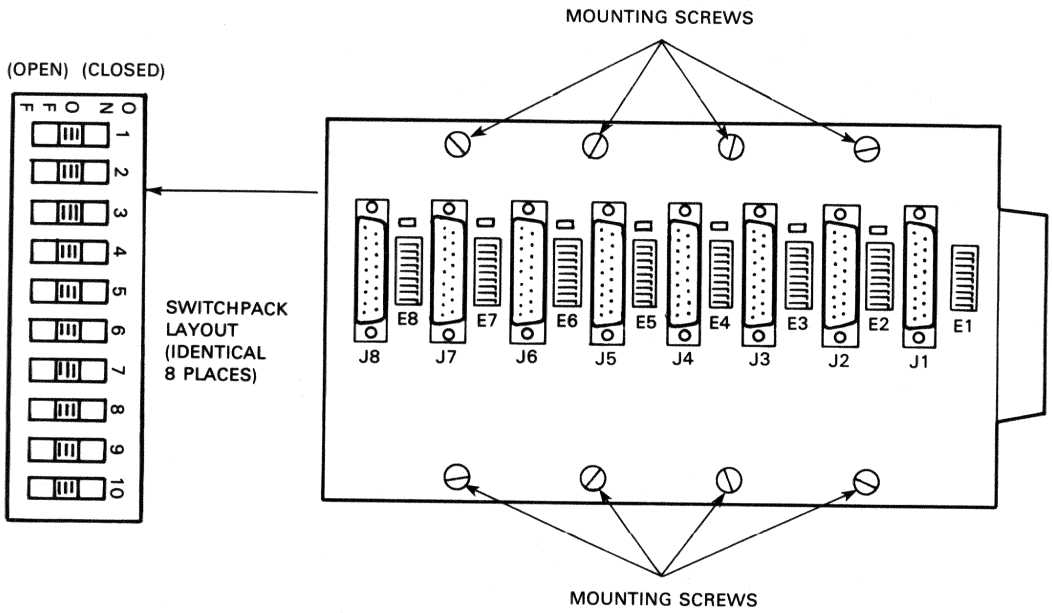
DH11-AD, AE/DH11-AD Modem Control Cabling



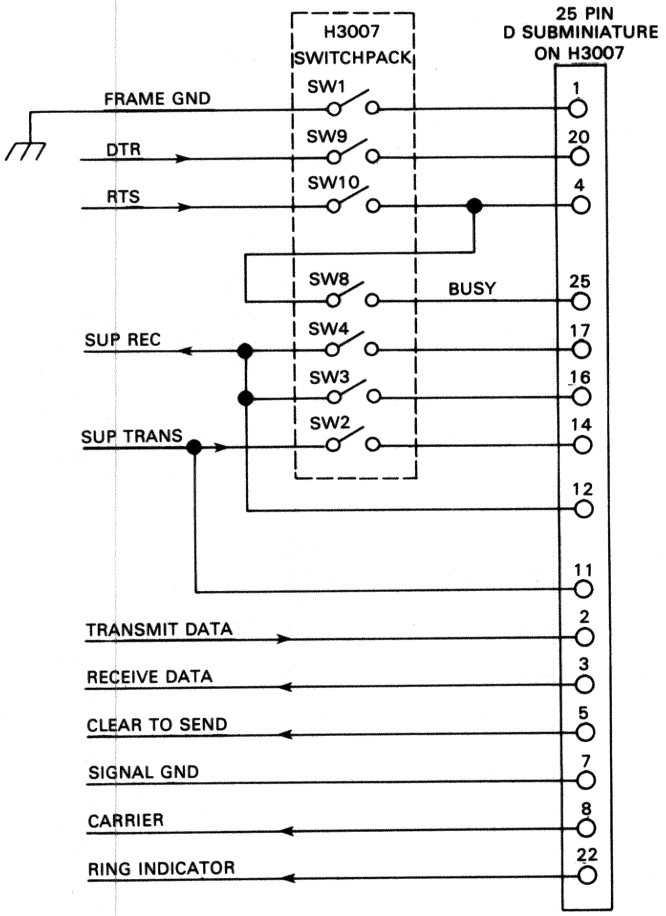


NOTES:
1. TO INSTALL M7807 AND M7147 OR M7808 CABLES:
   a) REMOVE M7821 FROM A02 AND M796 FROM B02.
   b) ROUTE CABLES DOWN THROUGH MODULES.
   c) CONNECT CABLES TO MODULES RIBBED SIDE OUT.
   d) REINSERT M7821 AND M796.
2. CIRCLED ITEMS INDICATE LABELS WHICH MUST BE ATTACHED AT CABLE END.

H3007 Distribution Panel Component Locations (Front View)



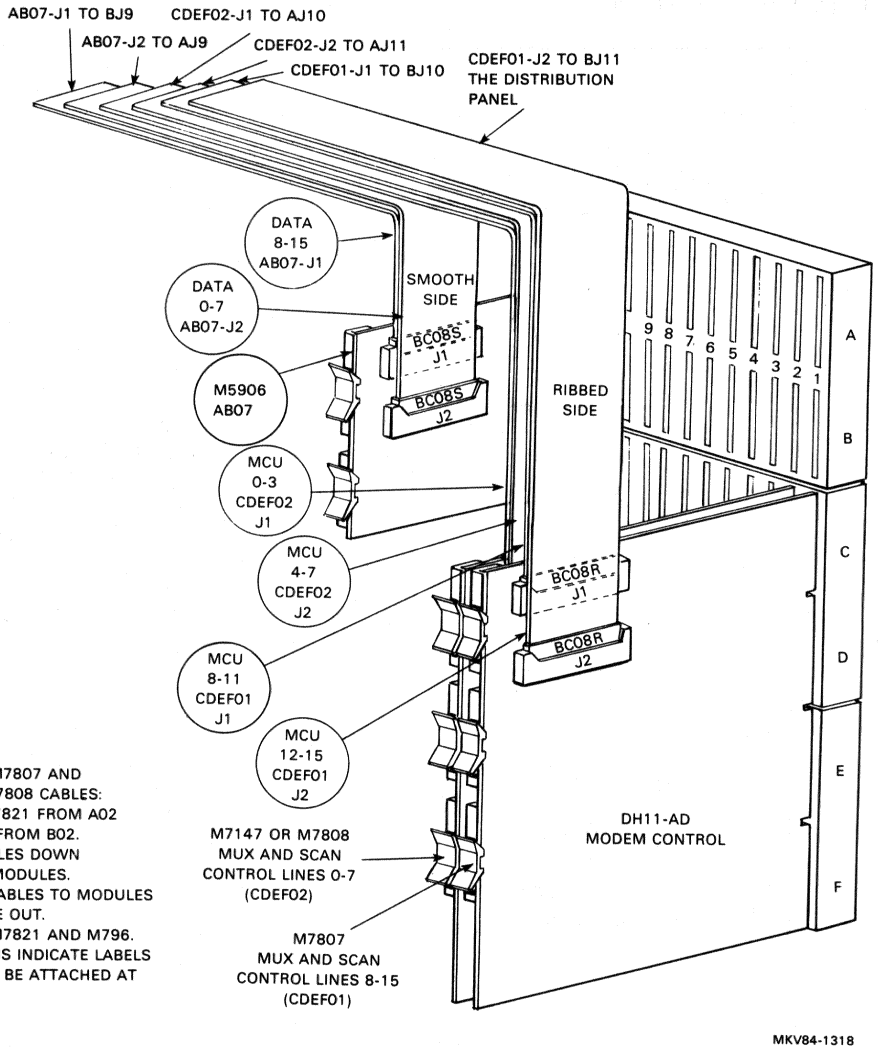
H3007 Switch Selections



SWITCH	DF02/ 103J	DF03/ 212A	202S	H315 TESTING	DEC TERMINAL	COMMENTS
1	OFF	OFF	OFF	OFF	OFF	FRAME GND – NORMALLY OFF
2	*	*	*	ON	*	SEC XMIT DATA
3	*	*	*	*	*	SEC RECV DATA
4		*	*	ON	*	RECEIVER CLK
8	OFF	OFF	*	ON	*	BUSY
9	ON	ON	ON	ON	ON	DTR
10	*	*	ON	ON	ON	RTS

*DON'T CARE

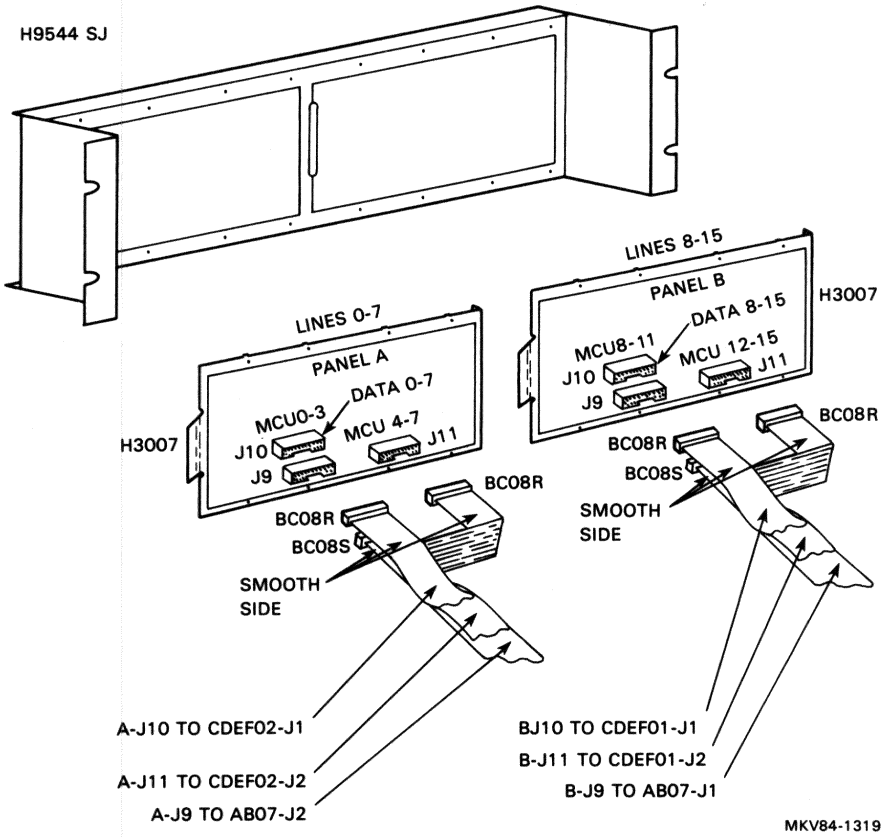
MKV84-0267



MKV84-1318

NOTES:
1. TO INSTALL M7807 AND M7147 OR M7808 CABLES:
   a) REMOVE M7821 FROM A02 AND M796 FROM B02.
   b) ROUTE CABLES DOWN THROUGH MODULES.
   c) CONNECT CABLES TO MODULES RIBBED SIDE OUT.
   d) REINSERT M7821 AND M796.
2. CIRCLED ITEMS INDICATE LABELS WHICH MUST BE ATTACHED AT CABLE END.

QMA DH11 Distribution Panels Cabling (Interior View)



DH11 Diagnostics

Four Diagnostic programs are available to support the DH11 in PDP-11 systems. These diagnostics are listed in Table DH-6.

Table DH-6 DH11 Diagnostics

Diagnostic Function	Diagnostic Name	PDP-11 Systems
Checks Dh11 Functional Logic	DH11 Diagnostic	(C)ZDHM**
Checks DH11 Line Logic	Data Reliability Test	(C)ZDHN**
Checks DH11 Modem Control	Modem Control Diagnostic	(D)ZDHK**
DH11 Link Testing	Interprocessor Test Program (ITEP) ITEP Monitor DH11 Overlay	 (D)ZITA** (D)ZDHL**

CZDHM Diagnostic Summary – The CZDHM includes 44 tests to verify all of the functional logic and 4 additional tests for limited modem control testing. Each line may be tested separately, up to a total of 256 lines. Comprehensive error reports are available for complete fault isolation (see program document).

CZDHN Diagnostic Summary – The CZDHN is a general purpose test and exerciser that consists of the following three independent subprograms:

- Subprogram 1 – Data Reliability Test (Starting Address 200). Checks up to 16 DH11s, all lines one at a time, using various combinations of line parameters.
- Subprogram 2 – Single Line Echo Test (Starting Address 214). Provides the capability to compose messages sent to an attached terminal or messages echoed from the terminal.
- Subprogram 3 – Data Patterns/Cable Tests (Starting Address 220). Provides a variety of data patterns to be transmitted and turned around using an H315 Test Connector at the cable end.

NOTE
To use default parameters, start at address 204.

DZDHK Diagnostic Summary – The DZDHK is a Modem Control diagnostic that consists of the following four test groups:

- Group 0 – Tests all scanner and line multiplexer functions.
- Group 1 – Tests a single line using modem cable and H315 test connector.
- Group 2 – Connect-Disconnect test for 103A modems.
- Group 3 – Connect-Disconnect test for 202C modems.

Running DH11 Diagnostics – Two procedures (One for running CZDHM and CZDHN: one for DZDHK) for running DH11 diagnostics are provided as follows.

CZDHN and CZDHM diagnostics can be executed automatically using the internal autosizer routine by setting SWR Bit 0=0. These diagnostics can also be executed manually (where operator intervention is needed to enter correct parameters), by setting SWR 0=1. CZDHM can also be executed without the modem control tests by setting SWR 10=1.

Running CZDHM and CZDHN Diagnostics – The following summarizes running DH11 diagnostics. Tables DH-7 through DH-10 provide descriptions of the parameter inputs for each of the diagnostics.

Table DH-7 Typical CZDHM/CZDHN Diagnostic Parameters

Parameter Question	Description
Type No. of addresses (octal) between vectors (10 or 20) 10 CR	Enter 10 or 20 followed by <CR>. If modem control vectors are interleaved with DH11 vectors, CZDHN only enter 20. For standard DH11 contiguous vectors enter 10.
Type SCR address for first DH11 _____<CR>	Enter the device address in DH11 octal of first device followed by <CR>.
Type Vector Address for first DH11 _____<CR>	Enter the Vector address for the first DH11 followed by <CR>.
Type device selection parameter _____<CR>	Enter octal number encoded as follows. Bit00=1 Test DH11 #00 Bit01=1 Test DH11 #01 Bit02=0 Do not test DH11 #02 " " Bit15=1 Test DH11 #15 Examples: 177777<CR> Test all 16 DH11's 100000<CR> Test only DH11 #17(8) 000005<CR> Test DH11 #00 and 02 If a <CR> only is entered the program will default to the last device select parameter entered. If this is the initial load it will default to 000003 (DH11 #00 and 01).
Type Line Selection Parameter _____<CR>	Enter line number(s) in octal (same format as device selection above). If a <CR> return only is typed the program will default to 16. Lines for all programs except CZDHN subprograms 2 and 3, which default to line 00. If more than one DH11 is tested, the same combination of lines will be tested on all DH11's selected.

Table DH-8 Additional Parameter Inputs for CZDHN Subprograms 2 and 3

Parameter Question	Description
Do you want to change "LPR" (Y or N)?_____<CR>	Enter Y for YES or N for NO If this is the first pass and NO is entered, the program will default to: 9600 baud, 8 bit characters, 1 stop bit and odd parity; otherwise it will default to the previous LPR selection and the program proceeds with FILLER CHARACTER prompt below. If yes, program proceeds with next prompt.
TRANSMITTER SPEED?_____<CR> RECEIVER SPPED?_____<CR>	Enter one of 13 available speeds for transmit and receive followed by <CR>. For 134.5 baud, do not enter decimal point.
CHAR LENGTH (6, 7, or 8)? _____<CR>	Enter desired number followed by <CR>.
NO. OF STOP BITS (1 or 2)? _____<CR>	Enter desired number followed by <CR>.
PARITY SELECTION (E,O, or <CR>? _____<CR>	Enter desired condition O followed by <CR>=ODD E followed by <CR>=EVEN Enter just <CR> for NO parity
FILLER CHARACTER? _____<CR>	Enter desired filler character followed by <CR>. For NULL filler just enter <CR>.
FILLER COUNT? _____<CR>	Enter 1, 2, 3 or 4 followed by <CR>. Enter just <CR> for 0.

Table DH-9 Additional Parameter Inputs for CZDHN Subprogram 2

Parameter Question	Description
	NOTE **The following parameter questionaire applies only to subprogram 2. Refer to Table DH-9 for continued subprogram 3 parameters.**
SEND MODE - (Y OR N)Y<CR>	Enter Y for yes or just <CR> for no. If yes, the following prompt appears. If no, the program assumes ECHO mode (see below).
TYPE SEND BUFFER - TERMINATE WITH CONTROL-C	At the console, type in any characters you wish to send to the test terminal. Always start the buffer with CR, LF. Example: CR, LF THE QUICK BROWN ... DOGS BACK CONTROL-C Remember to end the buffer with CONTROL-C. Once the buffer is sent, the program will repeat the procedure beginning with the prompt TYPE LINE # (00-17 OCTAL) _____<CR>
SEND MODE - (Y OR N) N<CR>	Program assumes ECHO mode.
Testing Line 00 - Go type in on test line TYPE:[CONTROL-C TO EXIT] [CONTROL-E TO ECHO BUFFER]	At the test terminal, type in any characters you wish to echo through the DH11 back to the terminal. 1. To echo complete message, terminate with CONTROL E. 2. To return to console, type CONTROL-C. At the test terminal verify that the echoed characters match the original.

Table DH-10 Additional Parameter Inputs for CZDHN Subprogram 3

Parameter Question	Description
BUFFER SIZE (1-512) _____<CR>	Enter decimal number of buffer size. Enter <CR> only for default buffer size of 256.
PATTERN TYPE? (A, U, D, R, S, B or <CR>? SET SR7=1 TO LOCK ON PATTERN	Enter the desired data pattern described below. A ALTERNATING 1/0 U BINARY UP COUNT D BINARY DOWN COUNT R RANDOM DATA B TYPED IN BUFFER S SINGLE CHARACTER <CR> SEQUENCE OF A, U, D, AND R If A, U, D, R or <CR> is entered, the program will transmit, receive and data check the selected pattern. If SR7=1 the program will loop on the selected pattern, otherwise the program returns to the: BUFFER SIZE (1-512) prompt If B is selected, the following prompt appears.
TYPE IN TEST BUFFER – TERMINATE WITH CONTROL-C	Enter any characters that you wish to use as the data pattern followed by CONTROL-C. The program begins when CONTROL-C is entered. If S is selected as the pattern type, the following prompt appears.
TYPE SINGLE TEST CHAR_____<CR>	Enter any single character followed by <CR>. The program will fill the buffer with the selected character and begin execution.

NOTE

Running DZDHK Diagnostics – The DZDHK diagnostic is used to check various functions of DH11 Modem Control. Typical parameter selections are provided in Table DH-9. Start program at address 200 with SWR0=1.

VECTOR ADDRESS_____<CR>	Enter the correct vector address followed by <CR>. If entry is incorrect, program will type "?" and repeat prompt. If entry is not the device under test, program halts.

Running DZDHK Diagnostics – The DZDHK diagnostic is used to check various functions of DH11 Modem Control. Typical parameter selections are provided in Table DH-11. Start program at address 200 with SWR0=1.

Table DH-11 DZDHK Diagnostic/Parameters

Parameter Question	Description
CONTROL REGISTER ADDRESS _____<CR>	Enter the correct 6 digit control register address followed by <CR>. If entry is incorrect, program will type "?" and repeat prompt. If register address is non-existent, the program halts.
LINE SELECT PARAMETER_____<CR>	Enter line number in octal followed by <CR>. BIT00=1 Test line #00 BIT01=1 Test line #01 BIT02=0 Do not test line #02 . . . BIT15=1 Test line #15 Examples: 177777<CR>Test all 16 lines 100000<CR>Test line 17(8) only 000005<CR>Test lines 00 and 02
TEST - _____CR	Enter 3 digit number for the Test Group desired followed by <CR> Test Group 0=000 Test Group 1=100 Test Group 2=200 Test Group 3=300 Refer to examples of each selected test and additional parameter as required.

For Test-000 <CR> – The program prints the title;"16 LINE SCANNER TEST" and begins testing. Turnaround test connectors are not needed for this test.

For Test-001 <CR> – The program prints the title followed by one additional parameter prompt:

SINGLE CABLE TEST LINE NUMBER _____<CR>	Enter the correct line number being tested followed by a <CR>. An H315 test connector must be attached to the Modem Cable for the selected line.

Table DH-11 DZDHK Diagnostic/Parameters (Cont)

Parameter Question	Description
For Test-002 <CR> and Test 003 <CR> – The program prints the title and the following parameter prompts.	
103A or 202C Connect-Disconnect Test	Enter the line number that will originate the call (0-17 octal) followed by <CR>.
ANSWER LINE – _____<CR>	Enter the line number that will answer the call (0-17 octal) followed by <CR>.
DIAL ANSWERING – _____<CR>	Enter the line number that will answer the call (0-17 octal) followed by <CR>.
DIAL ANSWERING DATA SET*	You have about 5 minutes to make connection between the two data sets. Follow the procedure below.
TYPE TTY KEY TO DISCONNECT	Press any key at the terminal. This causes the program to begin the disconnect sequence. When the sequence is completed, the following message is printed, indicating successful completion.
103A or 202C TEST COMPLETE	Indicates DONE, no errors.

SPECIAL CONTROL FUNCTIONS:

- CONTROL-C – Escape from current test and select a new test.
- CONTROL-V – Changes vector and register address.
- CONTROL-D – Changes line number.

*Procedure for line connection:

1. Place answering data set in AUTO-ANSWER mode.
2. Place originate data set in TALK mode.
3. Dial answering data set from originate data set.
4. Wait for tone, then press DATA button. Data indicator should light on both data sets.

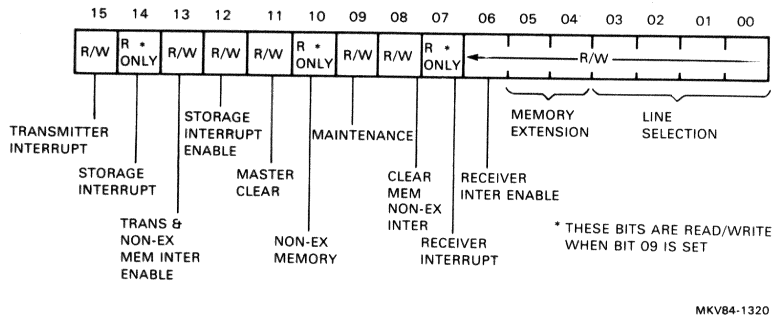
NOTE

The program now waits for interrupts from the modem control. If the connection was properly established the program will print the following prompts.

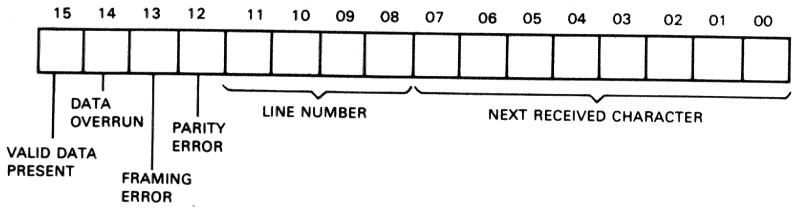
DH11 Register Bit Assignments

Register bit assignments for the DH11 are shown below.

SYSTEM CONTROL REGISTER 00 (READ/WRITE)

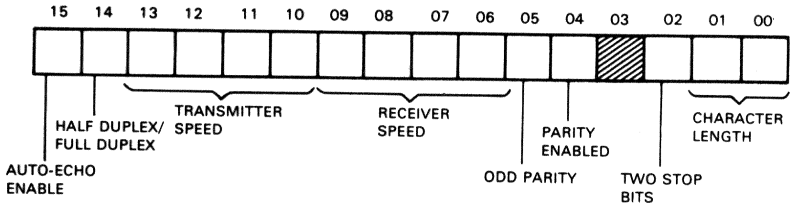


MKV84-1320



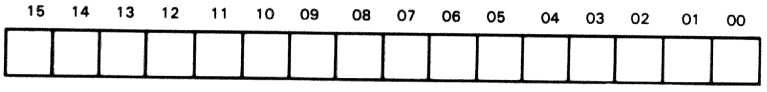
MK-2832

LINE PARAMETER REGISTER 04 (WRITE ONLY)



MK-2833

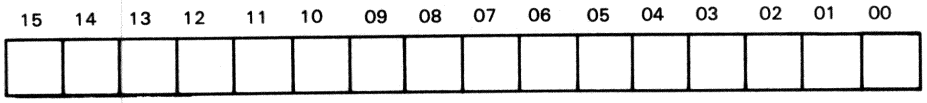
CURRENT ADDRESS REGISTER 06 (READ/WRITE)



WHEN WRITTEN = LOADS RAM
WHEN READ = CURRENT ADDRESS OF TRANSMIT BUFFER

MK-2834

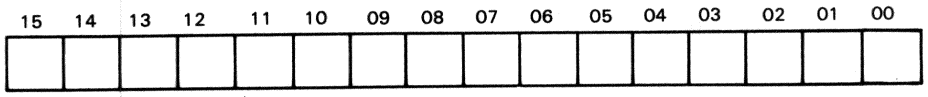
BYTE COUNT REGISTER 10 (READ/WRITE)



CONTAINS THE TWO'S COMPLEMENT OF THE NUMBER OF CHARACTERS TO BE TRANSMITTED

MK-2835

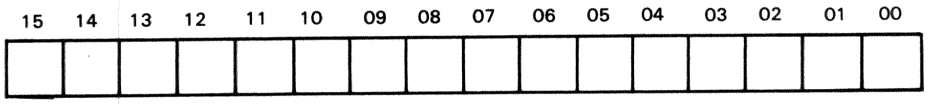
BUFFER ACTIVE REGISTER 12 (READ/WRITE)



SET ONE BIT FOR EACH LINE = TRANSMIT GO

MK-2836

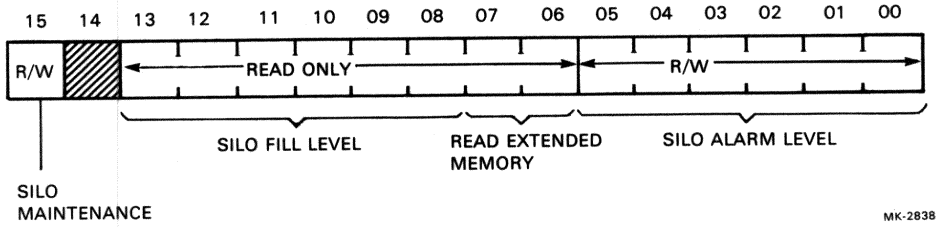
BREAK CONTROL REGISTER 14 (READ/WRITE)



SET ONE BIT FOR EACH LINE = BREAK CHARACTER

MK-2837

SILO STATUS REGISTER 16 (READ/WRITE)



MK-2838

DH11 Tech Tips/FCO Index

This section provides tabulated listings of all Tech-Tips and FCOs issued to date on the DH11 option.

Table DH-12 Tech Tip Index

Tech Tip No.	Title	Speed Bulletin No.
1	Erroneous Clearing or RTS	
2	DH11 UNIBUS Loads	
3	DH11 Parity Errors	
4	DH11 Parity Operation	
5	DM11/DH11 Installation	
6	H739 Loss of Output Voltage	
7	M5960 or M596 Used Above 150 Baud	
8	DM11/DH11 Glitches on INIT	
9	DH11 Peripherals Handbook Error	
10	Modem Control Programming	
11	DH11 Revised Checkout Procedure	
12	Power Up Problem with M7838 (DH11-AE)	
13	Power Short Circuit in DH11/M7821	
14	DM11-BB Byte Instructions	105
15	DHS11/CSS Ext. Clock Option Cabling Error	105
16	DH11 Power Harness Shorting	105
17	Program Difference with M7147 vs. M7808	160
18	Data Tester/Turnaround	173

Table DH-13 DH11 FCO History Chart

Module	FCO No.	Date	Reason	Quick Check
M7821	C0001	APR 72	Eliminates ground noise.	
M7278	D0002	JUN 73	Parity always enabled.	Etch trimmed.
	D0003	JUN 73	By etch from E74, pin 8 to FF2 touching E74, pin 7.	Between E74, pin 7 and pin 8.
M7277	B0003	FEB 74	INIT timing with MOS or solid state memory may fail DZDHC on PDP-11/45, or PDP-11/50s.	E66 is 7440.
M7821	S0005	JUL 75	Grant line reflections cause double grants.	Added 180 ohm R11 & R12 by E1.
M7277	R0006	DEC 75	INIT timing with solid state memory may fail DZDHC on PDP-11/70.	E8 is 74121 C89 is 100 mfd.
DH11	S0008	SEP 76	Bus data to B INIT line cross talk.	Added wire D08U1 to F02D1.
DH11	S0011	SEP 76	Unused inputs & A02E1 grounded on A02 (M7821).	Wiring A02H2-to-A02C2 & A02E1-to A03C2.
M7277	R0008	NOV 76	Required when DH11 used on PDP-11/34s.	9602 added at E2.
M7807	R0004	APR 78	Lines 8-16 Line Status unstable.	R34, thru R37 are removed and R24=10K ohm.
M7808	R0005	MAY 78	±10 V regulator failure	R6 thru R9 deleted.
DH11	S0012	DEC 78	Transitions on Modem lines	M7147 installed in backplane slot C-F2.

DHU11 INSTALLATION

DHU11 OPTION

DHU11 General Description

The DHU11 option is an asynchronous multiplexer which provides 16 full-duplex asynchronous serial data channels on UNIBUS systems.

DHU11 Features

- 256-entry FIFO buffer for received characters, dataset status changes, and diagnostic information
- NPR or programmed transfers on transmit
- 64 byte FIFO for output data, each channel
- RS-423-A/V.10/X.26 and RS-232-C/V.28 compatible
- Full-duplex point-to-point or auto-answer dial-up operation
- Programmable split speed per line
- Total module throughput of 15000 characters per second
- Automatic flow control of transmitted and received data
- Self-test and background monitor diagnostics

DHU11 Reference Documentation

Refer to the following documents if the level of content in this section is insufficient:

- *DHU11 Technical Manual* – EK-DHU11-TM
- *DHU11 User Guide* – EK-DHU11-UG
- *DHU11 Print Set* – MP01794

DHU11 Components

A factory installed DHU11 is refered to as a DHU11-AP. A field upgrade consists of a DHU11-M (M3105) and the appropriate cabinet kit from Table DHU-1. Contents of the available cabinets are listed in Table DHU-2.

Table DHU-1 Cabinet Kits

Cabinet Kit	For
CK-DHU11-A1	Non-FCC-compliant cabs (19 inch rack)
CK-DHU11-TF	Orion-U rack and stack box
CK-DHU11-AE	VAX-11/730/750 kernal systems
CK-DHU11-TE	Orion-U system cabs
CK-DHU11-AD	Expansion Cabinets
CK-DHU11-AF	VAX-11/725

CONTENTS \ CABINET KITS	CK-DHU11-AD	CK-DHU11-AE	CK-DHU11-AF	CK-DHU11-A1	CK-DHU11-TE	CK-DHU11-TF
BC05L-03			4			4	
BC05L-06					4		
BC05L-07		4					
BC05L-10	4			4			
H325	1	1	1	1			
H3029	2	2	2	2			
H3030					1	1	
H3277					2	2	
H9544-SJ.				1			
70-20928-01					2	2	

MKV84-0679

Power Requirements/UNIBUS Loading

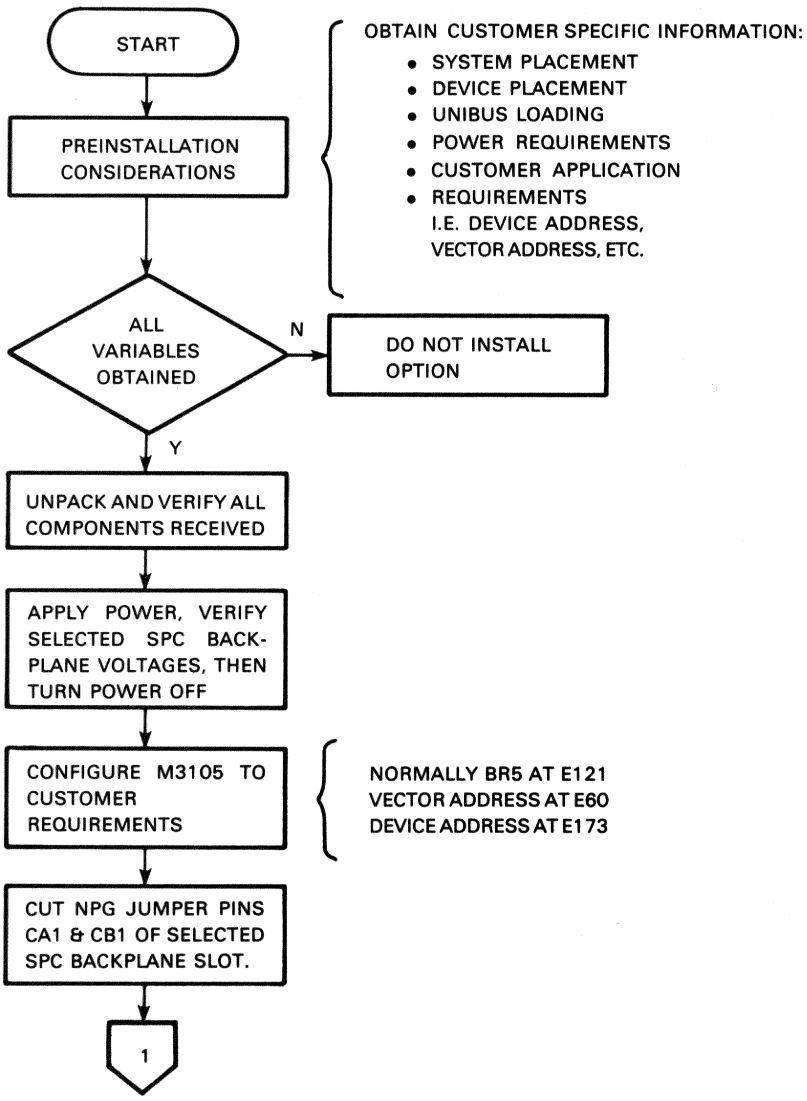
Table DHU-3 Power Requirements/UNIBUS Loading

Option	Voltage Rating Volts	Amps	Maximum Voltage	Minimum Voltage	Backplane Pin No.	UNIBIS Loads
M3105	+5.0	6.000	+5.25	+4.75	A1A2	2.5 AC
	+15.0	0.400	+15.60	+14.40	C1U1	1.0 DC
	−15.0	0.400	−15.60	−14.40	F1B2	

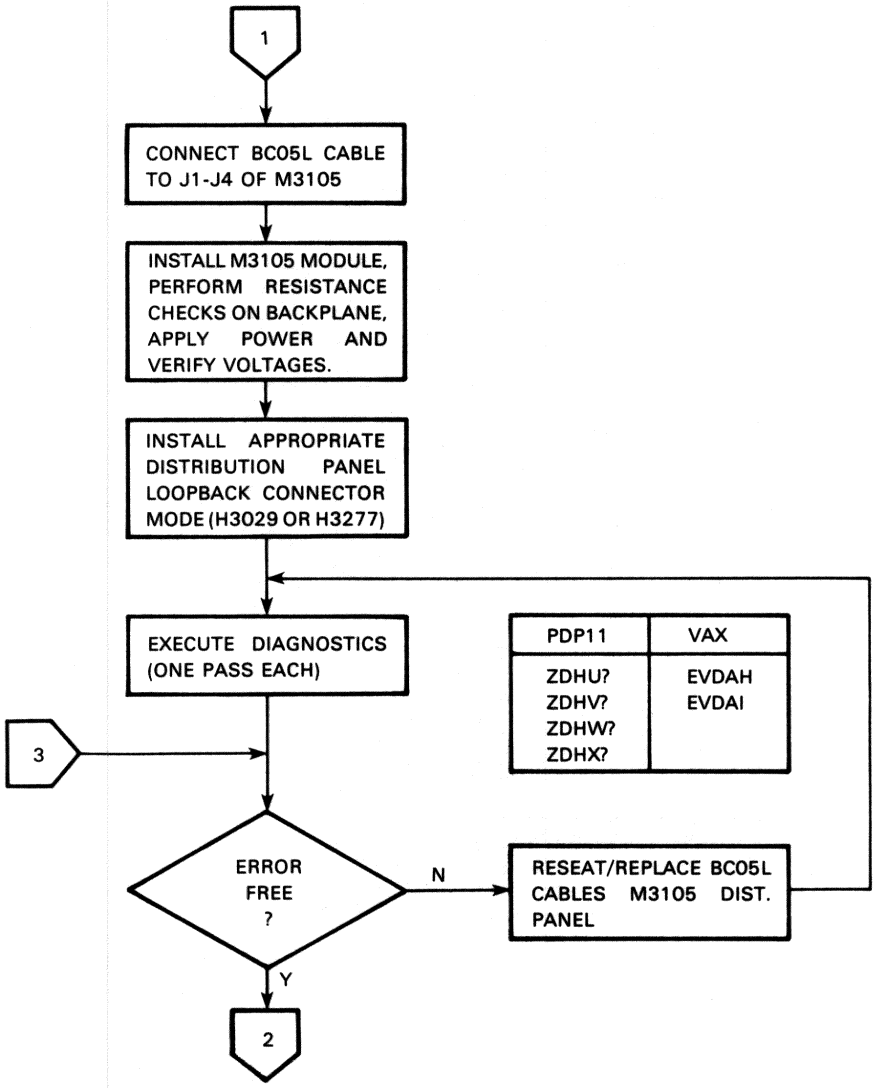
Device Placement

The DHU11 (M3105) may be installed in any HEX height UNIBUS SPC slot.

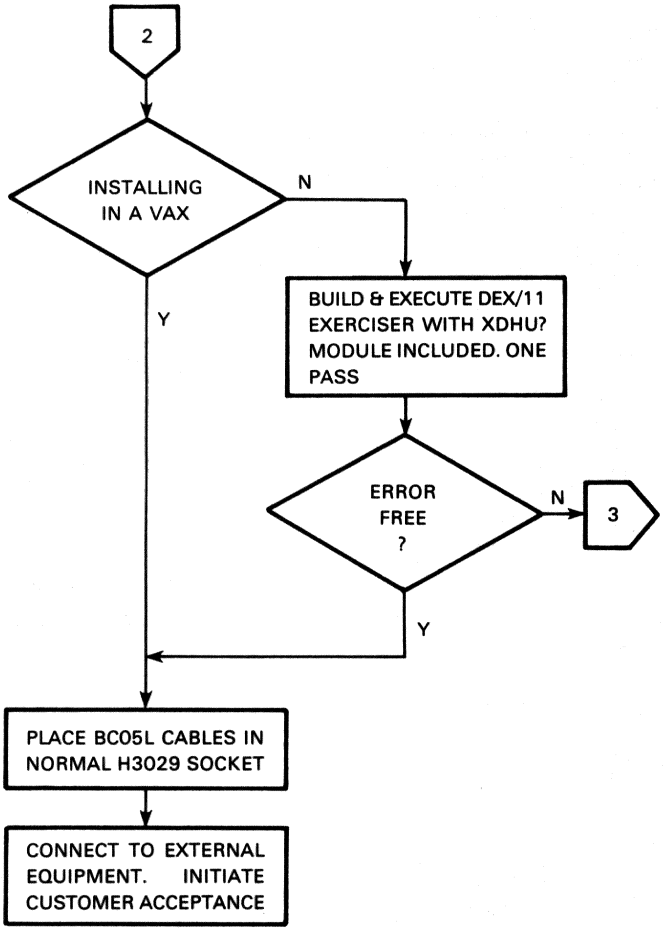
DHU11 Installation Flowchart



MKV84-0680

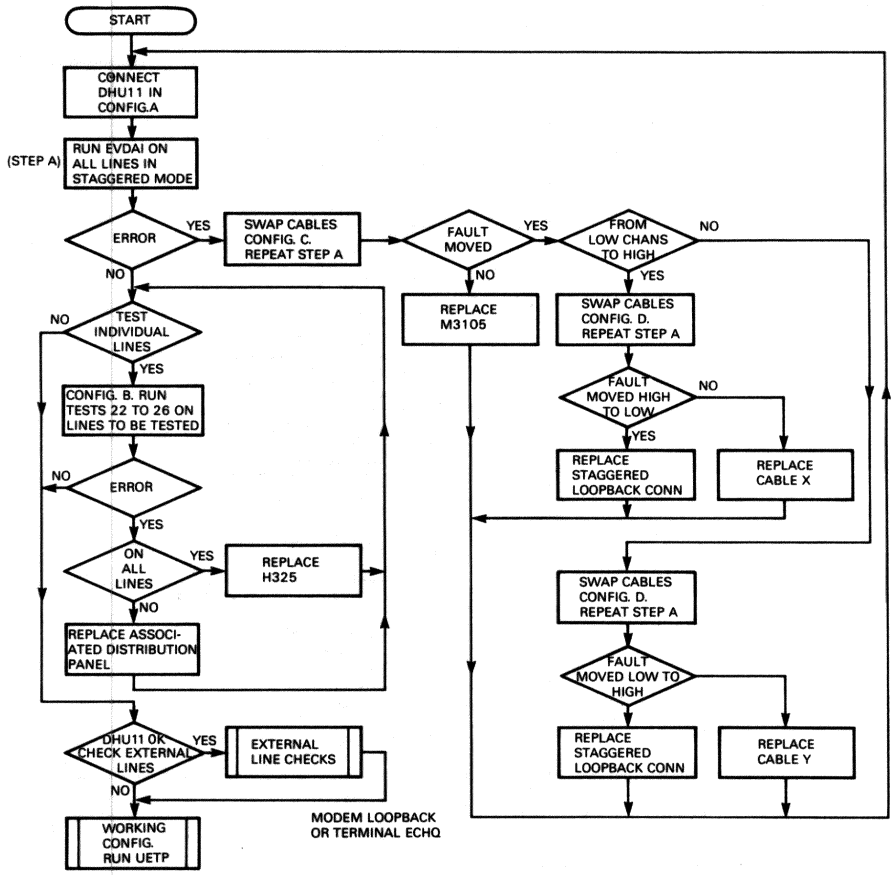

1
CONNECT BC05L CABLE TO J1-J4 OF M3105
INSTALL M3105 MODULE, PERFORM RESISTANCE CHECKS ON BACKPLANE, APPLY POWER AND VERIFY VOLTAGES.
INSTALL APPROPRIATE DISTRIBUTION PANEL LOOPBACK CONNECTOR MODE (H3029 OR H3277)
EXECUTE DIAGNOSTICS (ONE PASS EACH)
PDP11
VAX
ZDHU?
ZDHV?
ZDHW?
ZDHX?
EVDAH
EVDAI
3
ERROR FREE ?
N
RESEAT/REPLACE BC05L CABLES M3105 DIST. PANEL
Y
2

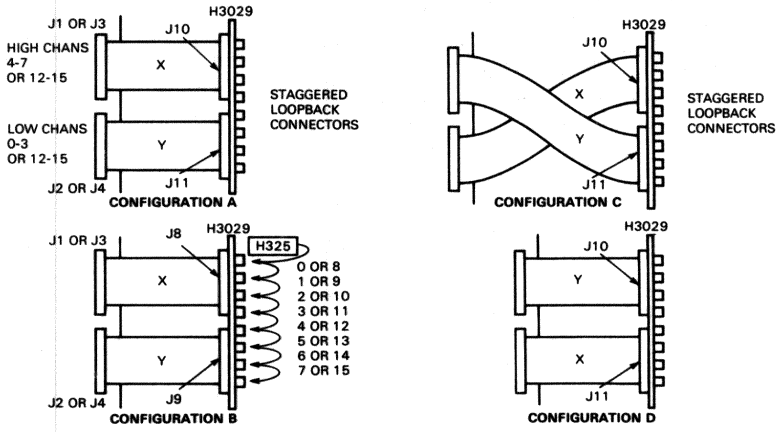
MKV84-0681


2
INSTALLING IN A VAX
N
Y
BUILD & EXECUTE DEX/11 EXERCISER WITH XDHU? MODULE INCLUDED. ONE PASS
ERROR FREE ?
N
3
Y
PLACE BC05L CABLES IN NORMAL H3029 SOCKET
CONNECT TO EXTERNAL EQUIPMENT. INITIATE CUSTOMER ACCEPTANCE

MKV84-0682

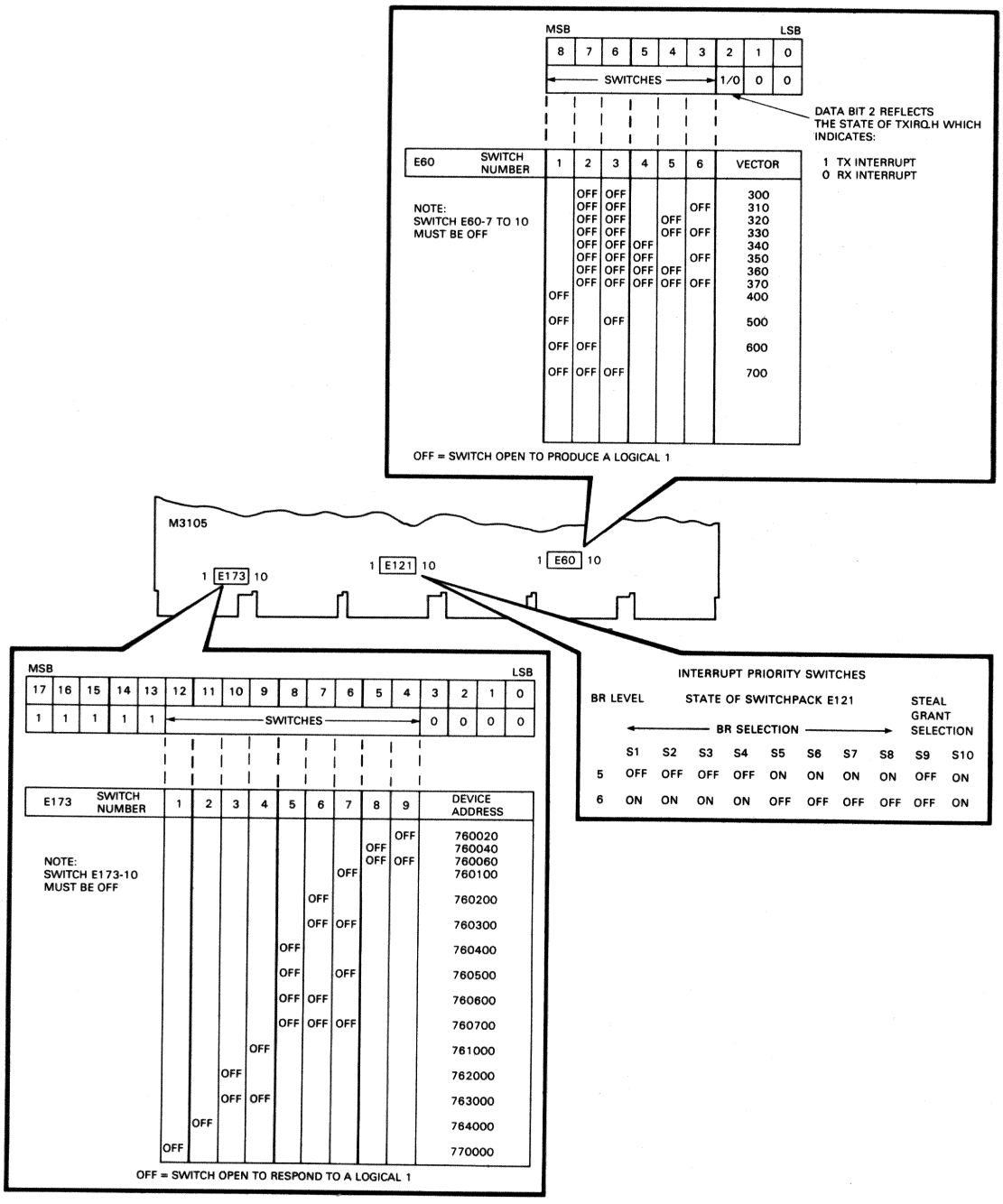
CZDH?? Troubleshooting Flowchart





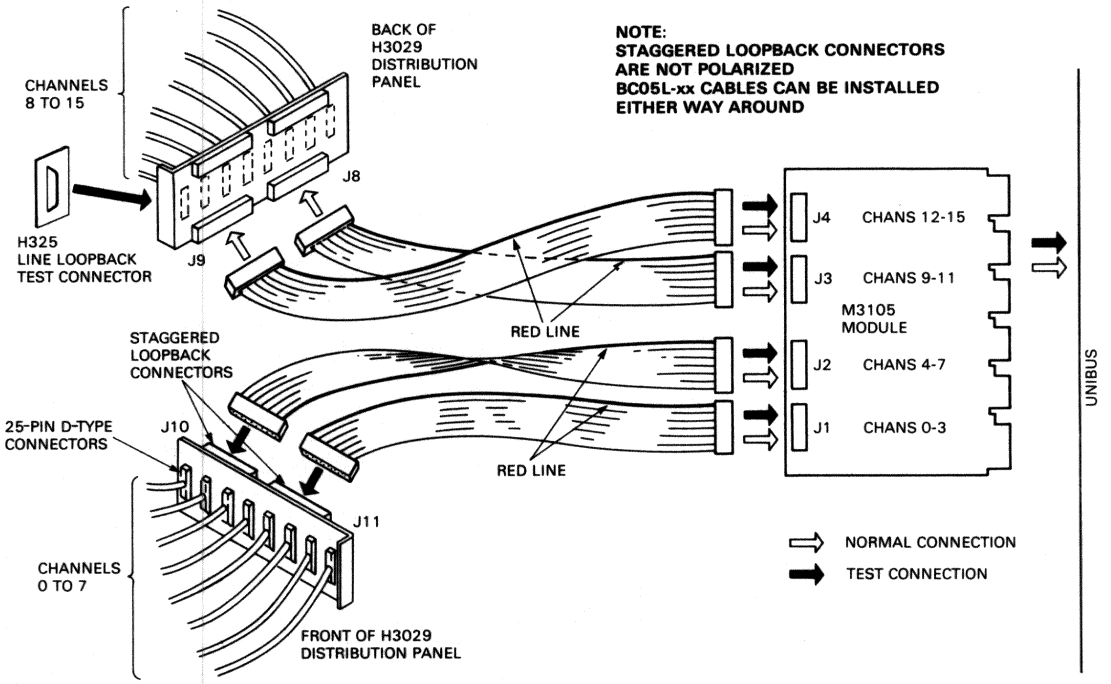
MKV84-0683

DHU11 Switch Settings



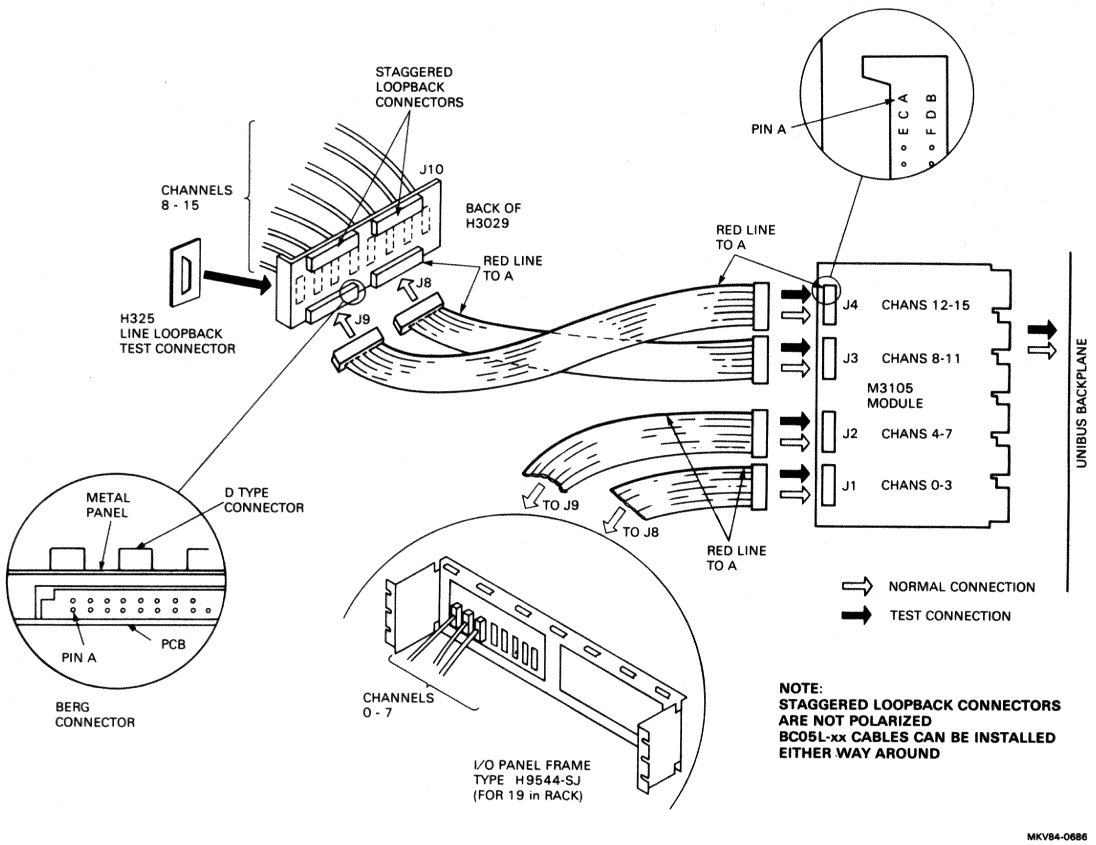
DHU11 Cabling

DHU11 normal and Test Connections from M3105 to H3029



MKV84-0685

DHU11 Connections from M3105 to H3029 and H9544SJ



DHU11 PDP11 Diagnostics

The DHU11 has a built in GO/NOGO self test. This test starts immediately at power up and after a bus or device reset. Successful completion is indicated by the green LED going OFF/ON/OFF before coming ON permanently. The Background Monitor Program carries out tests when the DHU11 is not engaged in other tasks. It will report to the host processor and extinguish the green LED when a failure occurs.

The following diagnostic supervisor diagnostics form a Functional Verification Test. They must be executed in alphabetic order.

ZDHU?
ZDHV?
ZDHW?
ZDHX?

After successful completion of the above tests, you should run the DECX/11 exerciser with module XDHU? installed.

Running DHU11 Diagnostics – Table DHU-4 summarizes running PDP-11/DHU11 diagnostics.

Table DHU-4 Typical PDP-11/DHU11 Diagnostic Parameters

PROMPT DR> Operator must respond by typing one or more commands; for example, STA/PASS:NNNN?TEST:NNNN

Parameters	Description
DR> *STA*	
CHANGE HW (L)? *Y*	The program will ask if any hardware changes are required and the number of units to test.
# UNITS(D)? *1*	
UNIT 0	
CSR ADDRESS: (0) 160460? *160340*	Enter the appropriate CSR address.
INTERRUPT VECTOR ADDRESS: (0) 310? *340*	Enter the appropriate Vector address.
ACTIVE LINE BIT MAP: (0) 177777?	Enter an octal number with bits set to indicate which lines to test.
INTERRUPT BR LEVEL: (0) 5?	Prompted by CZDHU? only.
TYPE OF LOOPBACK (1=INTERNAL, 2+H3029 OR H3277, 3=H325, 4=MODEM 5=KEYBOARD ECHO): (0) 2? *	Enter number to indicate the desired loopback type.
CHANGE SW (L)? *Y*	
REPORT UNIT NUMBER AS EACH UNIT IS TESTED: (L) Y?	
REPORT NUMBER OF BITS TESTED IN DMA ADDR TEST: (L) Y?	
EXTENDED ERROR REPORTING: (L) N?	
NUMBER OF INDIVIDUAL DATA ERRORS TO REPORT ON A LINE: (D) 0?	

NOTE

Not all diagnostics prompt for all the loopback modes.

Running VAX-11/DHU11 Diagnostics – Tables DHU-5 and DHU-6 summarize running VAX-11/DHU11 diagnostics. There are two diagnostics available: EVDAH – online diagnostic (level 2R) and EVDAI – standalone diagnostic (level 3). EVDAH is supported by online help facility EVDAH.HLP. EVDAI is supported by online help facility EVDAI.HLP. VMS operating system must be version V4.0 or later and the Diagnostic Supervisor must be version V6.13 or later.

Table DHU-5 Typical VAX-11/DHU11 Program Operation

Command Function	Example
$ *ALL TYA0*	ALLOCATE lines to be tested
$ *ALL TYA1*	EVDAH only
$ *RUN E*SAA*	RUN the Diagnostic Supervisor
1. LOAD appropriate diagnostic	DS> LOAD EVDAI or EVDAH
2. ATTACH the UNIBUS interface to the system bus	DS> ATT DW780 SBI DW0 3 4, or DS> ATT DW750 CMI DW0, or DS> ATT DW730 HUB DW0
3. ATTACH the device to the system. *	DS> ATT DHU11
4. SET appropriate event flag(s)	DS> SET EVENT FLAG(S) n,n,n
4. SET TRACE if you desire a printout of the tests as they are executed	DS> SET TRACE
5. START the program with the start command	DS> START

NOTE

This command now enters the hardware parameter information for the device (refer to Table DHU-6 for Typical Hardware Parameters). When the various hardware parameters are qualified, the program returns to the supervisor level of operation.

Table DHU-6 Typical Hardware Parameters for EVDAH and EVDAI

Command/Parameter	Description
DS> *ATT DHU11*	Attach the DHU11
DEVICE LINK? *DW0*	The option is linked to the UBA
DEVICE NAME? *TYA*	The option is named TYA
CSR? *760440*	The CSR address is selected from floating UNIBUS address space (range 760000-777776) (lowest 760440)
VECTOR? *300*	Vector address if floating (range 300-776)
BR? *5*	BR interrupt level is 5 (range 5-6)
DS> *SEL TYA:*	Select Unit Under Test

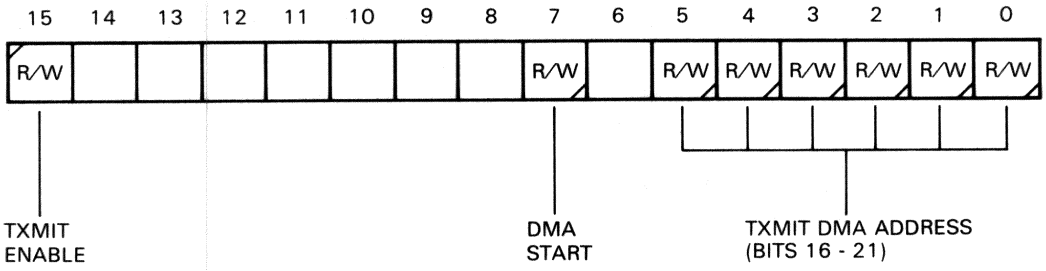
Table DHU-7 EVDAH Event Flags

Event	Test	Function
20	4 & 5	When set, the program is suspended after each channel is tested.
21	1 to 3	When clear, only the first DHU11 selected is tested.
		When set, all DHUs tested in selected order.
	4 & 5	When clear, only the first DHU11 selected is tested.
		When set, program is suspended before each module is tested.

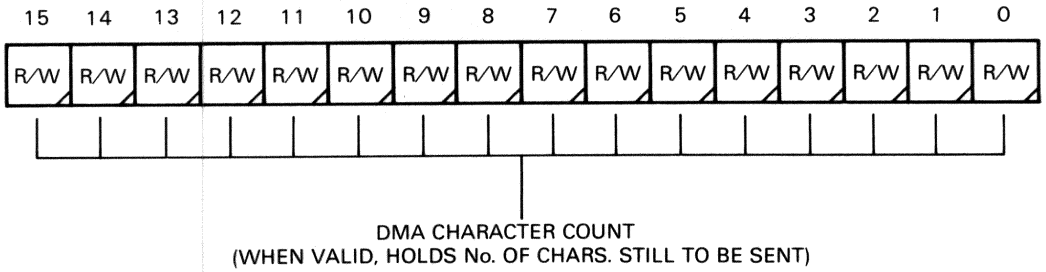
DHU11 Register Bit Assignments

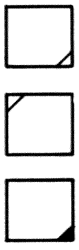
Register bit assignments for the DHU11 are shown in the following diagrams.

TBUFFAD2 (BASE + 14)



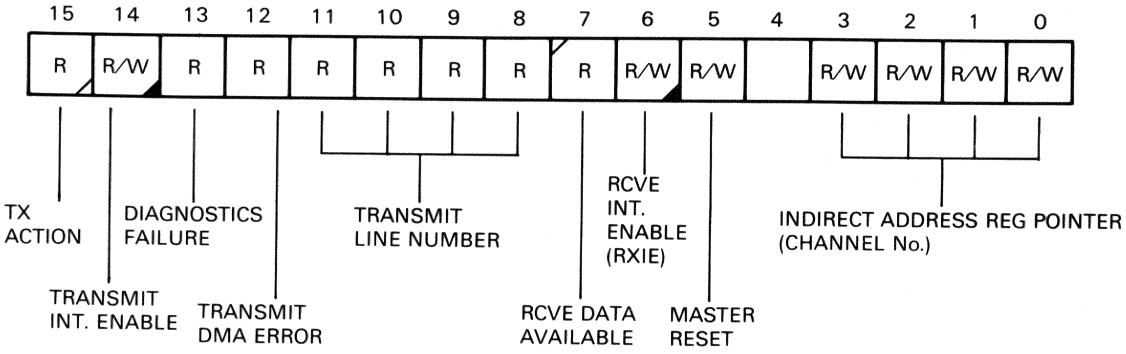
TBUFFCT (BASE + 16)



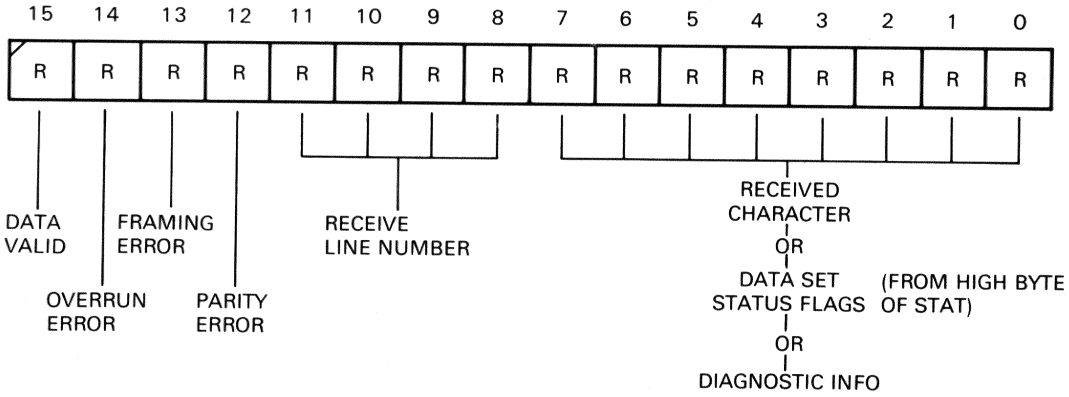


MKV84-0687

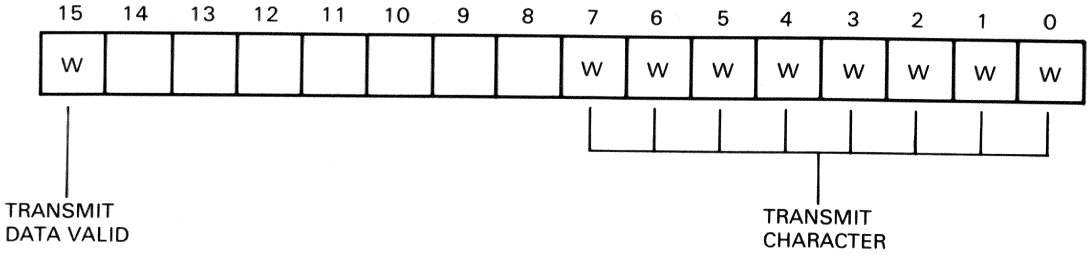
CSR (BASE)



RBUF (READ BASE + 2)

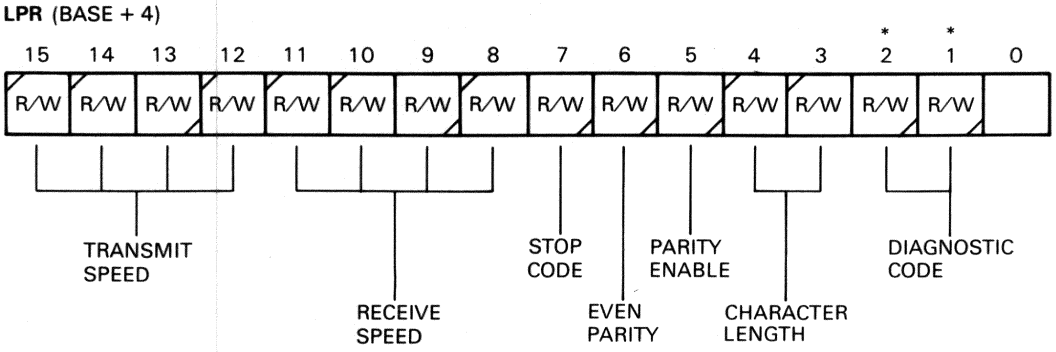


TXCHAR (WRITE BASE + 2)

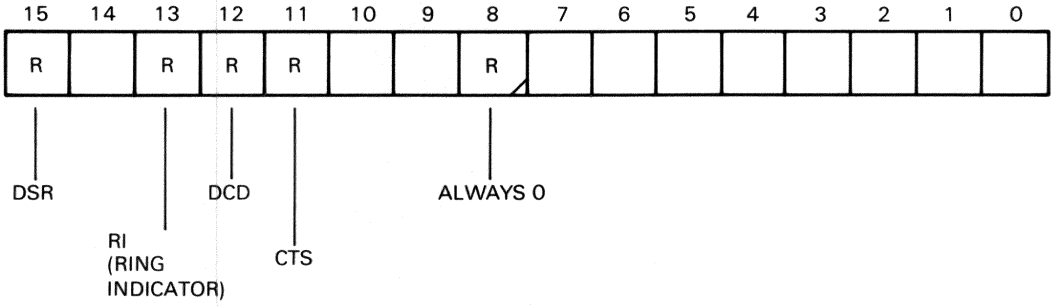


MKV84-0688

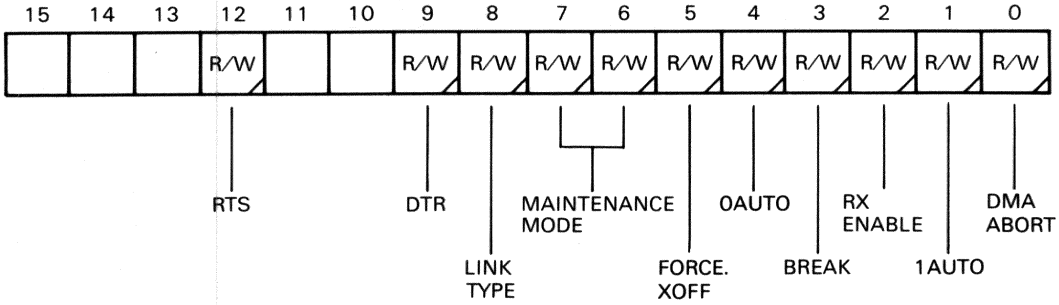
LPR (BASE + 4)



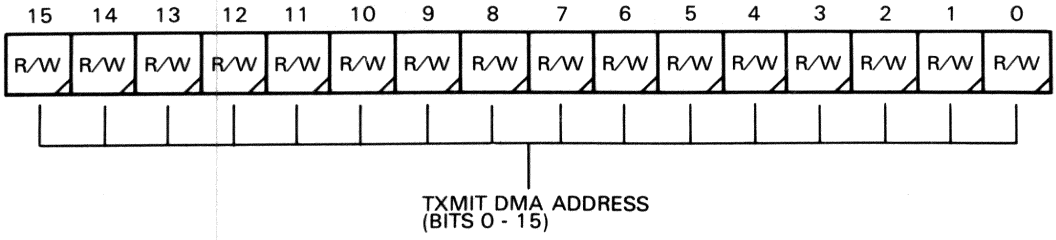
STAT (BASE + 6)



LNCTRL (BASE + 10)



TBUFFAD1 (BASE + 12)



MKV84-0689

DHU11 Tech-Tip/FCO History

Table DHU-8 DHU11 Tech-Tip Index

Tech Tip No.	Title	Speed Bulletin No.

Table DHU-9 DHU11 FCO History

FCO No.	Date	Reason	Quick Check

DHV11 INSTALLATON

DHV11 OPTION

DHV11 General Description

The DHV11 option is an asynchronous multiplexer which provides eight full-duplex asynchronous serial data channels on Q-bus systems.

DHV11 Features

- Eight full-duplex asynchronous data channels
- DMA or single character programmed transfers on transmit
- 256 entry FIFO buffer for received characters, dataset status changes, and diagnostic information
- RS-423-A/V.10/X.26 and RS-232-C/V.28 compatible
- Full-duplex point-to-point or auto-answer dial-up
- Programmable split speed per line
- Total module throughput of 15000 characters per second
- Automatic flow control of transmitted and received data
- Q16, Q18, and Q22 bus compatible
- Self-test and background monitor diagnostics
- Programmable test facilities
- Single quad-height module (M3104)
- All functions are programmable, except for device address and vector selection which are implemented in switches

DVH11 Reference Documents

Refer to the following documents if the level of content in this section is insufficient.

- *DHV11 Technical Manual* – EK-DHV11-TM
- *LSI-11 Sysstems Service Manual* – EK-LSIFS-SV
- *Terminals and Communications Handbook* – EB-20752-20

- *Microcomputers and Memories* – EB-20912-20
- *DHV11 Print Set* – MP01793
- *DHV11 Maintenance Card* – EK-DHV11-MC

DVH11 Components
The DHV11-M module kit consists of an M3104, DHV11 module and a DHV11 Technical Manual. Select the necessary cabinet kit from Table DHV11-1.

Table DHV11-1 DHV11 Cabinet Kits

CONTENTS \ CABINET KITS	CK-DHV11-AA	CK-DHV11-AB	CK-DHV11-AC
BC05L-01		2	
BC05L-1K	2		
BC05L-2F			2
H325	1	1	1
H3173-A	2	2	2
H3277	1	1	1
90-06021-01	8	8	8
90-06633-00	8	8	8
74-286441			1

MKV84-1233

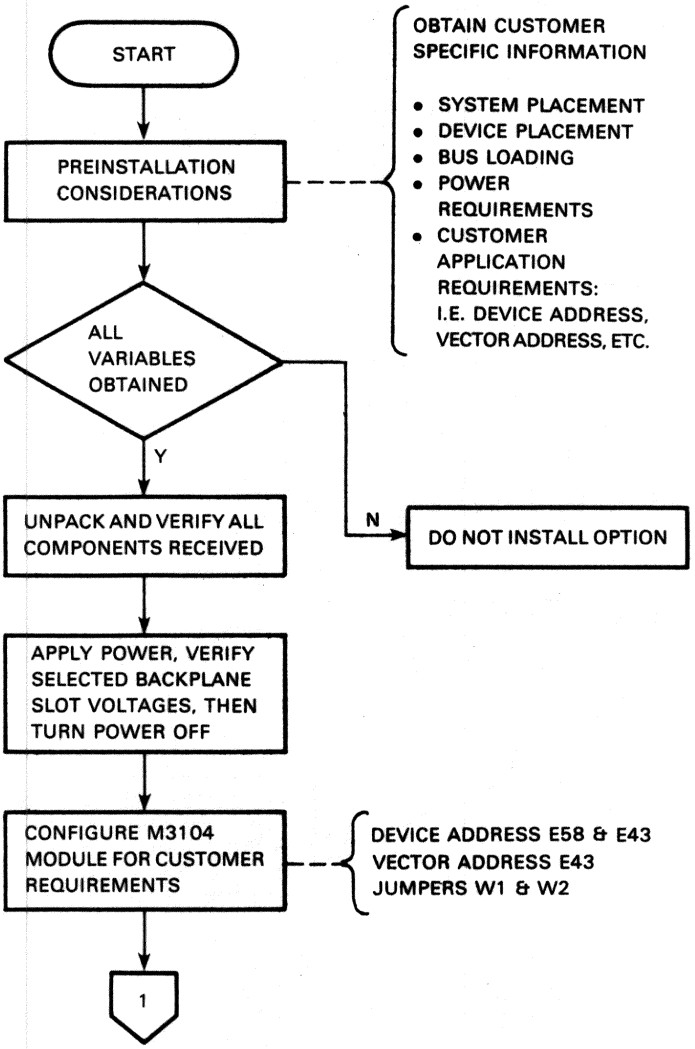
Device Placement
The DHV11 (M3104) can be mounted in any LSI-11 bus compatible backplane such as H9275. LSI-11 configurations apply and must be followed.

Power Requirements/LSI Bus Loading

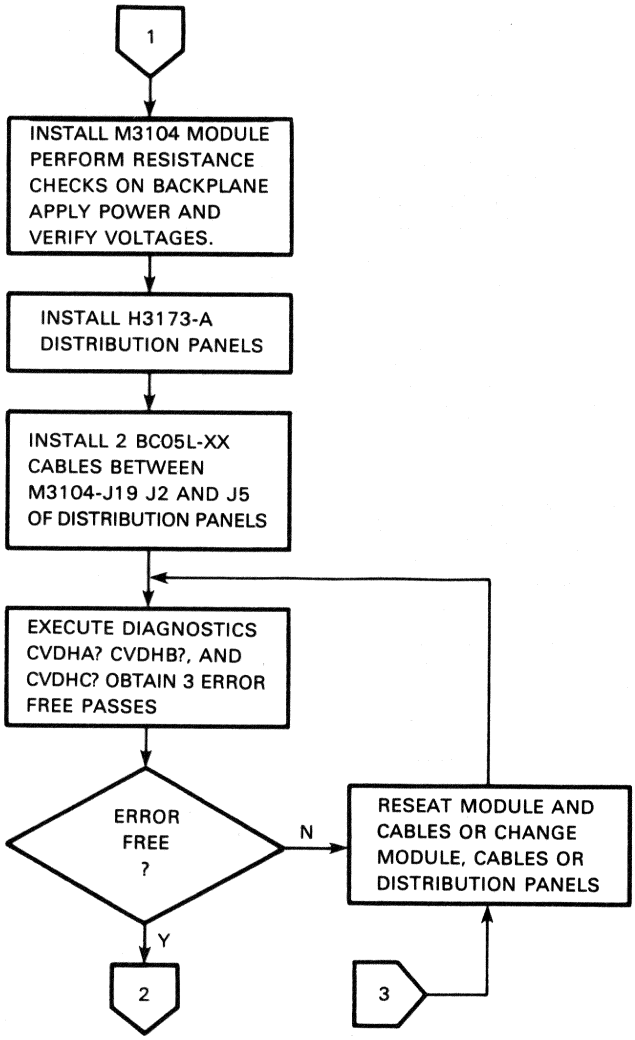
Table DHV11-2 Power Requirements/LSI Bus Loading

Module	Voltage Rating Volts	Amps	Maximum Voltage	Minimum Voltage	Backplane Pin No.	Bus Loading
M3104	+5	4.300	+5.25	+4.75	AA2	2.9 AC
	+12	0.475	+12.75	+11.25	AD2	1.0 DC

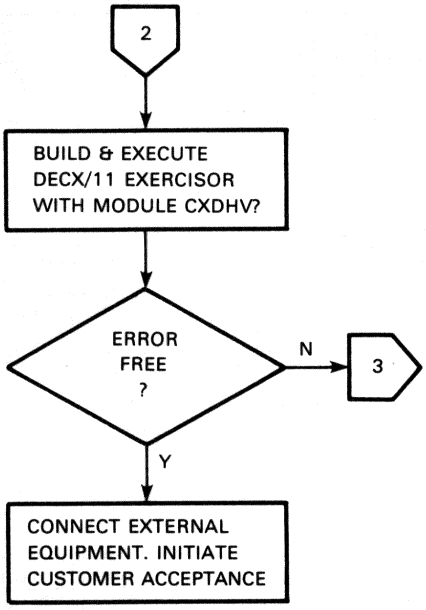
DHV11 Installation Flowchart



MKV84-1234

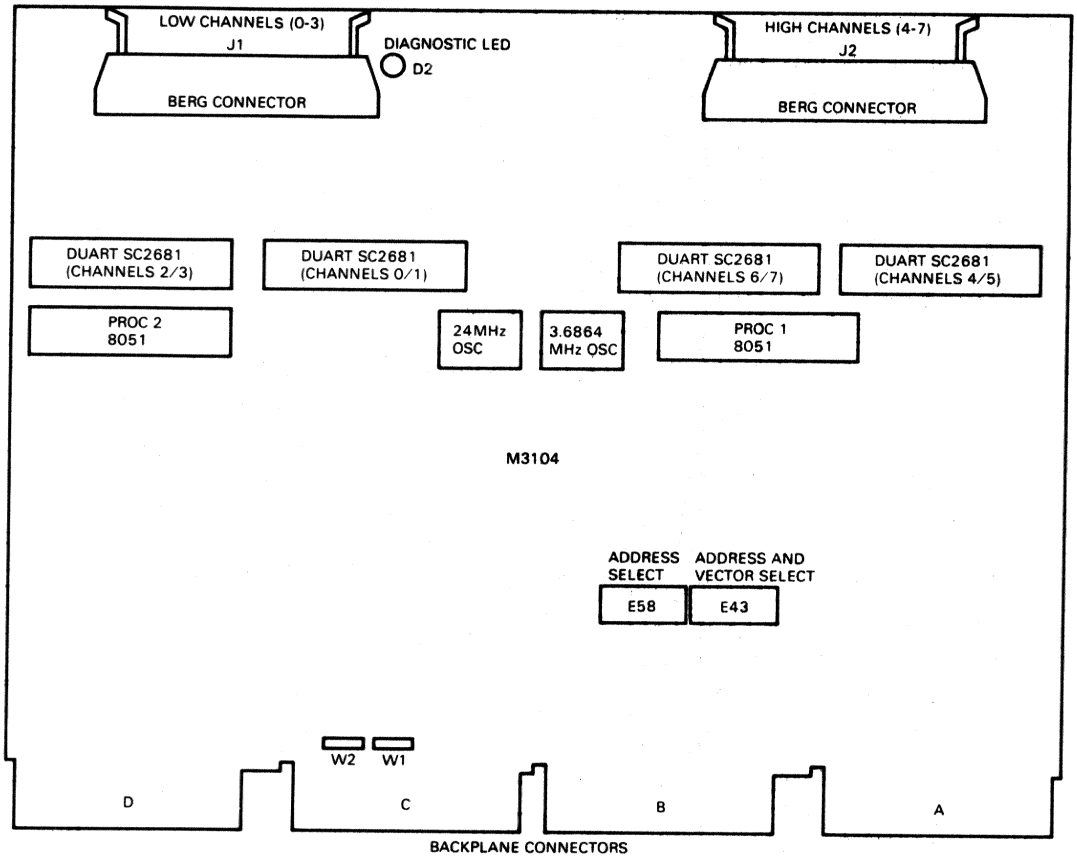

1
INSTALL M3104 MODULE PERFORM RESISTANCE CHECKS ON BACKPLANE APPLY POWER AND VERIFY VOLTAGES.
INSTALL H3173-A DISTRIBUTION PANELS
INSTALL 2 BC05L-XX CABLES BETWEEN M3104-J19 J2 AND J5 OF DISTRIBUTION PANELS
EXECUTE DIAGNOSTICS CVDHA? CVDHB?, AND CVDHC? OBTAIN 3 ERROR FREE PASSES
ERROR FREE ?
N
RESEAT MODULE AND CABLES OR CHANGE MODULE, CABLES OR DISTRIBUTION PANELS
Y
2
3

MKV84-1235


2
BUILD & EXECUTE
DECX/11 EXERCISOR
WITH MODULE CXDHV?
ERROR
FREE
?
N
3
Y
CONNECT EXTERNAL
EQUIPMENT. INITIATE
CUSTOMER ACCEPTANCE

MKV84-1236

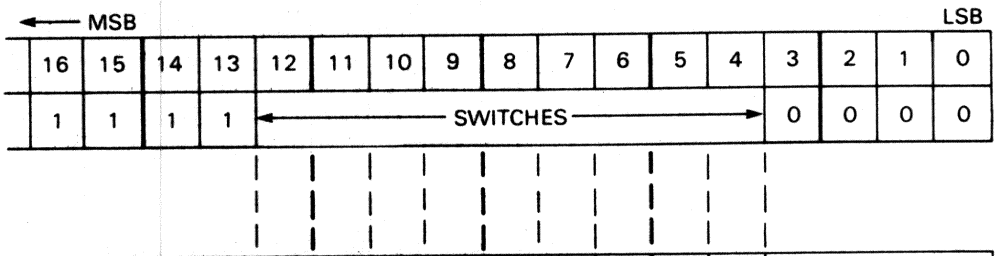
M3104 Switchpack/Jumper Locations



W1 – INTERRUPT ACK GRANT
W2 – DMA GRANT
} IN FOR H9270 AND H9275 BACKPLANES
OUT FOR H9273 AND H9276 BACKPLANES

MKV84-1237

DHV11 Device Address Selection



SWITCH NUMBER	E58 1	E58 2	E58 3	E58 4	E58 5	E58 6	E58 7	E58 8	E43 1	DEVICE ADDRESS
									ON	17760020
								ON		17760040
								ON	ON	17760060
							ON			17760100
						ON				17760200
						ON	ON			17760300
					ON					17760400
					ON		ON			17760500
					ON	ON				17760600
					ON	ON	ON			17760700
				ON						17761000
			ON							17762000
			ON	ON						17763000
		ON								17764000
	ON									17770000

ON = SWITCH CLOSED TO RESPOND TO A LOGICAL 1 ON THE BUS

MKV84-1238

DHV11 Vector Address Selection

MSB

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	LSB
0	0	0	0	0	0	0	← SWITCHES →						1/0	0	0	

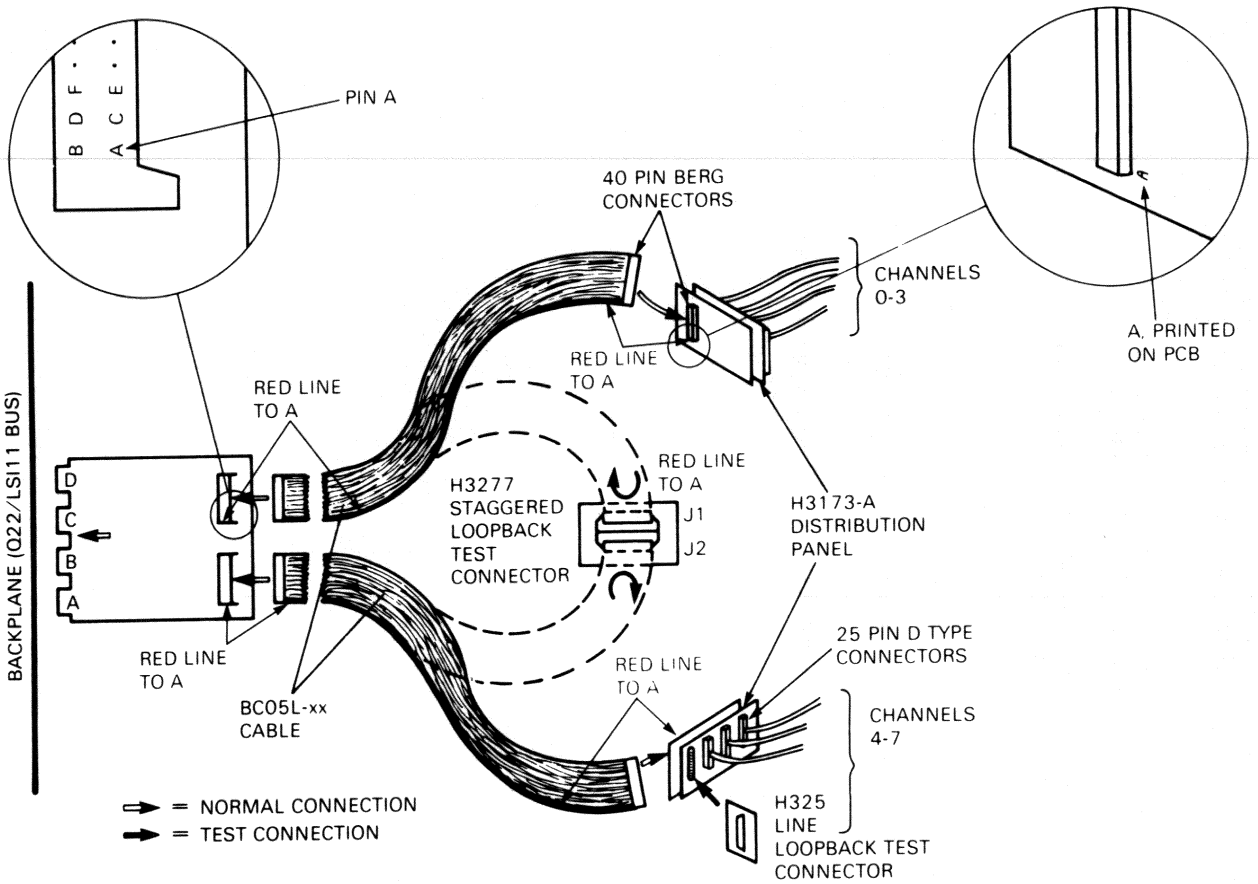
E43-2
NOT USED

SWITCH NUMBER	E43 3	E43 4	E43 5	E43 6	E43 7	E43 8	VECTOR ADDRESS
		ON	ON				300
		ON	ON			ON	310
		ON	ON		ON		320
		ON	ON		ON	ON	330
		ON	ON	ON			340
		ON	ON	ON		ON	350
		ON	**ON**	ON	ON		360
		ON	ON	ON	ON	ON	370
	ON						400
	ON		ON				500
	ON	ON					600
	ON	ON	ON				700

ON = SWITCH CLOSED TO PRODUCE A LOGICAL 1 ON THE BUS

MKV84-1239

DHV11 Normal and Test Cabling Connections



NOTE: BC05L-01 = 30.48 CM (12 INCHES)
BC05L-1K = 53.34 CM (21 INCHES)
BC05L-2F = 76.2 CM (30 INCHES)

MKV84-1240

DHV11 Diagnostics

DVH11 Q-Bus Processor Family Diagnostics

The DHV11 has a built in GO/NOGO self test. This test starts immediately at power up and after a bus or device reset. Successful competion is indicated by the LED going OFF/ON/OFF before coming ON permanently.

The Background Monitor Program carries out tests when the DHV11 is not engaged in other tasks. It will report to the host processor and extinguish the LED when a failure occurs.

The following diagnostics form a Functional Verfication Test. They run under the diagnostic supervisor. They should be executed in alphabetical order.

CVDHA?
CVDHB?
CVDHC?

After successsful competion of the above tests, you should build and execute a DECX/11 exerciser with module CXDHV?? installed.

Running DHV11 Diagnostics – Table DHV11-3 summarizes running PDP-11/DHV11 diagnostics.

PDP-11/DHV11 DIAGNOSTICS

Table DHV11-3 Typical PDP-11/DHV11 Diagnostic Parameters

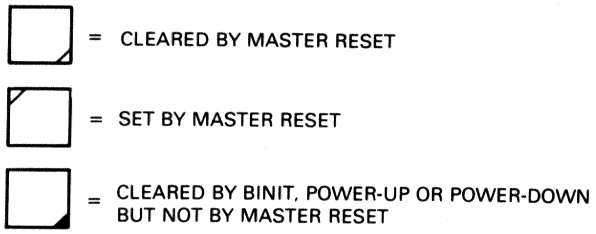
PROMPT DR> Operator must respond by typing one or more commands; for example, STA/PASS:NNNN/TEST:NNNN

Parameters	Description
DA> *STA*	
CHANGE HE (L)? *Y*	The program will ask if any hardware changes are required and the number of units to test.
#UNITS (D)? *1*	
UNIT 0	
CSR ADDRESS: (0) ? 160460 *160500*	Enter the appropriate CSR address.
INTERRUPT VECTOR ADDRESS: (0) 300? *340*	Enter the appropriate vector address.
ACTIVE LINE BIT MAP: (0) 377? *377*	Enter an octal number with bits set to indicate which lines to test. Bit 0 = line 0 Bit 1 = line 1
TYPE OF LOOPBACK (1=INTERNAL, 2=STAGGERED, 3=25 PIN CONNECTOR 4=MODEM): (0) 2? —	Enter number to indicate the desired Loopback type. This parameter not prompted by CVDHA?
INTERRUPT BR LEVEL: (0) 4? —	Enter the number equal to the BR level of the device.
CHANGE SW (L)? *Y*	
REPORT UNIT NUMBER AS EACH UNIT IS TESTED: (L) Y? —	
NUMBER OF INDIVIDUAL DATA ERROR TO REPORT ON A LINE: (D) 0? —	

DHV11 Register Bit Assignments

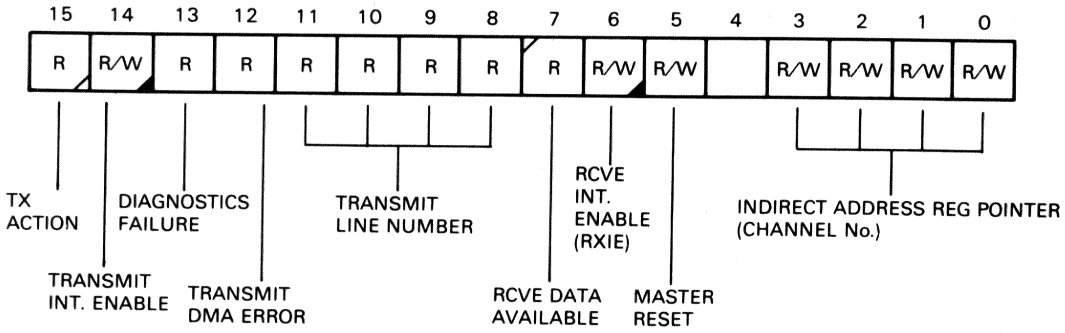
Register bit assignments for the DHV11 are shown in the following diagrams.

Register Coding



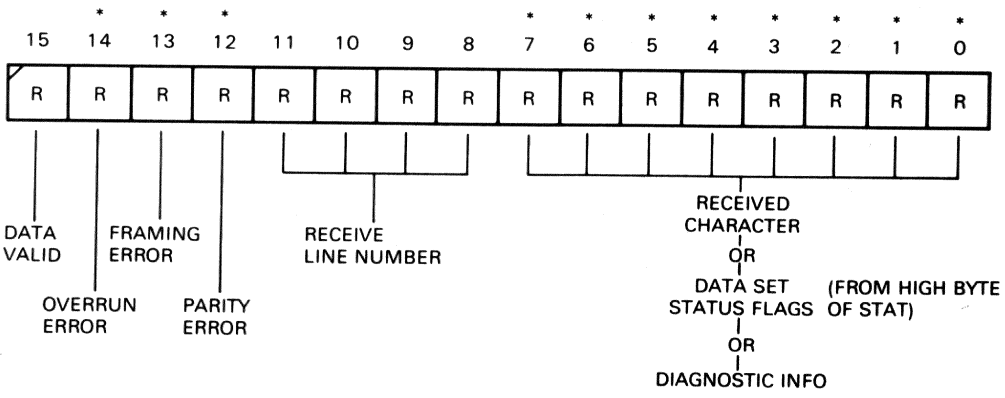
MKV84-1241

CSR (BASE)



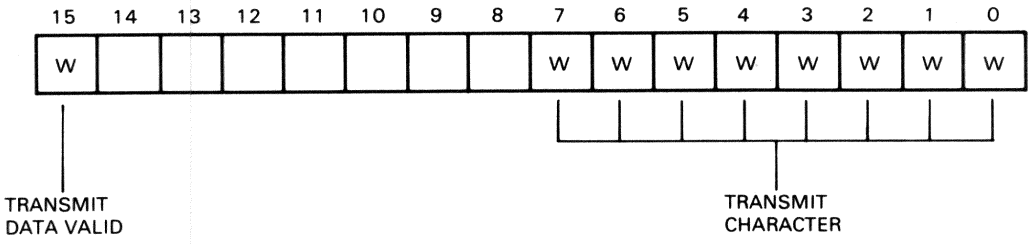
MKV84-1242

RBUF (READ BASE + 2)



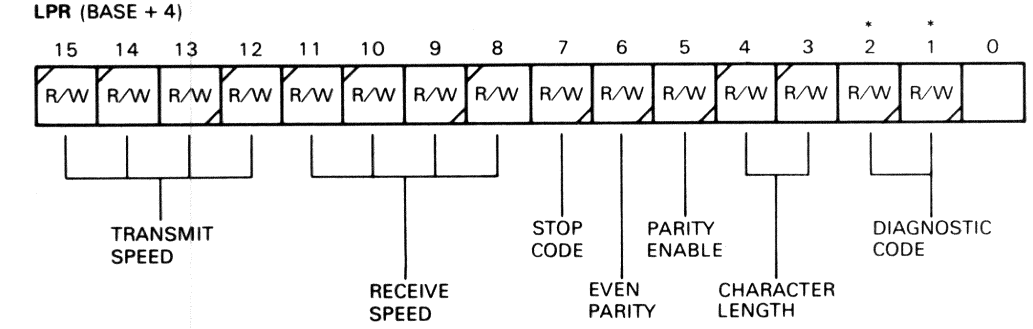
MKV84-1243

TXCHAR (WRITE BASE + 2)



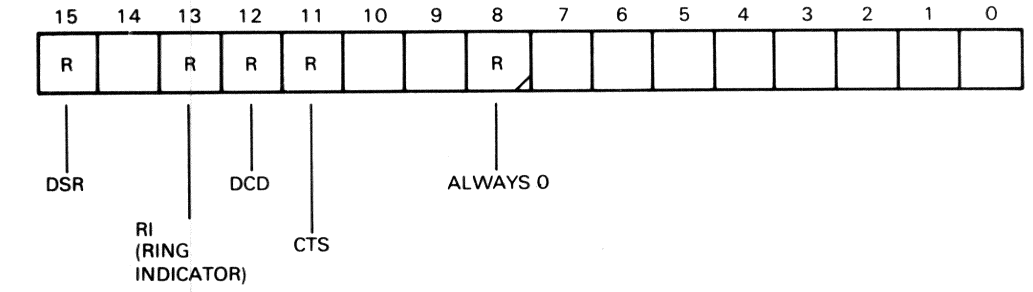
MKV84-1244

LPR (BASE + 4)



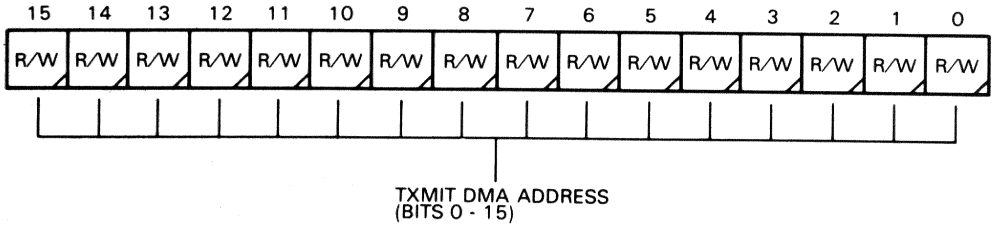
MKV84-1245

STAT (BASE + 6)



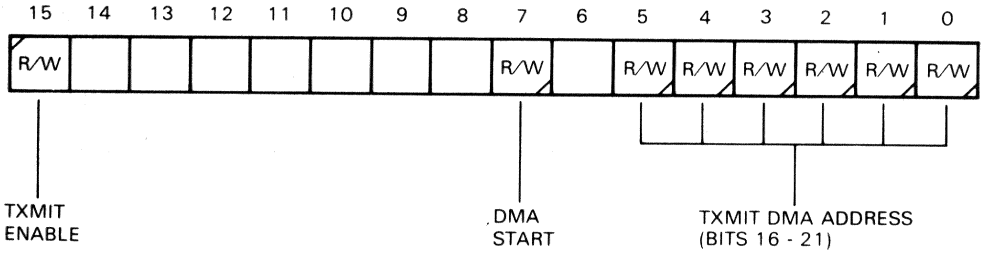
MKV84-1246

TBUFFAD1 (BASE + 12)



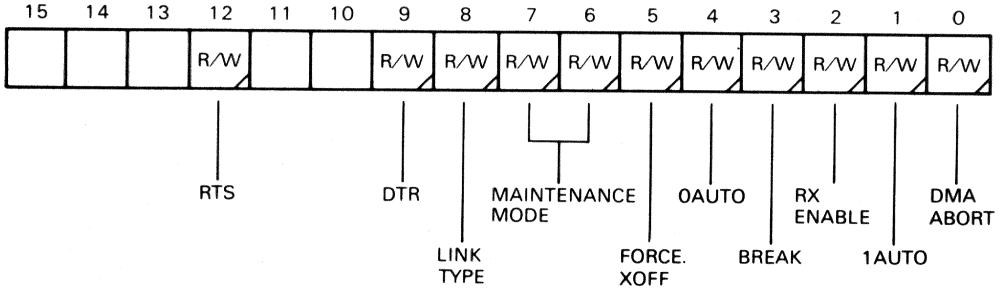
MKV84-1248

TBUFFAD2 (BASE + 14)



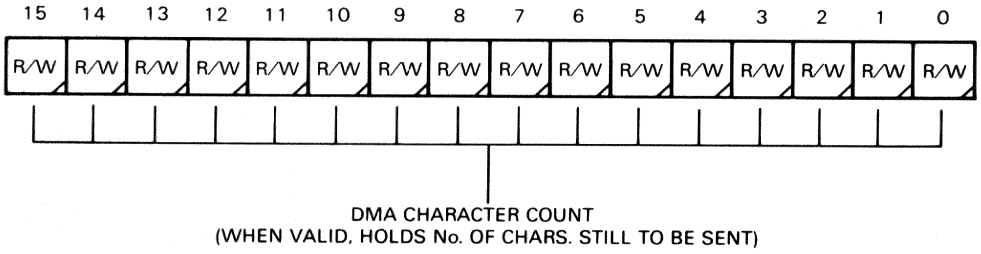
MKV84-1249

LNCTRL (BASE + 10)



MKV84-1247

TBUFFCT (BASE + 16)



MKV84-1250

DHV11 Tech-Tip/FCO History

Table DHV11-4 DHV11 Tech-Tip Index

Tech Tip No.	Title	Speed Bulletin No.

Table DHV11-5 DHV11 FCO History

FCO No.	Date	Reason	Quick Check

Communications Options
Minireference Manual
Vol 1 – EK-CMIV1-RM-002
(ZKO)

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