DIMENSION® 600/2000 PBX
PERIPHERAL LINE MONITOR TEST
(PROC 537)

1. GENERAL

1.1 This section is issued in order to make available the information contained in the Administration and Maintenance Manual, 500-497, PROC 537.

1.2 The attachment provides monitoring capability for the data channel used by a peripheral interface circuit (PIC).

ATTACHMENT

PROC 537 (10 pages)

Reason for Issue:
New Section

Manager, Denver PBX PECC

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PROC 537 - PERIPHERAL LINE MONITOR

A. DESCRIPTION

Procedure 537 is used to monitor data that passes between the PBX and the peripheral interface circuit (PIC) for a specified peripheral device. This procedure does not turn on or retire any alarms.

Two tests are available:

- Test 1 - Captures and prints individual data words sent to and/or received from the peripheral device.
- Test 2 - Prints the entire message sent to and/or received from the peripheral device.

TEST 1: CAPTURE AND PRINT INDIVIDUAL DATA WORDS SENT TO AND/OR RECEIVED FROM THE DEVICE. USE 'NEXT DATA' TO DISPLAY NEXT DATA WORD IF A MAINTENANCE PRINTER IS NOT USED.	TEST 2: PRINT COMPLETE MESSAGES SENT TO AND/OR RECEIVED FROM THE DEVICE.	CODES: FIELD 2: 8=PRINTER 9=DATA SET 10=PMS 11=CRT FIELD 4: 0=NOT BUSIED 1=BUSIED OUT	FIELD 6: 0=DATA SENT TO DEVICE 1=DATA RECEIVED FROM DEVICE 2=BOTH OF ABOVE FIELD 7: 1=DATA HAS BEEN LOST	FIELDS 10-13: DECIMAL EQUIVALENTS OF HEX DIGITS REPRESENTING DATA WORD.	SPECIAL ERROR CODE: 81=NO DATA TO DISPLAY 82=PRINTER MUST BE SPECIFIED
USE 'NEXT UNIT' TO ADVANCE TO THE NEXT DEVICE TYPE. USE 'NEXT CKT' TO ADVANCE TO THE NEXT DEVICE NUMBER ASSIGNED TO THE DISPLAYED DEVICE TYPE.					

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	DEVICE ID								TEST 1			
									COMMANDS		DATA	
TEST NO	DEVICE TYPE	DEVICE NUMBER	MTCE BUSY STAT	MTCE PRINTER DEVICE NUMBER	DATA TYPE	STATUS CODE	TOTAL	INDEX	CHANNEL I/O	PIC FUNCTION		
1	2	3	4	5	6	7	8	9	10	11	12	13
1.	1	0.		1.	0.		2.	0.	-.		3	6.		3	3.	—		1.		0.		4.	1	3.		537

FIELD 1 2 3 4 5 6 7 8 9 10 11 12 13

B. FIELD DEFINITIONS AND CODES

Field	Code	Definition
1	1,2	Test number.
2		Device type:
	8	Printer.
	9	Data set.
	10	PMS.
	11	CRT.
3	1-31	Device number.
4		Maintenance busy status of device being monitored:
	0	Not busied.
	1	Busied out.
5	*	Number of printer to be used to display monitored data.
6		Type of data monitored:
	0	Data sent: data words in Test 1, message in Test 2.
	1	Data received: Data words in Test 1, message in Test 2.
	2	Both of the above.

Field	Code	Definition
7		Status code:
	1	No space in output buffers; some data lost.
	blank	No problem.
8	0-999	Total number of data words (Test 1) or messages (Test 2) monitored.
9	0-999	Index of last data word or message displayed.
10†		I/O command for the channel (LC34):
	1	Transmit to the PIC.
	2	Retransmit the last data word.
	3	No operation.
11†		PIC function commands:
	0	Transmit the encodes displayed in fields 12 and 13 to the peripheral device.
	1	Read RAM location in PIC and return this data to the PBX.
	2	Write into RAM location.
	3	Write encodes displayed in fields 12 and 13 into RAM location.

B. FIELD DEFINITIONS AND CODES (Contd)

Field	Code	Definition
11† (Contd)	4	Request data from the interface (ie, read the peripheral device).
	5	Initialize the USART with the data in fields 12 and 13.
	6,7	(Reserved for maintenance).
	8	Disable "read storage" output to allow on-line maintenance to check PIC status.
	9	Enable "read storage" output upon completion of on-line maintenance inquires.
12,13†	Four Characters	Data for the PIC encoded in ASCII notation, which is listed in Table 537-1.

° Varies according to system configuration.

† Fields 10 through 13 are displayed in Test 1 only. The encodes are the decimal equivalents of the hexidecimal codes:

Decimal	Hex	Decimal	Hex	Decimal	Hex
0	0	6	6	11	B
1	1	7	7	12	C
2	2	8	8	13	D
3	3	9	9	14	E
4	4	10	A	15	F
5	5				

CRT - Cathode ray tube
I/O - Input/Output
PMS - Property management system
RAM - Random access memory
USART - Universal synchronous-asynchronous receiver-transmitter

C. TEST PROCEDURE

A list of peripheral line monitoring tests, what each one does, and how each is run follows:

Call in Procedure 537:

PROC NO.; 537; ENTER

Test 1 is automatically selected.

Depressing the NEXT TEST key repeatedly advances the procedure to the desired test.

Busy out (or release from busy) the printer used for monitoring:

CAUTION

If a printer is used for monitoring (optional in Test 1, required in Test 2), it must be busied out before the test is run. Therefore, functions it normally handles will either be lost or diverted to an alternate printer, as assigned in Procedure 220. It is important to consider the consequences of losing this service before the printer is busied out. An alternative is to attach an additional PIC and printer to the system using Procedure 253 to administer them.

Do not busy out the printer monitoring PMS messages in Test 2. When this printer is busied out, it will not accept PMS data, which would be lost.

Call in Procedure 537; 8; ENTER; (Device number); ENTER; BUSY OUT (or RLS BUSY OUT)

The WAIT indicator remains turned on until the system is able to complete the busy out or release busy out. The following is then displayed on the MAAP:

Field	Contents
1	Test number.
2	8, printer device type.
3	Device number.
4	1, maintenance busy status.

Test 1:

Test 1 captures and displays individual data words sent to and/or received from the peripheral device.

If the printer busy-out procedure described previously has not been run, call in Procedure 537 and enter the appropriate data in fields 2 through 6; eg:

8; ENTER; (Device Number); ENTER; BUSY OUT; CHANGE FIELD; 2; ENTER; (Device Type); ENTER; (Device Number); ENTER;(Maintenance Printer Device Number); ENTER; (Data Type); ENTER; EXECUTE

The MAAP display includes the following:

Field	Contents
2,3	Device identification.
4	Maintenance busy status.
5	Maintenance printer device number.
6	Data type being monitored.

C. TEST PROCEDURES (Contd)

Field	Contents
7	Blank*, buffer status code.
8	Total number of data words monitored.
9	Index of last data word displayed.

* Field 7 remains blank until the procedure's internal buffer becomes full, at which point a 1 is displayed in field 7 and monitoring stops. Printing continues until the buffer is empty, resulting in a blank field again.

Fields 8 and 9 flash indicating that the test is running. Depressing the STOP key stops the test.

> **NOTE**
>
> Depressing the EXECUTE key anytime after STOP has been used causes all data to be removed from the buffer. This sequence should be used only when testing has been completed.

The NEXT DATA key can be used to display the monitored data words in fields 10 through 13 if no printer has been specified, or to display (on the MAAP and printer) the words remaining in the buffer when STOP was depressed. Repeatedly depressing NEXT DATA steps the display through each data word, until the last one is displayed. Depressing NEXT DATA after the last data word has been displayed dashes fields 10 through 13. Depressing NEXT DATA again loops the display around to the data word that was first displayed when the test was stopped.

The NEXT UNIT key can be used to advance field 2 to the next device type. The first device number for this device type is displayed in field 3. NEXT CIRCUIT advances field 3 to the next device number that is assigned to the displayed device type.

Test 1 may be run in an alternate manner. After Procedure 537 has been called in, the NEXT UNIT and/or NEXT CIRCUIT keys can be used to advance fields 2 and 3 through the display, as indicated previously. After testing is completed, repeatedly depressing NEXT DATA steps the display through each of the data words (fields 10 through 13).

If no printer is available to use for Test 1, enter dashes in the Maintenance Printer Device Number field by depressing ENTER for field 5. Under these conditions, the number of data words captured is displayed in field 8, but field 9 contains a zero because nothing is being printed.

> **NOTE**
>
> Special error code 81 appears if there is no data to display when the NEXT DATA key is pressed.

C. TEST PROCEDURES (Contd)

Test 2:

Test 2 prints complete messages sent to and/or received from the peripheral device. The message printed is actually the contents of the peripheral interface buffer which was sent to and/or received from the device. If the actual message is longer than one buffer, it is printed as two messages.

> **NOTE**
>
> A maintenance printer to print messages must be assigned in Test 2 because only individual data words can be displayed on the MAAP. Special error code 82 indicates that a printer must be specified.

To start the test, select Test 2. If the printer busy-out procedure described previously has not been run, call in Procedure 537 and enter the appropriate data in fields 2 through 6; eg:

8; ENTER; (Device Number); ENTER; BUSY OUT; CHANGE FIELD; 2; ENTER; (Device Type); ENTER; (Device Number); ENTER; (Maintenance Printer Device Number); ENTER; (Data Type); ENTER; EXECUTE

The MAAP display includes the following:

Field	Contents
2,3	Device identification.
4	Maintenance busy status.
5	Maintenance printer device number.
6	Data type being monitored.
7	Blank* buffer status code.
8	Total number of data words monitored.
9	Index of last data word displayed.

* Field 7 remains blank until the procedure's internal buffer becomes full, at which point a 1 is displayed in field 7 and monitoring stops. Printing continues until the buffer is empty, resulting in a blank field again.

Fields 8 and 9 flash indicating that the test is running. Because Test 2 prints only actual messages, maintenance interrogation commands sent and received are ignored. Depressing the STOP key stops the test.

> **NOTE**
>
> Depressing the EXECUTE key anytime after STOP has been used causes all data to be removed from the buffer. This sequence should be used only when testing has been completed.

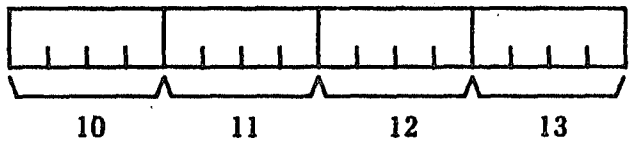
No data appears in fields 10 through 13 because this test only prints messages and, therefore, the NEXT DATA key cannot be used.

C. TEST PROCEDURES (Contd)

The NEXT UNIT key can be used to advance field 2 to the next device type. The first device number for this device type is displayed in field 3. NEXT CIRCUIT advances field 3 to the next device number that is assigned to the displayed device type.

D. DATA FORMATTING AND SAMPLE OUTPUTS

Data is passsed between the PBX and the device in "words", each of which consists of 16 bits. For ease of notation, these 16 bits are converted into four hexadecimal digits. Each digit has a predetermined meaning as described below. Data words sent from the PBX to the PIC associated with the device being monitored have the following format:

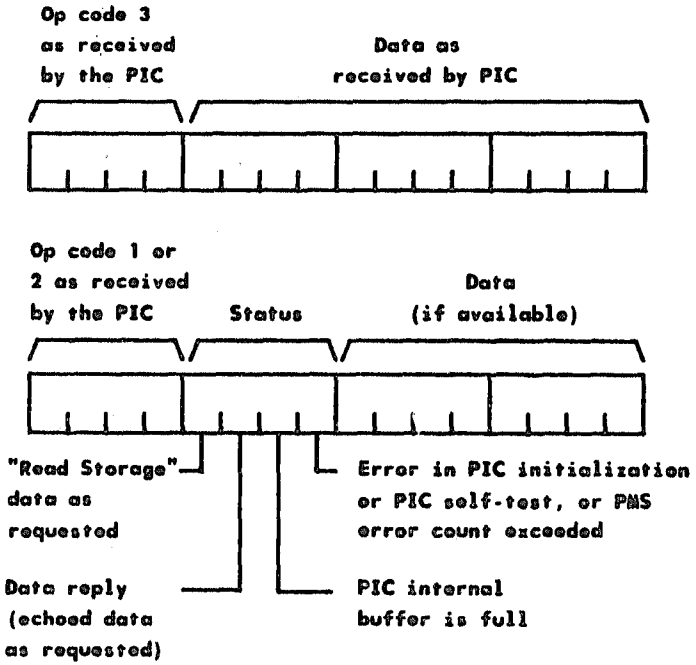


Field(s) 10 = I/O command for the channel (LC34)
11 = function command for the PIC
12,13 = eight bits of data for the command

Refer to paragraph B for a description of encodes for each of these fields.

The PBX receives a data word from the PIC in response to every word it sends to the PIC with an encode of 1 or 2 in field 10(I/O command). This data provides the current status of the PIC along with the eight data bits being returned, as shown following:

<00> = NULL
<02> = STX(start of text)



The letter T or F proceeds all printed data words and messages to denote that the data is sent to or received from the peripheral device. Refer to the sample outputs.

When monitoring a printer, CRT, or long distance billing device, each line of the message is enclosed in quotes (" "). Each unprintable character is printed in hexadecimal and enclosed in carets (< >). The most common unprintable characters are:

D. DATA FORMATTING AND SAMPLE OUTPUTS (Contd)

<03> = ETX(end of text)
<04> = EOT(end of transmission)
<05> = ENQ(enquiry)
<06> = ACK(acknowledge)
<0A> = LF(line feed)
<0D> = CR(carriage return)
<14> = FF(form feed)
<15> = NAK(negative acknowledge)
<7F> = DEL(delete)

When monitoring a PMS device, messages are edited to appear exactly as they would on a PMS audit printer.

Sample Outputs:

(a) Wakeup summaries as monitored on a Victor printer:

Test 1:

T100A T1057 T1041 T104B
T1045 T1055 T1050 T1020
T1053 T1055 T104D T104D
T1041 T1052 T1059 T100D
T100A T1030 T1036 T102F
T1032 T1033 T102F T1037
T1038 T1020 T1031 T1034
T103A T1031 T1039 T1020
T1050 T102D T1030 T1031
T100D T100A T100A T1045
T104E T1044 T100D T100A
T100A T100A T100A T100A
T100A T100A T100A T100A
T100A T100A T100A T100A
T100A

Test 2:

T"<0A>WAKEUP SUMMARY<0D>"
T"<0A>"
T"06/23/78 14:20 P"
T"-01<0D><0A><0A>"
T"END<0D><0A><0A><0A><0A>"
"<0A><0A><0A><0A><0A>"
"<0A><0A><0A>"
T"<0A><0A>"

(b) On-line maintenance interrogation of the PIC (Test 1):

T1800 F1000 T11E0 F1300
T1400 F1404 T1900

(c) Long distance billing data:

Long distance billing data is sent to the PBX in eight-bit ASCII code via the automated charge quotation service of the Traffic Service Position System (TSPS). Typical message sequences are as follows:

(1) Individual messages:

ENQ LF DEL "msg text" FF
DEL DEL DEL EOT DEL

(2) Mutiple messages:

D. DATA FORMATTING AND SAMPLE OUTPUTS (Contd)

```
ENQ LF DEL "msg text" FF
    DEL DEL DEL
    LF DEL "msg text" FF
    DEL DEL DEL
    .....................
    LF DEL "msg text" FF
    DEL DEL DEL EOT DEL
```

(3) Message text format:

stxNNNBbHHHbMM/DDbRRRRRbHH:MMbTTTTb$DDD.CCbCALLED#etx

where stx = start of text (hex 02)
etx = end of text (hex 03)
b = blank (space)
NNN = message number
B = buffer identifier
HHH = hotel identifier
MM/DD = month and day
RRRRR = room number (may be RRRRb)
HH:MM = time call was placed
TTTT = elapsed time of call
$DDD.CC = charge for call
CALLED# = called number, left justified with "L" appended if call was local, or 7-to-12 digit packed number followed by "F" for foreign calls

(4) Sample long distance billing output (Test 2):

```
F"<02>028<61> <62><74><6C> 06/16 1919  05:32 "
 "0031 $075.77 600-555-9889<03>"
```

```
F"<02>029<61> <62><74><6C> 06/16 1919  09:22 "
 "0045 $034.89 600-756-9665L<03>"
```

(d) PMS output:

Refer to Section E, Repair Guide, for sample testing of PMS data.

E. REPAIR GUIDE

1. This procedure does not generate or retire any alarms. Use Procedure 530 to analyze alarm conditions associated with the PIC.

2. Output data should be checked to verify that the information sent to and/or received from the monitored device is as expected. If the information is not as expected, run Procedure 530 to test the PIC. If the PIC is functioning correctly, then the problem is either in the external device or in the software of the PBX.

3. A quick check of the operation of the PMS can be done by activating and/or deactivating the message waiting indicators while using Test 1 or 2 of this procedure to monitor the results. This allows the data sent to or received from the PIC to be checked without requiring detailed knowledge of the various message types or formats.

   Listed below are the possible cases involving activation/deactivation of the message waiting indicators. Also shown is the output for

Tests 1 and 2 used to monitor the transaction. Assume that:

a) the telephone station number = abcd
b) the time = 1:27 PM
c) m = message count, 0 < m < 9

Case 1: Enable message waiting lamp from the PMS
Test 1: F1802 F1813 F18m1 F18ba F18dc F1803
Test 2: F abcd 13:27 MW1

Case 2: Clear message waiting lamp from the PMS
Test 1: F1802 F1813 F18m2 F18ba F18cd F1803
Test 2: F abcd 13:27 MW2

Case 3: Enable message waiting lamp from the PBX
Test 1: T1002 T1013 T10m3 T10ba T10dc T1003
Test 2: T abcd 13:27 MW3

Case 4: Clear message waiting lamp from the PBX
Test 1: T1002 T1013 T10m4 T10ba T10dc T1003
Test 2: T abcd 13:27 MW4

Table 537-1. Partial List of ASCII Codes

Hex	ASCII	Hex	ASCII	Hex	ASCII	Hex	ASCII
0	NULL	6	ACK	C	FF	12	DC2
1	SOH	7	BEL	D	CR	13	DC3
2	STX	8	BS	E	SO	14	DC4
3	ETX	9	HT	F	SI	15	NAK
4	EOT	A	LF	10	DLE	16	SYN
5	END	B	VT	11	DC1	17	ETB

Table 537-1 Partial List of ASCII Codes (Contd)

Hex	ASCII	Hex	ASCII	Hex	ASCII	Hex	ASCII
18	CAN	34	4	50	P	6C	l
19	EM	35	5	51	Q	6D	m
1A	SUB	36	6	52	R	6E	n
1B	ESC	37	7	53	S	6F	o
1C	FS	38	8	54	T	70	p
1D	GS	39	9	55	U	71	q
1E	RS	3A	:	56	V	72	r
1F	US	3B	;	57	W	73	s
20	SPACE	3C	<	58	X	74	t
21	!	3D	=	59	Y	75	u
22	"	3E	>	5A	Z	76	v
23	#	3F	?	5B	[	77	w
24	$	40	@	5C	\	78	x
25	%	41	A	5D	]	79	y
26	&	42	B	5E	↑	7A	z
27	'	43	C	5F	←	7B	
28	(	44	D	60	/	7C	|
29	)	45	E	61	a	7D	
2A	*	46	F	62	b	7E	
2B	+	47	G	63	c	7F	DEL
2C	,	48	H	64	d		
2D	-	49	I	65	e		
2E	.	4A	J	66	f		
2F	/	4B	K	67	g		
30	0	4C	L	68	h		
31	1	4D	M	69	i		
32	2	4E	N	6A	j		
33	3	4F	O	6B	k		

END