GA27-3086-1
File No. S360/370-09

Systems

Guide to Using the IBM 3704 Communications Controller Control Panel

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IBM

Second Edition (September 1974)

This is a major revision of and makes obsolete GA27-3086-0 and TNL GN27-3133. The *Summary of Amendments* section describes the changes made in this edition.

This edition applies to the following program releases and to all subsequent releases until otherwise indicated in new editions or Technical Newsletters:

Emulation Program	*Network Control Program*		
DOS, OS, DOS/VS, OS/VS Version 2 Modification 3	OS	Version 1	Modification 3
	OS/VS	Version 2	Modification 2
	OS/VS	Version 3	Modification 2
	OS/VS	Version 4	Modification 1
	DOS/VS	Version 3	Modification 2

Changes are periodically made to the information herein; before using this publication in connection with the operation of IBM Systems, consult the latest *IBM System/360 and System/370 Bibliography* (GA22-6822) and associated Technical Newsletters for editions that are applicable and current.

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Preface

This publication is a guide for using the local or remote IBM 3704 Communications Controller control panel. It primarily describes the functions and uses of the 3704 panel controls. It provides information for the systems programmer, the systems engineer, the customer engineer and the programming service representative with a knowledge of the internal operation of the local or remote 3704 and a need to use either control panel for normal operation, testing, or diagnostics.

For the operator, an *IBM 3704 Operator Reference Summary* is provided with this manual to be used as an easy reference for preparing the 3704 for operation and for handling basic error conditions.

This manual is divided into five sections and five appendixes.

Section 1 describes the general capabilities of the 3704 control panel and how to use the panel.

Section 2 describes the basic and advanced program-independent control panel procedures for the 3704.

Section 3 describes the 3704 control panel procedures used with the Emulation Program. The EP will not run in the remote 3704 Communications Controller.

Section 4 describes the 3704 control panel procedures used with the Network Control Program. The terms NCP 4, NCP 3, and NCP 2 are used throughout the manual when referring to Version 4, Version 3, and Version 2, respectively, of the Network Control Program.

Section 5 is an alphabetical list of the 3704 panel controls that summarizes their functions and provides a cross-reference to the applicable procedures.

The appendixes provide supplementary information to execute and interpret certain of the control panel procedures. Appendix E contains error recovery procedures that may be used at your option as an aid for determining the cause of an error condition before calling your service representative.

A special feature of the manual is a foldout diagram of the 3704 control panel (Appendix D). The diagram is divided into areas, each of which has a number. Throughout the book, references to a specific panel control are keyed to the section of the diagram where that control is located. For ease of reference, the diagram can be folded out to be seen with any other page of the manual.

Prerequisite Publication:

Introduction to the IBM 3704 and 3705 Communications Controllers, GA27-3051

Related Publications:

Emulation Program Publications:

IBM 3704 and 3705 Communications Controllers Emulation Program Generation and Utilities Guide and Reference Manual, GC30-3002
IBM 3704 and 3705 Communications Controllers Emulation Program Storage and Performance, GC30-3005
IBM 3704 and 3705 Program Reference Handbook, GY30-3012*

Network Control Program Publications:

IBM 3704 and 3705 Communications Controllers Network Control Program Generation and Utilities Guide and Reference Manual (for OS/MFT and OS/MVT TCAM Users), GC30-3000
IBM 3704 and 3705 Communications Controllers Network Control Program/VS Generation and Utilities Guide and Reference Manual (for OS/VS TCAM Users), GC30-3007
Network Control Program/TCAM Network User's Guide, GC30-3009

Program-Independent Publications:

IBM 3704 and 3705 Communications Controllers Principles of Operation, GC30-3004
IBM 3704 Operator Reference Summary, GA27-3091
IBM 3705 Operator Reference Summary, GA27-3092
Guide to Using the IBM 3705 Communications Controller Control Panel, GA27-3087*

TCAM Publications:

OS/MFT and OS/MVT TCAM Programmer's Guide, GC30-2024
TCAM User's Guide, GC30-2025

*This publication contains EP and NCP/PEP information.

Contents

Section 1: Introduction 1-1

Section 2: 3704 Program-Independent Control Panel Procedures 2-1

Basic 3704 Control Panel Procedures 2-3

Preparing the 3704 2-4

Turning Power On 2-5

Turning Power Off 2-6

Resetting a Power Check 2-7

Activating/Deactivating the Control Panel 2-8

Enabling/Disabling the Channel Interface (Local only) 2-9

Initial Program Load (IPL)

Local 2-10

Remote 2-12

Lamp Test 2-16

Replacing a Light Emitting Diode 2-17

Displaying 3704 Status 2-18

Resetting a CCU Check 2-19

Advanced 3704 Control Panel Procedures 2-11

Instruction Step 2-22

Character Entry — Single Digit Mode 2-23

Character Entry — Serial Digit Mode 2-24

Set Address or Display for Registers 2-25

Storing Data in a Register 2-26

Set Address or Display for Storage 2-27

Storing Data in a Storage Location 2-28

Store Address Compare 2-29

Load Address Compare 2-30

Displaying the Storage Address Register (SAR)
and the Operation (OP) Register 2-31

Storage Test Pattern 2-32

Storage Scan 2-33

Displaying Display Registers 1 and 2 (Program Display) 2-34

Section 3: 3704 Control Panel Procedures used with the Emulation Program . . 3-1

Dynamic Display of an ICW, CCB, BCB (Local only) 3-2

Dynamic Display of Storage (Local only) 3-5

Generating Channel End/Device End (Local only) 3-6

Activating the Level 2 Line Trace (Local only) 3-7

Deactivating the Level 2 Line Trace (Local only) 3-8

Activating/Deactivating the Level 2 and/or Level 3 Line Trace 3-9

Line Test Function (Panel Test) (Local only) 3-10

Section 4: 3704 Control Panel Procedures used with the Network Control Program 4-1

Setting the Control Panel Mode with PEP 4-2

Dynamic Display of an ICW 4-3

Dynamic Display of Registers 4-5

Dynamic Display of Storage 4-6

Allow Additional Register Range Bit 4-7

Network Shutdown 4-8

Address Trace Facility 4-10

Activating the Level 2 Line Trace (NCP/PEP) (Local only) 4-16

Deactivating the Level 2 Line Trace (NCP/PEP) (Local only) 4-17

Contents (continued)

Activating/Deactivating the Level 2 and/or Level 3 Line Trace (NCP/PEP) (Local only) 4-18
Line Test Function (Panel Test) 4-19

Section 5: 3704 Control Panel Descriptions 5-1

Appendix A: Register Addresses A-1

Appendix B: Functions of the Display A and Display B Check, and Status Lights B-1

Appendix C: Aids for Reading the Display Lights
Binary Conversion of Control Panel Displays C-1
Type 1 Scanner Bit Control Block (BCB) (EP) C-2
Character Control Block (CCB) (EP and PEP) C-3
Line Test Control Block (LTS)
NCP 1 and NCP 2 . . . . . C-5
NCP 3 . . . . . C-6

Appendix D: 3704 Control Panel Diagram D-1

Appendix E: 3704 Error Recovery Procedures E-1
Error Recovery Checklist E-2
Modem Error Recovery E-3
Modem Equalization Procedure E-9
Flow chart for Auto-Answer and Auto-Call, Modem Tests E-11
Flow chart for Auto-Call (ACO) Tests E-13
Auto-Answer Test with EP E-15
Auto-Answer Test with NCP or NCP/PEP E-16
Auto-Call Test with EP E-17
Auto-Call Test with NCP or NCP/PEP E-18
Modem Test 2 (Modem Wrap) with EP E-19
Modem Test 2 (Modem Wrap) with NCP or NCP/PEP E-20
Modem Test 3 (Transmit All Marks) with EP E-21
Modem Test 3 (Transmit All Marks) with NCP or NCP/PEP E-22
Modem Test 4 (Receive All Marks) with EP E-23
Modem Test 4 (Receive All Marks) with NCP or NCP/PEP E-24
SDLC Link Test with NCP or NCP/PEP (for NCP V4M1 only) E-25

Glossary G-1

Index X-1

Abbreviations

ATB	address trace block
ACO	automatic call originate
BCB	bit control block
BPS	bits per second
BSC	binary synchronous communications
CCB	character control block
CCU	central control unit
CDS	configuration data set
CE	Customer Engineer
CHAN	channel
CMD	command
CNTL	control
CPU	central processing unit
CRC	cyclic redundancy checking
CS	cycle steal
DISBL	disable
DOS	Disk Operating System
DS LEADS	data set leads
ENBL	enable
EP	Emulation Program
ESC	emulation subchannel
ext	external
ICW	interface control word
ID	identification
INTF	interface
IPL	initial program load
JCL	job control language
L	level
LCD	line control definer
LIB	line interface base
LRC	longitudinal redundancy check
LTS	line test control block
NCP	Network Control Program
NO-OP	no operation
NSC	native subchannel
OP Reg	operation register
OS	Operating System
PCF	primary control field
PDF	parallel data field
PEP	Partioned Emulation Programming
PIU	path information unit
PLM	program logic manual
PROG	program
ROS	read-only storage
S	start
SAR	storage address register
SCF	secondary control field
SDF	serial data field
SDLC	synchronous data link control
SDR	storage data register
TAR	temporary address register
TCAM	telecommunications access method
TCU	transmission control unit
TERM	terminal

Summary of Amendments for GA27-3086-1

This revision updates the publication as follows:

- TNL GN27-3133 has been incorporated.
- Four new procedures have been added: an Initial Program Load (IPL) procedure for the remote 3704, and three procedures to be used with the EP portion of PEP with NCP 3 - Activating the Line Trace, Deactivating the Line Trace and an Activating/Deactivating the Line Trace procedure. For NCP 3, new test commands have been added to the Line Test (Panel Test) procedure and the line test control block has been updated.
- Updates have been made to procedures where applicable for remote controller operation.
- Updates have been made to Modem Tests 2, 3, and 4 with NCP 3 for synchronous data link control (SDLC) operation.
- All cross references have been updated.

A technical change or addition to existing page is indicated by a vertical line to the left of the change.

The following pages have been added:

2-12 - 2-15
4-16 - 4-18

Section 1: Introduction

This manual contains the information you need to use the facilities of the local or remote IBM 3704 Communications Controller control panel as well as a description of all the panel controls and their functions.

The 3704 is a program-controlled communications controller that performs a wide range of functions and takes over many responsibilities that were once allocated to the access method. Both the hardware and the control program allow a high degree of flexibility in configuring the 3704 to meet the particular requirements of most teleprocessing installations. This flexibility extends to the control panel, for in many cases, the control program determines what happens when you press a certain push button switch (hereafter called push buttons). These are program-dependent functions that are executed by both the hardware and the particular control program resident in controller storage. In this manual, the program-dependent functions are in Sections 3 and 4. The program-independent functions (functions that are executed by the hardware alone) are in Section 2.

One IBM-supplied control program, the Emulation Program (EP), makes the controller perform most of the functions of an IBM 2701 Data Adapter Unit, an IBM 2702 Transmission Control, or an IBM 2703 Transmission Control and is designed to make the change-over from a 2701, 2702, or 2703 to a 3704 easier. To the access method in the host processor (the computer to which the 3704 is attached), a 3704 with the Emulation Program appears to be a 2701, 2702, or 2703. The messages printed out on the system console, for example, are the same for the 3704 as for one of those transmission control units. The Emulation Program supports several 3704 control panel functions such as dynamic displays, line trace, and a diagnostic line test procedure. The EP will not run in the remote 3704 Communications Controller.

The second IBM-supplied control program, the Network Control Program (NCP), supports several 3704 control panel functions including dynamic displays, the operator-control shutdown feature, and address trace. A feature of the Network Control Program is the Partitioned Emulation Programming (PEP) extension. The PEP extension allows you to run some communication lines in network control mode while concurrently running others in emulation mode. In a PEP environment, most of the panel procedures available for the Emulation Program are supported in addition to those available for the NCP. The Network Control Program with the PEP extension will not run in the remote 3704 Communications Controller. The terms NCP 4, NCP 3, and NCP 2 are used throughout the manual when referring to Version 4, Version 3, and Version 2, respectively, of the Network Control Program.

This manual describes procedures performed at the system console only when they are not related to an access method. These include primarily the procedures for loading the control program into the local or remote 3704 Communications Controller. Host operating procedures that are related to the access method support for the 3704 are described in the applicable access method publication.

In the following four sections are the procedures for operating the controller both under normal operating conditions and in diagnostic mode. Section 5 describes each panel control, its function, and the procedures in which it is used. The appendixes give additional information relating to certain procedures or to the use of certain panel controls. At your option, you may use Appendix E - Error Recovery Procedures - as an aid for determining the cause of an error condition before calling your service representative.

For additional introductory information about the local or remote IBM 3704 Communications Controller, refer to the 3704 and 3705 *Introduction* manual.

Section 2: 3704 Program-Independent Control Panel Procedures

This section describes the procedures you can execute at the 3704 control panel, regardless of the control program resident in the controller. The procedures are organized in two groups. The first group includes the basic procedures that you will use most often. The second group consists of advanced operating procedures that are normally used by an experienced programmer or service representative who is familiar with the system configuration and application.

Each procedure is described in flowchart form, showing the actions you should take. The 3704 responses to your action as well as explanatory notes and additional information are located in the margins.

At the bottom of the page for each procedure is a list of the control panel push buttons and lights used in that procedure. The number after each one is a key to the section of the control panel diagram (Appendix D) where that push button or light is located. The diagram folds out so that you can look at it with any other page of the manual. The key should help you locate the controls easily if you are unfamiliar with the panel.

The remote 3704 control panel is identical to the local 3704 control panel except that it does not have the CHANNEL INTERFACE push buttons and lights and the LOCAL POWER and REMOTE POWER push buttons.

Each push button on the control panel responds with an audio signal when it is pressed. The tone is to inform you that the push button has been activated and can be heard as long as it is pressed

Basic 3704 Control Panel Procedures

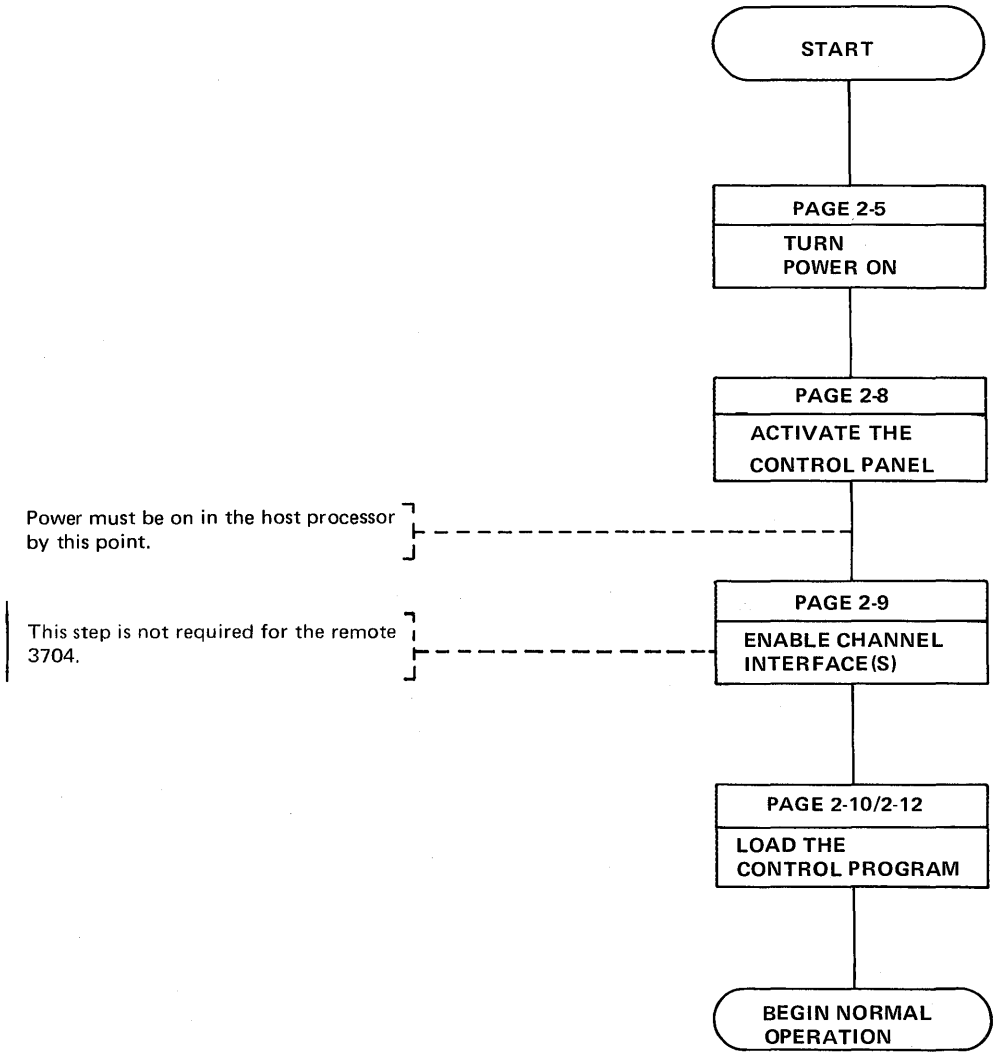
The following procedures are ones used most frequently during normal 3704 operation. They are primarily those procedures needed to start and stop the 3704, make the control panel active, and enable or disable the channel interface. They also include procedures for correcting certain error conditions.

The 3704-related procedures in the host access method are not described here. Refer to the operator's or user's guide for the access method under which you are running for a description of these procedures.

The remote 3704 requires a remote program loader in place of a channel adapter; therefore, any procedure which enables or disables the channel interface does not apply to remote operation.

The 3704-related procedures in the host access method are not described here. Refer to the operator's or user's guide for the access method under which you are running for a description of these procedures.

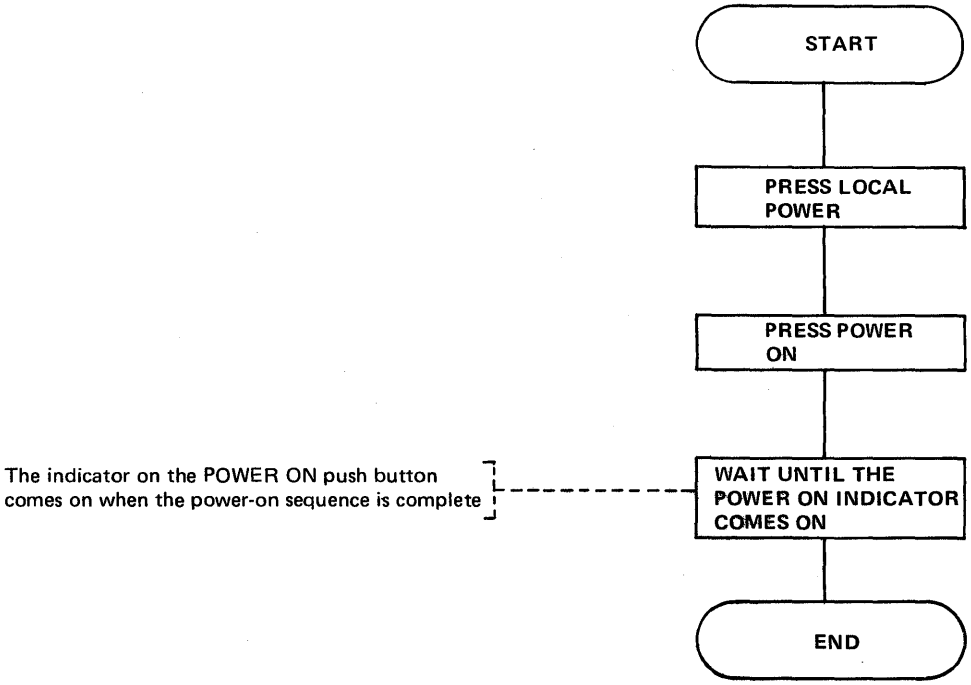
Execute these procedures in the order shown. When the sequence is complete, the 3704 is ready for normal operation.



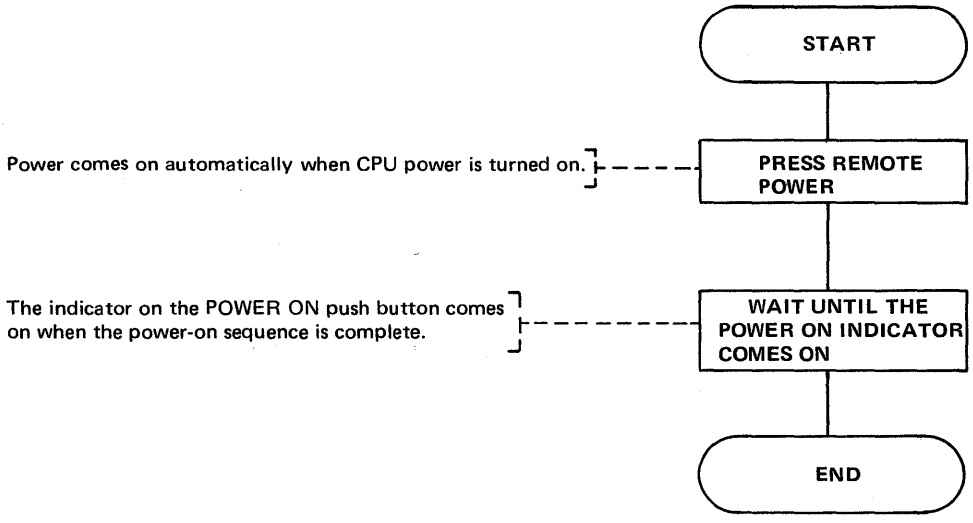
Turning Power On*

Use this procedure to turn power on when the LOCAL POWER push button is activated.

*The remote 3704 does not have the REMOTE POWER or LOCAL POWER push buttons. The only way to turn power on at the remote is by pressing POWER ON.

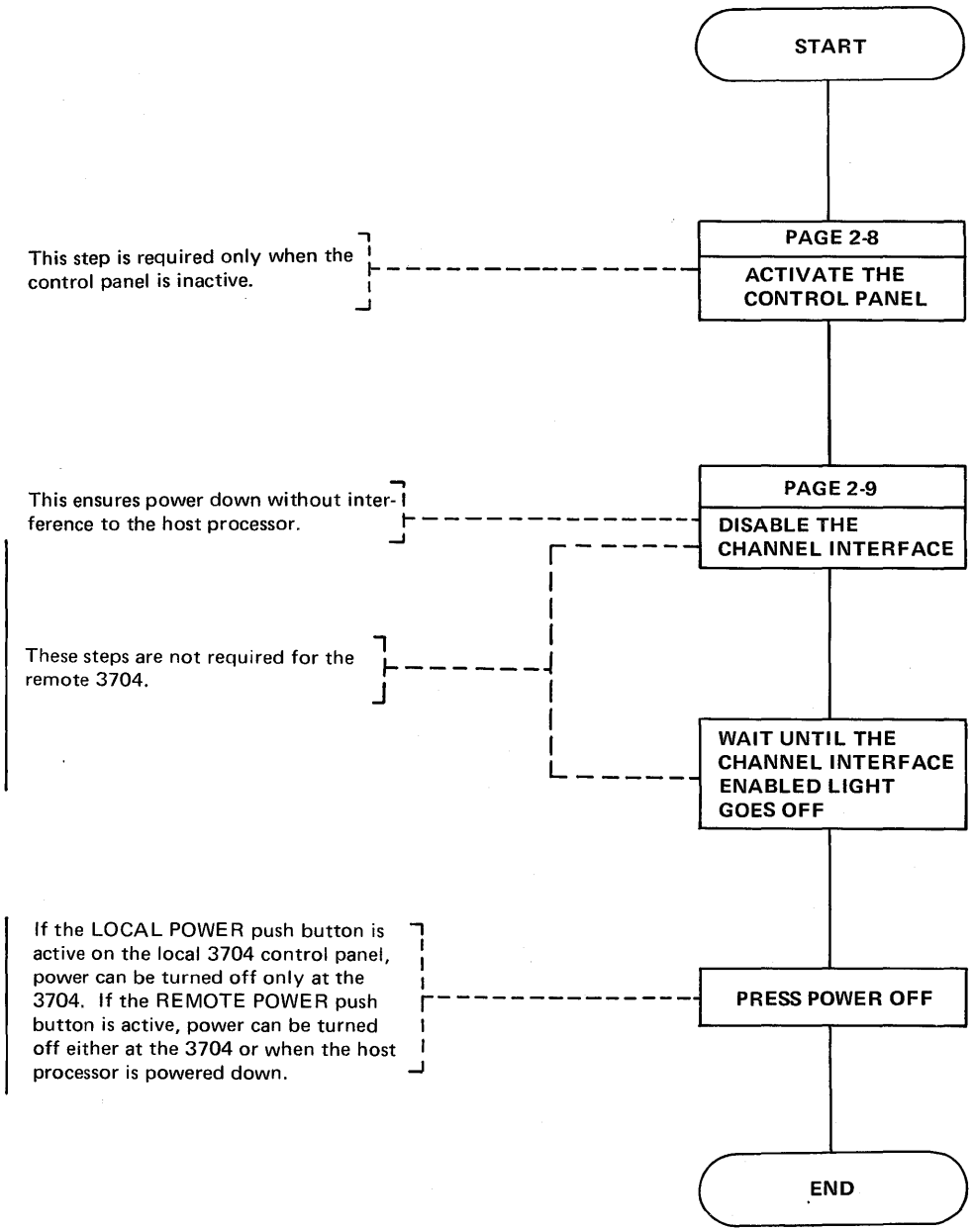


Use this procedure to turn power on when the REMOTE POWER push button is activated.



LOCAL POWER push button 12
POWER ON push button 13
REMOTE POWER push button 12

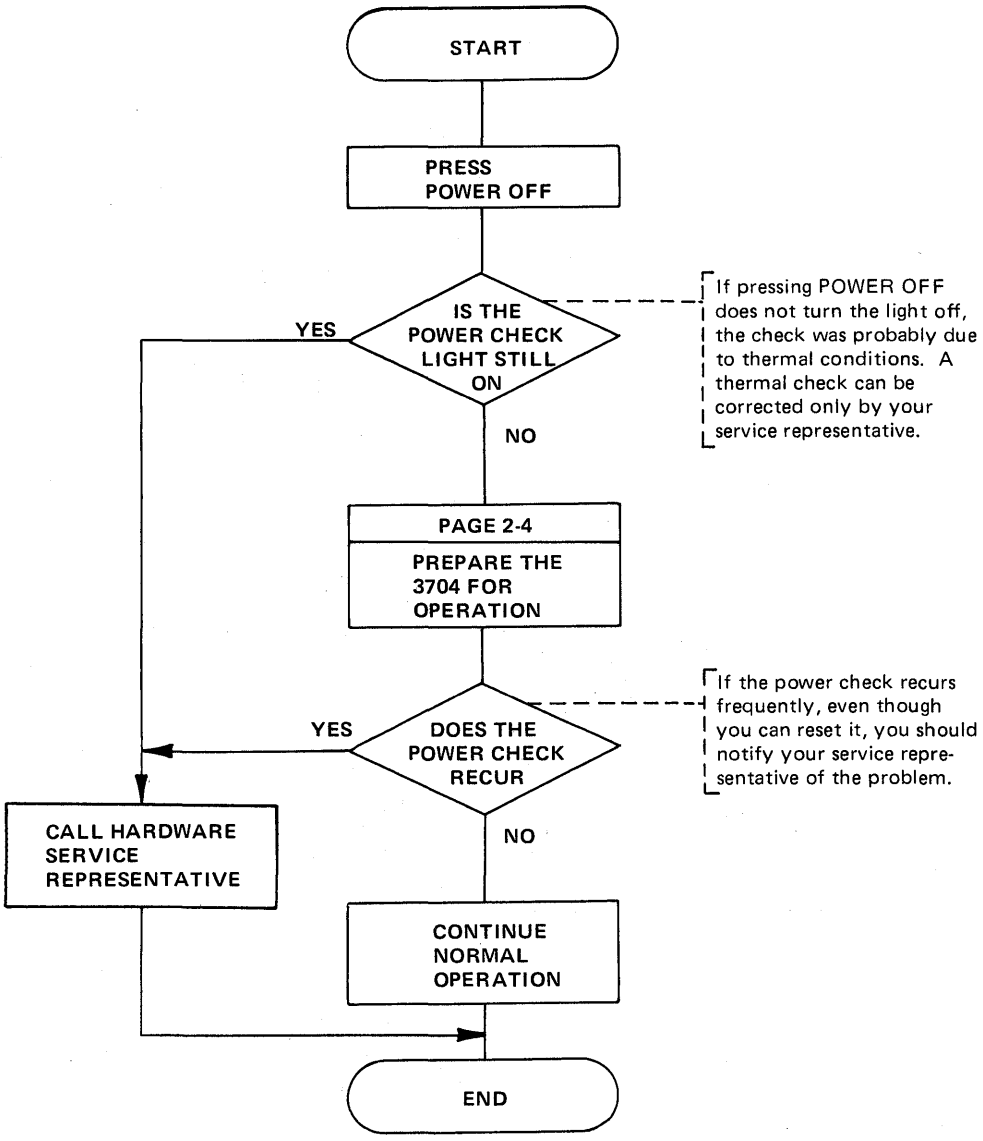
CAUTION Always disable all channel interfaces before pressing POWER OFF.



CHANNEL INTERFACE ENABLED light 2
LOCAL POWER push button 12
POWER OFF push button 13
REMOTE POWER push button 12
WAIT light 11

When a power check occurs, a power off sequence is initiated and the POWER CHECK light comes on. Try to reset the check by executing this procedure.

Note: An abnormal power off sequence sets the LOCAL POWER push button to the active state.

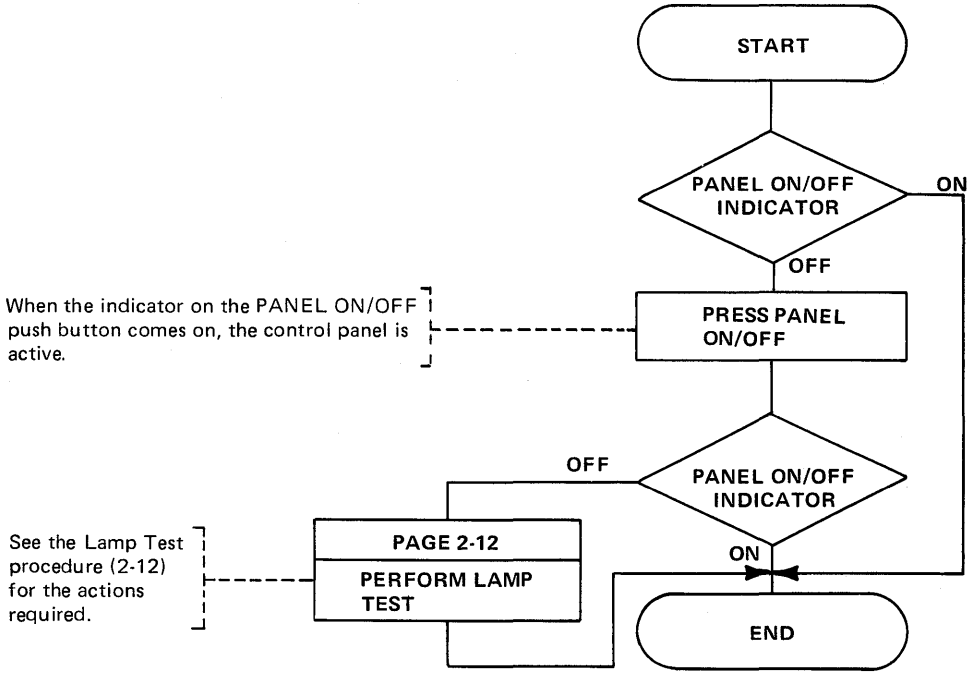


POWER CHECK light 11
POWER OFF push button 13

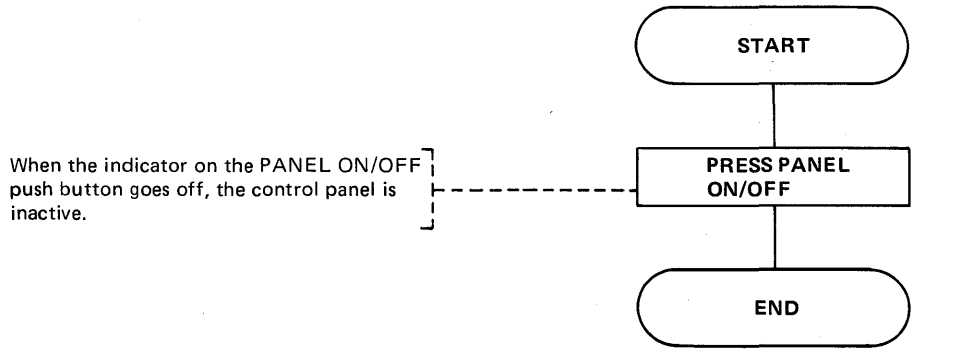
Activating/Deactivating The Control Panel

When the 3704 is powered on, the control panel is inactive. In this state, only the following push buttons are effective: POWER ON, POWER OFF, LOCAL POWER, PANEL ON/OFF, and REMOTE POWER. The POWER ON push button is effective only if the 3704 is on local power. When the panel is inactive, the 3704 operates as if the MODE SELECT–PROCESS, the DIAGNOSTIC CONTROL–PROCESS, and the DISPLAY SELECT–STATUS push buttons were activated. When the control panel becomes active, the FUNCTION SELECT–STORAGE ADDRESS and the HEXADECIMAL DISPLAY CONTROL–SINGLE DIGIT MODE push buttons are automatically activated.

To Activate The Panel



To Deactivate The Panel



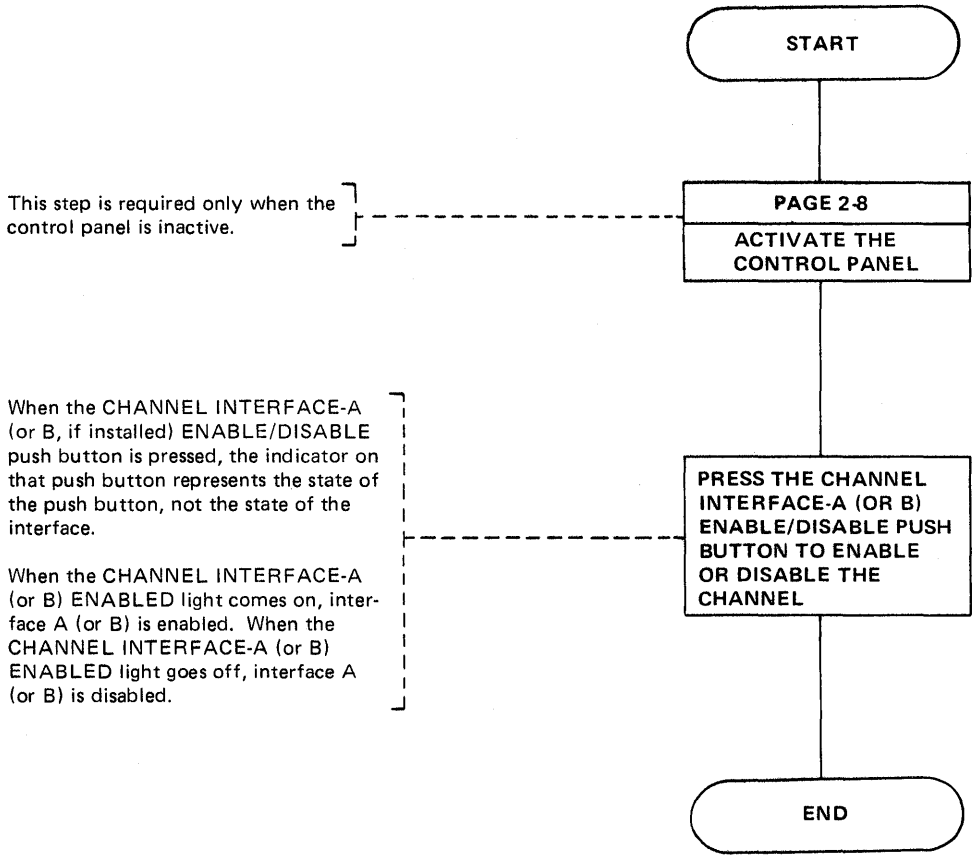
PANEL ON/OFF push button 13

Enabling/Disabling The Channel Interface (Local only)

A channel interface must be enabled to allow the local 3704 to communicate with the host processor. If the two channel switch feature is installed, only one channel interface can be enabled. The interface (s) should be disabled before normal power off. On abnormal power off, the interfaces are automatically disabled.

CAUTION

If the control program is inoperative due to a storage test pattern or if an error stop has occurred, press the DIAGNOSTIC CONTROL–PROCESS push button then the RESET, and LOAD push buttons before enabling the interface.



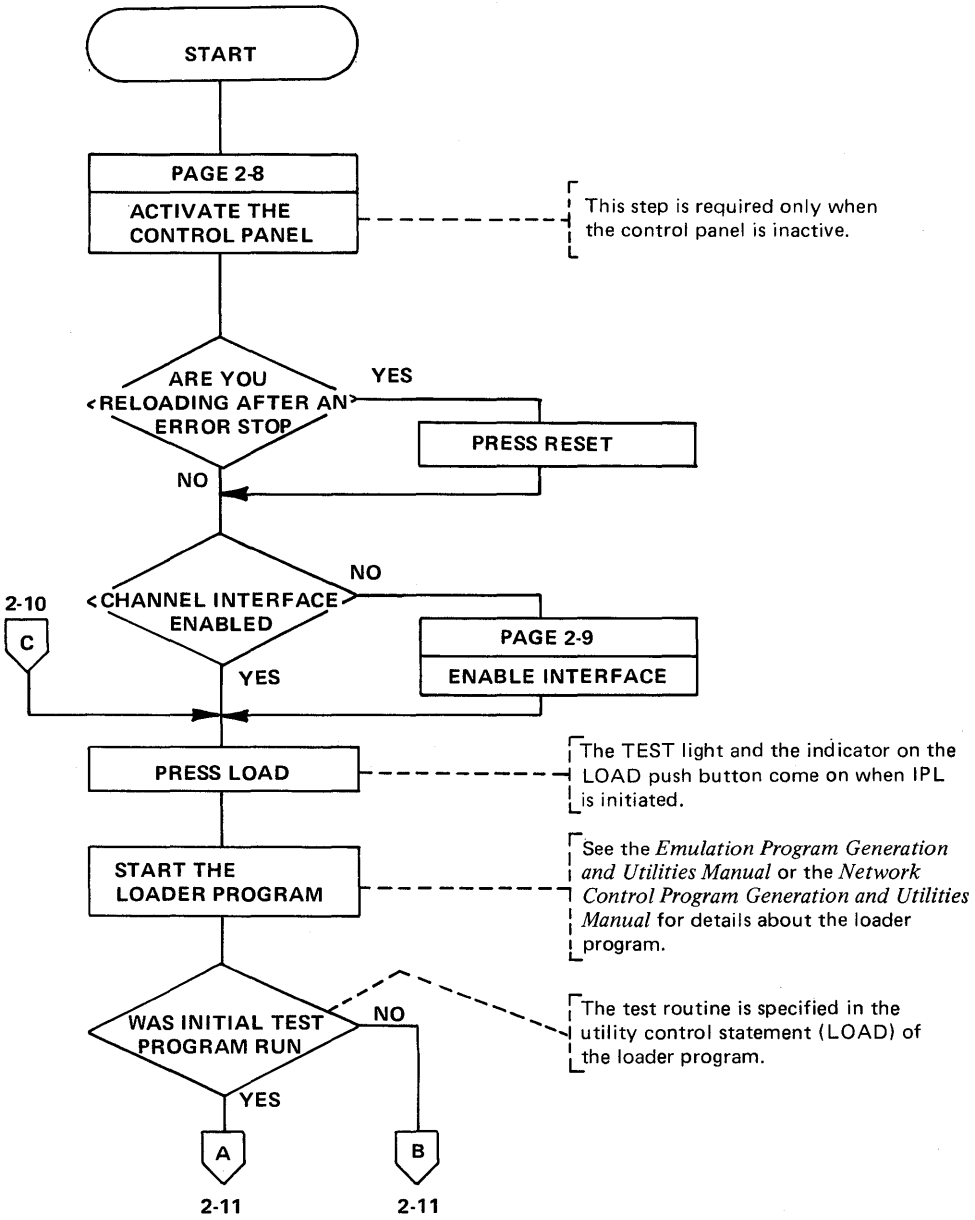
CHANNEL INTERFACE ENABLED lights 2

CHANNEL INTERFACE ENABLE/DISABLE push buttons 2

Use this procedure to load the control program across the channel into the local IBM 3704.

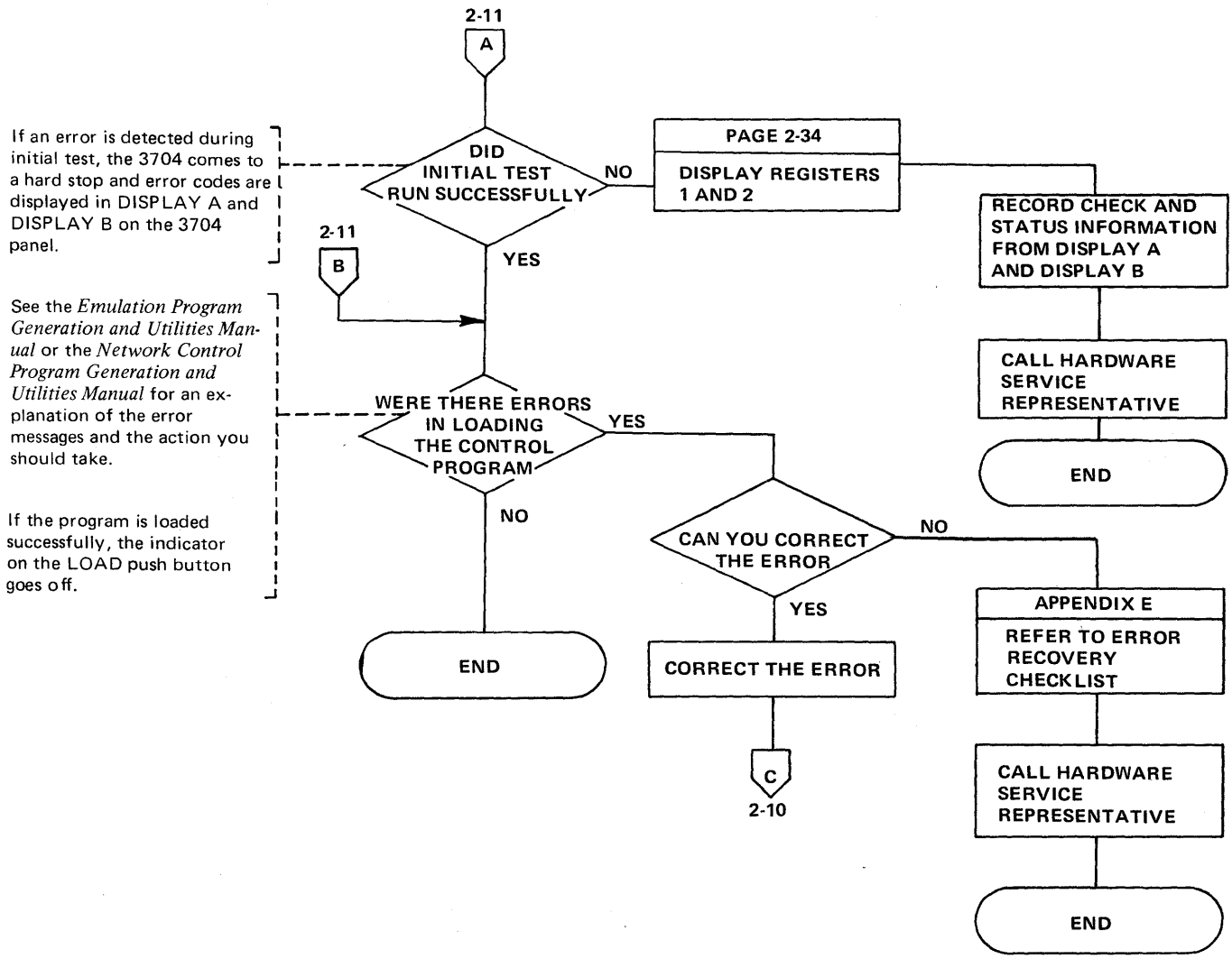
CAUTION Do not press the LOAD push button while subchannels are in operation under the Emulation Program.

CAUTION If the control program is inoperative due to a program stop, press the RESET then LOAD push buttons.



LOAD push button 6
RESET push button 11
TEST light 11

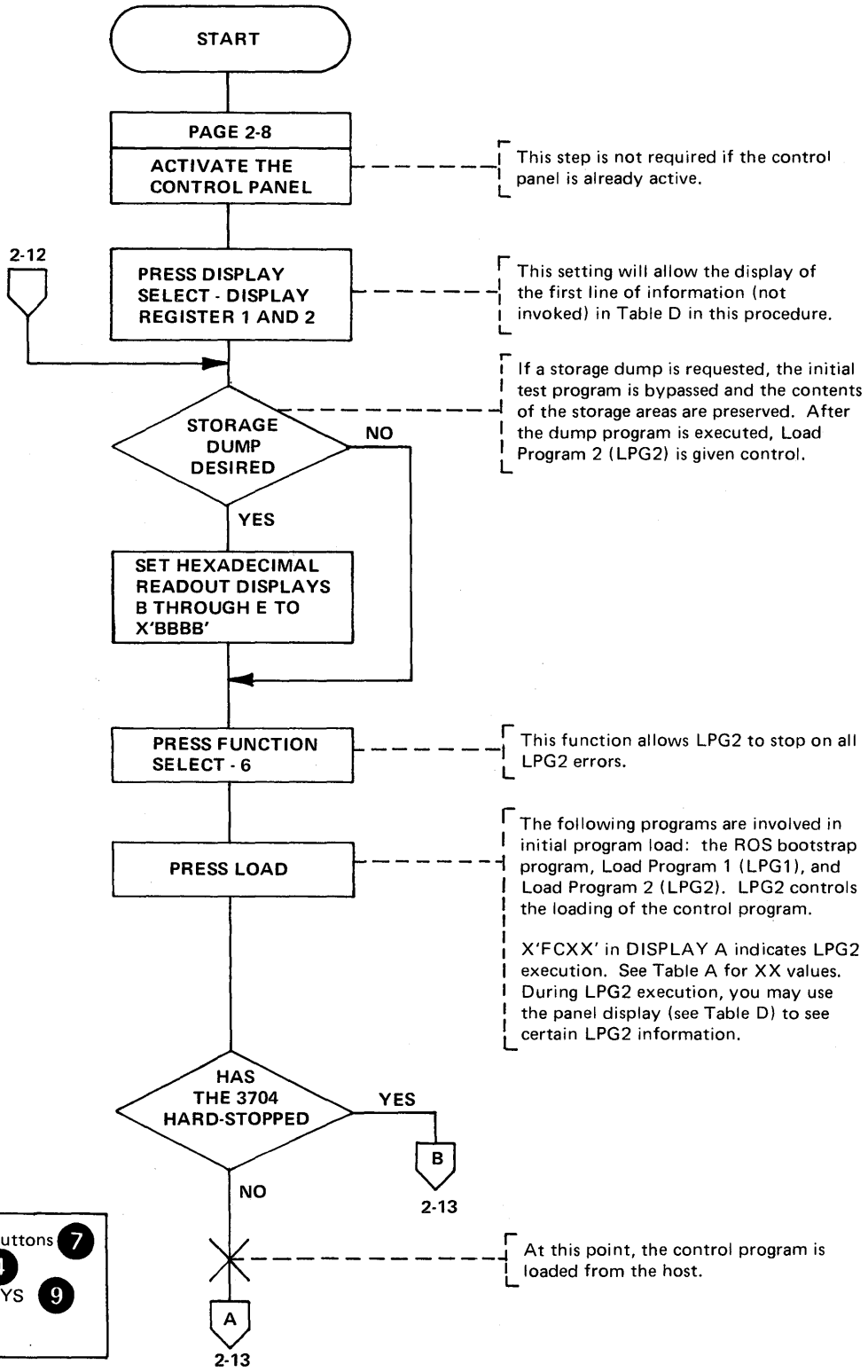
Initial Program Load (IPL) (Local only) (Part 2 of 2)



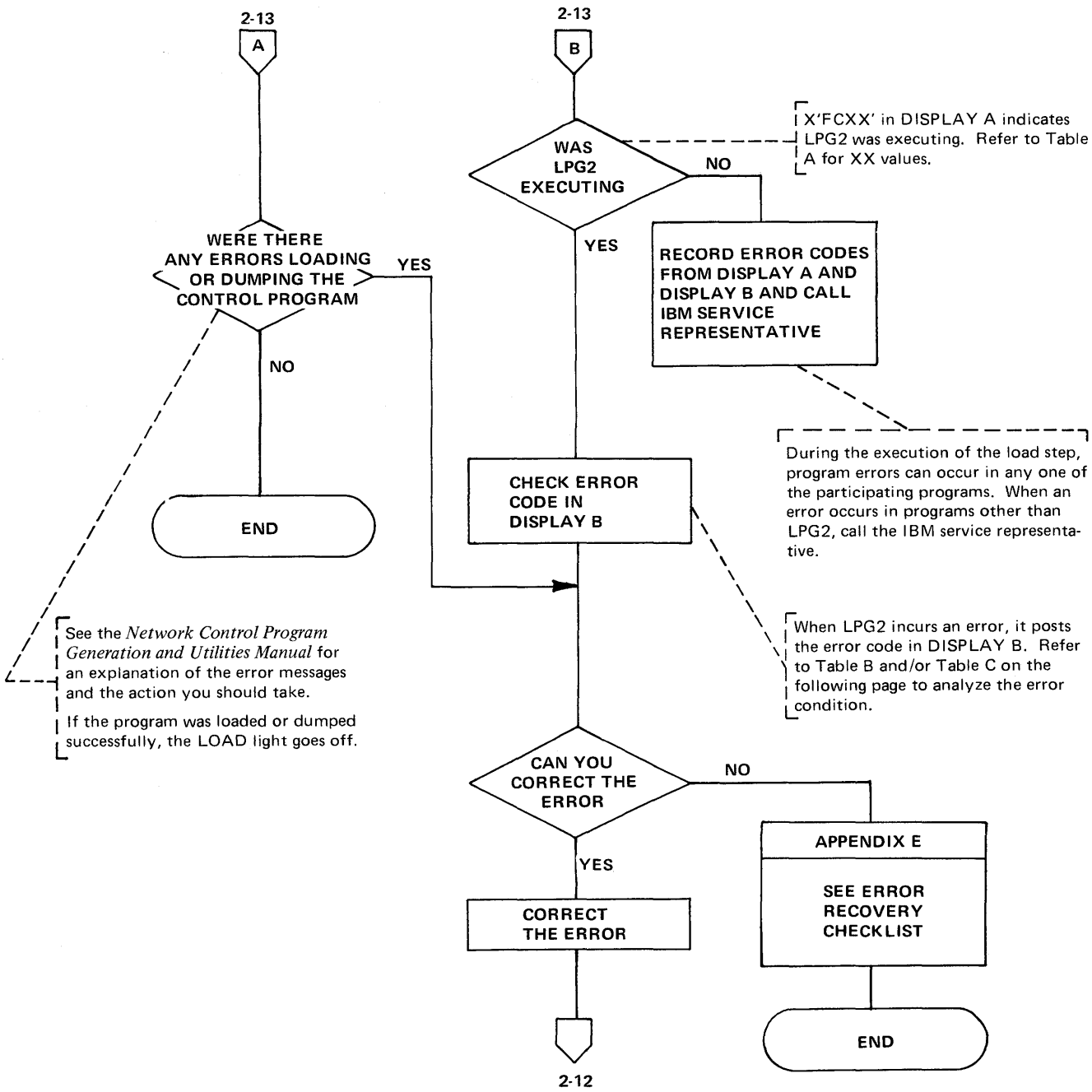
DISPLAY A 1
DISPLAY B 1

Initial Program Load (IPL) (Remote only) (Part 1 of 4)

Use this procedure to load the control program across the channel and through the local controller into the remote IBM 3704.



Initial Program Load (IPL) (Remote only) (Part 2 of 4)



DISPLAY A 1

DISPLAY B 1

X'FCXX' in DISPLAY A indicates LPG2 execution. Values for XX - the IPL sequence indicator - are shown in Table A. These codes indicate the progress of the IPL procedure.

Table A - IPL Sequence Indications

XX = IPL Sequence Indicator	Descriptions
80	Monitor IPL state
40	Load state
20	Dump state
10	If load state - entry point received
10	If dump state - dump-final received
08	PIU received, response not yet transmitted
04	Reserved
02	High 8K of storage is in from disk
01	Type 2 Scanner indicator

Table B describes the error codes that cause LPG2 to unconditionally hardstop. Table C describes the LPG2 abend codes for errors that cause LPG2 to automatically reload itself. If FUNCTION SELECT - 6 has been activated, these errors cause a hard stop rather than an automatic re-IPL.

Table B - LPG2 Error Codes (conditions causing unconditional hardstops)

DISPLAY B	Error Descriptions
30F0	No SDLC lines defined as active in CDS*
30F1	Type 1 Scanner failed to enable, hardware error or CDS definition error
30F2	CDS invalid

*CDS is the remote IPL *configuration data set.* It is defined as part of the 3704 installation procedure.

Table C - LPG2 Abend Codes (conditions causing re-IPL)

Abend code*	Error Descriptions
X'3F01'	No lines active (enable failed or transmit initial failed).
X'3F02'	SDRM (set disconnect response mode) received while monitoring one line. LPG2 re-IPLs to monitor all CDS lines.
X'3F03'	SNRM (set normal response mode) received while monitoring one line and load final not yet received. LPG2 re-IPLs to monitor all lines.
X'3F04'	Timer expiration. User-specified inactive interval has expired.
X'3F05'	Level 1 error.
X'3F10'	SIM (set initialization mode) received during the load or dump state.

*If the Netowrk Control Program was running and FUNCTION SELECT - 1 is activated, the NCP abend code is displayed in DISPLAY B if an abend occurred.

Table D describes the LPG2 panel displays. These displays may be used during LPG2 execution to display certain LPG2 information.

Table D - LPG2 Control Panel Displays

Always press INTERRUPT after pressing the FUNCTION SELECT push button.

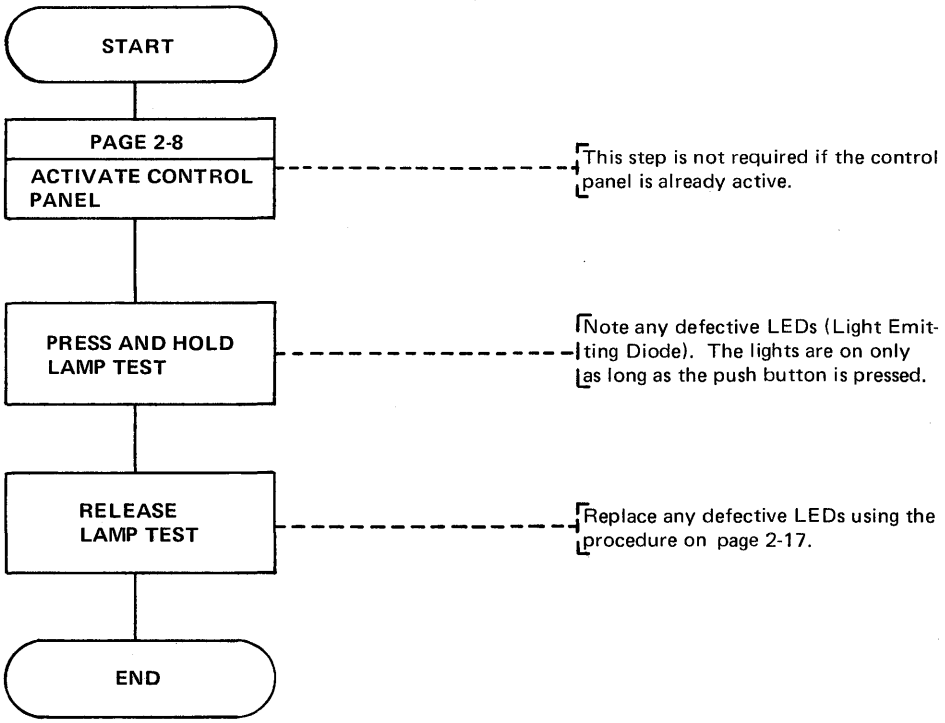
FUNCTION SELECT push buttons	HEXADECIMAL READOUT DISPLAYS B C D E	DISPLAY A	DISPLAY B
Not invoked. Do not press INTERRUPT	Unused	F C X X (See Table A for XX values)	0 X X X last line address (after hardware interrupt)
STORAGE ADDRESS	Address of storage location	Address entered	Contents of storage location
REGISTER ADDRESS	R 0 R 0 R = register desired	R 0 R 0	Contents of storage register
1	Unused	Status i 0 0 s (see Note)	Abend Code (see Table C)
2	0 X X X line address	SCF/PDF	LCE/PDF DS leads
3	Unused	PIU Request Code / XX see Table A	Storage pointer
4	0 X X X line address	Receive SDLC Address Character Control Character	Transmit SDLC Address Character Control Character
5	Receive ≠ 0 Transmit = 0 / Displacement	Displacement into PIU	Contents current of PIU
6	Forces the not-invoked display state and causes LPG2 to hardstop if a Table C condition occurs.		

Note: For status in FUNCTION SELECT - 1: i = IPL information from register X'6B' (see the *3704 and 3705 Principles of Operation* manual for information on register X'6B')
s = four bits indicating which CDS line to use

Lamp Test

This procedure may be used to verify that most of the control panel lights are working properly. The hexadecimal display indicators in readout displays B, C, D, and E must be checked independently. You can test them by entering EEEE and then 1111. This activates all of the LED segments.

This procedure does not affect normal 3704 operation.



LAMP TEST push button 13

Replacing A Light Emitting Diode

The following procedure is used to open the display panel and replace a defective Light Emitting Diode (LED).

Note: If one of the hexadecimal display LEDs is defective, you must call your service representative for replacement.

(a) Remove the face plate.

Pull from the bottom and lift off.

(b) Open the display panel.

At the top of the display panel loosen the knurled knob and lay the panel down. It will pivot at the bottom.

(c) Replace the defective Light Emitting Diode (LED).

LEDs marked "spare" are located behind the display panel in the lower right quadrant. The LEDs plug into receptacles in the panel base. Remove the defective LED and replace it with one of the spares.

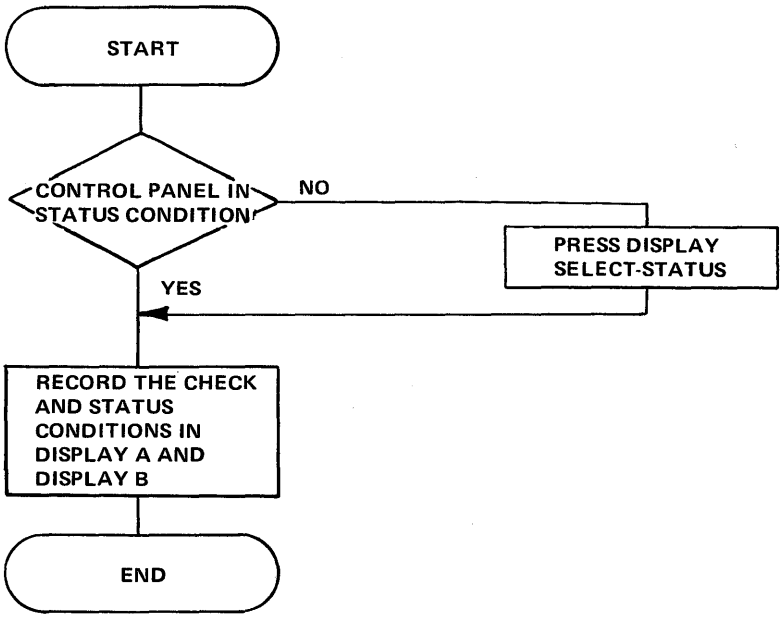
Be careful to insert the replacement LED in the proper direction. Replacement instructions are printed on the inside of the display panel.

(d) Close the display panel and tighten the knurled knob.

(e) Replace the face plate by placing the top in position first and then snapping the bottom in place.

Displaying 3704 Status

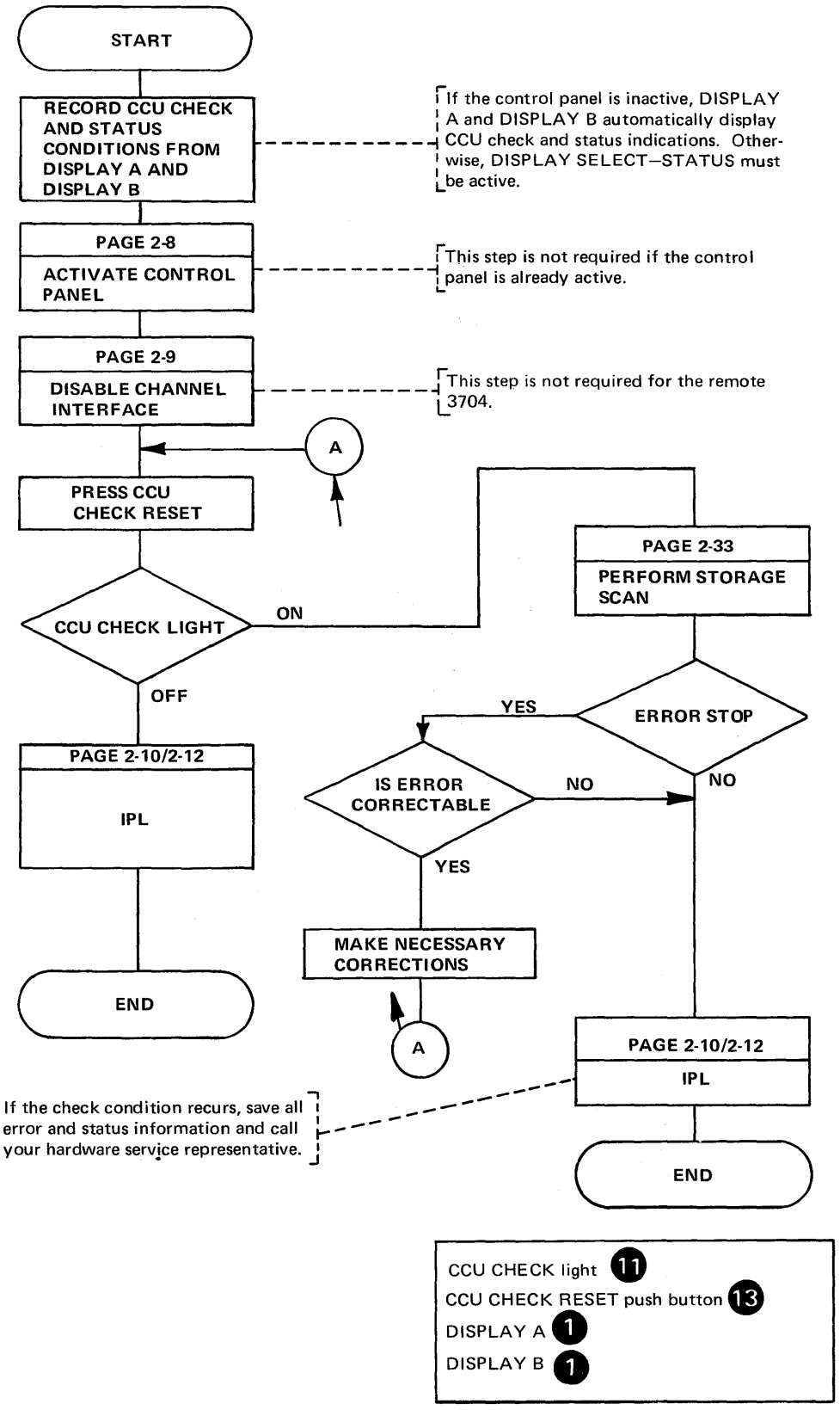
The 3704 normally operates with the control panel in the STATUS display state. If the control panel is in another display state, activate the STATUS state to see the status at that point of the procedure; then return to your original procedure. When a CCU CHECK or another check appears, record the error and status, and try to correct the error. If you are unable to correct the conditions, record the status and check conditions displayed in DISPLAY A and DISPLAY B. Give this information to your service representative.



DISPLAY A 1
DISPLAY B 1
DISPLAY SELECT CONTROL push buttons 7

Resetting A CCU Check

When the CCU CHECK light comes on, try to reset the check by executing this procedure.



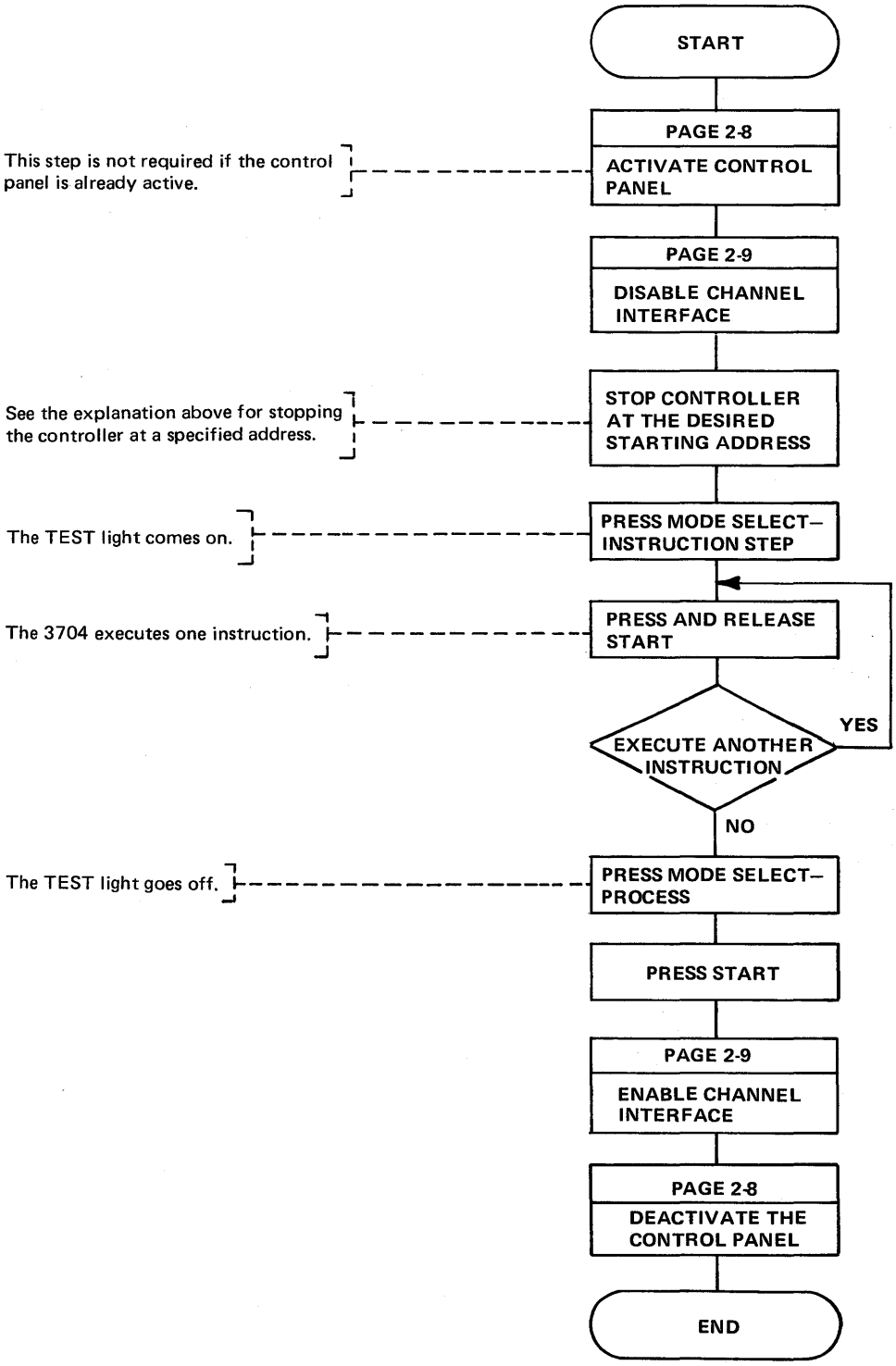
Advanced 3704
Control Panel Procedures

For the following procedures to be useful, you need some knowledge of the internal operation of the 3704. If you have need for any of these procedures, you may want to refer to the *3704 and 3705 Principles of Operation* manual for details.

Instruction Step

This procedure should be used only when the 3704 is offline. Instruction Step mode changes the program interrupt priorities and can cause character overrun on the communication lines.

To begin instruction stepping at a specified address either: (1) do a Store Address Compare operation (page 2-29) or (2) do a Load Address Compare operation (page 2-30) at the specified address. (In either case, MODE SELECT—ADDRESS COMPARE PRG STOP should be activated.) Then switch to the instruction step procedure.



MODE SELECT push buttons 5

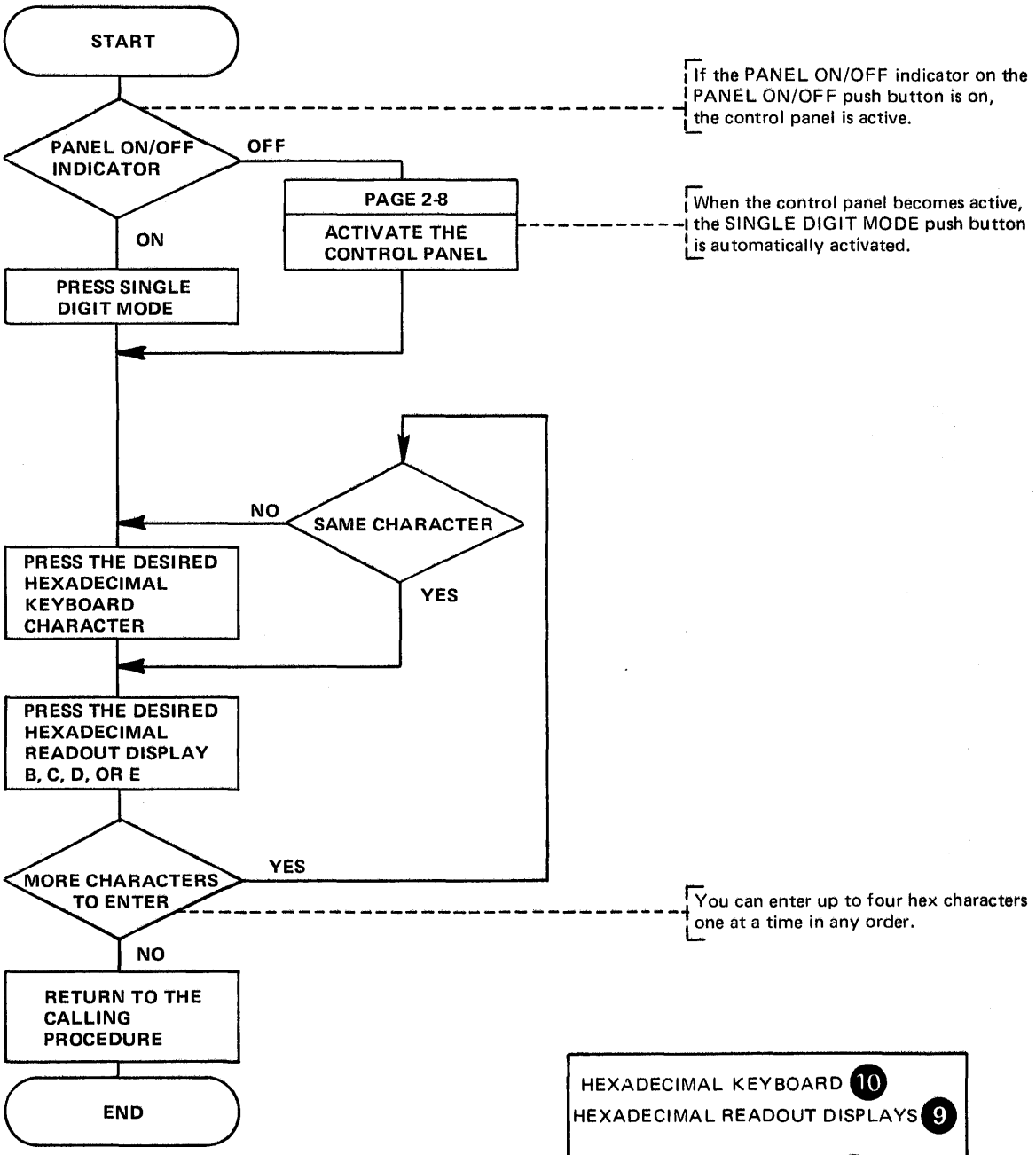
START push button 6

TEST light 11

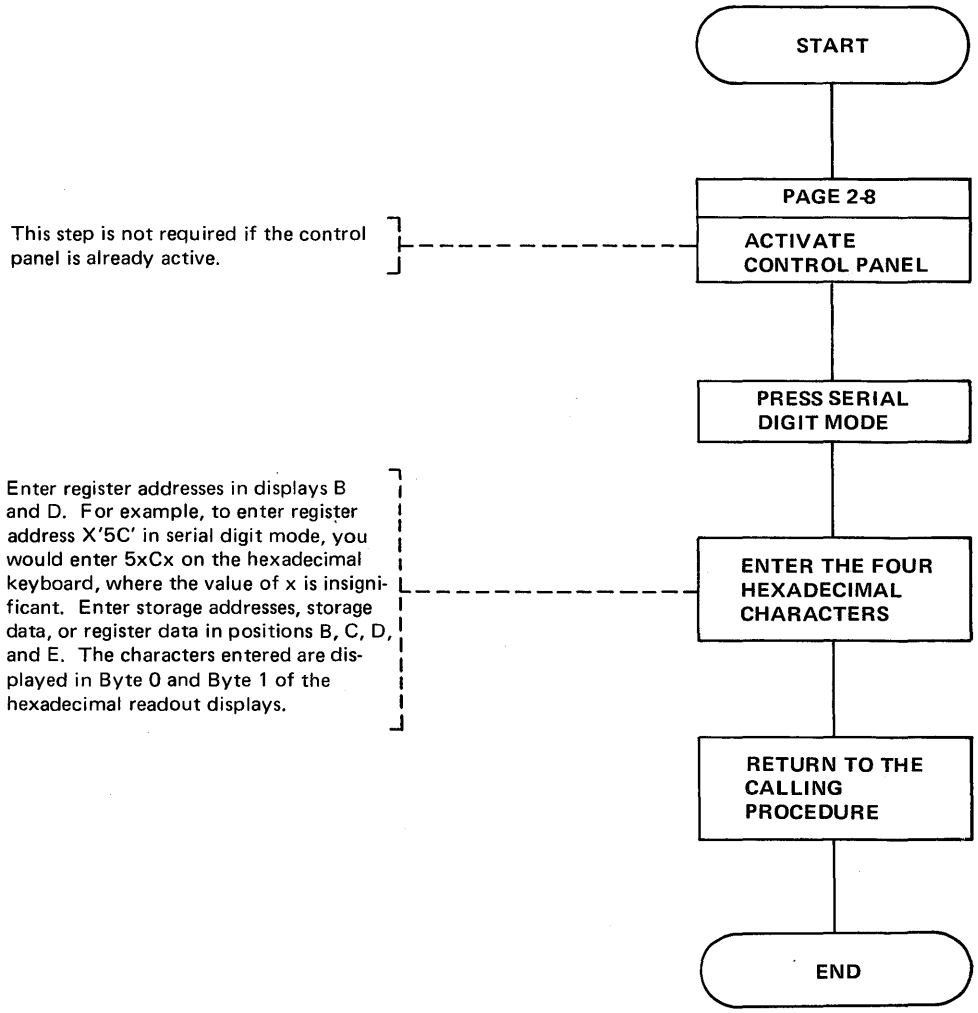
Character Entry—Single Digit Mode

Single digit mode allows you to enter a character in one of the hexadecimal readout displays by pressing the appropriate hexadecimal character push buttons ('0' through 'F'), and then pressing the desired hexadecimal readout displays (B, C, D, or E). The hexadecimal character entered is displayed in the readout display position of the push button that was pressed. Characters can be entered in any order.

You can enter from one to four hexadecimal characters. Enter register addresses in readout positions B and D; enter storage addresses, storage data, or register data in readout positions B, C, D, and E.



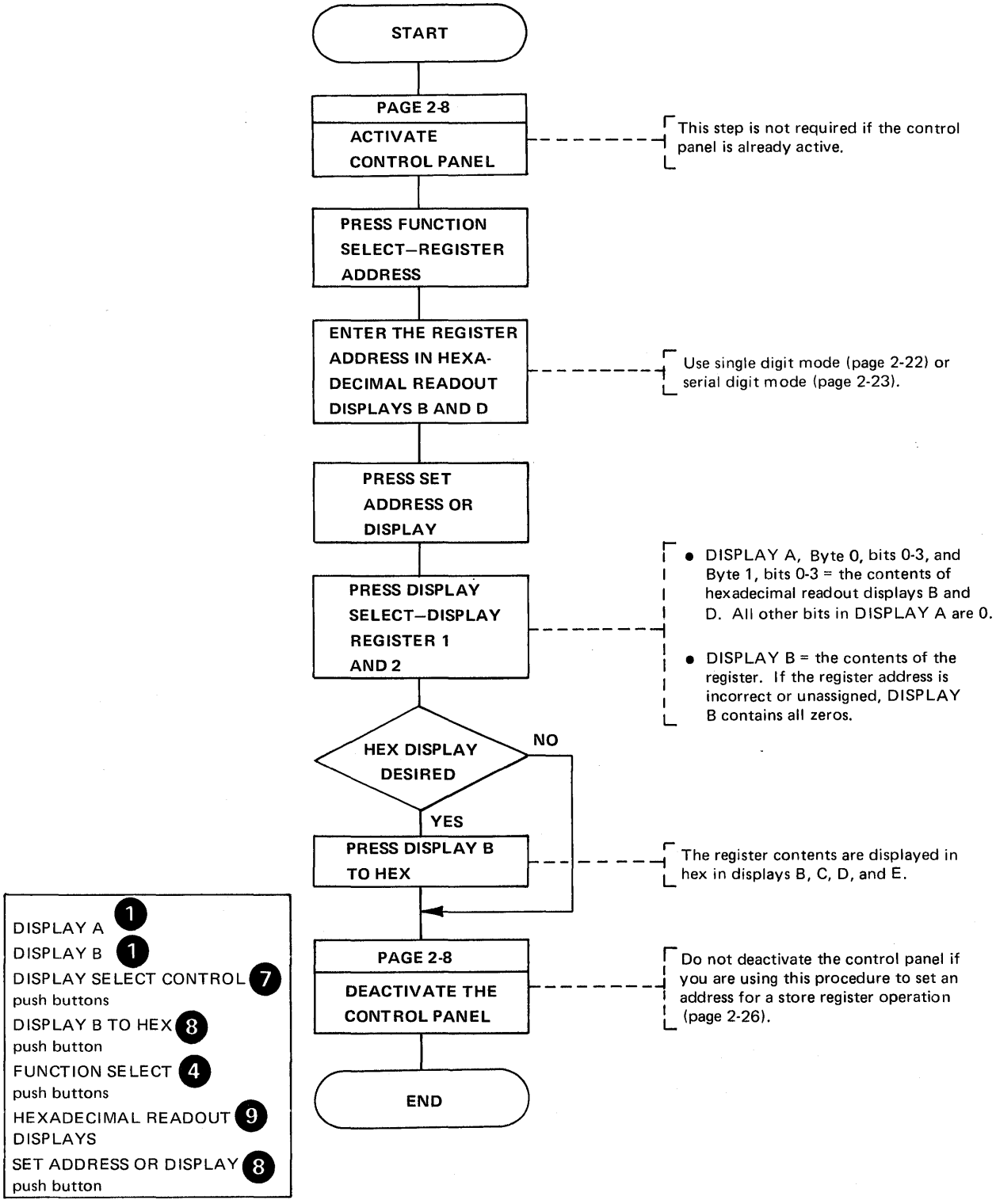
Serial digit mode allows you to quickly enter four hexadecimal characters into the readout displays. The characters shift automatically from right to left as they are entered in the hexadecimal readout displays (from position 'E' to 'D' to 'C' to 'B'). If you enter more than four characters, only the last four are retained in the readout displays. Register addresses, storage addresses, and data are all entered in this mode.



HEXADECIMAL KEYBOARD 8
HEXADECIMAL READOUT DISPLAYS 10
SERIAL DIGIT MODE 9
push button

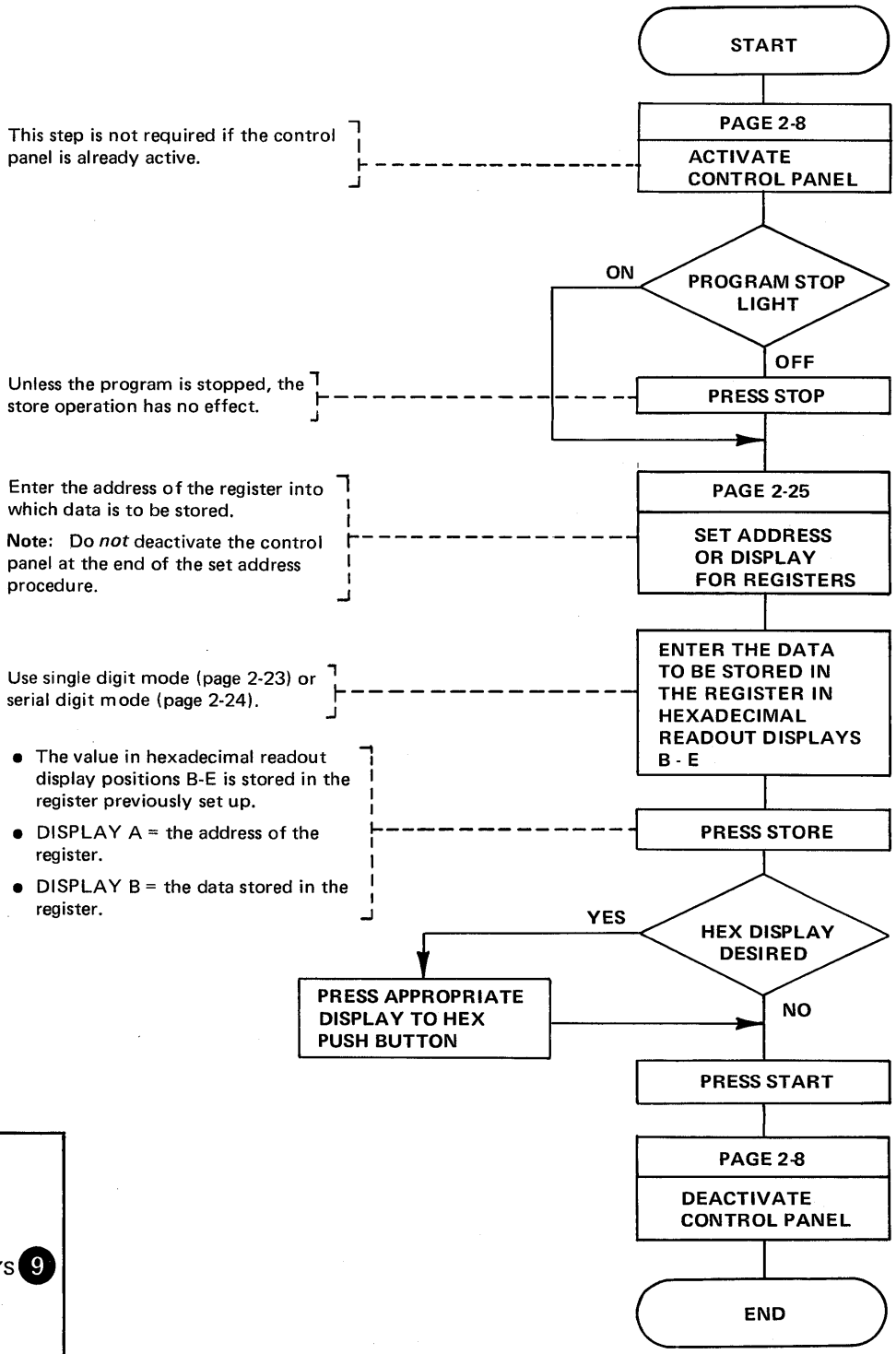
Set Address or Display for Registers

CAUTION Use care in displaying any register other than the general registers (00-1F). Displaying an external register may affect normal operation and cause a CCU check. It is a good procedure to have the 3704 in a stop mode or offline.



CAUTION

You can change data in any valid register; however, changing data in registers may affect normal program operation and destroy data. Pressing STOP while data is being transferred over the communication lines can cause character overrun/underrun errors.

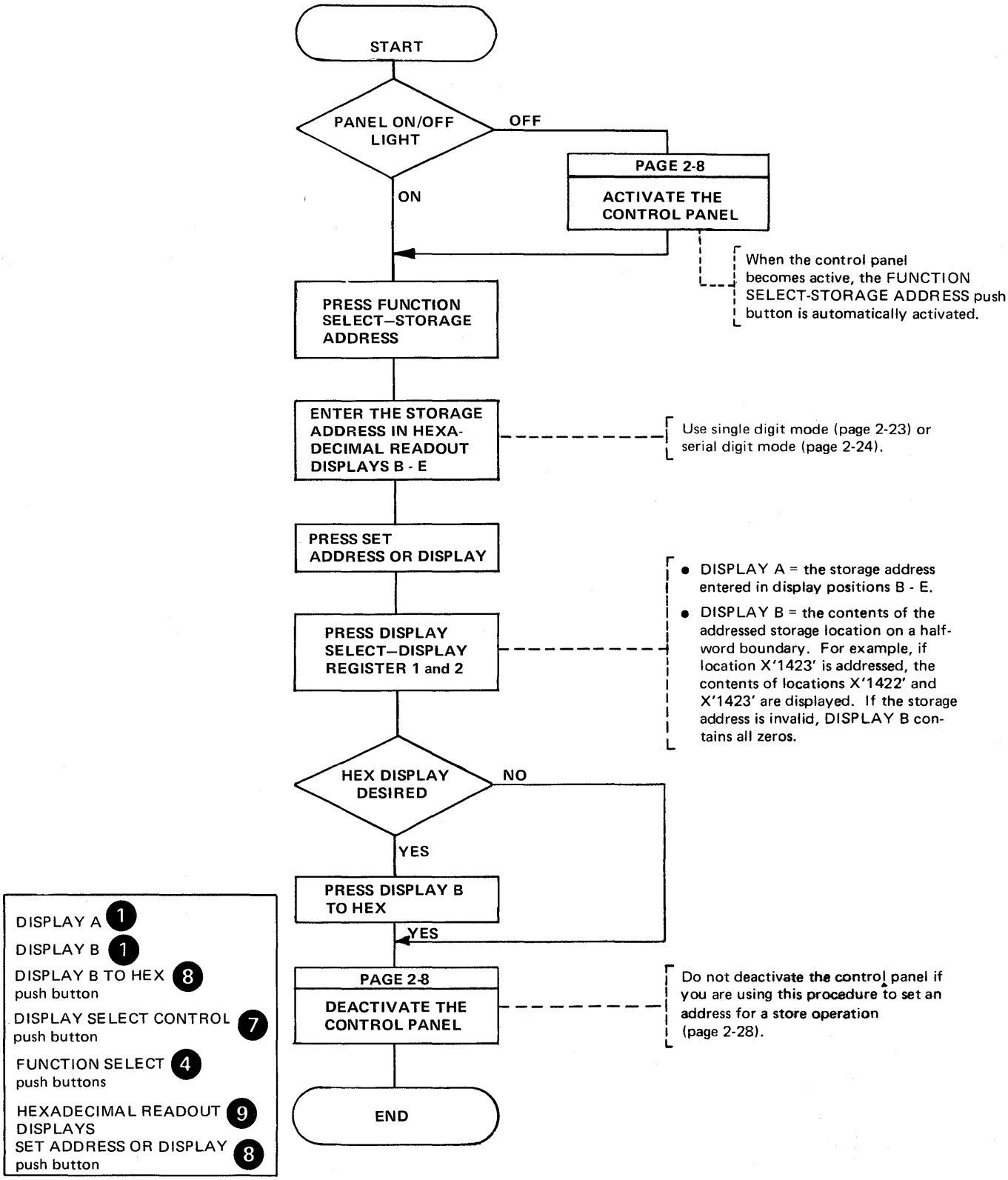


DISPLAY A 1
DISPLAY B 1
DISPLAY TO HEX push button 8
HEXADECIMAL READOUT DISPLAYS 9
PROGRAM STOP light 11
START push button 6
STOP push button 6
STORE push button 8

Set Address or Display for Storage

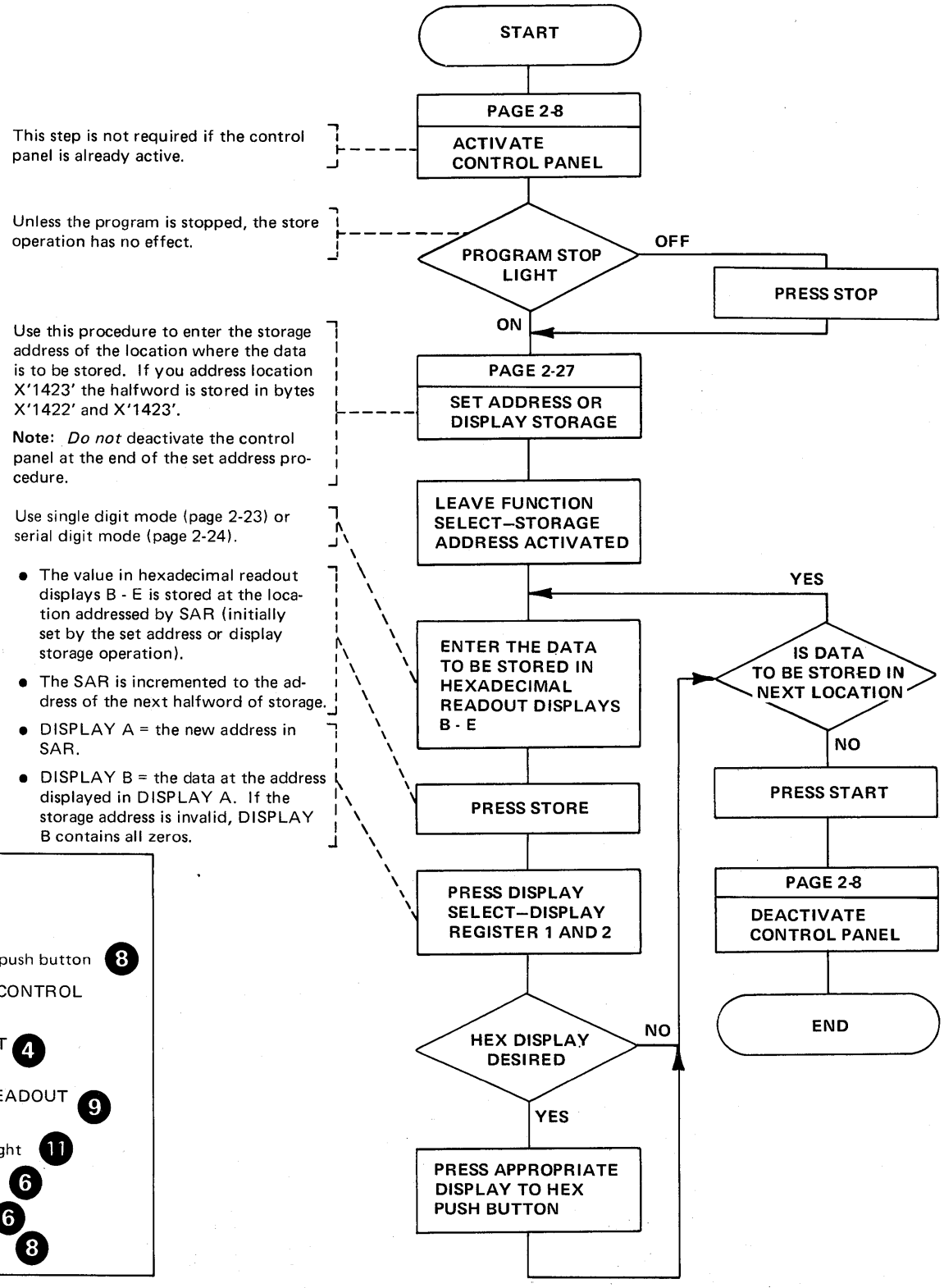
Use this procedure to display a halfword of storage in DISPLAY B on the control panel.

Executing this procedure does not affect normal program operation.



CAUTION

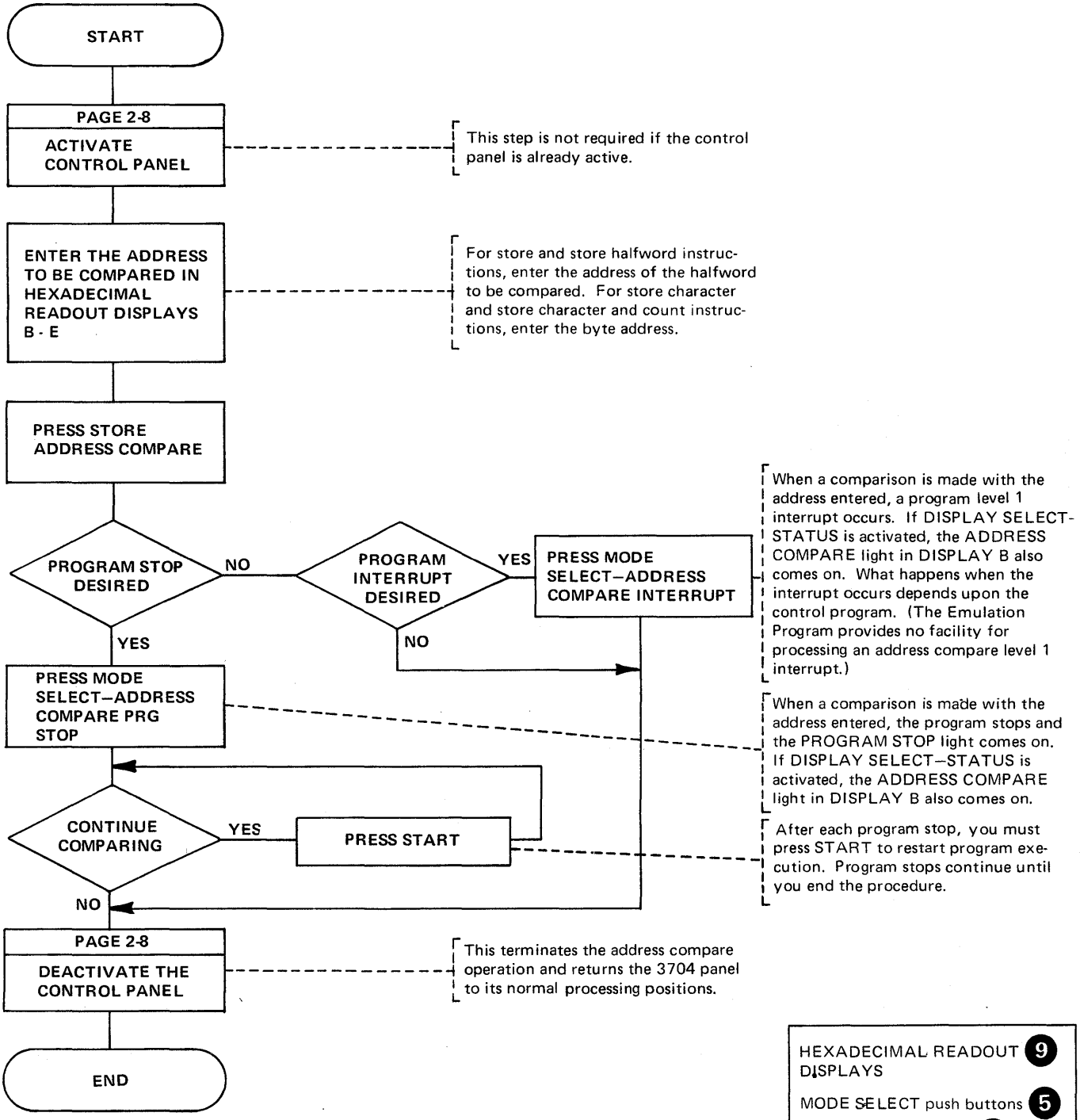
Pressing STOP while data is being transferred over the communication lines can cause character overrun or underrun conditions. The data that you store may affect normal program operation or destroy data that the program uses.



Store Address Compare

Use this procedure to determine whether the contents of a register are ever stored in a specific byte or halfword of storage by a program instruction.

CAUTION If the program is stopped while data is being transferred over the communication lines, character overrun or underrun conditions can occur.

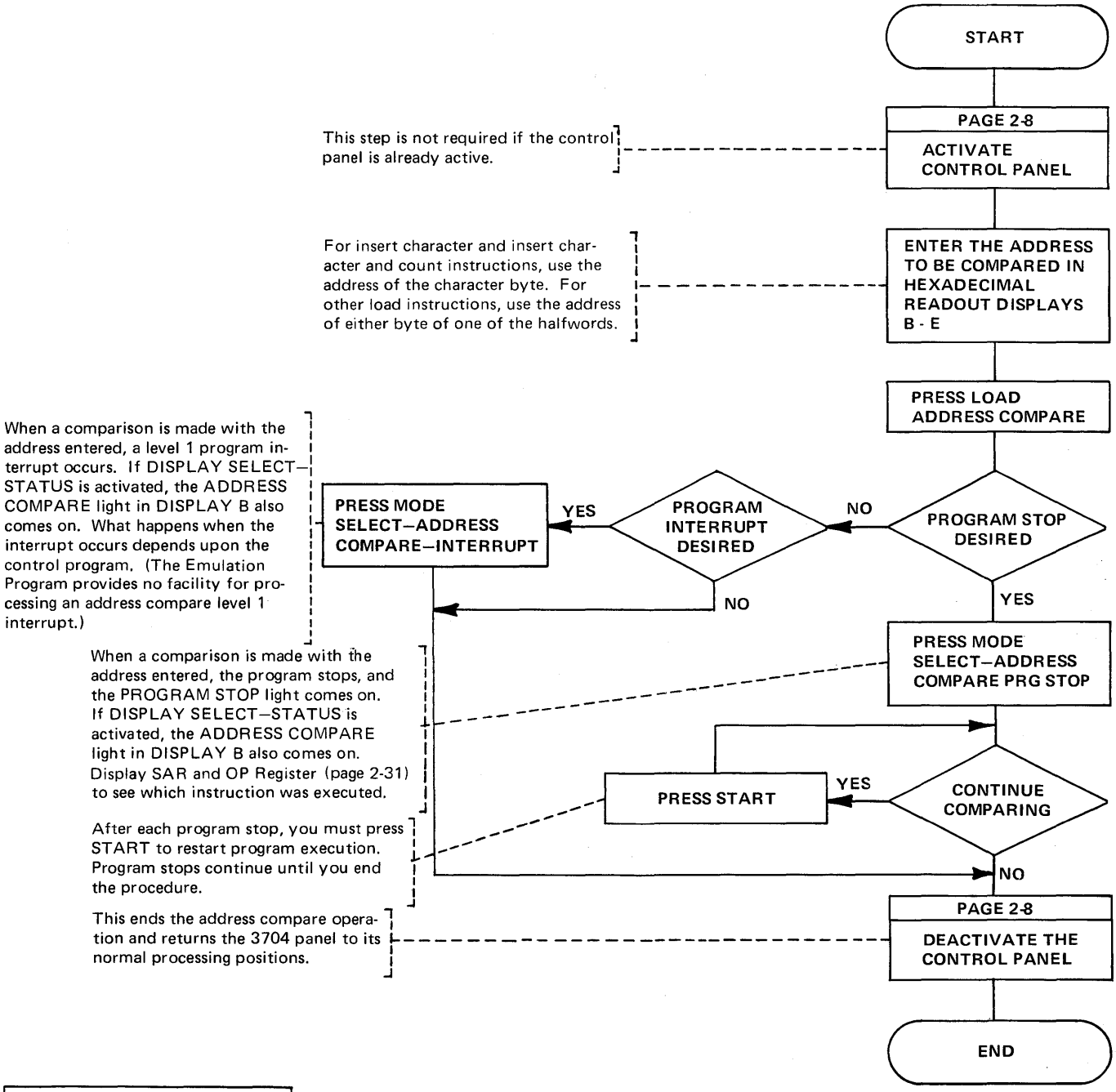


HEXADECIMAL READOUT DISPLAYS 9
MODE SELECT push buttons 5
PROGRAM STOP light 11
START push button 6
STORE ADDRESS COMPARE push button 12

Load Address Compare

Use this procedure to determine if an instruction is ever executed or if a specific byte is loaded into byte 0 or byte 1 of a register.

CAUTION If the program is stopped while data is being transferred over the communication lines, character overrun or underrun conditions can occur.



HEXADECIMAL READOUT DISPLAYS 9

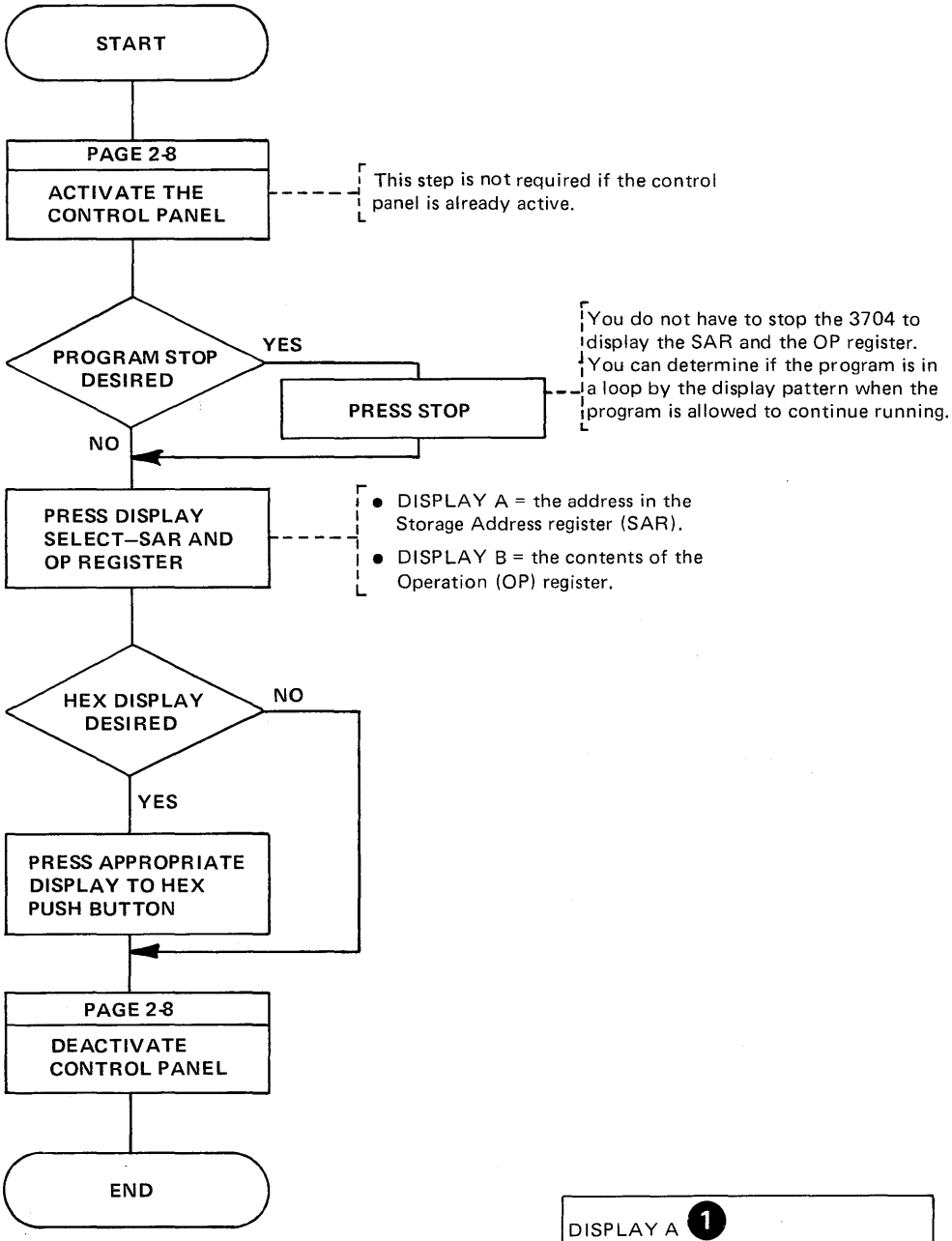
LOAD ADDRESS COMPARE push button 12

MODE SELECT push buttons 5

START push button 6

Displaying the Storage Address Register (SAR) and the Operation (OP) Register

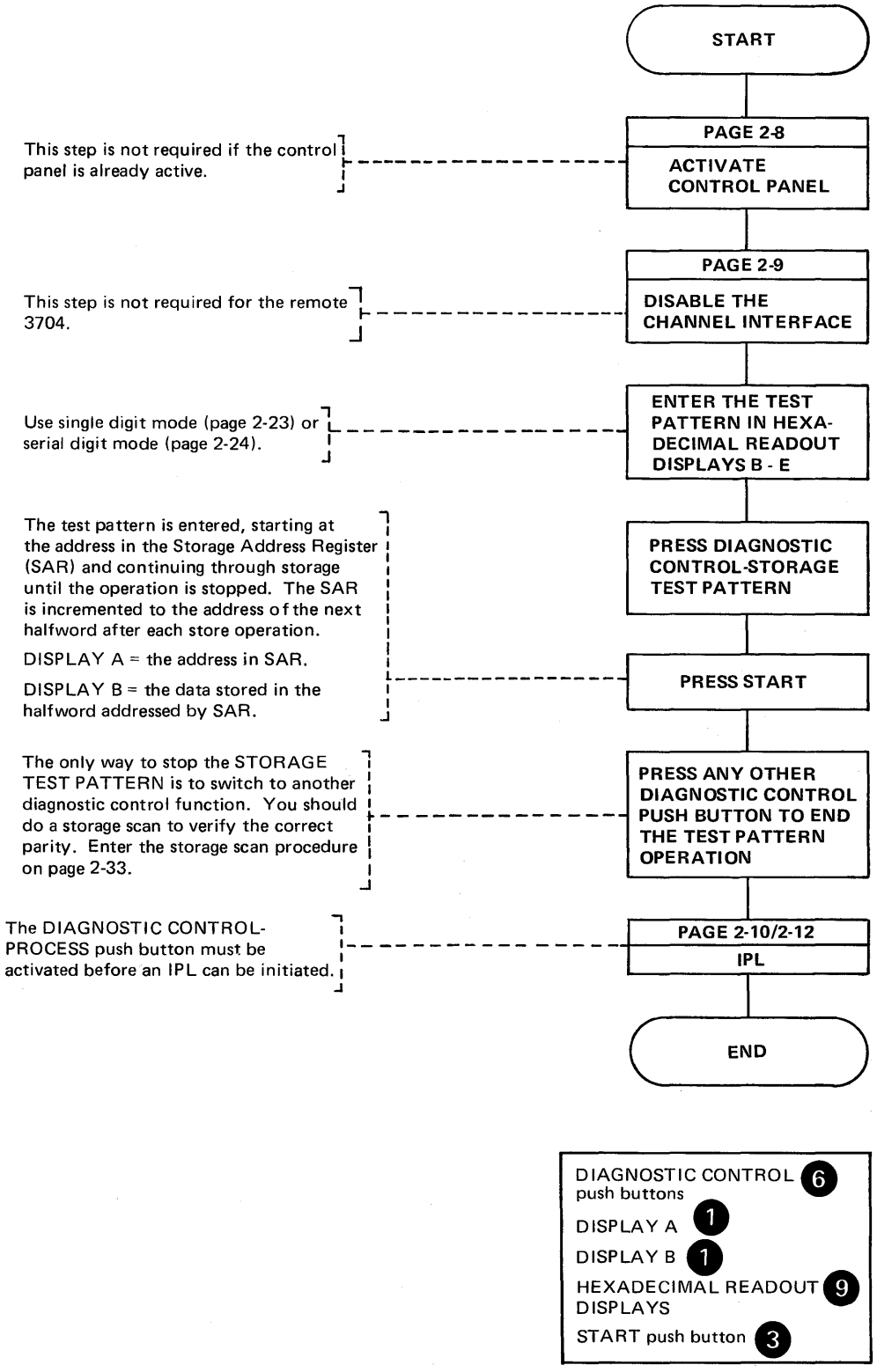
The Operation (OP) register contains the sixteen bit operation code of the last instruction executed. The Storage Address register (SAR) contains the address of the next instruction to be executed.



DISPLAY A 1
DISPLAY B 1
DISPLAY SELECT CONTROL 7
push buttons
DISPLAY TO HEX 8
push button
STOP push button 6

Storage Test Pattern

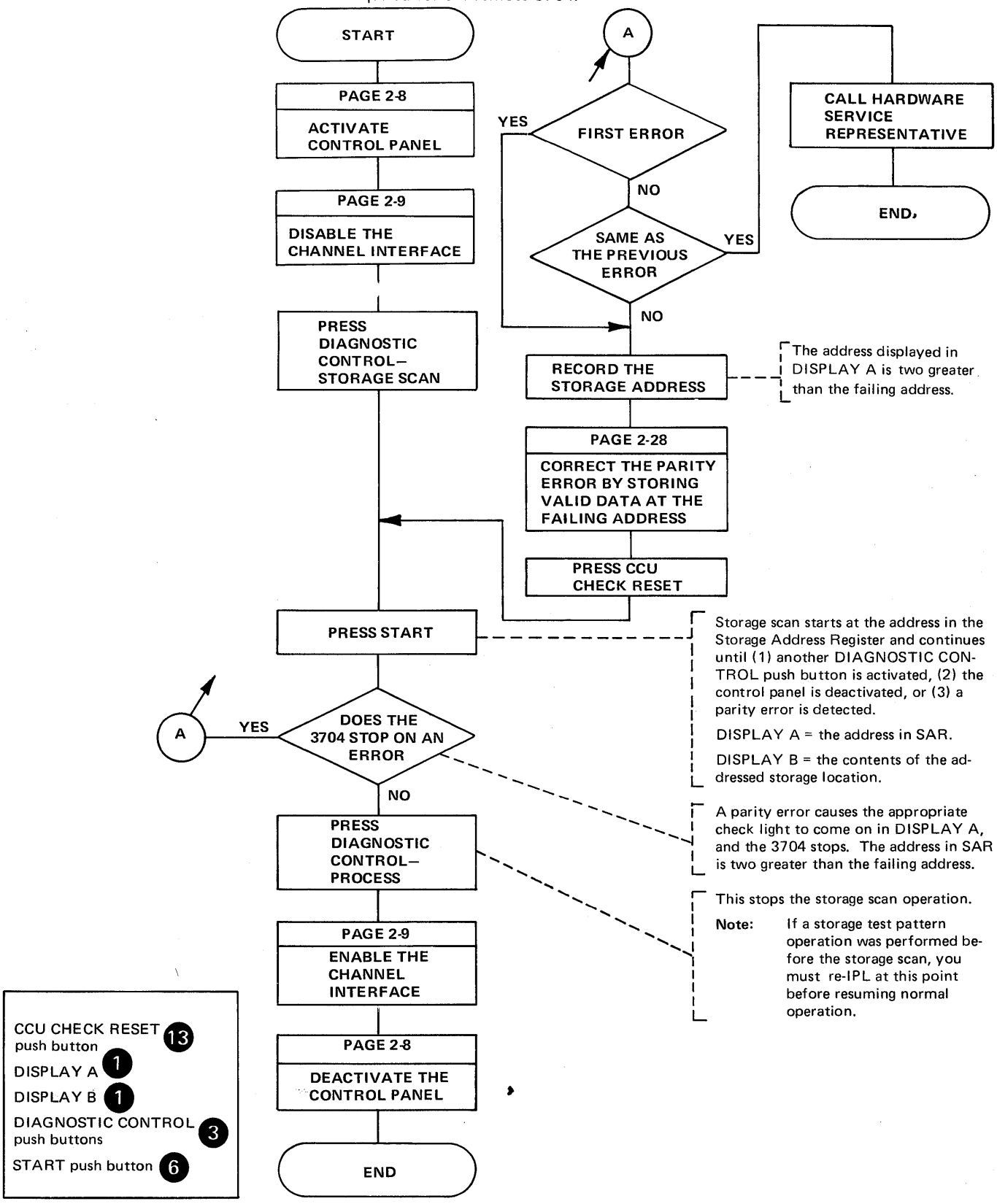
Use this procedure to clear storage or to store valid data throughout 3704 storage. This procedure should be used only when the 3704 is offline. After a storage test pattern operation, you must perform an IPL operation before proceeding with normal operations. It is a good practice to do a storage scan after a storage test pattern operation.



Storage Scan

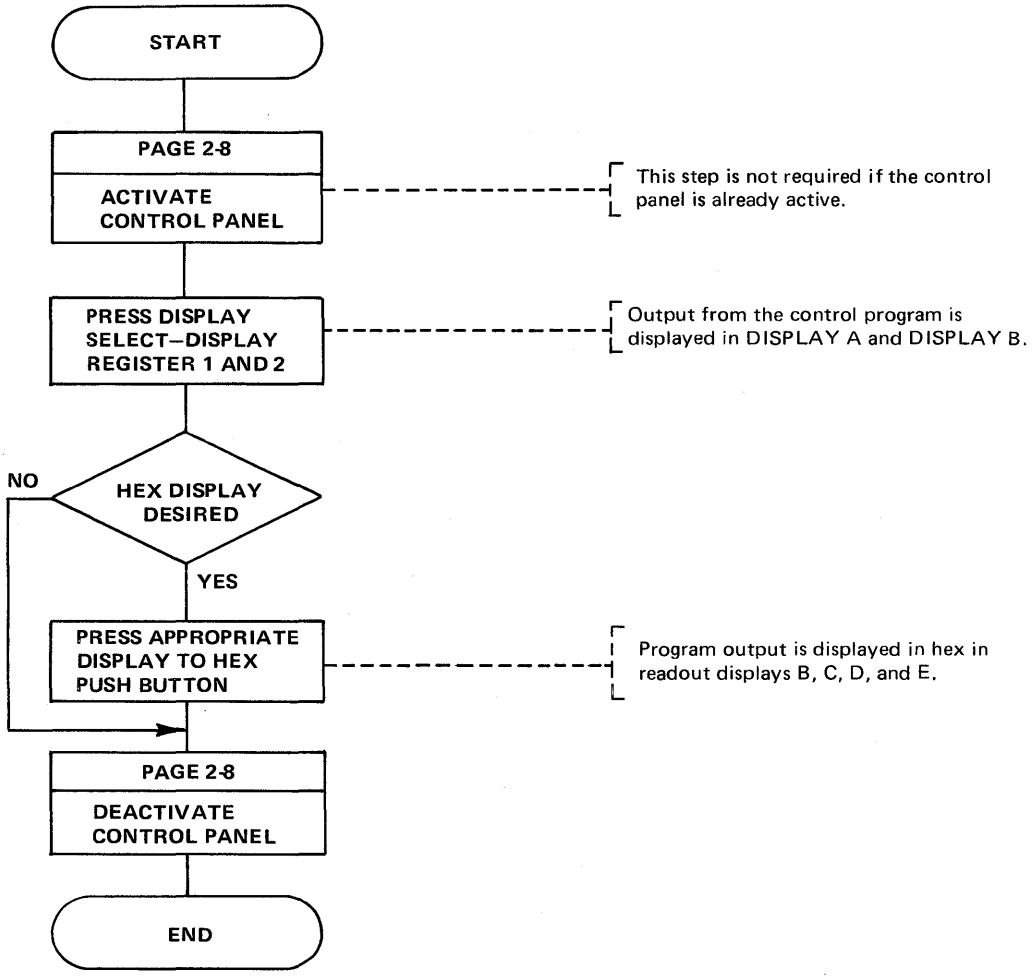
This procedure is used to check for correct parity in storage and should only be used offline.

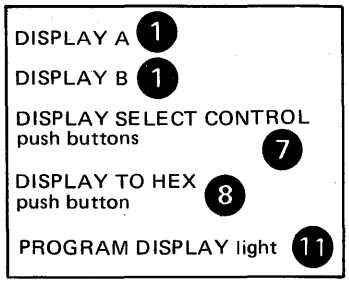
Note: Any step in this procedure that enables or disables the channel interface is not required for the remote 3704.



Displaying Display Registers 1 and 2 (Program Display)

When the 3704 control program places output in display registers 1 and 2 (internal output units gated to the DISPLAY A and DISPLAY B lights), the PROGRAM DISPLAY light comes on at the control panel. To see the program output, activate the control panel and display the display registers. Refer to the *Principles of Operation* manual for additional information.





Section 3: 3704 Control Panel Procedures Used with the Emulation Program

The Emulation Program (EP) supports several 3704 control panel functions, including the dynamic displaying of the interface control word (ICW), certain Emulation Program control blocks, and a fullword of 3704 storage. The EP allows many programs written for support of the IBM 2701 Data Adapter Unit, the IBM 2702 Transmission Control, the IBM 2703 Transmission Control, or any combination of the three to operate with the 3704 with no modification. The Emulation Program will not run in the remote 3704 Communications Controller.

You should review the EP generation macro statements before attempting EP procedures. The macros include information on the types of lines, line speeds, modems, auto-call units, and other system information for the lines involved, as well as terminal information. This type of information is necessary to run certain of the panel procedures, for example, the line test (panel test) function.

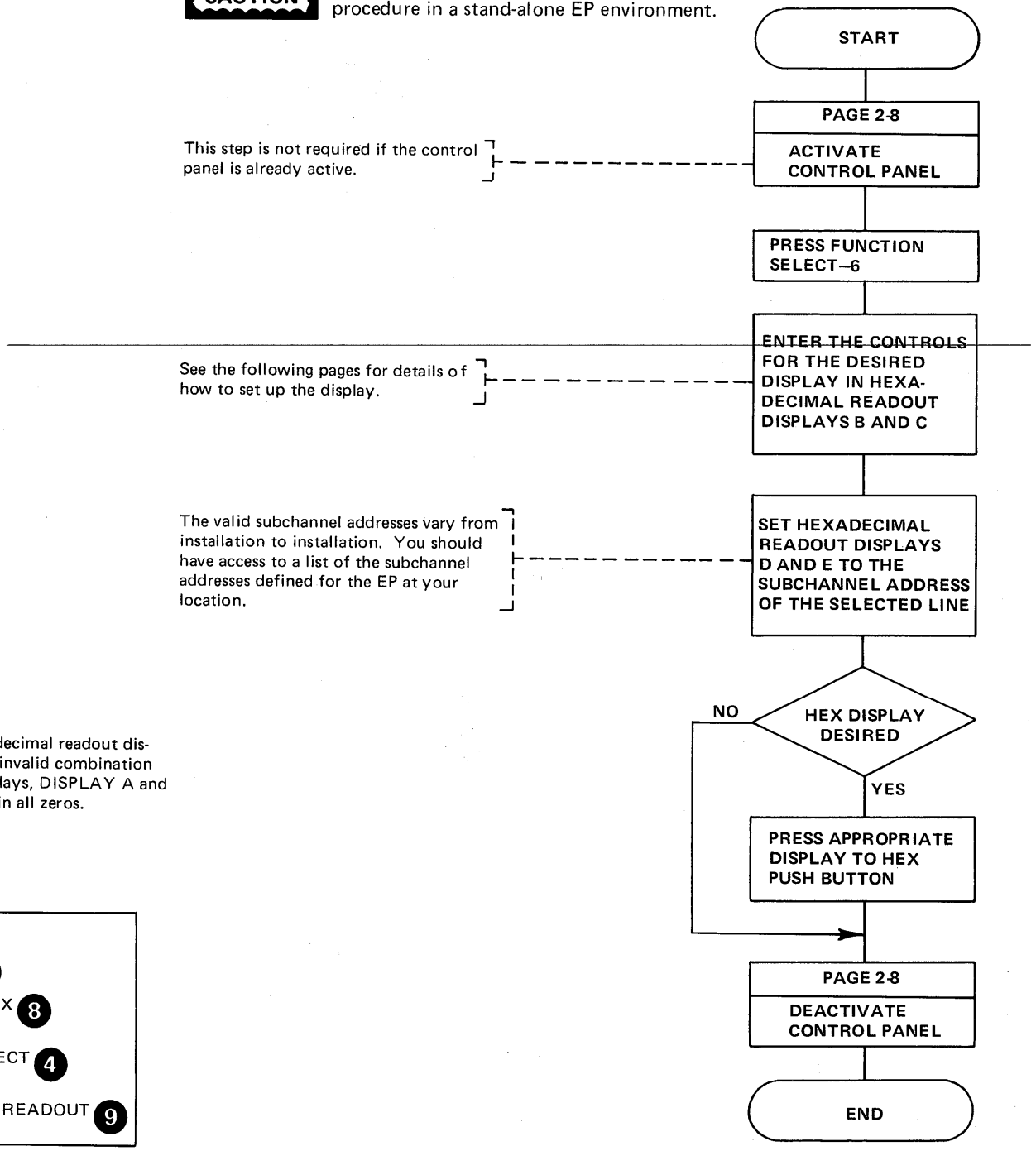
Note: When the local 3704 is operating in a PEP environment, the control panel must be placed in EP mode (page 4-2) before executing the procedures in this section. The remote 3704 will not operate in a PEP environment.

Dynamic Display of an ICW, CCB, or BCB (Local only) (Part 1 of 3)

This procedure provides a dynamic display of the interface control word (ICW), the character control block (CCB), or the bit control block(BCB) for any line specified during the generation of the Emulation Program. The display is updated ten times a second until you end the operation.

See the *Principles of Operation* manual for more information about the ICW. See Appendix C for the layouts of the BCB and the CCB.

CAUTION The usage meter runs continuously during the execution of this procedure in a stand-alone EP environment.



Note: If the hexadecimal readout displays are set to an invalid combination for any of the displays, DISPLAY A and DISPLAY B contain all zeros.

DISPLAY A 1
DISPLAY B 1
DISPLAY TO HEX push button 8
FUNCTION SELECT push buttons 4
HEXADECIMAL READOUT DISPLAYS 9

Dynamic Display Of an ICW, CCB, or BCB (Local only) (Part 2 of 3)

For an ICW Display

If readout display B	= 0 = 1	Data line ICW displayed Dial line ICW displayed		
If readout display C	= 0		Byte 0 0 1 2 3 4 5 6 7	Byte 1 0 1 2 3 4 5 6 7
		DISPLAY A =	LCD* PCF*	Data set leads
		DISPLAY B =	SCF	PDF
	= 1	DISPLAY A =	SCF	PDF
		DISPLAY B =	ICW Bits 32 - 45	
	= 2	DISPLAY A =	ICW Bits 32 - 45	
		DISPLAY B =	LINE ADDRESS **	

*See Appendix C for the LCD/PCF configuration with the Type 1 Scanner.

**Display storage at the address that is in DISPLAY B. The contents of this halfword is the address of the CCB.

These are the only valid settings for readout displays B and C. The data set leads bit definitions are on page 3-4.

For a CCB Display

If readout display B	= 2	the first part (first 16 halfwords) of the CCB is selected.
	= 3	the second part (the remaining halfwords, maximum 16) of the CCB is selected.

Readout display C can be set to any position 0-F. The setting determines which halfword in the selected part of the CCB is displayed in DISPLAY A (0-F = halfwords 1-16 respectively). In each case, DISPLAY B contains the next halfword after the selected one.

These are the only valid settings for readout displays B and C for a CCB display.

Note: Refer to Appendix C for CCB format and internal byte displacement.

For a BCB Display

(valid only if the Type 1 Communication Scanner is installed)

If readout display B	= 0	data line information displayed.
	= 1	dial line information displayed.

Readout display C can be set to any position 8-F. The setting determines which halfword of the BCB is displayed in DISPLAY A (8-F = halfwords 1-8, respectively). In each case, DISPLAY B contains the next halfword after the selected one.

For a BCB display, these are the only valid settings for readout displays B and C.

Note: Refer to Appendix C for BCB layout and internal byte displacement and also for the LCD/PCF configuration with a Type 1 Scanner.

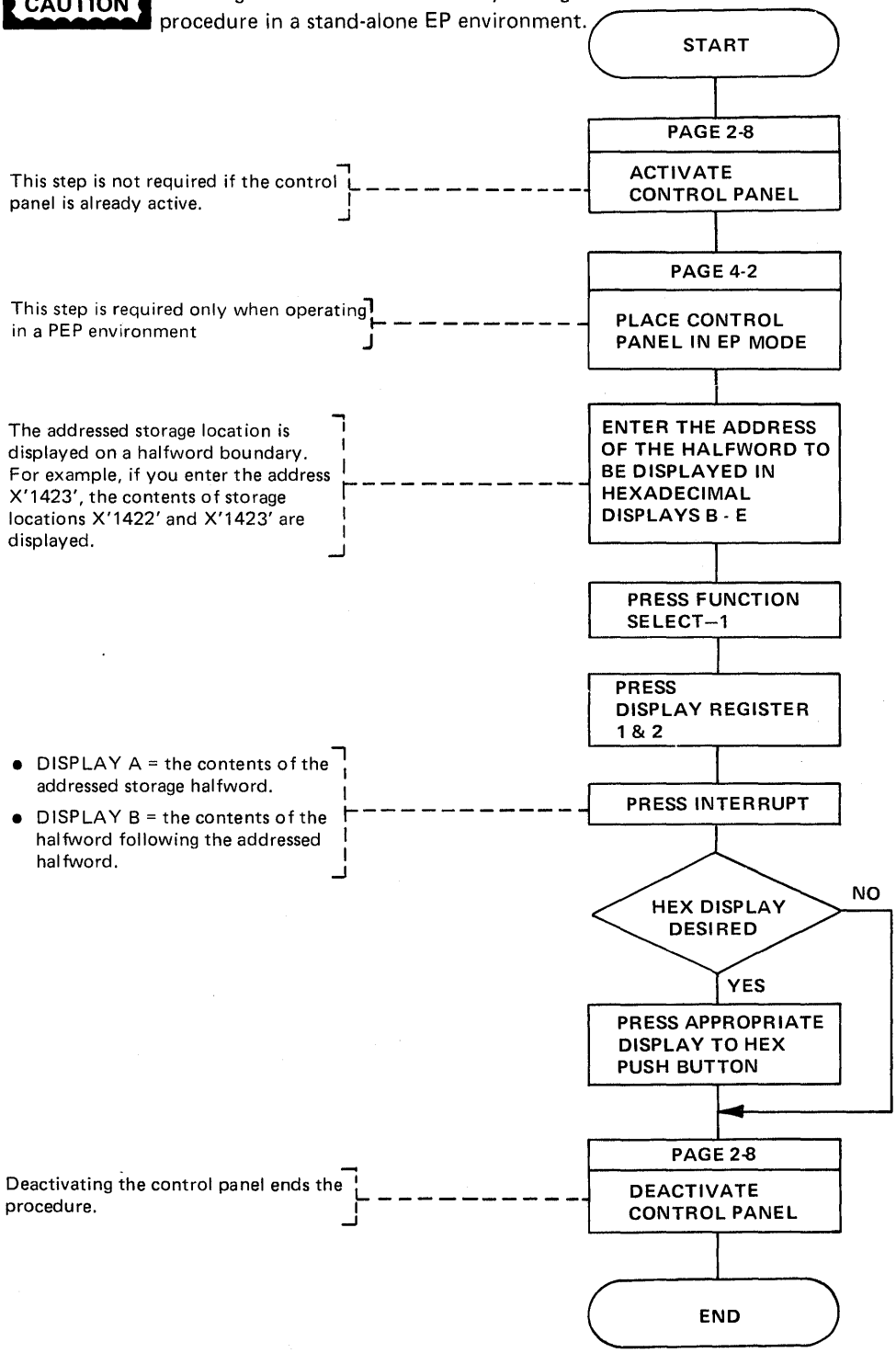
Dynamic Display Of an ICW, CCB, or BCB (Local only) (Part 3 of 3)

	Data Set Leads displayed in the ICW	
Bit	Data Line	Dial Line
0	Clear to Send	Abandon Call and Retry
1	Ring Indicator	Present Next Digit
2	Data Set Ready	Data Line Occupied
3	Receive Line Signal	Power Indicator
4	Receive Data Bit Buffer	Zero (not used)
5	Diagnostic Wrap Mode	Call Originating Status
6	Bit Service Request	Bit Service Request
7	Zero (not used)	Zero (not used)

Dynamic Display of Storage (Local only)

This procedure provides a dynamic display of two halfwords of local 3704 storage in DISPLAY A and DISPLAY B. The display is updated ten times per second until you end the operation.

CAUTION The usage meter runs continuously during the execution of this procedure in a stand-alone EP environment.



- DISPLAY A 1
- DISPLAY B 1
- DISPLAY SELECT CONTROL push buttons 7
- DISPLAY TO HEX push button 8
- FUNCTION SELECT push buttons 4
- HEXADECIMAL READOUT DISPLAYS 9
- INTERRUPT push button 6

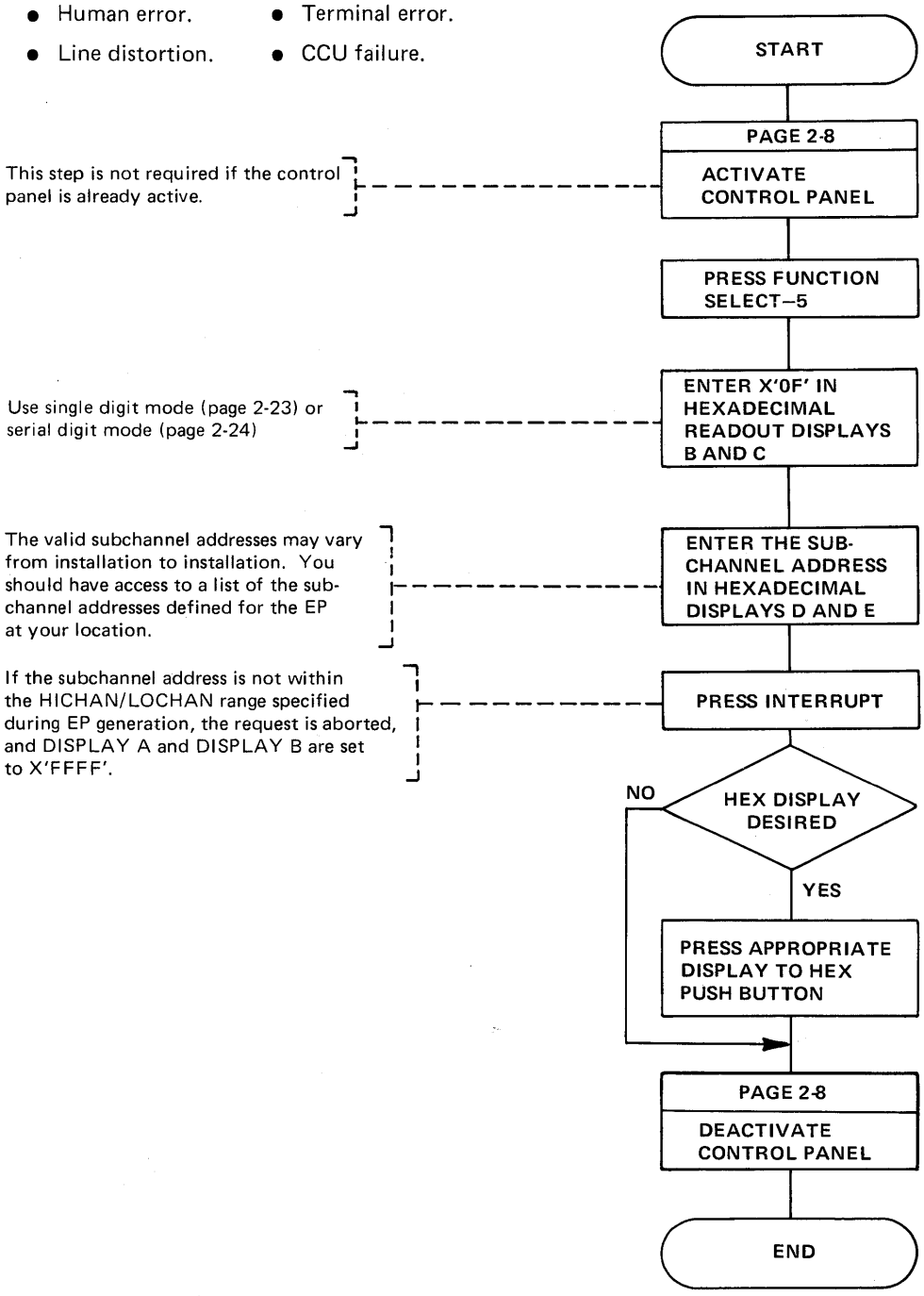
Generating Channel End/Device End (Local only)

Use this procedure to clear a locked subchannel dynamically without having to re-IPL the local 3704 or the host processor. Channel End/Device End status is forced to the host processor for the subchannel you specify at the control panel.

CAUTION To be sure the subchannel that you are releasing is not in a valid operation, display the CCBCMD field of the CCB (page C-3) bit 5 (command end). If this bit is set, the subchannel is not in valid operation.

The subchannel may be locked because of a time-out failure caused by:

- Human error.
- Line distortion.
- Terminal error.
- CCU failure.



DISPLAY TO HEX push button 8
FUNCTION SELECT push buttons 4
HEXADECIMAL READOUT DISPLAYS 9
INTERRUPT push button 6

Activating the Level 2 Line Trace (Local only)

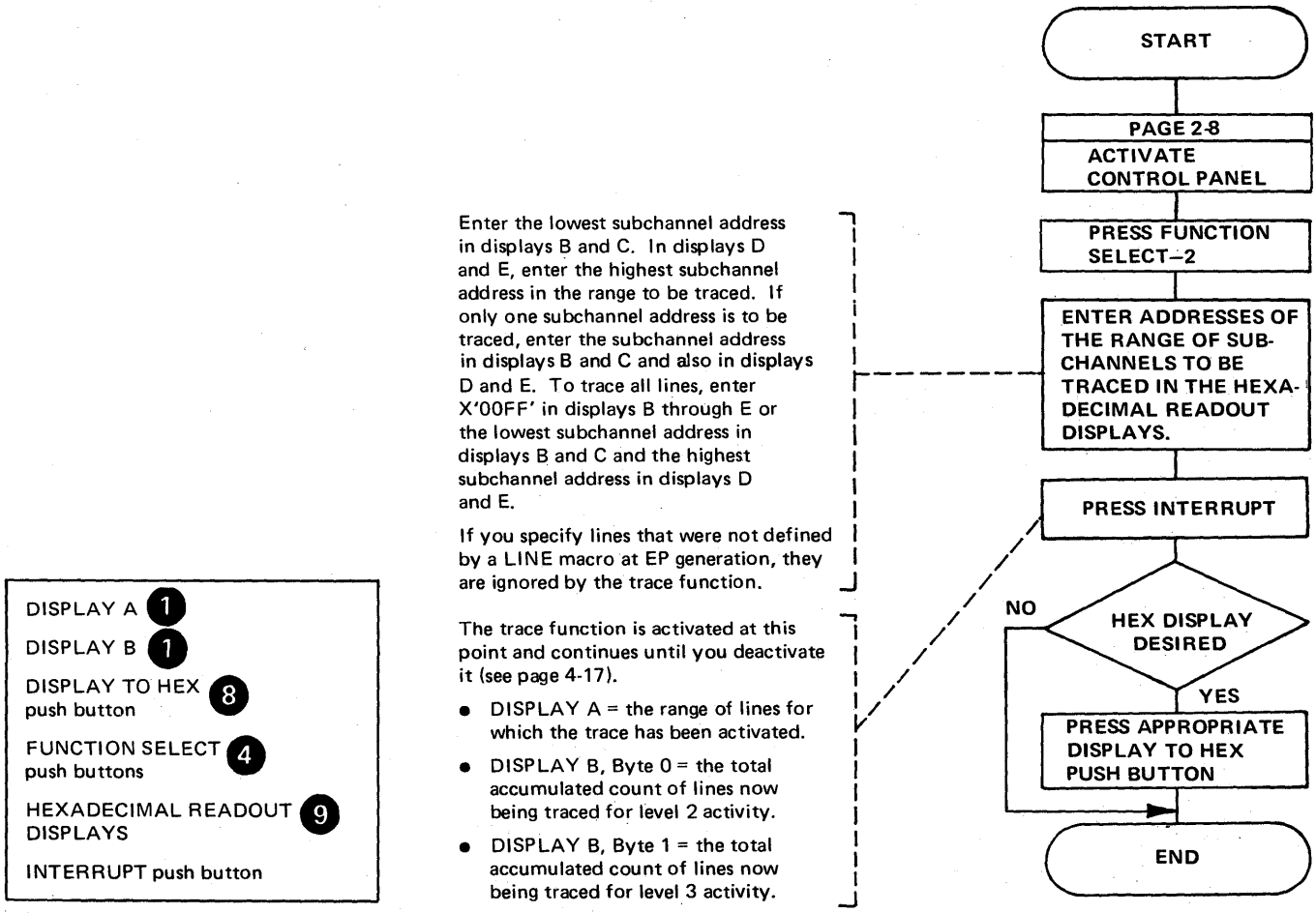
Line trace is an optional function of the Emulation Program. It is included in the EP unless LINETRC = NO is specified on the BUILD macro during EP generation. In addition to the stand-alone EP, this function is also available in the EP portion of PEP with NCP (page 4-16) and in an NCP generated for EP functions only (TYPGEN = EP specified with the BUILD macro at NCP generation). (See the *Network Control Program Generation and Utilities Manual.*

Use this procedure to trace all line and channel interrupts for the selected line(s). To activate the trace for noncontiguous lines or groups of lines, repeat this procedure for each line or group of lines. A subchannel address is represented by either two or three hexadecimal digits in the EP generation language, for example, 06A. When activating the trace function, only the last two digits are used (that is, 6A).

To determine whether the trace is active for a given line, use the procedure on page 3-2 to display the CCBOPT field on the line's CCB. The trace is active if bit 1 is on.

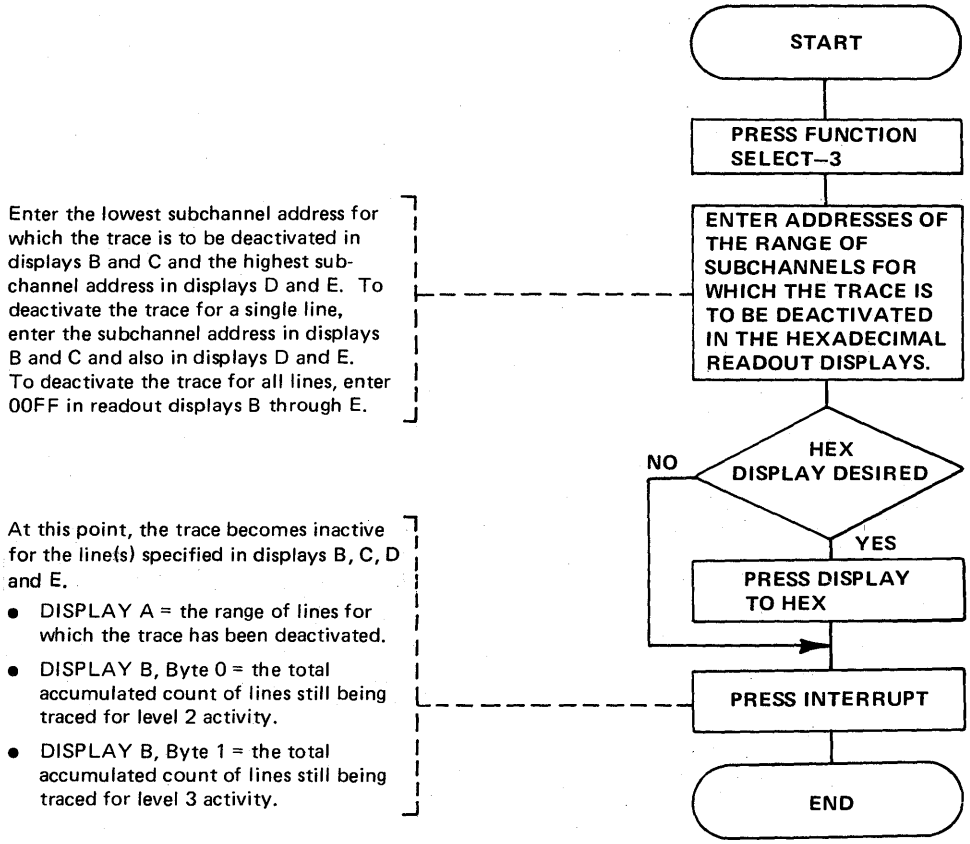
For each Type 2 Scanner, only one data set interface can be shown in the level 2 line trace. The interface can be selected by using Function 6 to display the data set leads in the ICW (see page 3-2) before the line trace is enabled.

CAUTION The trace can degrade the performance of the Emulation Program. Refer to the *EP Storage and Performance Manual* for the possible effects of the trace on performance.



Deactivating the Level 2 Line Trace (Local only)

Use this procedure in a standalone EP environment to deactivate the trace function for all or some of the lines for which the trace is active.



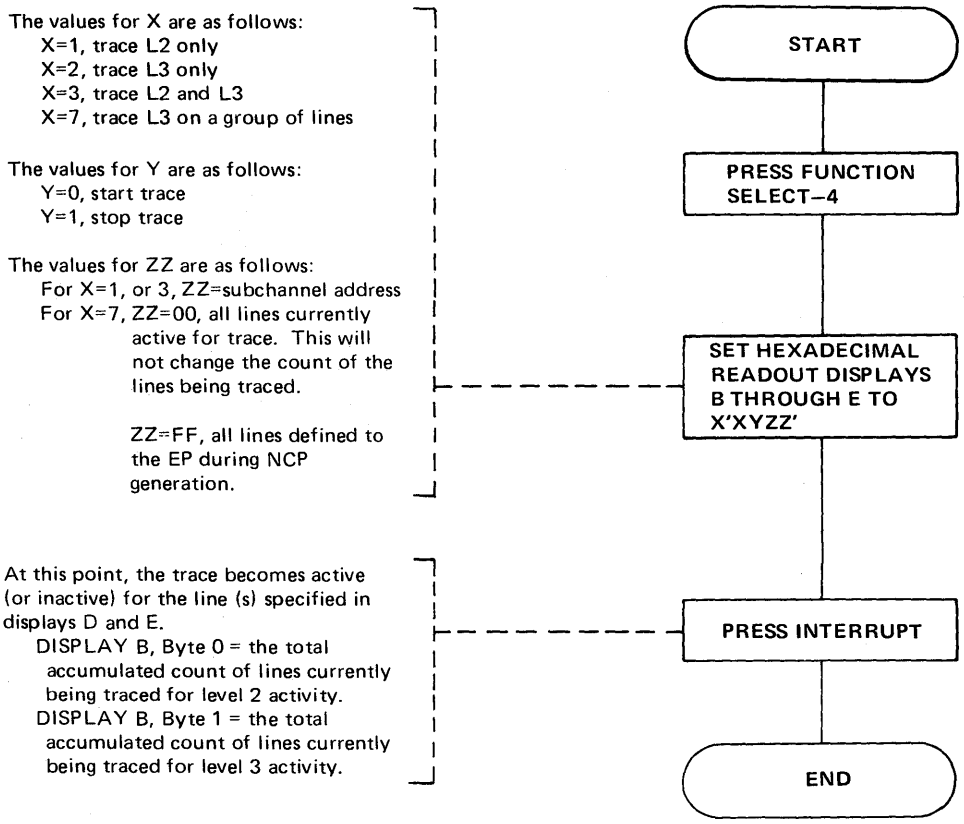
After you deactivate the line trace, you should obtain a storage dump of the 3704 by using the dump utility program or the dynamic dump utility program. Refer to the *Emulation Program Generation Manual* for the job control statements required. The trace may be in the storage dump as follows:

- The trace table pointer is in high storage above the Emulation Program load module. Look for the characters that spell out 'START TRACE' on the right-hand side of the dump. The trace table pointer starts four fullwords from the area that spells out 'START TRACE' in EBCDIC.
- The first word is the address of the latest entry in the trace table. The table will wrap if full; therefore, you need the address of the latest entry in the table to find the last entry prior to dumping storage.
- The second word is the address of the beginning of the trace table.
- The third word is the upper limit of the trace table. Each entry in the table is 8 bytes long.

DISPLAY A 1
DISPLAY B 1
DISPLAY TO HEX push button 8
FUNCTION SELECT push buttons 4
HEXADECIMAL READOUT DISPLAYS 9
INTERRUPT push button 6

Activating/Deactivating the Level 2 and/or Level 3 Line Trace (Local only)

Use this procedure in an EP standalone environment to activate or deactivate the tracing of level 2 and/or level 3 interrupts for a single line or level 3 interrupts for a group of lines.



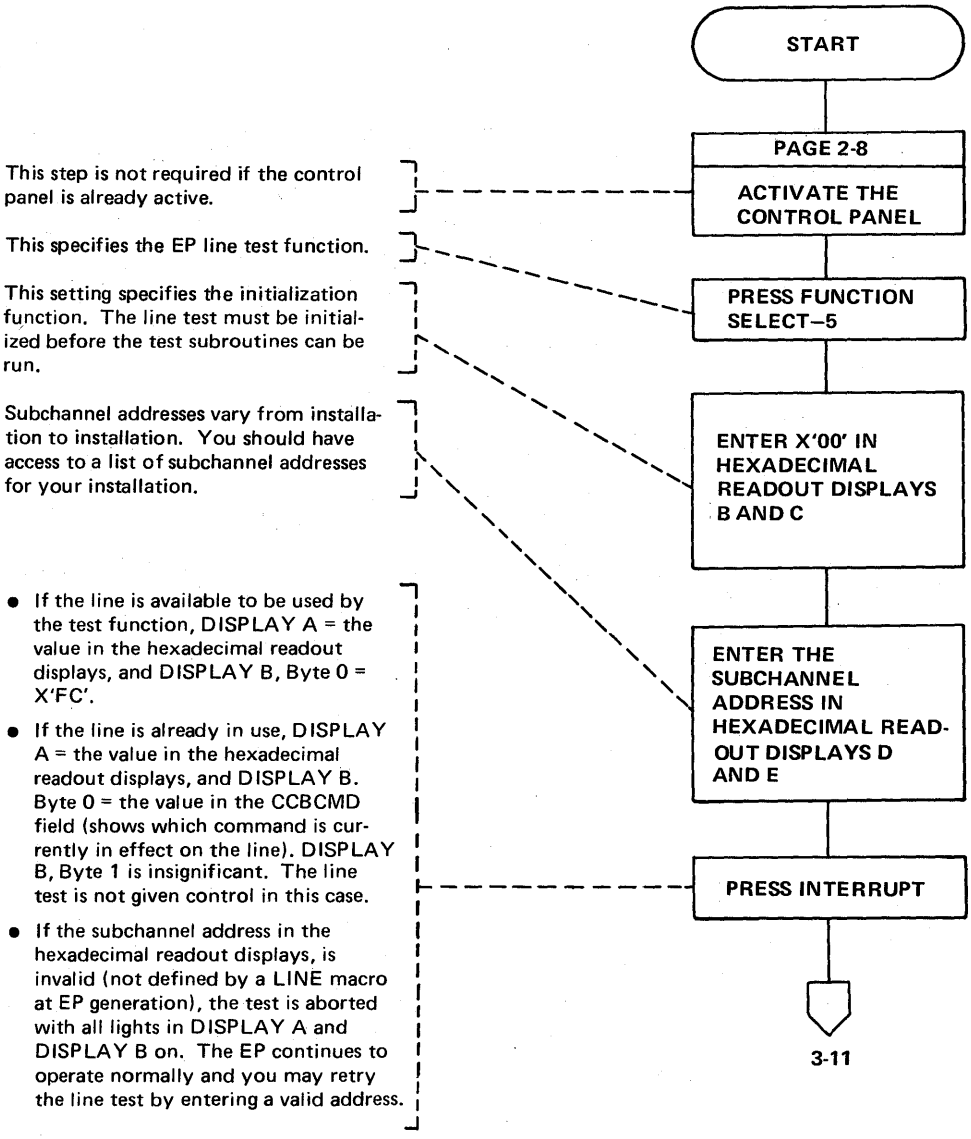
DISPLAY A 1
FUNCTION SELECT push button 4
HEXADECIMAL READOUT DISPLAYS 9
INTERRUPT push button 6

Line Test Function (Panel Test) (Local only) (Part 1 of 12)

The line test is an optional function of the Emulation Program. It is included in the EP only if TEST=YES is specified on the BUILD macro during EP generation.

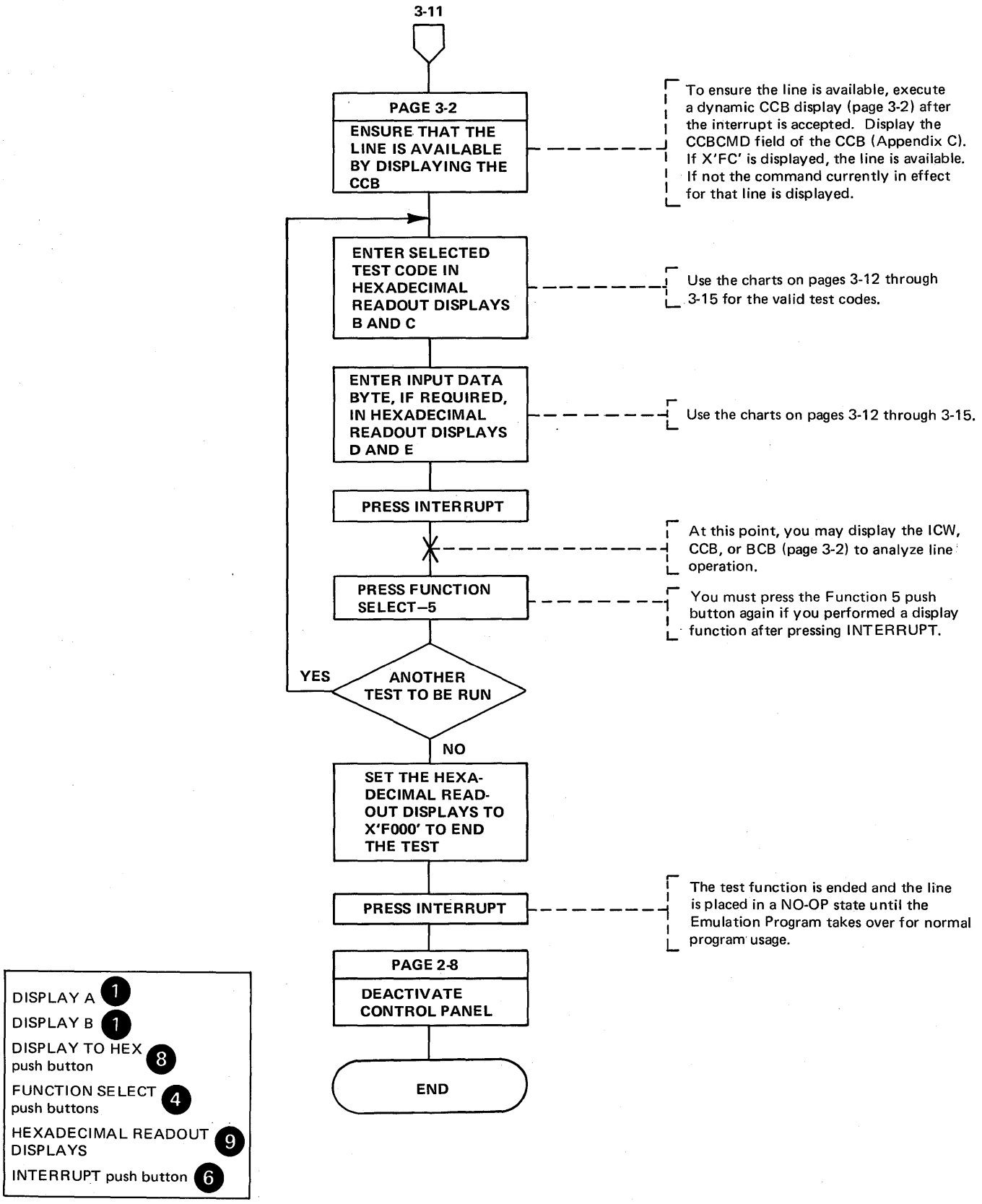
The line test provides a means of testing a communication line via the control panel. The test function consists of an initialization subroutine, a series of test subroutines and an end-test subroutine. The test can be used to analyze the operation of line by observing the ICW (displayed in DISPLAY A and DISPLAY B, see page 3-2) during any part of the test executed in level 2 or level 3.

CAUTION If a line is in use by the test function, it is not available to the system. If a line is in use by the system, it is not available to the test function. Always use X'F0' to end all line test functions to ensure the availability of the line.



DISPLAY A 1
DISPLAY B 1
FUNCTION SELECT push buttons 4
HEXADECIMAL READOUT DISPLAYS 9
INTERRUPT push button 6

Line Test Function (Panel Test)
(Local only)
(Part 2 of 12)



Line Test Function (Panel Test)
(Local only)
(Part 3 of 12)

Test Settings for the EP Line Test Function

Note: The test functions are supported under Version 2 Modification 2(V2M2).or higher levels of the Emulation Program. See examples of use on the following pages.

Functions	HEXADECIMAL READOUT DISPLAYS B and C	HEXADECIMAL READOUT DISPLAYS D and E Input Data Byte	Descriptions
Initialization	00	Subchannel Address	Checks the subchannel address entered in HEXADECIMAL READOUT DISPLAYS D and E for validity and places the line address, if valid, in the test character control block (TCCB). Prevents level 2 interrupts (from the line just initialized) from causing program checks, etc.
Present Status	0F	Subchannel Address	Issues a Read command to the line if no command is active in the CCB, and the status/sense field is zero and presents resulting ending status to the channel. Issues a halt I/O to the line if the CCB has an active command.
Load Buffer 0	10	Test Character*	Loads a 40-character transmit buffer when HEXADECIMAL READOUT DISPLAYS D and E are set to the desired character. Enter a X'99' (end of buffer) in displays D and E after the last data character.
Load Buffer 1	11	Test Character*	Loads a 40 character transmit data buffer when HEXADECIMAL READOUT DISPLAYS D and E are set to the desired character. Enter a X'99' (end of buffer) in displays D and E after the last data character.
Set Mode Using CCB Data	20	None	Retrieves the set mode byte from the test line's CCB and loads it into the line's SDF. Sets the PCF state to X'1' (set mode) and returns the line to a NO-OP state.
Load First Rcv Compare Character	21	Test Character*	Places the line back into transmit mode and retransmits the originally selected transmit buffer if a compare is made with any received data character. The compare character is preset to X'37'.
Load Second Rcv Compare Character	22	Test Character*	Places the line back into transmit mode and retransmits the orjginally selected transmit buffer if a compare is made with any received data character. The compare character is preset to X'70'.
Load Third Rcv Compare Character	23	Test Character*	Places the line back into transmit mode and retransmits the originally selected transmit buffer if a compare is made with any received data character. Normally turns the line around if any data has been received from the terminal even though no previous compare was made. The compare character is preset to X'FF'.

*The test character should be entered according to the tables in the *3704/3705 Handbook* for the type of transmission code being used. Use the column labeled *PDF Code.*

Line Test Function (Panel Test)
(Local only)
(Part 4 of 12)

Functions	HEXADECIMAL READOUT DISPLAYS B and C	HEXADECIMAL READOUT DISPLAYS D and E Input Data Byte	Descriptions
Load First Buffer Swap Character	24	Test character*	Selects buffer 0, regardless of the buffer selected via the control panel, if a compare on received data is made with this character. The compare character is preset to X'FE' for a normal no compare state.
Load Second Buffer Swap Character	25	Test character*	Selects buffer 1, regardless of the buffer selected via the control panel, if a compare on received data is made with this character. The compare character is preset to X'EF' for a normal no compare state.
Set Mode Using Displays D and E	30	Data for an Output X'46'.	Loads the byte from HEXADECIMAL READOUT DISPLAYS D and E into the line's SDF. Sets the PCF to X'1' and returns the line to a NO-OP state.
Transmit Initial	40	None	Places the CCB PAD/SYN character into the line's SDF and PDF and sets the PCF state to X'8'. When the PCF state goes to X'9', the PAD/SYN is transmitted repeatedly.
Transmit Test Character and Fill	50	Test character*	Reads the test character from HEXADECIMAL READOUT DISPLAYS D and E and places it in the line's PDF. The line must be in transmit mode already (PCF state X'9'). Transmits the test character once and the PAD/SYN character repeatedly thereafter.
Transmit Test Character and Repeat	60	Test character*	Reads the test character from HEXADECIMAL READOUT DISPLAYS D and E and places it in the line's PDF. The line must be in transmit mode already (PCF state X'9'). The test character is transmitted repeatedly.
Transmit Buffer 0 and Receive	70	None	Prepares the line for transmission (PCF state X'8') then transmits data from buffer 0 until an end of buffer (X'99') character is recognized. At this point, the line is turned around to the receive state. When the line begins to receive characters, characters 0 through 7 are stored in the CCB data buffers. If more than eight characters are received, subsequent characters wrap the CCB data buffer starting at character 0. If a compare is made with any of the receive compare characters, the line will be turned around to transmit again.

*The test character should be entered according to the tables in the *3704/3705 Handbook* for the type of transmission code being used. Use the column labeled *PDF Code.*

Line Test Function (Panel Test)
(Local only)
(Part 5 of 12)

Functions	HEXADECIMAL READOUT DISPLAYS B and C	HEXADECIMAL READOUT DISPLAYS D and E Input Data Byte	Descriptions
Transmit Buffer 1 and Receive	71	None	Prepares the line for transmission (PCF state X'8') then transmits data from buffer 1 until an end of buffer (X'99') character is recognized. At this point, the line is turned around to the receive state. When the line begins to receive characters, characters 0 through 7 are stored in the CCB data buffers. If more than eight characters are received, subsequent characters wrap the CCB data buffer starting at character 0. If a compare is made with any of the receive compare characters, the line will be turned around to transmit again.
Auto-answer Using Buffer 0	80	None	Performs a set mode operation with data terminal ready on and a PCF state of X'2'. When someone dials in, the line is set to receive. The received characters are stored in the CCB data buffers, bytes zero through seven. A compare is made on data characters received for possible line turn-around to transmit data buffer 0.
Auto-answer Using Buffer 1	81	None	Performs a set mode operation with data terminal ready on and a PCF state of X'2'. When someone dials in, the line is set to receive. The received characters are stored in the CCB data buffers, bytes zero through seven. A compare is made on data characters received for possible line turn-around to transmit data buffer 1.
Dial Digit Buffer Load	90	D = 0 E = digit	Loads the dial digit from HEXADECIMAL READOUT DISPLAY E into a 16-position buffer. The last digit loaded must be a X'F'. The X'F' indicates the end of the dial digits.
Dial Operate Using Buffer 0	A0	D = 0 E = 0 or number of digits to be dialed.	Performs an auto-dial operation using the dial digit buffer. When the last digit has been dialed, the PCF state is set to X'2' (monitor for data set ready). When data set ready becomes active, the line is set to transmit data buffer 0. After transmitting the data buffer, the line is then turned around to receive.
Dial Operate Using Buffer 1	A1	D = 0 E = 0 or number of digits to be dialed.	Performs an auto-dial operation using the dial digit buffer. When the last digit has been dialed, the PCF state is set to X'2' (monitor for data set ready). When data set ready becomes active, the line is set to transmit data buffer 1. After transmitting the data buffer, the line is then turned around to receive.

Line Test Function (Panel Test)
(Local only)
(Part 6 of 12)

Functions	HEXADECIMAL READOUT DISPLAYS B and C	HEXADECIMAL READOUT DISPLAYS D and E Input Data Byte	Descriptions
Data Rate Select	B0	FF = High Rate Select 00 = Low Rate Select	Selects the high or low data rate for a line previously defined in the test. The set mode byte and LCD field (CCBBTLCD) in the CCB for the line under test is displayed in DISPLAY B. Data rate select is bit 5 of the set mode byte.
End Test - Leave DTR Active	C0	Subchannel Address	Ends the test for the subchannel addressed and places the line in the NO-OP state, leaving data terminal ready (DTR) active.
Set Receive	C1	None	Set the receive state in the ICW, PCF state 7.
Oscillator Select	D0	D = 0 E = Oscillator selected for the test line (0, 1, 2, or 3)	Allows for the selection of one of the four possible oscillator positions as the internal clock for the line under test. This is a permanent change to the set mode byte of the CCB.
Network Select	E0	D = 0 E = Network Select Options	Changes the setting of bits 4 and 5 of the CCBOPT field in the CCB. The setting of display E determines what options are selected (0 = Leased Line/Half-Duplex, 1 = Leased Line/Duplex, 2 = Switched Line/Half-Duplex, 3 = Switched Line/Duplex).
End Test - Normal	F0	None	Ends all testing on the line selected at initialization time. This routine leaves the test function ready for new input.

Line Test Function (Panel Test)
(Local only)
(Part 7 of 12)

Example of Auto-Answer Using Data Buffer 1

	Functions	HEXADECIMAL READOUT DISPLAYS BCDE		Descriptions
Step 1	Initialization	0020	Press INTERRUPT	Initialize line 20 for testing.
Step 2	Load Buffer 1	11XX	Press INTERRUPT	Load buffer 1. Buffer 1 must be loaded with desired transmission before executing this routine.
Step 3	Load Buffer 1	1199	Press INTERRUPT	End load of data buffer 1.
Step 4	Load First Rcv Compare Character	21XX	Press INTERRUPT	Load receive compare character with last expected data character from terminal. Receive compare characters must be set up to turn the line around on expected response from the terminal.
Step 5	Auto-answer using Buffer 1	8120	Press INTERRUPT	Set up line 20 for auto-answer.

Note: If the FUNCTION SELECT push button is left in position 5, DISPLAY A, Byte 1 contains the last received character from the terminal. DISPLAY B displays the Character Address Count (CAC). If Byte 1 DISPLAY A contains a X'99', no data has been received from the terminal.

Line Test Function (Panel Test)
(Local only)
(Part 8 of 12)

Example of the Load Data Buffer 0
Test Function with the 3275 Poll Sequence

	Functions	HEXADECIMAL READOUT DISPLAYS BCDE		Descriptions
Step 1	Load Buffer 0	1055	Press INTERRUPT	Loads leading pad X'55'
Step 2	Load Buffer 0	1032	Press INTERRUPT	EBCDIC BSC SYN character
Step 3	Load Buffer 0	1032	Press INTERRUPT	EBCDIC BSC SYN character
Step 4	Load Buffer 0	1037	Press INTERRUPT	EBCDIC BSC EOT character
Step 5	Load Buffer 0	10FF	Press INTERRUPT	Trailing pad X'FF'
Step 6	Load Buffer 0	1032	Press INTERRUPT	SYN
Step 7	Load Buffer 0	1032	Press INTERRUPT	SYN
Step 8	Load Buffer 0	1040	Press INTERRUPT	General poll address CU = 0
Step 9	Load Buffer 0	1040	Press INTERRUPT	General poll address CU = 0
Step 10	Load Buffer 0	107F	Press INTERRUPT	General poll device address
Step 11	Load Buffer 0	107F	Press INTERRUPT	General poll device address
Step 12	Load Buffer 0	102D	Press INTERRUPT	EBCDIC BSC Enquiry character
Step 13	Load Buffer 0	10FF	Press INTERRUPT	Trailing pad
Step 14	Load Buffer 0	1099	Press INTERRUPT	End of buffer

Line Test Function (Panel Test)
(Local only)
(Part 9 of 12)

Example of the Transmit Buffer 0 and Receive Test Function

	Functions	HEXADECIMAL READOUT DISPLAYS BCDE		Descriptions
Step 1	Load Buffer 0	10XX	Press INTERRUPT	Load data buffer 0 using the line character codes in the *3704/3705 Handbook* for the appropriate test characters. Use the column labeled *PDF Code.*
Step 2	Load First Rcv Compare Character	21XX	Press INTERRUPT	Load compare character to turn line back to transmit.
Step 3	Initialization	0020	Press INTERRUPT	Initialize line for testing.
Step 4	Set Mode Using CCB Data	2020	Press INTERRUPT	Issue a set mode using CCB data.
Step 5	Transmit Buffer 0 and Receive	7020	Press INTERRUPT	Transmits buffer 0 and turns to receive. Compares each received character with that loaded in step 2 and turn line back to transmit if compare is made.

Line Test Function
(Panel Test)
(Part 10 of 12)

Example of Addressing a Start/Stop Terminal (1050)

	Function	HEXADECIMAL READOUT DISPLAYS B C D E	
Step 1	Initialization	0 0 X X (Subchannel Address)	Press INTERRUPT
Step 2	Set Mode	2 0 0 0	Press INTERRUPT
Step 3	Transmit Initial	4 0 0 0	Press INTERRUPT
Step 4	Transmit Test Character and Fill	5 0 7 C	Press INTERRUPT
Step 5	Transmit Test Character and Fill	5 0 0 0	Press INTERRUPT
Step 6	Transmit Buffer 0 and Receive	7 0 2 0	Press INTERRUPT At this point you may display the CCB, BCB or the ICW. If you look at the second byte in the CCB buffer, you can see the terminal's response; if negative go to step 3; if positive, go to the next step. Negative ((N)) = 01/81; Positive ((Y)) = 37/B7.
Step 7	Transmit Initial	4 0 3 4	Press INTERRUPT
Step 8	Transmit Test Character and Fill	5 0 3 4	Press INTERRUPT
Step 9	Transmit Test Character and Fill	5 0 X X (hex character)	Press INTERRUPT

Line Test Function
(Panel Test)
(Part 11 of 12)

Example of Addressing a Start/Stop Terminal (1050) (Continued)

	Function	HEXADECIMAL READOUT DISPLAYS B C D E	
Step 10	Transmit Test Character and Fill	5 0 5 E	Press INTERRUPT
Step 11	Transmit Buffer 0 and Receive	7 0 X X	Press INTERRUPT This step sends and LRC character in switch positions D and E. If you do not need to calculate an LRC character, repeat step 10 and go to step 13. If you send the same character an even number of times, you must send two (B) characters. You can display the CCB, BCB or the ICW at this point. The CCB buffer has the response. (See Note below)
Step 12	Transmit Initial (if the response is positive)	4 0 0 0	Press INTERRUPT
Step 13	Transmit Test Character and Fill	5 0 7 C	Press INTERRUPT
Step 14	End of Test	X*0 X X (Subchannel Address)	Press INTERRUPT

*Switch position B = 8 for Emulation Program, Version 1 Modification 1
= F for Emulation Program, Version 1 Modification 2 and later versions.

Note: For a blank LRC character send a (B) . The Emulation Program simulates the (B) for the blank.

Line Test Function
(Panel Test)
(Part 12 of 12)

Example of Polling a
Start/Stop Terminal (1050)

	Function	HEXADECIMAL READOUT DISPLAYS B C D E	
Step 1	Set Mode	0 0 X X (Subchannel Address)	Press INTERRUPT
Step 2	Transmit Initial	4 0 0 0	Press INTERRUPT
Step 3	Transmit Test Character and Fill	5 0 7 C	Press INTERRUPT
Step 4	Transmit Test Character and Fill	5 0 A 3	Press INTERRUPT
Step 5	Transmit Buffer 0 and Receive	7 0 5 4	Press INTERRUPT You may display the ICW, CCB, or BCB at any point. At this time the terminal response is the second byte in the CCB buffer, the first byte will have the component select code. If the response is negative, go to step 2 and repeat the remaining steps. If the response is positive, the terminal will start sending data, then an EOB and an LRC. The last character in the buffer is the LRC. You should respond with a positive receive. Negative (Ⓝ) = 01/81; Positive (Ⓨ) = 37/87.
Step 6	Transmit Initial	4 0 0 0	Press INTERRUPT
Step 7	Transmit Buffer 0 and Receive	7 0 3 7	Press INTERRUPT (The terminal will answer with an EOT)
Step 8	End of Test	X*0 X X (Subchannel Address)	Press INTERRUPT

*Switch position B = 8 for Emulation Program Version 1 Modification 1
F for Emulation Program, Version 1 Modification 2 and later versions.

Section 4: 3704 Control Panel Procedures Used with the Network Control Program

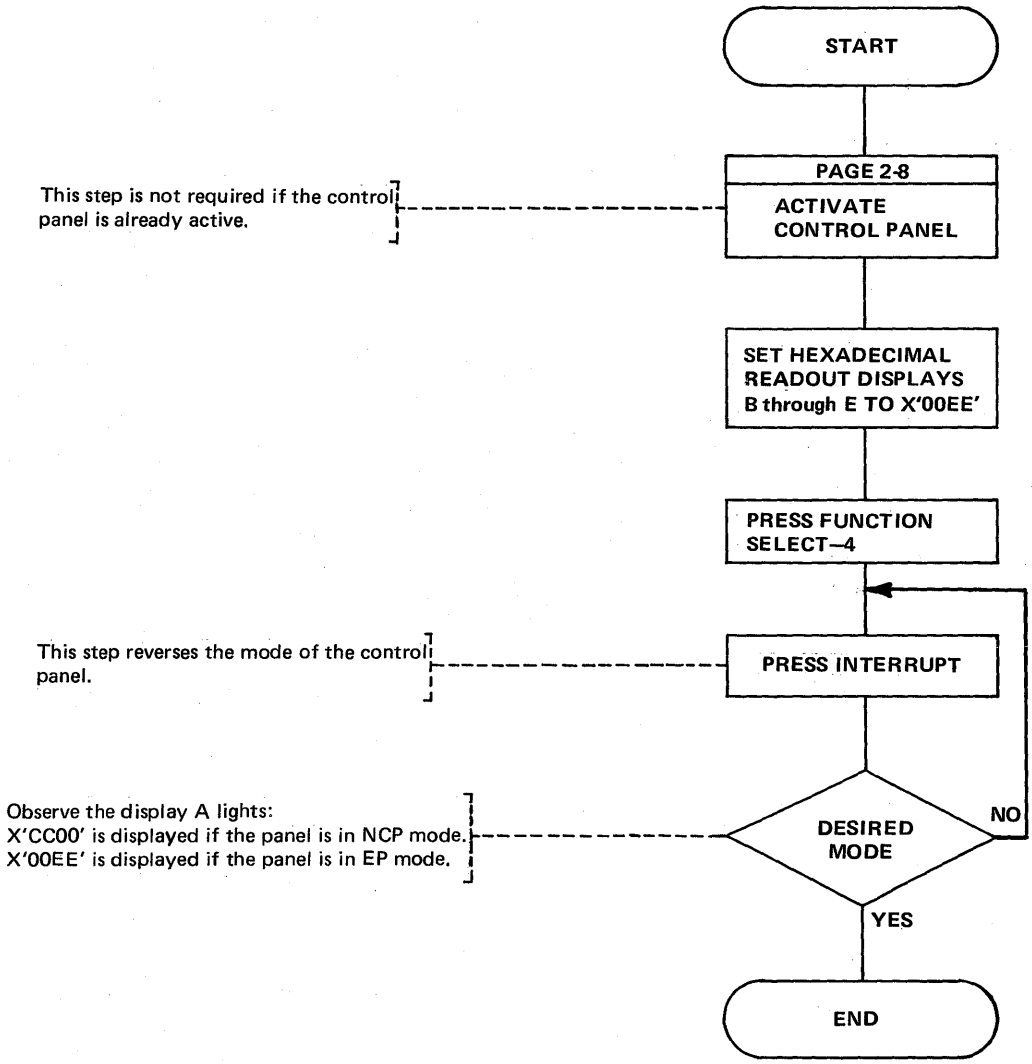
The Network Control Program supports several 3704 control panel functions that dynamically display registers and storage locations and allow testing of the 3704 while it is in operation. You should review the Network Control Program (NCP) generation macro statements before attempting NCP procedures. The macros include information on the type of lines, line speed, modems, auto-call units, auto-answer capability, and other system information for the lines involved, as well as terminal information. This type of information is necessary to run certain of the panel procedures, for example, the line test function.

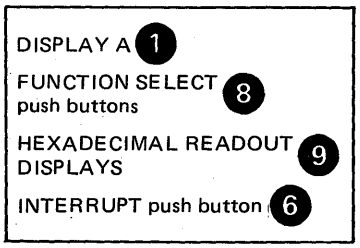
A feature of the Network Control Program is the Partitioned Emulation Programming (PEP) extension. In a PEP environment, you can run some communication lines in network control mode while concurrently running others in emulation mode. The remote 3704 will not operate in a PEP environment. When the local 3704 is operating in a PEP environment, the control panel must be placed in NCP mode (page 4-2) before executing the procedures in this section, except the line trace procedures.

Setting the Control Panel Mode With PEP

Use this procedure to reverse the mode of the control panel operation when running in a PEP environment. The panel operates in either NCP or EP mode with the functions of each system remaining intact. The only exception is the EP line test function. You must use the NCP line test function in a PEP system.

After a local 3704 IPL in a PEP environment, the panel is initially in EP mode.



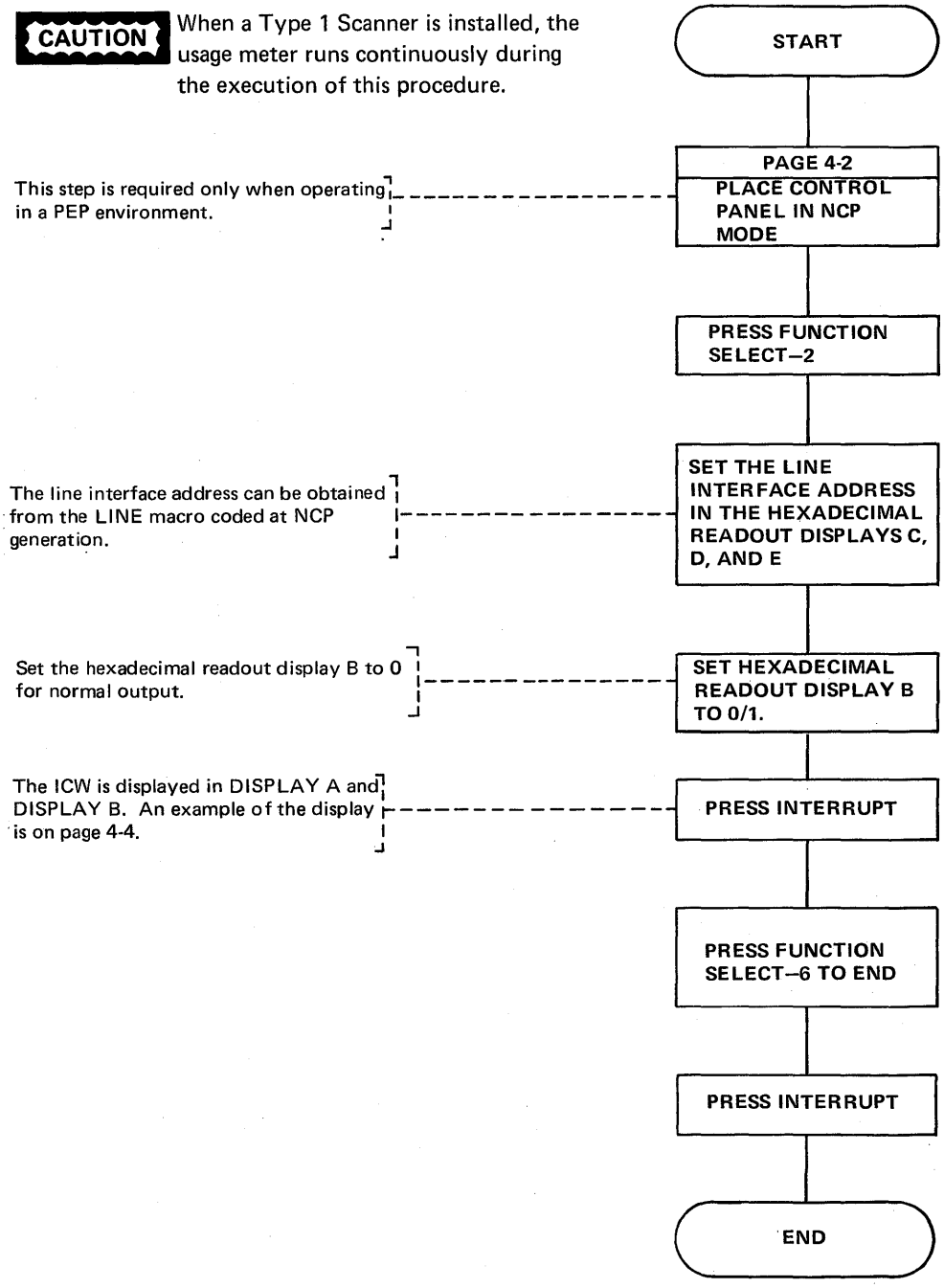


Dynamic Display of an ICW (Part 1 of 2)

Use this procedure to display the Interface Control Word (ICW) for the line specified in the HEXADECIMAL READOUT DISPLAYS. The display is updated ten times per second until the operation stops.

Note: See the 3704 and 3705 *Principles of Operation* manual for details about the ICW.

CAUTION When a Type 1 Scanner is installed, the usage meter runs continuously during the execution of this procedure.



FUNCTION SELECT push buttons 4
HEXADECIMAL READOUT DISPLAYS 9
INTERRUPT push button 6

Dynamic Display of an ICW (Part 2 of 2)

The ICW display is used for both the Type 1 and Type 2 Scanners. The NCP samples the BCB for the Type 1 Scanner and arranges the output to look like the ICW for a Type 2 Scanner.

CONTROL PANEL DISPLAY OUTPUT

Bits	Byte 0 0123 4567	Byte 1 0123 4567
Display A	xxxx xxxx	xxxx xxxx
ICW Bits	0 - - 7	8 - - 15
ICW Fields	SCF	PDF
Display B	xxxx xxxx	xxxx xxxx
ICW Bits	16 - - 23	24 - - 31
ICW Fields	LCD PCF	DS LEADS

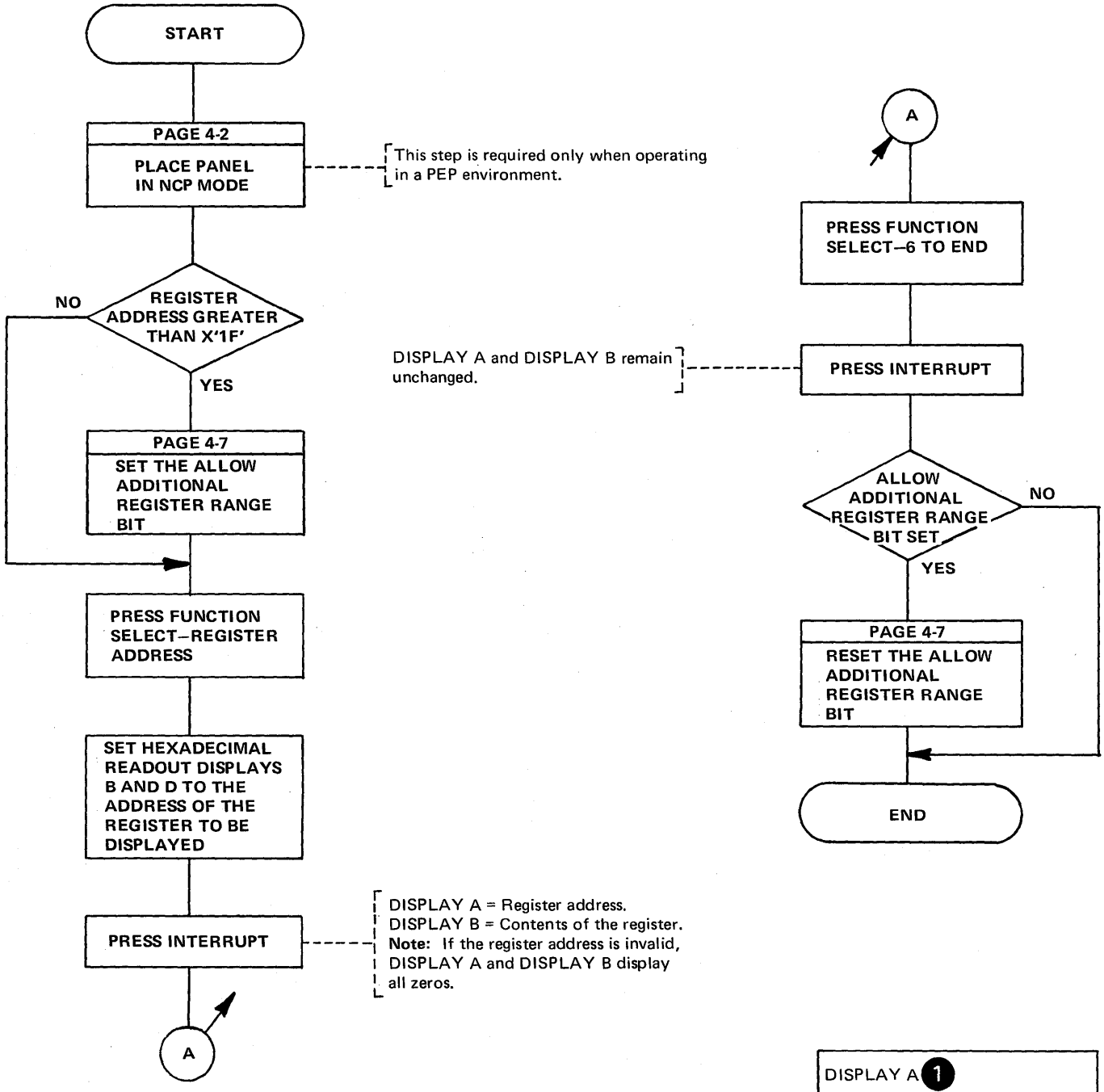
DATA SET LEADS DISPLAY

	BYTE 1		BYTE 1
Bit	Data Line	Bit	Auto-call*
0	Clear to Send	0	Abandon Call and Retry
1	Ring Indicator	1	Present Next Digit
2	Data Set Ready	2	Data Line Occupied
3	Receive Line Signal	3	Digit Present
4	Receive Data Bit Buffer	4	Call Request
5	Diagnostic Wrap Mode	5	Call Originating Status
6	Bit Service Request	6	Bit Service Request
7	Zero (not used)	7	Interrupt to Remember

*The LCD contains X'3' (auto-dial) when the DS Leads display dial line information.

Dynamic Display of Registers

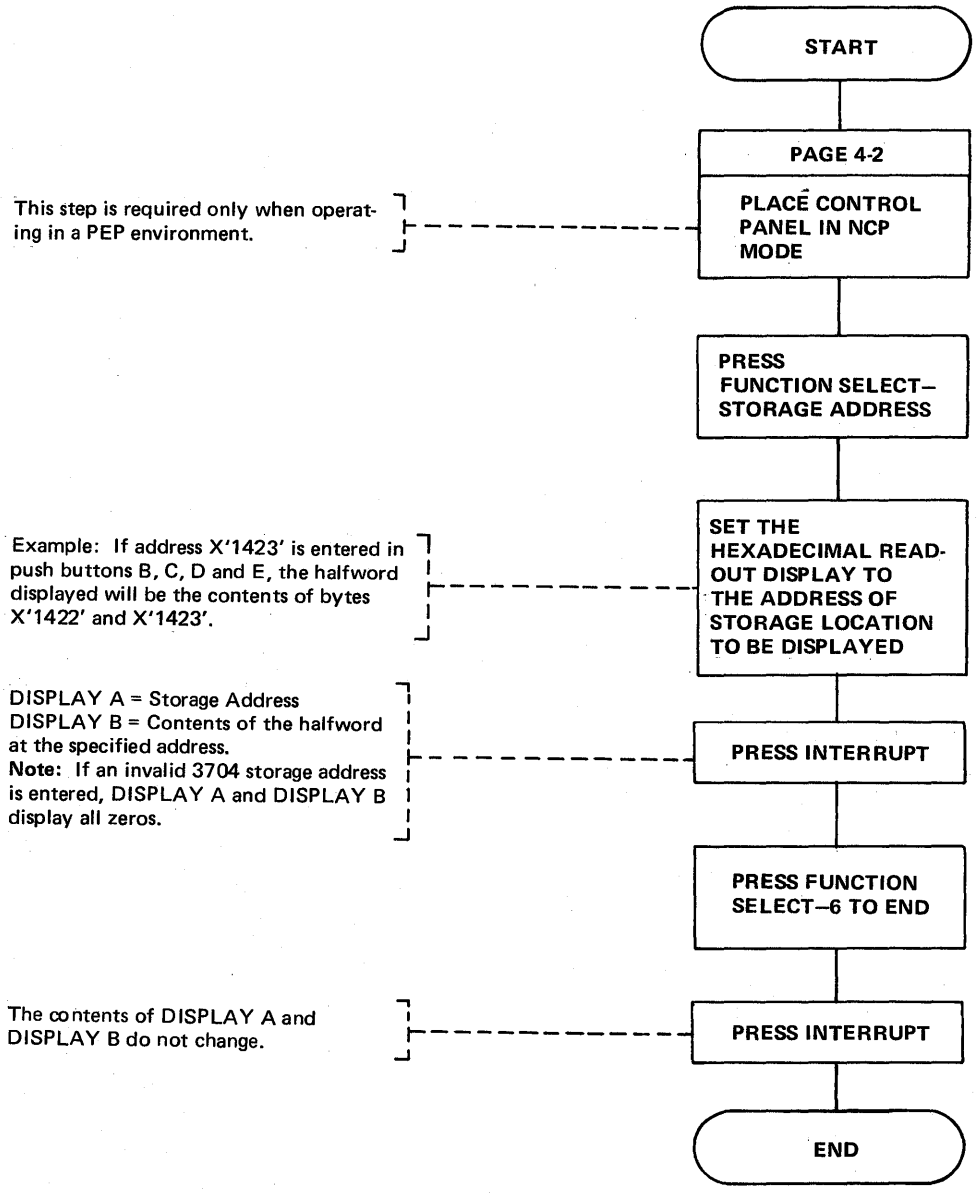
Use this procedure to display external register contents in DISPLAY B. The display is updated ten times per second until the operation ends. If you display registers other than X'00' through X'1F', you must set the Allow Additional Register Range bit (page 4-7)

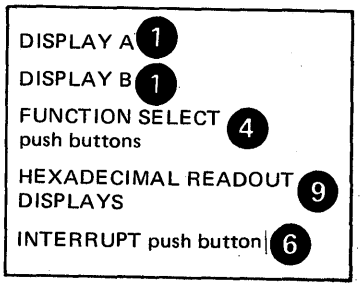


DISPLAY A 1
DISPLAY B 1
FUNCTION SELECT push buttons 4
HEXADECIMAL READOUT DISPLAYS 9
INTERRUPT push button 6

Dynamic Display of Storage

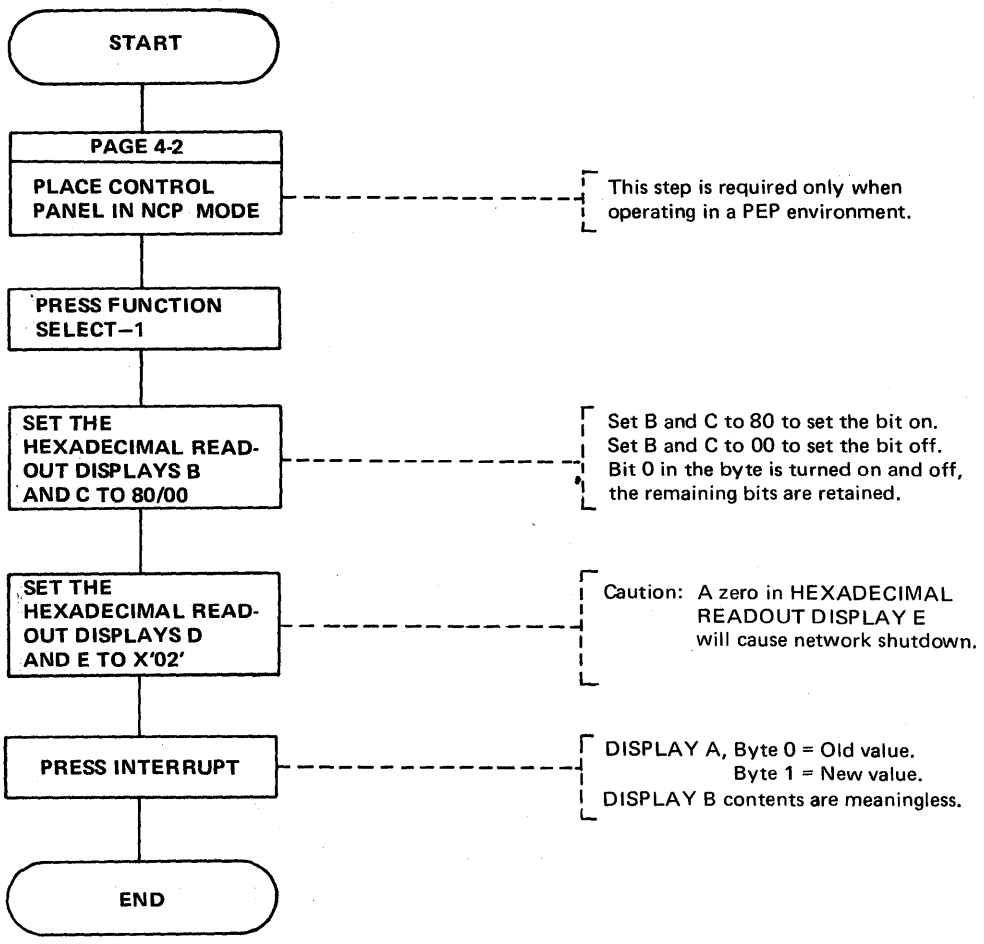
Use this procedure to display two bytes of 3704 storage on halfword boundaries. The display is updated ten times per second until the operation ends.





Allow Additional Register Range Bit

The Allow Additional Register Range bit must be set to dynamically display or trace registers with addresses greater than X'1F'. A bit is provided, *for test purposes only,* that can be set on dynamically to allow these displays. When you complete the register display or trace you must set this bit off.



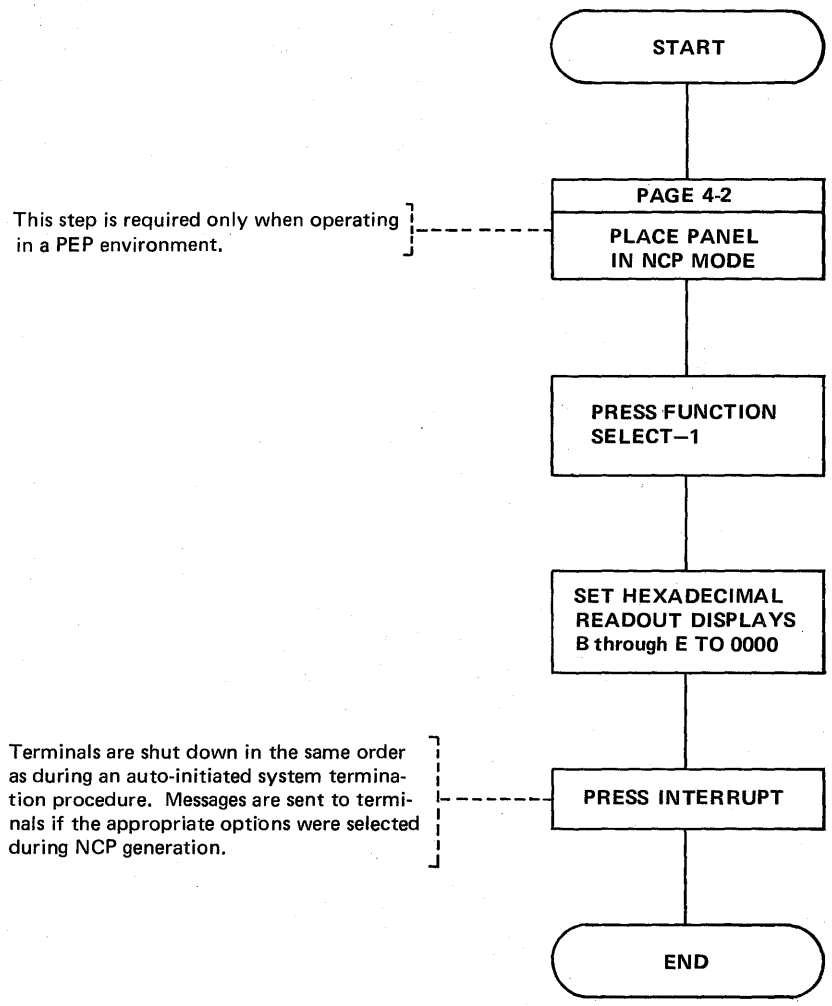
FUNCTION SELECT 4 push buttons

HEXADECIMAL READOUT 9 DISPLAYS

INTERRUPT push button 6

Network Shutdown (Part 1 of 2)

Auto-network shutdown is an optional NCP-initiated system termination procedure. This option must be chosen during NCP generation (ANS = YES specified on the BUILD macro). This procedure is initiated (1) when the NCP recognizes it can no longer successfully communicate with the host processor or (2) when an operator request is made via the 3704 control panel. The active lines in the 3704 are not disabled, but any service seeking operations are terminated. A critical situation message can be sent to all active terminals if specified during Network Control Program generation. The user-specified message should inform the terminal users that the system is shutting down.



FUNCTION SELECT 4 push buttons

HEXADECIMAL READOUT 9 DISPLAYS

INTERRUPT push button 11

Network Shutdown
(Part 2 of 2)

The following are the restart procedures for the 3704 after a network shutdown with TCAM as the access method in the host processor.

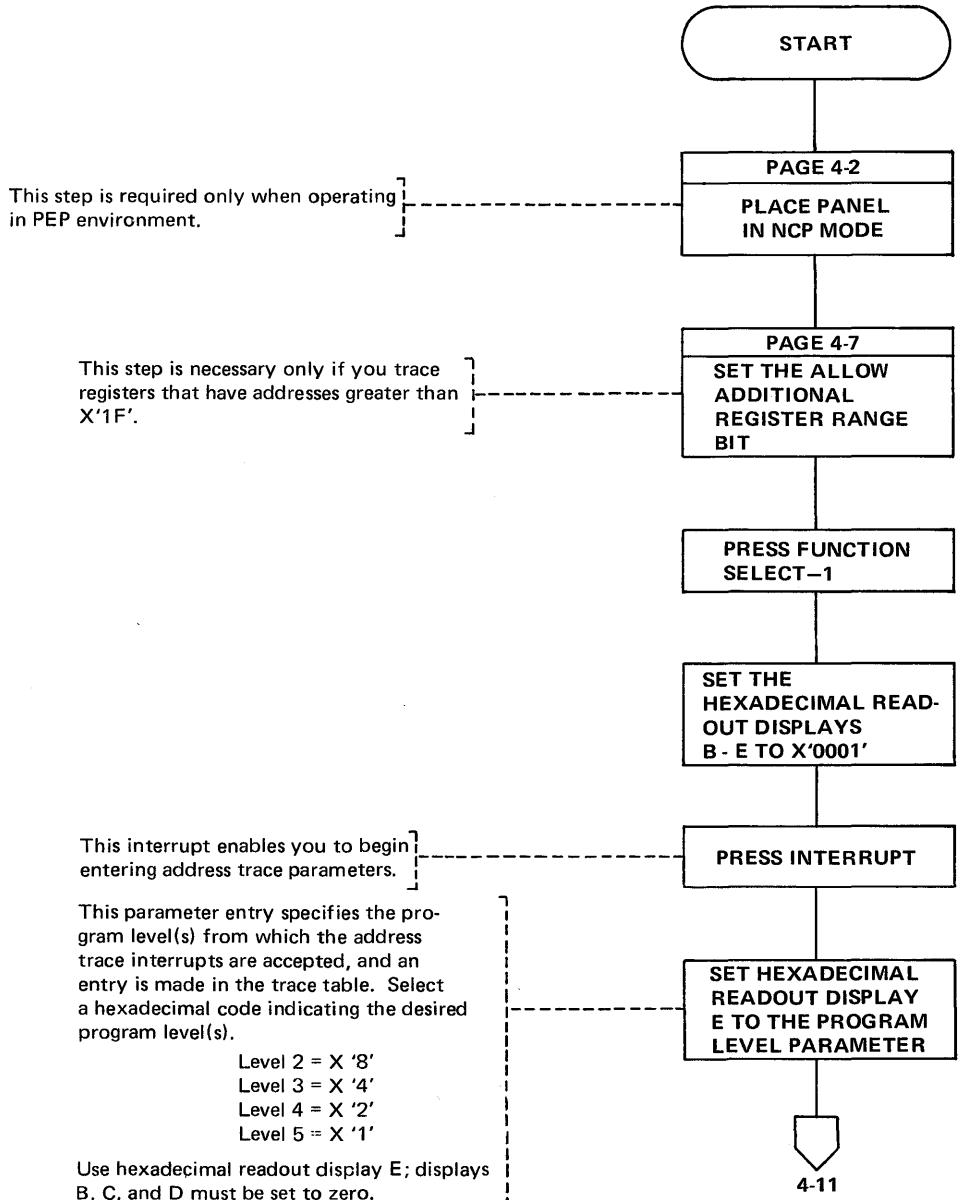
Auto-shutdown:

A message is sent to the system console stating that the 3704 is shutting down. After the shutdown, TCAM will try to resume normal operation. If the system is unable to resume traffic, the operator should intercede and determine the nature of the shutdown.

Operator-initiated shutdown:

Activate the 3704 at the system console.

Use this procedure to obtain an online trace via the control panel. It is available only if the option TRACE = YES is specified in the BUILD macro during NCP generation. The trace consists of storing one to four variables in a trace table each time an address that you specify is accessed in one of the program levels that you specify. Each variable can be either two consecutive halfwords in storage or the contents of a general register. If you trace registers with addresses greater than X'1F', you must set the Allow Additional Register Range bit (page 4-7). To obtain a trace, execute the following steps in order.

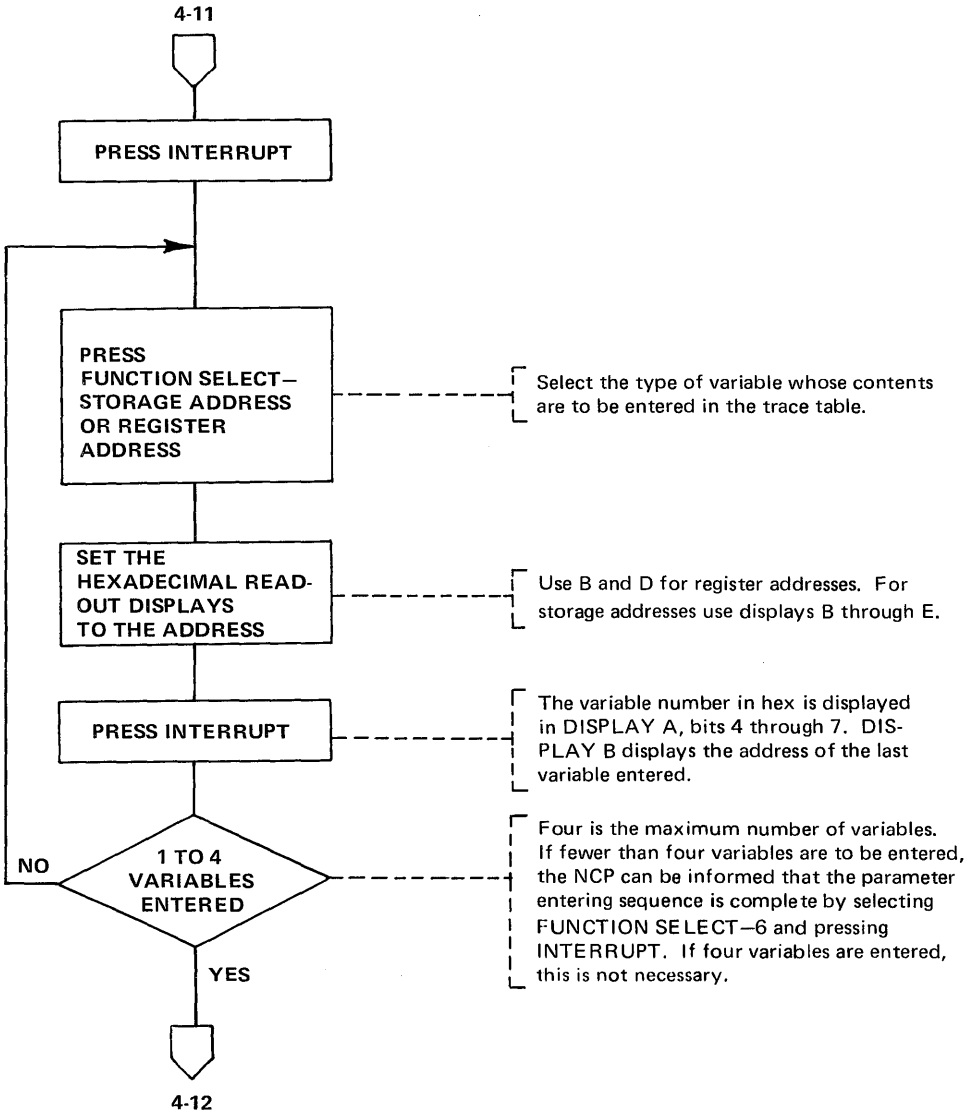


FUNCTION SELECT push buttons 4

HEXADECIMAL READOUT DISPLAYS 9

INTERRUPT push button 6

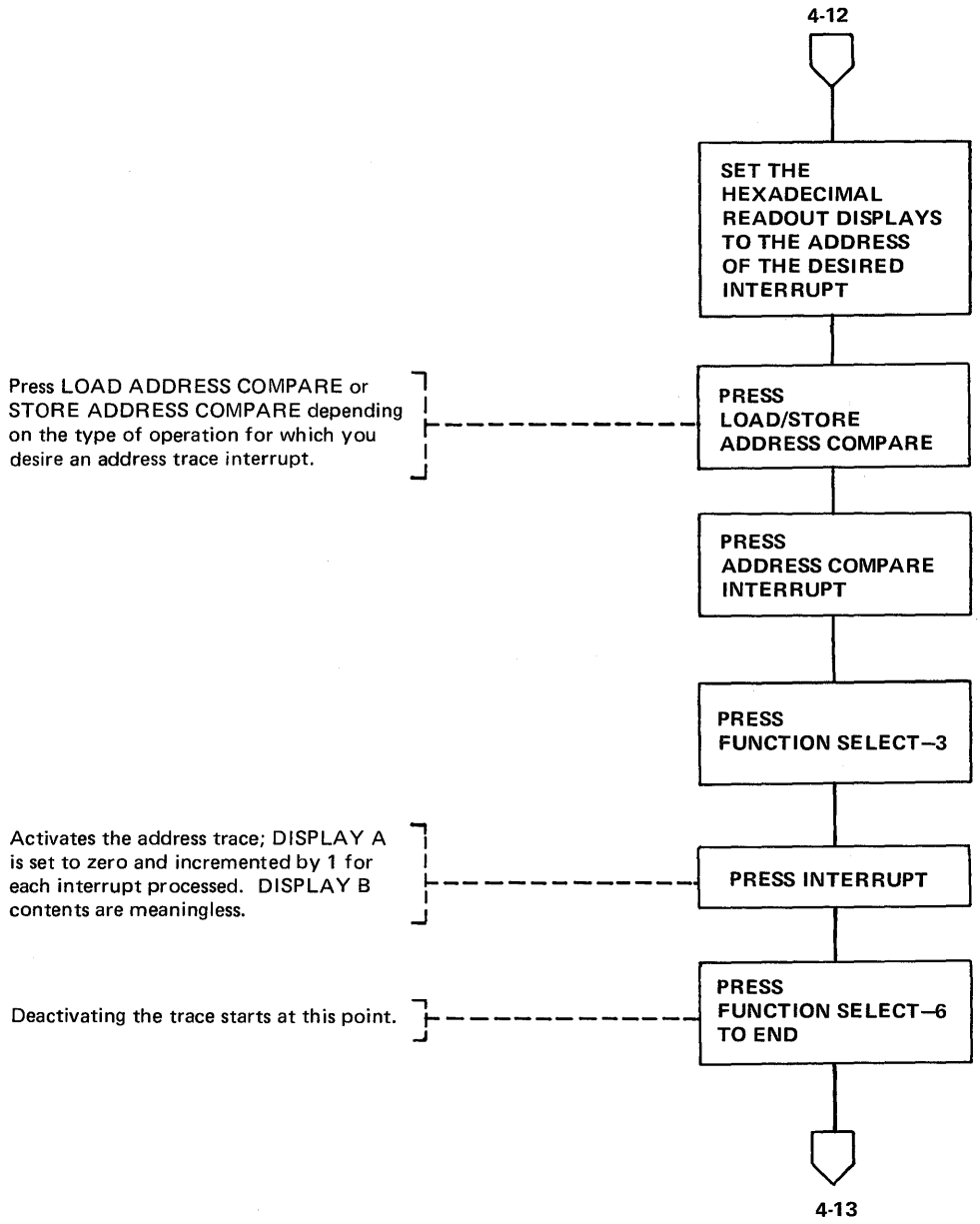
Address Trace Facility
(Part 2 of 6)



FUNCTION SELECT push buttons 4

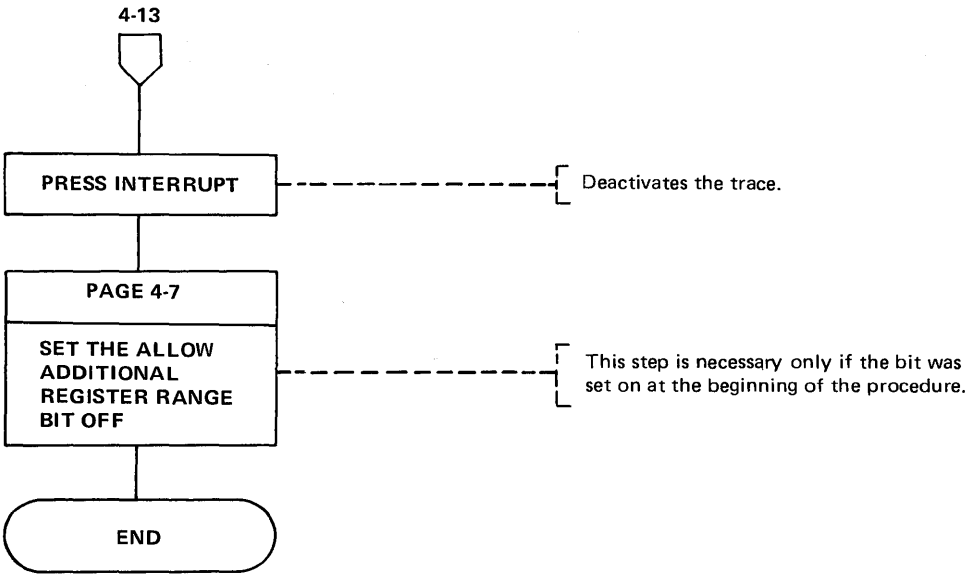
HEXADECIMAL READOUT DISPLAYS 9

INTERRUPT push button 6



ADDRESS COMPARE INTERRUPT push button 5
FUNCTION SELECT push buttons 4
HEXADECIMAL READOUT DISPLAYS 9
INTERRUPT push button 6
LOAD ADDRESS COMPARE push button 12
STORE ADDRESS COMPARE push button 12

Address Trace Facility
(Part 4 of 6)



Note: The trace table can be displayed via the console panel, dynamic storage display or a 3704 storage dump.

A pointer to the address trace table can be found in the ATB block described in the *3704/3705 Handbook;* use a storage dump to obtain the actual addresses. A link edit map can also direct you to the trace table.

The contents of the general registers that are used in program level 2 cannot be traced with address trace because general registers 0 through 7 are used with both level 1 and level 2. Therefore you must trace the register information from the storage locations listed below. This is necessary because the address trace is executed in program level 1. A save area has been provided in storage at the following locations:

Register 1 =7A0
Register 2 =7A4
Register 3 =7A8

Register 4 =7AC
Register 5 =7B0
Register 6 =7B4

Register 7 =7B8
Register 74 =7BC
Register 0 =7C0

The save area contains the contents of the general registers used for level 2 and the contents of the Lagging Address Register (LAR, X'74').

INTERRUPT push button 6

Example of Address Trace

Address trace is used with 3704 hardware and software. The following procedure is an example of tracing the contents of three registers each time a program level 2 interrupt occurs for a terminal that is assigned to the interface address X'840'. A fixed storage interface address list should be provided for your installation. The three registers that are being traced are not registers between X'00' through X'1F'; therefore, the Allow Additional Register Range bit must be set to obtain the trace information.

	FUNCTION SELECT Push Buttons	HEXADECIMAL READOUT DISPLAYS B C D E		Descriptions
Step 1	Dynamically set the Allow Additional Register Range bit (page 4-7) off.			To sample registers other than registers, X'00' through X'1F', you must set the Allow Additional Register Range bit. This step is not necessary if you are sampling storage locations or registers in the range X'00' through X'1F'.
Step 2	Press FUNCTION SELECT–1	0001	Press INTERRUPT	Calls the Address Trace routine.
Step 3	Press FUNCTION SELECT–1	0008	Press INTERRUPT	You can select interrupts on one to four program levels. In the example all interrupts on program level 2 for a particular terminal are being traced.
Step 4	Press FUNCTION SELECT–REGISTER ADDRESS	4020	Press INTERRUPT	Enter the address of register X'42'. The contents of this register is the first information placed in the trace table each time a level 2 interrupt occurs for the device that is being traced.
Step 5	Press FUNCTION SELECT–REGISTER ADDRESS	4030	Press INTERRUPT	Second entry in the trace table.
Step 6	Press FUNCTION SELECT–REGISTER ADDRESS	4040	Press INTERRUPT	Third entry in the trace table.
Step 7	Press FUNCTION SELECT–6	0000	Press INTERRUPT	Stops the entering of the variables into the trace table. You could enter one more variable if you desired.
Step 8	Press FUNCTION SELECT–3, MODE SELECT–ADDRESS COMPARE INTERRUPT, LOAD ADDRESS COMPARE	0840	Press INTERRUPT	Sets the type of compare interrupt for a LOAD operation at the address (X'840') specified. The trace starts at this point and runs until it is deactivated.

Address Trace Facility
(Part 6 of 6)

Example of Address Trace (Continued)

	FUNCTION SELECT Push Buttons	HEXADECIMAL READOUT DISPLAYS B C D E		Descriptions
Step 9	This step deactivates the trace. Press FUNCTION SELECT 6.	0000	Press INTERRUPT	Deactivates the trace.
Step 10	Dynamically set the Allow Additional Register Range bit (page 4-17) off.			Sets the Allow Additional Register Range bit off. The address of the trace table can be obtained from a link-edit map. You can display the information dynamically or by getting a 3704 storage dump and mapping the trace table.

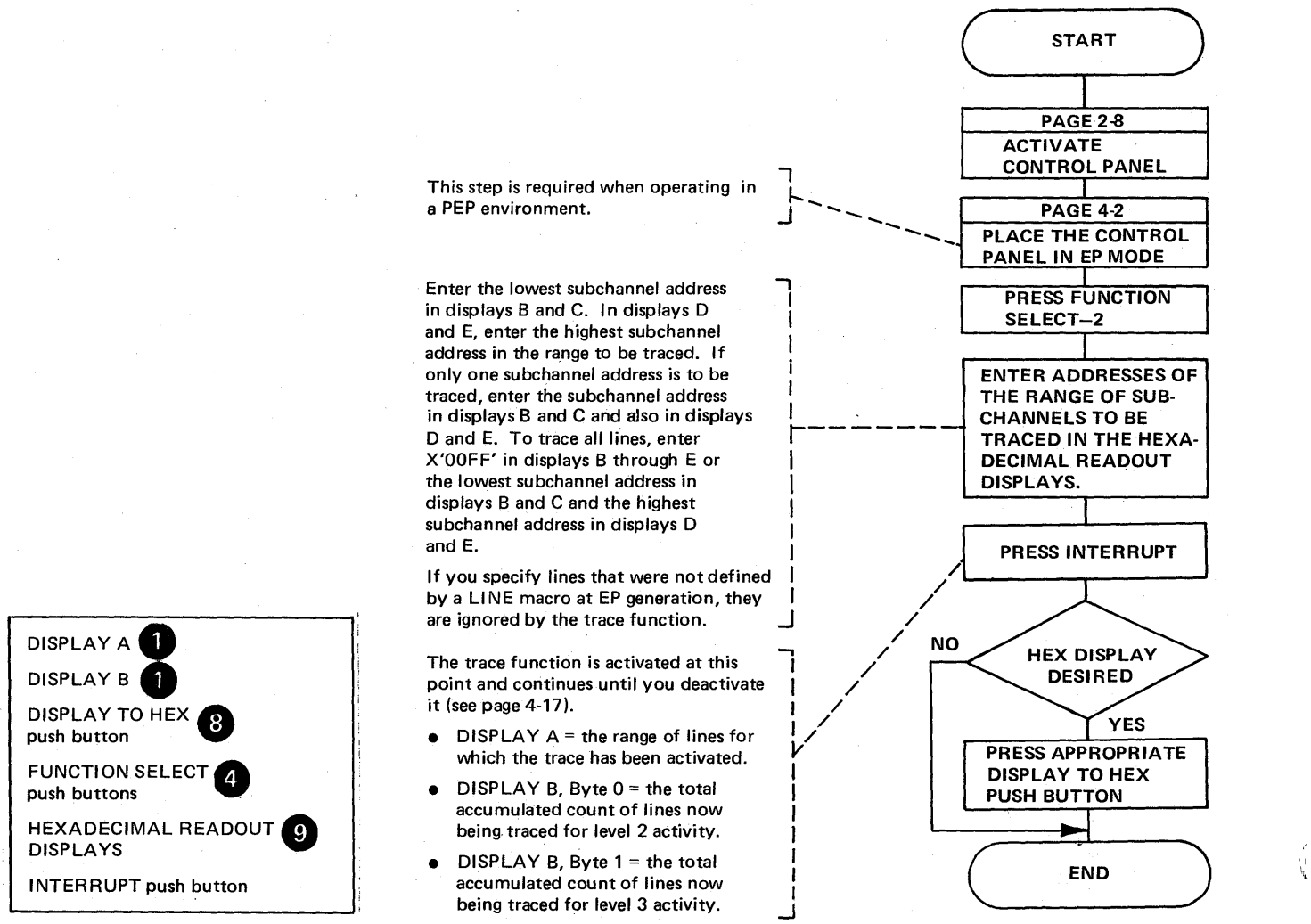
Activating the Level 2 Line Trace (NCP/PEP) (Local only)

Line trace is an optional function of the Emulation Program. It is included in the EP portion of PEP with NCP if LINETRC=YES is specified on the BUILD macro at NCP/PEP generation time. In addition, this procedure may be used with an NCP generated for EP functions only (TYPGEN=EP specified with the BUILD macro at NCP generation). (See the *Network Control Program Generation and Utilities Manual.)* NCP 3.)

Use this procedure to activate the level 2 interrupt trace for a line or a group of lines. To activate the trace for noncontiguous lines or groups of lines, repeat this procedure for each line or group of lines. A subchannel address is represented by either two or three hexadecimal digits in the EP generation language, for example, 06A. When activating the trace function, only the last two digits are used (that is 6A).

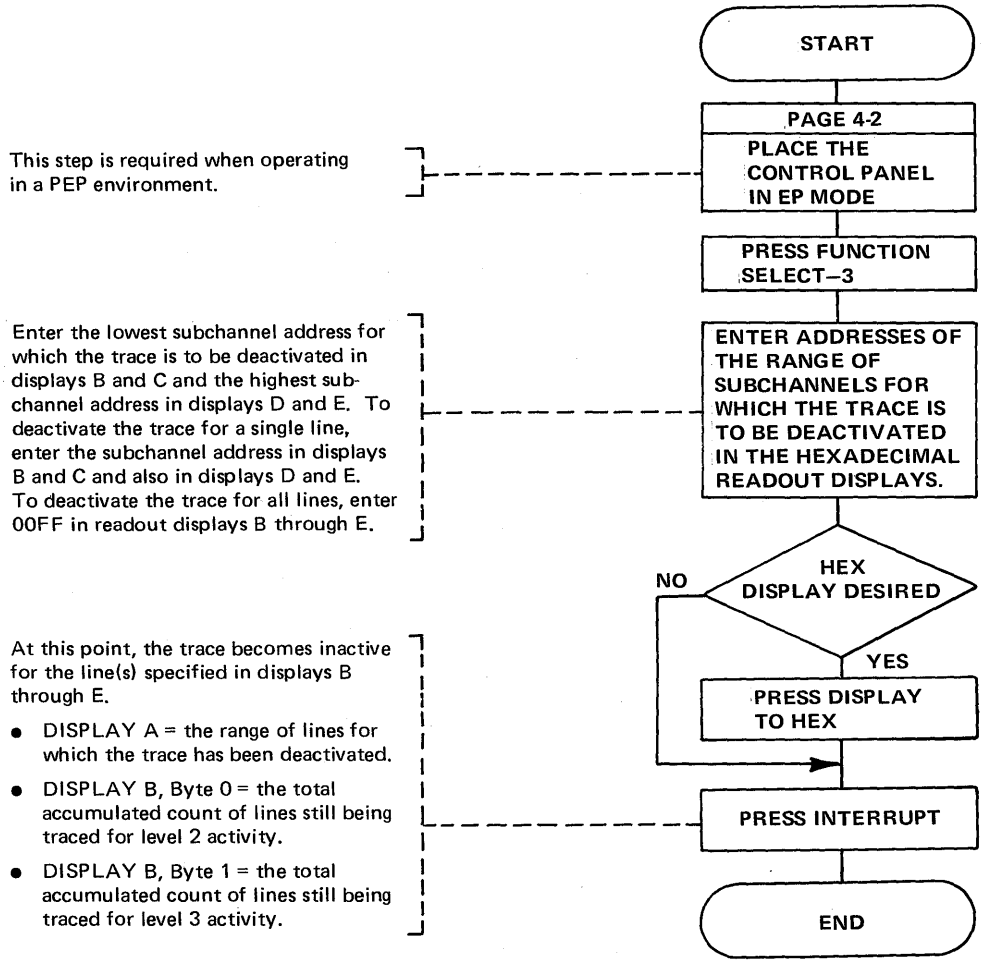
For each type 2 scanner, only one data set interface can be shown in the level 2 line trace. The interface can be selected by using Function 6 to display the data set leads in the ICW (see page 3-2) before the line trace is enabled.

CAUTION The trace can degrade the performance of the Emulation Program. Refer to the *EP Storage and Performance Manual* for the possible effects of the trace on performance.



Deactivating the Level 2 Line Trace (NCP/PEP) (Local only)

Use this procedure to deactivate the level 2 interrupt trace function for all or some of the lines for which the trace is active.



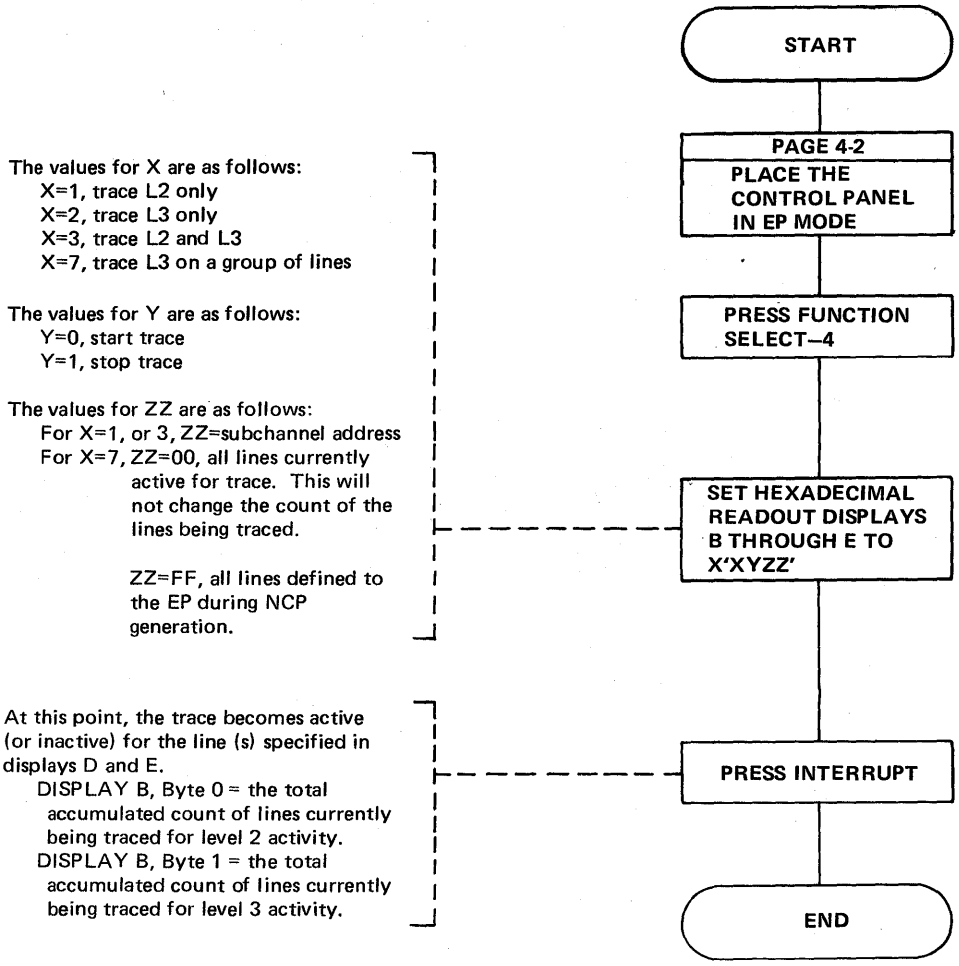
After you deactivate the line trace, you should obtain a storage dump of the 3704 by using the dump utility program or the dynamic dump utility program. Refer to the *Emulation Program Generation Manual* for the job control statements. The trace table may be found in the storage dump as follows:

- The trace table pointer is in high storage above the Emulation Program load module. Look for the characters that spell out 'START TRACE' on the right-hand side of the dump. The trace table pointer starts four fullwords from the area that spells out 'START TRACE' in EBCDIC.
- The first word is the address of the latest entry in the trace table. The table will wrap if full; therefore, you need the address of the latest entry in the table to find the last entry prior to dumping storage.
- The second word is the address of the beginning of the trace table.
- The third word is the upper limit of the trace table. Each entry in the table is 8 bytes long.

DISPLAY A 1
DISPLAY B 1
DISPLAY TO HEX push button 8
FUNCTION SELECT push buttons 4
HEXADECIMAL READOUT DISPLAYS 9
INTERRUPT push button 6

Activating/Deactivating the Level 2 and/or Level 3 Line Trace (NCP/PEP) (Local only)

Use this procedure in an NCP/PEP environment to activate or deactivate the tracing of level 2 and/or level 3 interrupts for a single line or level 3 interrupts for a group of lines.



DISPLAY A 1
FUNCTION SELECT push button 4
HEXADECIMAL READOUT DISPLAYS 9
INTERRUPT push button 6

Line Test Function
(Panel Test)
(Part 1 of 15)

The line test is an optional function provided only with NCP 2, NCP 3, and NCP 4. To include the line test function, PNLTEST = YES is specified on the BUILD macro at NCP generation time.

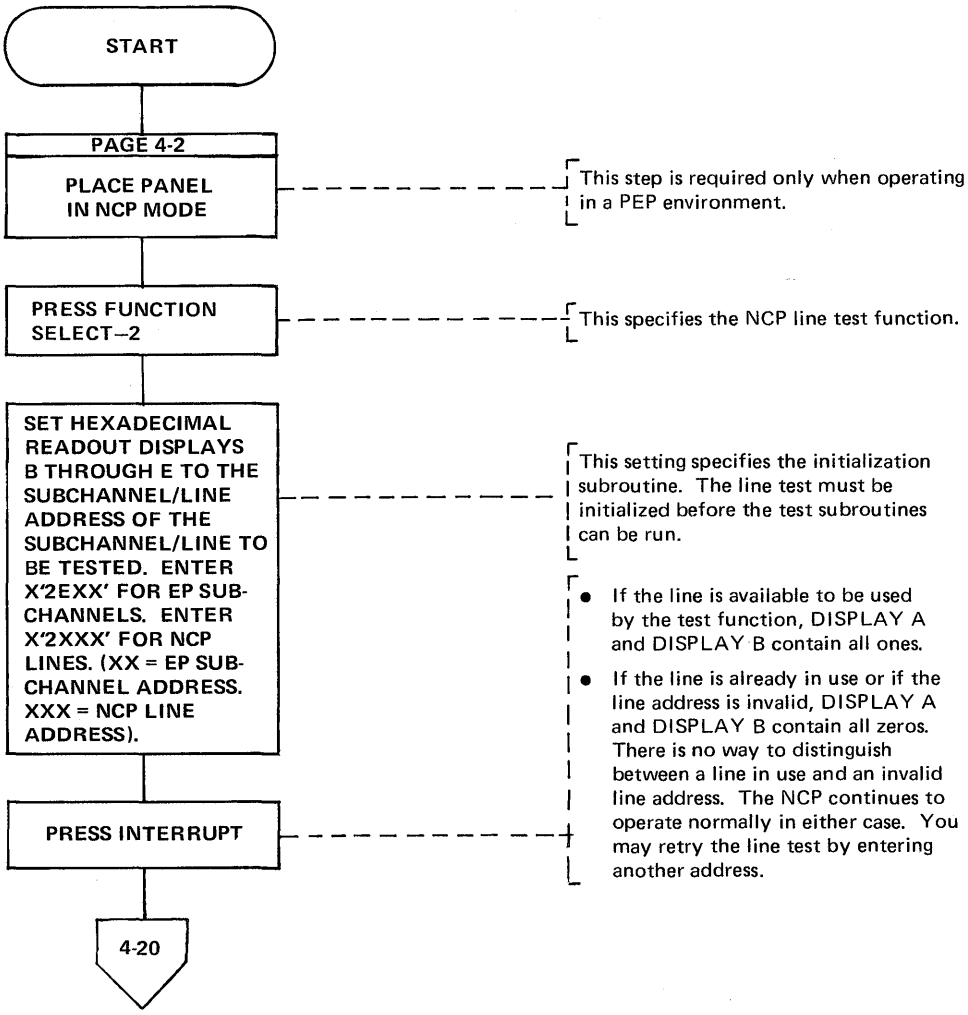
The line test provides a means of testing a communication line via the control panel. The test function consists of an initialization subroutine, a series of test subroutines and an end-test subroutine. The test can be used to analyze the operation of a line by observing the ICW (displayed in DISPLAY A and DISPLAY B) (see page 4-3) during any part of the test executed in level 2 or level 3.

CAUTION

If a line is in use by the test function, it is not available to the system. If a line is in use by the system, it is not available to the test function. Always use X'50' to end all test functions to ensure the availability of the line.

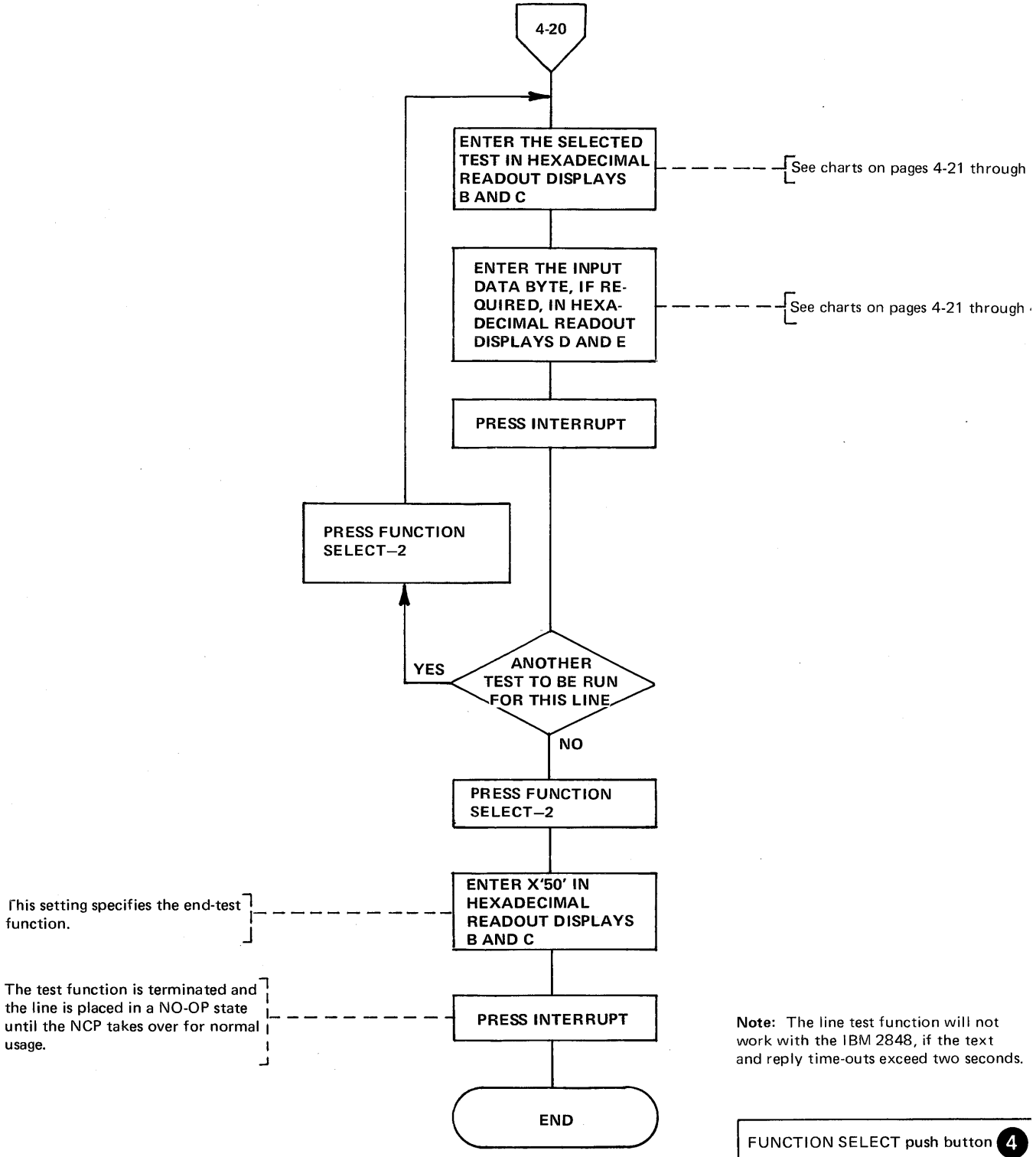
CAUTION

To run the NCP line trace and the NCP line test (panel test) procedures together, start the line test procedure first then start the line trace.



DISPLAY A 1
DISPLAY B 1
FUNCTION SELECT push buttons
HEXADECIMAL READOUT DISPLAYS 9
INTERRUPT push button 6

Line Test Function
(Panel Test)
(Part 2 of 15)



Note: The line test function will not work with the IBM 2848, if the text and reply time-outs exceed two seconds.

FUNCTION SELECT push button 4
HEXADECIMAL READOUT DISPLAYS 9
INTERRUPT push button 6

Line Test Function
(Panel Test)
(Part 3 of 15)

Test Settings for the NCP Line Test Function

The following line test functions are applicable for NCP 2, NCP 3, and/or NCP 4. The superscripts 2, 3, and 4 used with each function (for example, Transmit Initial[2,3,4] indicate whether that function is applicable to NCP 2, NCP 3, NCP 4 or any combination of the three.

Note: See examples for use on the following pages.

Functions	HEXADECIMAL READOUT DISPLAYS B and C	HEXADECIMAL READOUT DISPLAYS D and E Input Data Byte	Descriptions
Set Mode[2,3,4] (set by NCP generation)	40	None	Retrieves set mode byte from the ACB and loads it into the line's SDF. Sets the PCF to *set mode* state and returns the line to the NO-OP state.
Set Mode[2,3,4] (variable)	41	Set mode character to be used instead of the CCB byte.	Loads the byte from hexadecimal readout displays D and E into the line's SDF. Sets the PCF to *set mode* state and returns the line to the NO-OP state.
Transmit Initial[2,3,4]	42	None	Places the PAD/SYN character into the line's SDF and PDF and sets the PCF state to X'8'. When the PCF state goes to X'9' the PAD/SYN character is transmitted repeatedly.
Transmit Test Character and Fill[2,3,4]	43	Test Character*	Reads the test character from hexadecimal readout displays D and E and places it in the line's PDF. The line must be in transmit mode already (PCF state X'9'). The test character is transmitted once and the PAD/SYN character repeatedly thereafter.
Transmit Test Character and Repeat[2,3,4]	44	Test Character*	Reads the test character from hexadecimal readout displays D and E and places it in the line's PCF. The line must be in transmit mode already (PDF state X'9'). The test character is transmitted repeatedly.
Transmit Test Character and Turn to Receive[2,3,4]	45	Test Character*	Reads the test character from hexadecimal readout displays D and E and places it in the line's PDF. The line must be in transmit mode already (PCF state X'9'). The test character is transmitted, then the line is turned around to the receive state. When the line begins to receive characters, the first 15 characters are stored in the LTS data buffers, beginning with the second byte. The first byte contains the last character transmitted (the test character). If more than 15 characters are received, subsequent characters are overlapped into the last byte position of the data buffer.

*The test character should be entered according to the tables in the *3704/3705 Handbook* for the type of transmission code being used.

Line Test Function
(Panel Test)
(Part 4 of 15)

Test Settings for the NCP Line Test Function (Continued)

Functions	HEXADECIMAL READOUT DISPLAYS B and C	HEXADECIMAL READOUT DISPLAYS D and E Input Data Byte	Descriptions
Auto-answer[2,3,4] (Buffer 0/1 if reply)	46	0 (X) digit	Performs *set mode* operation with *data terminal ready* on. When someone dials in, a test is made for start-stop or BSC operation. For start-stop PCF state X'7' (receive) is set. For BSC, state X'5' (monitor for phase) is set. When character phase is detected, state X'7' (receive) is set. If Byte 1, bit 7 is zero and the received compare character compares with one of the compare characters, the line is set to transmit mode and buffer 0 is transmitted. If bit 7 is one, buffer 1 is transmitted. **Note:** Display the LTS to see the data received. See Appendix C for a layout of the LTS.
Dial Digit Load[2,3,4] (See Note 1)	47	0 (X) digit	Loads the dial digit from hexadecimal readout display E into a 16 position buffer. The last digit loaded must be X'F'. X'F' indicates the end of the dial digits.
Dial Operate[2,3,4] (Buffer 0/1 if reply)	48	(Y) (X) digit	Transmits the dial digits previously loaded to the auto-call unit. If hexadecimal readout display E is 0, the dial digits are transmitted to the auto-call unit, if nonzero, the sequence ends after the number of dial digits specified in E have been transmitted. When the dial is complated, the line is put in receive mode. If Byte 1, bit 3 is zero and a received character compares with one of the compare characters, the line is set to transmit mode and buffer 0 is transmitted. If bit 3 is 1, buffer 1 is transmitted.
Data Rate Select[2,3,4]	49	FF=high rate, 00=low rate	Selects the high or low data rate for a line previously defined in the test.
Receive Mode[2,3,4]	4A	None	Places the line in receive mode and places the first character received in the first position of the data buffer. If more than 16 characters are received, subsequent characters overlap into the last byte position of the data buffer.

Line Test Function
(Panel Test)
(Part 5 of 15)

Test Settings for the NCP Line Test Function (Continued)

Functions	HEXADECIMAL READOUT DISPLAYS B and C	HEXADECIMAL READOUT DISPLAYS D and E Input Data Byte	Descriptions
Change PCF turn character[2,3,4]	4B	Turn Character	Changes the PCF turn character to the value set in hexadecimal readout display E. Display D should be set to zero.
Display LTS[2,3,4]	4C	Displacement into LTS	Displays two halfwords of the line test control block (LTS) beginning at the displacement specified in hexadecimal readout displays D and E. See Appendix C for a layout of the LTS.
Present Status[2,3,4]	4D	Subchannel Address	Presents a status of CE DE to clear a hung EP subchannel. This function is valid for an EP line only.
Transmit Test Character and Repeat[3,4] (SCF bit 7 set) **Note:** For NCP 3 only	4E	Test Character*	Same as transmit test character and repeat except that SCF bit 7 is set. This test can be used to transmit a character on a SDLC (Synchronous Data Link Control) line with inhibit 0 bit insert set.
Transmit Buffer 0 or 1[3,4] (See Note 1)	4F	0 (X) digit	The line is set to transmit mode (PCF state X'8'). When PCF state X'8' goes to PCF state X'9' buffer 0 is transmitted if Byte 1, bit 7 is 0. If bit 7 is one, buffer 1 is transmitted. When the corresponding transmit end compare character is detected, the line is turned around to receive mode.
End Test[2,3,4]	50	0 (X) digit	If Byte 1, bit 7 is 0, the test is ended, the line test control block (LTS) is cleared, and the line is placed in a NO-OP state (drops DTR and resets options selected by set mode). If bit 7 is 1, the line remains enabled (DTR active).
Load Buffer 0[3,4] (See Note 1)	51	(XX) digit	The character in displays D and E is stored in a 40 character buffer.
Load Buffer 1[3,4] (See Note 1)	52	(XX) digit	Same as "Load Buffer 0" except the character is stored in buffer 1.
Load Receive Compare Character 1[3,4] (See Note 3).	53	(XX) digit	The character in displays D and E is stored as the first receive compare character.

Line Test Function
(Panel Test)
(Part 6 of 15)

Test Settings for the NCP Line Test Function (Continued)

Functions	HEXADECIMAL READOUT DISPLAYS B and C	HEXADECIMAL READOUT DISPLAYS D and E Input Data Byte	Descriptions
Load Receive Compare Character 2[3] (See Note 3)	54	(XX) digit	Same as Load Receive Compare Character 1 except the character is stored as the second receive compare character.
Load Receive Compare Character 3[3] (See Note 3)	55	(XX) digit	Same as Load Receive Compare Character 1 except the character is stored as the third receive compare character.
Load Swap Transmit Buffer 0 Compare Character[3] (See Note 3)	56	(XX) digit	The character in displays D and E (XX) is stored as the swap transmit buffer 0 compare character.
Load Swap Transmit Buffer 1 Compare Character (See Note 3)	57	(XX) digit	Same as Load Swap Transmit Buffer 0 Compare Character except the character is stored as the swap transmit buffer 1 compare character.
Load Buffer 0 Transmit End Compare Character[3]	58	(XX) digit	Stores the transmit end compare character to be used by the transmit routine into the LTSXEND0 field of the LTS to determine when all data has been transmitted. This character is compared with each character retrieved from the transmit buffer. When a compare is made, the line is turned around to receive.
Initialize Buffer 0 Offset[4] (For NCP V4M1 only)	58	XX	Sets in the LTS the displacement (normally X'00') into the appropriate buffer at which the storing of data entered through the panel is to begin. As the data is subsequently entered, a count of the data characters will be accrued and this count will then be used by the transmit routine to determine when the line should be placed into receive mode.

Note 1: The corresponding transmit end compare character must be stored (see function 58 or function 59) before buffer 0 and/or buffer 1 is loaded with data. The last character stored in the buffer must be the same as the character stored by function 58 or 59. This character is not transmitted.

Note 2: Before doing a Load Dial Digits operation (function 47) or Load Buffers 0 or 1 (function 4F), ensure that the LTSDCNT field in the LTS is zero by entering X'5899' then X'4F99' in the hexadecimal readout displays and pressing INTERRUPT.

Note 3: Each received character is compared with the five compare characters in the following order: receive compare character 1, 2, 3, swap transmit buffer 0 compare character, swap buffer 1 compare character. If the received character compares with one of the receive compare characters, the line is set to transmit mode and the previously specified buffer is transmitted. If the received character compares with the swap buffer 0 character, buffer 0 is transmitted; if it compares with the swap buffer 1 character, buffer 1 is transmitted.

Line Test Function
(Panel Test)
(Part 7 of 15)

Test Settings for the NCP Line Test Function (Continued)

Functions	HEXADECIMAL READOUT DISPLAYS B and C	HEXADECIMAL READOUT DISPLAYS D and E Input Data Byte	Descriptions
Load Buffer 1 Transmit End Compare Character[3]	59	(XX) digit	Same as function 58 except the transmit end compare character is stored in the LTSXEND1 field of the LTS.
Initialize Buffer 1 Offset[4] (For NCP V4M1 only)	59	XX	Same as function 58 except the displacement is for buffer 1.
BSC CRC Accumulation Buffer 0/1[4] (For NCP V4M1 only)	5A	00 (for buffer 0) 01 (for buffer 1)	Accumulates the CRC characters for BSC data (to be transmitted) as it is entered into either buffer 0 or buffer 1.
SDLC CRC Accumulation Buffer 0/1[4] (For NCP V4M1 only)	5B	00 (for buffer 0) 01 (for buffer 1)	Same as function 5A except that the CRC character accumulation is done SDLC data.
Set Receive Mode Byte[4] (For NCP V4M1 only)	5C	setting dependent on option selected (see description)	Allows the selection of certain options by setting a control byte in the LTS (line test control block). Bit 3 will indicate that the option of checking for two special characters (set by subfunctions 53 and 54) in sequence in a received data stream is to be used by the panel line test function to determine when the line being tested should be placed into transmit mode. Bit 6 of the control byte will indicate that CRC character accumulation is to be performed on BSC data during receive operations. Bit 7 will give the same indication for SDLC data.

Line Test Function
(Panel Test)
(Part 8 of 15)

Example of Addressing a Start Stop Terminal (1050) Using Buffers 0 and 1 (to be used with NCP 3)

	Functions	HEXADECIMAL READOUT DISPLAYS B C D E		Descriptions
Step 1	Initialization	2EXX or 2XXX	Press INTERRUPT	Initializes EP line XX or NCP line XXX for testing.
Step 2	Set Mode	4000	Press INTERRUPT	Executes a set mode using the NCP 3 generation value.
Step 3	Load Buffer 0 Transmit End Compare Character	5899	Press INTERRUPT	Stores the buffer 0 transmit end compare character into the LTSXEND0 field of the LTS.
Step 4	Load Buffer 0	51FF	Press INTERRUPT	Loads the pad character, X'FF', into buffer 0.
Step 5	Load Buffer 0	51FF	Press INTERRUPT	
Step 6	Load Buffer 0	517C	Press INTERRUPT	Loads a Ⓒ character into buffer 0.
Step 7	Load Buffer 0	51A3	Press INTERRUPT	Loads the terminal address, X'A3', into buffer 0.
Step 8	Load Buffer 0	5120	Press INTERRUPT	Loads the component select address, X'20', into buffer 0.
Step 9	Load Buffer 0	5199	Press INTERRUPT	Stores the transmit ending character in buffer 0.
Step 10	Load Buffer 1 Transmit End Compare Character	5988	Press INTERRUPT	Stores the buffer 1 transmit end compare character into the LTSXEND1 field of the LTS.
Step 11	Load Buffer 1	52FF	Press INTERRUPT	Loads the pad character, X'FF', into buffer 1.
Step 12	Load Buffer 1	5234	Press INTERRUPT	Loads the end of address character, X'34' Ⓓ , into buffer 1.
Step 13	Load Buffer 1	52XX	Press INTERRUPT	Loads data character X'XX' into buffer 1.
Step 14	Load Buffer 1	525E	Press INTERRUPT	Loads Ⓑ character, X'5E', into buffer 1.
Step 15	Load Buffer 1	52YY	Press INTERRUPT	Loads LRC character X'YY' into buffer 1. If the same data character is entered an even number of times in Step 13, the LRC will be Ⓑ , which can be entered for X'YY'.
Step 16	Load Buffer 1	5288	Press INTERRUPT	Stores the transmit ending character in buffer 1.

Line Test Function
(Panel Test)
(Part 9 of 15)

Example of Addressing a Start Stop Terminal (1050) Using Buffers 0 and 1 (to be used with NCP 3) continued

	Functions	HEXADECIMAL READOUT DISPLAYS B C D E		Descriptions
Step 17	Load Buffer 1 Swap Compare Character	5737	Press INTERRUPT	Loads the swap compare character for buffer 1. If the response from the terminal is X'37' Ⓨ , after buffer 0 is transmitted, the line is turned around and buffer 1 is transmitted.
Step 18	Transmit Buffer 0	4F00	Press INTERRUPT	Transmits buffer 0. When X'99' is detected, the line is set to receive mode. **Note:** After Step 14 is executed, buffer 0 is transmitted to the address of the 1050 terminal. The line is then set to receive mode. If the terminal responds with a Ⓨ (X'37'), the line is set to transmit mode and buffer 1 is transmitted.

Line Test Function
(Panel Test)
(Part 10 of 15)

Example of Loading Data Buffer 0 with 3275 Poll Sequence (to be used with NCP 3)

	Functions	HEXADECIMAL READOUT DISPLAYS B C D E		Descriptions
Step 1	Load Buffer 0 Transmit End Compare Character	5899	Press INTERRUPT	Stores the buffer 0 transmit end compare character into the LTSXEND0 field of the LTS.
Step 2	Load Buffer 0	5155	Press INTERRUPT	Loads leading pad X'55'.
Step 3	Load Buffer 0	5132	Press INTERRUPT	EBCDIC BSC SYN character X'32'.
Step 4	Load Buffer 0	5132	Press INTERRUPT	EBCDIC BSC SYN character X'32'.
Step 5	Load Buffer 0	5137	Press INTERRUPT	EOT X'37'.
Step 6	Load Buffer 0	51FF	Press INTERRUPT	Trailing pad X'FF'.
Step 7	Load Buffer 0	5132	Press INTERRUPT	SYN character X'32'.
Step 8	Load Buffer 0	5132	Press INTERRUPT	SYN character X'32'.
Step 9	Load Buffer 0	5140	Press INTERRUPT	General poll address CU = 0.
Step 10	Load Buffer 0	5140	Press INTERRUPT	General poll address CU = 0.
Step 11	Load Buffer 0	517F	Press INTERRUPT	General poll device address.
Step 12	Load Buffer 0	517F	Press INTERRUPT	General poll device address.
Step 13	Load Buffer 0	512D	Press INTERRUPT	Enquiry X'2D'.
Step 14	Load Buffer 0	51FF	Press INTERRUPT	Trailing pad X'FF'.
Step 15	Load Buffer 0	5199	Press INTERRUPT	Stores the transmit ending compare character in buffer 0.

Line Test Function
(Panel Test)
(Part 11 of 15)

Example of the Transmit Buffer 0 and Receive Test Function

	Functions	HEXADECIMAL READOUT DISPLAYS B C D E		Descriptions
Step 1	Initialization	2020	Press INTERRUPT	Initializes NCP line 20 for testing.
Step 2	Set Mode Using CCB Data	4000	Press INTERRUPT	Issues a set mode using the CCB set mode byte.
Step 3	Load Buffer 0 Transmit End Compare Character	58YY	Press INTERRUPT	Stores (YY) as the buffer transmit end compare character.
Step 4	Load Buffer 0	51XX	Press INTERRUPT	Loads Data Buffer 0. Use the line character codes in the *3704 / 3705 Handbook* for the appropriate characters.
Step 5	Load Buffer 0	51YY	Press INTERRUPT	Stores the transmit ending compare character in buffer 0. Must be same character stored in step 3.
Step 6	Load Receive Compare Character 1	53XX	Press INTERRUPT	Loads the compare character to turn the line back to transmit.
Step 7	Transmit Buffer 0 and Receive	4F00	Press INTERRUPT	Transmits buffer 0 and turns to receive when the buffer is empty. Compares each received character with that loaded in step 6, and turns the line back to transmit buffer 0 again if a compare is made.

Line Test Function
(Panel Test)
(Part 12 of 15)

Example of Auto-Answer Using Data Buffer 1 (to be used with NCP 3)

	Functions	HEXADECIMAL READOUT DISPLAYS B C D E		Descriptions
Step 1	Initialization	2020	Press INTERRUPT	Initializes NCP line 20 for testing.
Step 2	Set Mode	4000	Press INTERRUPT	Issues a set mode using the CCB set mode byte.
Step 3	Load Buffer 0 Transmit End Compare Character	58YY	Press INTERRUPT	Stores the buffer 0 transmit end compare character into the LTSXEND field of the LTS.
Step 4	Load Buffer 1	52XX	Press INTERRUPT	Loads buffer 1. Buffer 1 must be loaded with desired transmission before executing the auto-answer function.
Step 5	Load Buffer 0	51YY	Press INTERRUPT	Stores the transmit ending compare character in buffer 0.
Step 6	Load Receive Compare Character 1	53XX	Press INTERRUPT	Loads receive compare character with the last expected data character from the terminal. Receive compare characters must be set up to turn the line around on the expected response from the terminal.
Step 7	Auto-answer Using Buffer 1	4601	Press INTERRUPT	Sets up line XXX for auto-answer.

Note: Characters stored in buffer 1 in step 2 must include necessary pads, control characters and checking characters if required.

Line Test Function
(Panel Test)
(Part 13 of 15)

Example of reading data and doing a two character compare (to be used with NCP 4)

	Functions	HEXADECIMAL READOUT DISPLAYS B C D E		Descriptions
Step 1				Enter ABCD1234 at terminal and press request key.
Step 2	Initialize Test	2 Line Address	Press INTERRUPT	Initialize line for testing
Step 3	Initialize Buffer 0	5800	Press INTERRUPT	Sets buffer 0 offset
Step 4	Load Buffer 0	51XX*	Press INTERRUPT	Loads buffer 0 with poll sequence
Step 5	Set Receive Mode	5C10	Press INTERRUPT	Set two character compare on receive
Step 6	Set first compare character	53C4	Press INTERRUPT	Stores first receive compare character
Step 7	Set second compare character	54F1	Press INTERRUPT	Stores second receive compare character
Step 8	Set mode	4000	Press INTERRUPT	Set mode to line
Step 9	Transmit Initial	4200	Press INTERRUPT	Sets transmit mode
Step 10	Transmit Buffer 0	4F00**	Press INTERRUPT	Transmit from buffer 0
Step 11	Display LTS	4C08-12***	Press INTERRUPT	Displays received data
Step 12	End Test	5000	Press INTERRUPT	Ends the test.

*XX = AA, 32, 32, 37, FF, FF, AA, 32, 32, addr, addr, F0, 2D, FF

**If the data is received properly, the line will turn around, transmit buffer 0 again, then go to receive mode. The terminal will then time-out.

***The last received data character should be X'F1'.

Line Test Function
(Panel Test)
(Part 14 of 15)

Example of reading data from the 2770 Data Communication System and accumulating CRC characters (to be used with NCP 4)

	Functions	HEXADECIMAL READOUT DISPLAYS B C D E		Descriptions
Step 1				Enter data at terminal and press request key
Step 2	Initialize Line Test	2 Line Address	Press INTERRUPT	Initialize line test
Step 3	Initialize buffer 0	5800	Press INTERRUPT	Sets offset for buffer 0
Step 4	Load buffer 0	51XX*	Press INTERRUPT	Loads buffer 0 with polling sequence.
Step 5	Set Receive Mode	5C02	Press INTERRUPT	Sets receive mode byte to BSC accumulation on receive
Step 6	Set Mode	4000	Press INTERRUPT	Set mode operation to line
Step 7	Transmit Initial	4200	Press INTERRUPT	Set transmit state
Step 8	Transmit Buffer 0	4F00**	Press INTERRUPT	Transmits from buffer 0
Step 9	End Test	5000	Press INTERRUPT	Ends the test

*XX = FF, AA, 32, 32, 37, FF, FF, AA, 32, 32, addr, addr, F0, 2D, FF

**If the data is received properly, and the CRC is correct the line will turn around, transmit buffer 0 again, then go to receive mode. The terminal will then time-out.

Line Test Function
(Panel Test)
(Part 15 of 15)

Example of writing data to the 2770 Data Communication System (BSC lines) (to be used with NCP 4)

	Functions	HEXADECIMAL READOUT DISPLAYS B C D E		Descriptions
Step 1	Initialize Line Test	2 Line Address	Press INTERRUPT	Initializes line for test
Step 2	Initialize Buffer 0	5800	Press INTERRUPT	Sets initial buffer 0 offset
Step 3	Initialize Buffer 1	5900	Press INTERRUPT	Sets initial buffer 1 offset
Step 4	Load Buffer 0	51XX*	Press INTERRUPT	Load buffer 0 with address sequence
Step 5	Load Buffer 1	52XX**	Press INTERRUPT	Load buffer 1 with address sequence
Step 6	Accumulate CRC	5A01	Press INTERRUPT	Accumulates and stores CRC in buffer 1.
Step 7	Set mode	4000	Press INTERRUPT	Set mode to line
Step 8	Set compare character 1	533D	Press INTERRUPT	Sets receive compare character 1
Step 9	Set swap character 1	5661	Press INTERRUPT	Sets first swap character
Step 10	Set swap character 2	5770	Press INTERRUPT	Sets second swap character
Step 11	Transmit Initial	4200	Press INTERRUPT	Sets transmit state
Step 12	Transmit buffer 0	4F00***	Press INTERRUPT	Transmit from buffer 0
Step 13	End Test	5000	Press INTERRUPT	Ends the test.

*XX = FF, AA, 32, 32, 37, FF, FF, AA, 32, 32, ADDR, 2D, FF

**XX = FF, FF, AA, 32, 32, 02, E3, C5, E2, E3, 40, C2, D3, D6, C3, D2, 15, 03

***'TEST BLOCK' should print out repeatedly on the terminal until step 13 ends the test.

Section 5: 3704 Control Panel Descriptions

This section describes the function of each push button switch on the local and remote 3704 control panel. Each control is keyed to a section of the control panel diagram. This diagram is located at the back of the publication and may be folded out for reference. The key should help you locate the control on the panel quickly. In addition, you are referred from the description of the push button switch or light to the procedures in which it is used. The controls are presented in alphabetical order for easy reference.

CCU CHECK light 11

Function: Comes on when a CCU check occurs.

Used in Procedures:

Resetting a CCU Check (2-19)

CCU CHECK RESET push button 13

Function: Turns off the CCU Check light if the CCU checks are no longer present.

Used in Procedures:

Resetting a CCU Check (2-19)
Storage Scan (2-33)

CE Usage Meter (located on Modem Equalizer Panel)

Function: Records the 3704 operating time the IBM Customer Engineer uses for maintenance.

CHANNEL INTERFACE push button (Local only) 2

Function: Used to enable and disable channel interfaces.

Push Buttons:

- A ENABLE/DISABLE – This push button controls the enabling and disabling of channel interface A. The push button includes an indicator, which shows the state of the push button not the state of the channel interface.
- B ENABLE/DISABLE – This push button is an optional feature, present only if channel interface B is installed. It operates the same as the A ENABLE/DISABLE Push button for channel interface A.

Indicators:

- A ENABLED – This light indicates when channel interface A is enabled.
- B ENABLED – This light indicates when channel interface B, if installed, is enabled.

Used in Procedures:

Enabling/Disabling the channel interface (2-9)
Initial Program Load (IPL) (Local only) (2-10)
Turning Power Off (2-6)

Customer Usage Meter (located on Modem Equalizer Panel)

Function: Records 3704 operating time for customer usage. This meter runs independent of the host processor and is provided with its own CE key switch.

DIAGNOSTIC CONTROL push buttons 3

Function: Used to perform diagnostic tests on the 3704. These push buttons are normally for use only by the IBM customer engineer. However, you may use them under certain circumstances to execute the procedures listed below.

Push Buttons:

- PROCESS – This push button should be activated during normal operating conditions.
- BYPASS CCU CHECK STOP – When this push button is activated, the 3704 operates as if in DIAGNOSTIC CONTROL–PROCESS mode, except when a CCU check occurs. If a CCU check is detected, the auto-IPL sequence is not initiated and the hard stop is not entered. However, the CCU CHECK indicator comes on. The 3704 may or may not continue to operate properly, depending on the type of check that occurred.
- CCU CHECK HARD STOP – When this push button is activated, the 3704 operates as if in DIAGNOSTIC CONTROL–PROCESS mode, except when a CCU check occurs. If a CCU check is detected, the 3704 enters the hard stop state, but the auto-IPL sequence sequence is not initiated. The CCU CHECK indicator comes on.
- CYCLE STEP – When this push button is activated, the 3704 operates as if in DIAGNOSTIC CONTROL–PROCESS mode until the START push button is pressed. The first time START is pressed, the 3704 stops. Each time START is pressed and released after the first time, the 3704 executes one cycle and stops. If the DISPLAY SELECT–STATUS push button is active, the last cycle executed is displayed in the CYCLE TIME indicators in DISPLAY A.
- STORAGE SCAN – When this push button is activated, the 3704 stays in the DIAGNOSTIC CONTROL–PROCESS mode until the START push button is pressed. When START is pressed, the data in storage is parity checked and the operation continues until one of the following conditions is met:
  - The control panel is deactivated.
  - The STORAGE SCAN push button is deactivated by switching to another DIAGNOSTIC CONTROL position. Normally you would switch to PROCESS.
  - An error is detected in storage.
- STORAGE TEST PATTERN – When this push button is activated, the 3704 stays in DIAGNOSTIC CONTROL–PROCESS mode until the START push button is pressed. When START is pressed, the test pattern that is in data entry positions B, C, D, and E is stored in storage a halfword at a time, starting at the address that is in the SAR. This process continues until the push button is deactivated.

Used in Procedures:

Storage Scan (2-33)
Storage Test Pattern (2-32)

DISPLAY A and DISPLAY B 1

Function: Varies according to the active DISPLAY SELECT push buttons as follows:

- When DISPLAY SELECT–STATUS is activated, the DISPLAY A and DISPLAY B lights display the check and status information indicated by the labels on the control panel. (See Appendix B for an explanation of these lights.)
- When DISPLAY SELECT–SAR OP REGISTER is activated, the DISPLAY A lights display the contents of the Storage Address register (SAR) and the DISPLAY B lights display the contents of the Operation (OP) register.
- When DISPLAY SELECT–DISPLAY REGISTER 1 AND 2 is activated, the DISPLAY A and DISPLAY B lights display the program output or control panel display output in Display registers 1 and 2.

Used in Procedures:

Activating the Line Trace (Local only)
  EP (3-7)
  NCP/PEP (4-16)
Activating/Deactivating the Line Trace (NCP/PEP) (Local only) (4-18)
Changing Levels Being Traced (EP) (Local only) (3-8)
Deactivating the Line Trace (Local only)
  EP (3-9)
  NCP/PEP (4-17)
Displaying Display Registers 1 and 2 (Program Display) (2-34)
Displaying the Storage Address Register (SAR) and the Operation (OP) Register (2-31)
Displaying 3704 Status (2-18)
Dynamic Display of an ICW, CCB, or BCB (EP) (3-2)
Dynamic Display of Registers (NCP) (4-5)
Dynamic Display of Storage
  EP (Local only) (3-10)
  NCP (4-6)
Initial Program Load (IPL)
  Local (2-10)
  Remote (2-12)
Line Test Function (Panel Test)
  EP (Local only) (3-10)
  NCP (4-19)
Resetting a CCU Check (2-19)
Set Address or Display for Registers (2-25)
Set Address or Display for Storage (2-27)
Setting the Control Panel Mode with PEP (4-2)
Storage Scan (2-33)
Storage Test Pattern (2-32)
Storing Data in a Register (2-26)
Storing Data in a Storage Location (2-28)

DISPLAY SELECT CONTROL push buttons 7

Function: Determine the type of information displayed in DISPLAY A and DISPLAY B.

Push Buttons:

- STATUS – When this push button is activated, check and status information is displayed in DISPLAY A and DISPLAY B.
- SAR AND OP REGISTER – When this push button is activated, the Storage Address register (SAR) is displayed in DISPLAY A and the Operation (OP) register in DISPLAY B.
- DISPLAY REGISTER 1 AND 2 – When this push button is activated, DISPLAY A and DISPLAY B display the information that is in the Display registers (internal units in the 3704) from either a programmed data display output or a control panel display.

Used in Procedures:

Displaying Display Registers 1 and 2 (Program Display) (2-34)
Displaying the Storage Address Register (SAR) and the Operation (OP) Register (2-31)
Displaying 3704 Status (2-18)
Dynamic Display of Storage (EP) (Local only) (3-5)
Initial Program Load (IPL) (Remote only) (2-12)
Set Address or Display for Registers (2-25)
Set Address or Display for Storage (2-27)

FUNCTION SELECT push buttons (4)

Functions: These push button switches perform two types of functions:

- They select one of the program-controlled functions determined by the control program.
- They determine when the control program is to access a storage location or a register.

Push Buttons:

- 1—The Emulation Program uses the push button to start the dynamic storage display.
  The Network Control Program uses this push button to allow the additional register range bit to be set, to initiate network shutdown, and to enter the address trace parameter.
- 2—The Emulation Program uses this push button to activate the line trace
  The Network Control Program uses this push button to initiate the line test function, and for the dynamic display of an ICW.
- 3—The Emulation Program uses this push button to deactivate the line trace.
  The Network Control Program uses this push button to initiate the address trace.
- 4—The Emulation Program uses this push button to change trace levels.
  The Network Control Program uses this push button to set the control panel mode with PEP and for changing the levels being traced.
- 5—The Emulation Program uses this push button to specify the line test function.
  The Network Control Program does not use this push button.
- 6—The Emulation Program uses this push button to start the ICW, CCB, or BCB displays.
  The Network Control Program uses this push button to end dynamic displays and to end the address trace function. An NCP abend while Function 6 is set causes a hard stop (even if the start push button is pressed) instead of the normal request for IPL.
- STORAGE ADDRESS – This push button is used with the SET ADDRESS OR DISPLAY push button or the STORE push button in storage operations.
  The Network Control Program uses this push button for the dynamic display of storage.
- REGISTER ADDRESS – This push button is used with the SET ADDRESS OR DISPLAY push button or the STORE push button in register operations.
  The Network Control Program uses this push button for the dynamic display of registers.

Used in Procedures:

Activating the Line Trace (Local only)
  EP (3-7)
  NCP/PEP (4-16)
Activating/Deactivating the Line Trace (NCP/PEP) (Local only) (4-18)
Address Trace Facility (NCP) (4-10)
Allow Additional Register
  Range Bit (NCP) (4-7)
Changing Levels Being Traced (EP) (Local only) (3-8)
Deactivating the Line Trace (Local only)
  EP (3-9)
  NCP/PEP (4-17)
Dynamic Display of an ICW (NCP) (4-3)
Dynamic Display of an ICW, CCB, or BCB (EP) (3-2)
Dynamic Display of Registers (NCP) 4-5

Dynamic Display of Storage
EP (Local only) (3-5)
NCP (4-6)
Generating Channel End/Device End (EP) (3-6)
Initial Program Load (IPL) (Remote only) (2-12)
Line Test Function (Panel Test)
EP (Local only) (3-10)
NCP (4-19)
Network Shutdown (4-8)
Set Address or Display for Registers (2-20)
Set Address or Display for Storage (2-27)
Setting the Control Panel Mode with PEP (4-2)
Storing Data in a Storage Location (2-28)

HARD STOP light 11

Function: Comes on when one of the following conditions is met:

- The control panel is active, STORAGE SCAN is activated, and an SDR check is detected.
- The CCU CHECK HARD STOP push button is activated, the control panel is active, and a CCU check is detected.
- The control panel is active and the RESET push button is activated.
- A CCU check occurs during IPL phase 2 or 3.
- The program decodes an Output X'70' instruction.

The light comes on if one of the following conditions occur:

- Power on reset.
- IPL phase 1 reset.
- The control panel is active and the START push button is activated.

HEXADECIMAL DISPLAY CONTROL push buttons 8

Function: Control the entry of data into and the displaying of data by the hexadecimal readout displays B, C, D, and E.

Push Buttons:

- SINGLE DIGIT MODE – When this push button is activated, the user enters data into the readout displays from the sixteen-position push button keyboard by first pressing the desired digit and then pressing the hexadecimal readout display position where the digit is to be entered.
- SERIAL DIGIT MODE – When this push button is activated, the data entered from the push button keyboard is shifted into the hexadecimal readout displays automatically, from right to left. The display positions are not individually selected by the user.
- DISPLAY A TO HEX – When this push button is activated, the information in DISPLAY A is gated to the hexadecimal readout displays.
- DISPLAY B TO HEX – When this push button is activated, the information in DISPLAY B is gated to the hexadecimal readout displays.

Used in Procedures:*

Activating the Line Trace (Local only)
EP (3-7)
NCP/PEP (4-17)

Activating/Deactivating the Line Trace (NCP/PEP)
(Local only) (4-18)
Character Entry – Serial Digit Mode (2-24)
Character Entry – Single Digit Mode (2-23)
Deactivating the Line Trace (Local only)
EP (3-9)
NCP/PEP (4-17)
Displaying the Storage Address Register (SAR) and the
Operation (OP) Register (2-31)
Displaying Display Registers 1 and 2 (Program Display) (2-34)
Dynamic Display of an ICW, CCB, or BCB (Local only) (3-2)
Dynamic Display of Storage (EP) (Local only) (3-5)
Generating Channel End/Device End (EP) (Local only) (3-6)
Set Address or Display for Registers (2-25)
Set Address or Display for Storage (2-27)
Storing Data in a Register (2-26)
Storing Data in a Storage Location (2-28)
*Optional for all control panel operations.

HEXADECIMAL KEYBOARD 10

Function: Used to enter hexadecimal characters in single digit mode or serial digit mode. The keyboard consists of sixteen push button switches representing hexadecimal characters 0-F.

Used in Procedures:

Serial Digit Mode (2-19)
Single Digit Mode (2-23)

HEXADECIMAL READOUT DISPLAYS (B, C, D, E) 9

Function: Provide for data entry and display. Each unit can display a hexadecimal value 0 to F. Input data can be either the push button keyboard or the information displayed in DISPLAY A or DISPLAY B. For data entry purposes, each display unit serves the function of a sixteen-position hexadecimal switch set from the push button keyboard. In single digit mode, the user places a hexadecimal value in a readout display position by first pressing one of the hexadecimal characters on the push button keyboard, then pressing the readout display where the character is to be entered. This method can be used to enter data or addresses (a maximum of two bytes of data or a four-digit hexadecimal address). Data can be entered in serial digit mode without using the readout displays.

Used in Procedures:

All hex displays
Character Entry – Serial Digit Mode (2-24)
Character Entry – Single Digit Mode (2-23)

INTERRUPT push button 6

Function: When pressed, requests a level 3 interrupt. Normally, this push button is used for program-controlled control panel procedures. The control panel must be active to use this push button.

Used in Procedures:

Activating the Line Trace (Local only)
EP (3-7)
NCP/PEP (4-16)

Activating/Deactivating the Line Trace (NCP/PEP) (Local only) (4-18)
Address Trace Facility (NCP) (4-10)
Allow Additional Register Range Bit (NCP) (4-7)
Changing Levels Being Traced (EP) (Local only) (3-8)
Deactivating the Line Trace (Local only)
EP (3-9)
NCP/PEP (4-17)
Dynamic Display of an ICW (NCP) (4-3)
Dynamic Display of Registers (NCP) (4-5)
Dynamic Display of Storage
EP (Local only) (3-5)
NCP (4-6)
Generating Channel End/Device End (EP) (Local only) (3-6)
Line Test Function (Panel Test)
EP (Local only) (3-10)
NCP (4-19)
Network Shutdown (4-8)
Setting the Control Panel Mode with PEP (4-2)

LAMP TEST push button 13

Function: Turns on all control panel lights except the hexadecimal readout displays. This push button is effective only when the control panel is active.

Used in Procedures:

Lamp Test (2-16)

LOAD push button 6

Function: Causes the 3704 to be reset and starts an IPL sequence. This push button is effective only when the control panel is active.

Used in Procedures:

Initial Program Load (IPL)
Local (2-10)
Remote (2-12)

LOAD ADDRESS COMPARE push button 12

Function: Used to determine whether data from a specific storage location is loaded into a general register or whether the instruction at a specific storage location is ever executed.

Used in Procedures:

Address Trace Facility (NCP) (4-10)
Load Address Compare (2-30)

LOCAL POWER push button (Local only) 12

Function: Enables power to be turned on or off only at the 3704 control panel.

Used in Procedures:

Turning Power On (2-5)

MODE SELECT push buttons 5

Function: Select the mode of operation of the 3704.

Push Buttons:

- PROCESS – This push button should be activated during normal operating conditions.
- INSTRUCTION STEP – When this push button is active, the 3704 executes one instruction each time the START push button is pressed.
- ADDRESS COMPARE PROGRAM STOP – When this push button is activated, an equal compare detected during an address compare operation causes program execution to stop.
- ADDRESS COMPARE INTERRUPT – When this push button is activated, an equal compare detected during an address compare operation causes an interrupt to program level 1.

Used in Procedures:

Address Trace Facility (NCP) (4-10)
Instruction Step (2-22)
Load Address Compare (2-30)
Store Address Compare (2-29)

PANEL ON/OFF push button 13

Function: Controls enabling and disabling the control panel. When the control panel is off (inactive), none except the power-control push buttons (LOCAL POWER, REMOTE POWER, POWER ON, and POWER OFF) can be activated, and the 3704 operates as if the following push buttons were activated–MODE SELECT–PROCESS, DIAGNOSTIC CONTROL–PROCESS, DISPLAY SELECT–STATUS, FUNCTION SELECT–STATUS, and HEXADECIMAL DISPLAY CONTROL–SINGLE DIGIT MODE. Power on forces the PANEL ON/OFF push button to the OFF (inactive) state.

Used in Procedures:

All control panel procedures.

POWER CHECK light 11

Function: Comes on when either an overvoltage, an undervoltage, or an overcurrent condition is sensed. The indicator is reset by pressing the POWER OFF push button.

Used in Procedures:

Resetting a Power Check (2-7)

POWER OFF push button 13

Function: Initiates a power off sequence and resets the POWER CHECK indicator.

Used in Procedures:

Turning Power Off (2-6)
Resetting a Power Check (2-7)

POWER ON push button 13

Function: Initiates a power on sequence. When the power on sequence is complete, the indicator on the push button comes on. The POWER ON push button is effective only when the LOCAL POWER push button is active.

Used in Procedures:

Turning Power On (2-5)

PROGRAM DISPLAY light 11

Function: Comes on when one or both of the display registers contain program output. Pressing the DISPLAY SELECT–DISPLAY REGISTER 1 AND 2 push button causes DISPLAY A and DISPLAY B to display the program output.

Used in Procedures:

Displaying Display Register 1 and 2 (Program Display) (2-34)

PROGRAM STOP light 11

Function: Comes on when a program stop occurs. The indicator comes on when:

- An address compare is made and the ADDRESS COMPARE PROGRAM STOP push button is activated.
- Instruction stepping is in progress.
- A hard stop occurs.
- The control panel is active and the STOP push button is pressed.
- A storage test pattern or a storage scan operation is in progress.

Used in Procedures:

Store Address Compare (2-29)
Storing Data in a Register (2-26)
Storing Data in a Storage Location (2-28)

RESET push button 11

Function: Resets all conditions. This push button is effective only if the control panel is active. After the RESET push button is pressed, IPL is required to resume normal operation.

Used in Procedures:

Initial Program Load (IPL) (Local only) (2-8)

REMOTE POWER push button (Local only) 12

Function: Enables power to be controlled only from the power interface cable.

Used in Procedures:

Turning Power On (2-5)

SET ADDRESS OR DISPLAY push button 8

Function: Sets the address of a storage location or a register and then displays the contents. This push button is active only when the FUNCTION SELECT–STORAGE ADDRESS or FUNCTION SELECT–REGISTER ADDRESS push button is active.

Used in Procedures:

Set Address or Display for Registers (2-25)
Set Address or Display for Storage (2-27)

START push button 6

Function: Resets the HARD STOP light and the PROGRAM STOP light unless the STORAGE SCAN push button or the STORAGE TEST PATTERN push button is activated. It initiates an instruction step, a cycle step, a storage scan, or a storage test pattern operation. The START push button is effective only when the control panel is active.

Used in Procedures:

Instruction Step (2-22)
Load Address Compare (2-30)
Resetting a CCU Check (2-19)
Storage Scan (2-33)
Storage Test Pattern (2-32)
Store Address Compare (2-29)
Storing Data in a Register (2-26)
Storing Data in a Storage Location (2-28)

STOP push button 6

Function: Sets the program stop light and stops program execution but not cycle steal operations. This push button is effective only when the control panel is active.

Used in Procedures:

Displaying the Storage Address Register (SAR) and the Operation (OP) Register (2-31)
Storing Data in a Register (2-26)
Storing Data in a Storage Location (2-28)

STORAGE ADDRESS DATA push buttons (See Hexadecimal Readout Display B, C, D, and E push buttons)

STORE push button 8

Function: Used to store data from the hexadecimal data entry positions into a storage location or into a register. Each store operation (except for successive stores in a store operation) must be preceded by a SET ADDRESS OR DISPLAY operation.

Used in Procedures:

Storing Data in a Register (2-26)
Storing Data in a Storage Location (2-28)

STORE ADDRESS COMPARE push button 12

Function: Used to determine whether data from a general register is stored into a specific storage location.

Used in Procedures:

Address Trace Facility (NCP) (4-10)
Store Address Compare (2-29)

TEST light 11

Function: Comes on under any of the following circumstances:

- The DIAGNOSTIC CONTROL push button is not in PROCESS mode.
- The MODE SELECT push botton is not in PROCESS mode.
- An Output X'79' instruction is executed with byte 1, bit 2 on.
- A Power-On Reset or an IPL reset occurs.

The TEST light can be turned off by an Output X'79' instruction with byte 1, bit 3 on.

Used in Procedures:

Initial Program Load (IPL) (Local only) (2-10)
Instruction Step (2-22)

THERMAL CHECK light 11

Function: Comes on when a thermal switch senses a temperature that exceeds its limits. A thermal check causes a power-down sequence to occur. This condition cannot be reset from the panel. A service representative should be called to check the machine.

WAIT light 11

Function: Comes on when the CCU is idle (for example, the CCU is not taking instruction cycles or cycle steal cycles).

Used in Procedures:

Turning Power Off (2-6)

Appendix A: Register Addresses

Register Type	*Register*	*External Register Address (Hex)*
General Registers, Group 0 (Program Levels 1 & 2)	Register 0	00
	Register 1	01
	Register 2	02
	Register 3	03
	Register 4	04
	Register 5	05
	Register 6	06
	Register 7	07
General Registers, Group 1 (Program Level 3)	Register 0	08
	Register 1	09
	Register 2	0A
	Register 3	0B
	Register 4	0C
	Register 5	0D
	Register 6	0E
	Register 7	0F
General Registers, Group 2 (Program Level 4)	Register 0	10
	Register 1	11
	Register 2	12
	Register 3	13
	Register 4	14
	Register 5	15
	Register 6	16
	Register 7	17
General Registers, Group 3 (Program Level 5)	Register 0	18
	Register 1	19
	Register 2	1A
	Register 3	1B
	Register 4	1C
	Register 5	1D
	Register 6	1E
	Register 7	1F
Type 1 Communication Scanner	Interface Address	41
	CNTL A	42
	CNTL B/C	43
	Status	44
Type 2 Communication Scanner	Interface Address	40
	Check Register	43
	ICW Input Register 0-15	44
	ICW Input Register 16-31	45
	Display Register	46
	ICW Input Register 32-45	47

Register Type	*Register*	*External Register Address (Hex)*
Type 1 Channel Adapter	Initial Selection Control	60
	Initial Selection Address and Command	61
	Data/Status Control	62
	Address and ESC Status Bytes	63
	Data Buffer Bytes 1, 2	64
	Data Buffer Bytes 3, 4	65
	NSC Status Byte	66
	Controls	67
Central Control Unit	Storage Size Installed	70
	Panel Address/Data Entry Digits	71
	Panel DISPLAY/FUNCTION SELECT push button Controls	72
	Insert Key	73
	Lagging Address Register (LAR)	74
	Adapter Interrupt Requests Group 1	76
	Adapter Interrupt Requests Group 2	77
	Utility	79
	BSC CRC	7B
	CCU Check Register	7D
	CCU Interrupt Requests Group 1	7E
	CCU Interrupt Requests Group 2	7F

Appendix B: Functions Of The Display A And Display B Check And Status Lights

The DISPLAY A and DISPLAY B lights on the 3704 control panel show the information described in the appendix when the DISPLAY SELECT—STATUS push button is activated.

DISPLAY A Check Lights

Note: Whenever one of these lights comes on, the CCU CHECK light should also be on.

BYTE 0 and BYTE 1 (two lights): Come on when a parity check occurs in the data path.

OP REG: Comes on when a parity check occurs in the Operation (OP) Register. The BYTE 0 and/or BYTE 1 check light also comes on.

CLOCK: Comes on when a clock check occurs.

LVL 1 PROG: Comes on when a program check in level 1 occurs.

DISPLAY A Status Lights

I CYCLE: Comes on at the beginning of an instruction execution cycle and goes off at the end of the cycle. If this light is off for any noticeable length of time, the HARD STOP, PROGRAM STOP, or WAIT light should be on for the same length of time.

CS CYCLE: Comes on at the beginning of a cycle-steal cycle and goes off at the end of the cycle if no other cycle-steal cycle is to follow immediately.

CYCLE TIME (five lights): Indicate the 3704 machine cycle that is currently being executed.

DISPLAY B Check Lights

ADAPTER CHECK: Comes on when any adapter requests a program level 1 interrupt.

IN/OUT CHECK: Comes on when the CCU detects any of the following check conditions:

- SDR parity check during an Input instruction.
- An Input or Output instruction executed in program level 5.
- An Input or Output instruction executed at an address not recognized by the CCU or any adapter.

ADDRESS EXCEPTION: Comes on when an address greater than the maximum available address is addressed during instruction execution.

PROTECTION CHECK: Comes on when an attempt is made to execute in or to change protected data.

INVALID OP: Comes on when the CCU detects an invalid operation code.

DISPLAY B Status Lights

ADDRESS COMPARE: Comes on when an equal compare is detected during a Store Address Compare or a Load Address Compare operation.

IPL PHASE (two lights): Display a binary designation of the three IPL phases. A steady display for IPL phase 1 and 2 indicates a 3704 hardware failure. A steady display for phase 3 indicates an unsuccessful program load.

C/Z ACTIVE LEVEL (two lights): Indicate the state of the condition latches for the active program level.

ENTERED INTERRUPT LEVEL (four lights): Indicate which of the five program levels are active or have entered interrupt requests. If none of the lights are on, level 5 is active. If more than one light is on, the highest priority program level is the active level. (Program level 1 has highest priority.)

Appendix C: Aids For Reading The Display Lights

Binary Conversion of Control Panel Displays

The lights in DISPLAY A and DISPLAY B on a 3704 control panel show a binary representation of register or storage data. You are given the hexadecimal equivalent of the binary value when asked to read these lights. The following are the equivalent values. (Four binary digits = one hexadecimal digit.)

Binary	*Hexadecimal*	*Decimal*
0000	0	0
0001	1	1
0010	2	2
0011	3	3
0100	4	4
0101	5	5
0110	6	6
0111	7	7
1000	8	8
1001	9	9
1010	A	10
1011	B	11
1100	C	12
1101	D	13
1110	E	14
1111	F	15

For example, a hexadecimal value of 30A5 would appear as follows.

Byte 0		*Byte 1*	
0011	0000	1010	0101
3	0	A	5

Note: Refer to the *IBM 3704 and 3705 Program Reference Handbook* for details of the CCB bytes and BCB bytes.

Switch (C)	Hex (Disp)	BYTE 0	BYTE 1
8	00	CCB Address	
9	02	Address of next BCB in bit/character service queue	
A	04	Address of bit service routine	
B	06	Secondary Control Field (SCF)	Parallel Data Field (PDF)
C	08	Pointer to PCF vector table	LCD/PCF field
D	0A	Serial Data Field (SDF)	
E	0B	Transmit/Receive mask	
F	0E	BSC SYN character	Start-Stop shift count
F	0E	Start-Stop transmit break mask	

Note: The contents of the Type 1 Scanner LCD and PCF fields are as follows:

	LCD			PCF				
Bits	0	1	2	3	4	5	6	7
Start/Stop =	1	0	0					
BSC =	1	0	1		P			
Dial Line =	1	1	0		C			
Disabled =	1	1	1		F			Change Bit

Note: The PCF field is the same as for a Type 2 Scanner. Refer to the *3704 and 3705 Principles of Operation* manual for details.

Character Control Block (CCB)
(EP and PEP)

Use this CCB layout with an EP stand-alone or an NCP 2 or NCP 3 with PEP dynamic display. Settings for Hexadecimal Readout Displays B and C are given.

B and C	Hex Displacements	Field Descriptions	
20	00	CCBDATA (CCBSUB1) Data Buffer 0	
21	02		
22	04	CCBDATA1 Data buffer 1	
23	06		
24	08	CCBSVLNK Data service queue forward chain pointer	CCBSOLNK Status out queue forward chain pointer
26	0C	CCBSUBCH Multiplexer subchannel address	CCBBTLCD Type 1 LCD for set PCF line use
27	0E	CCBSTAT Final line status byte	CCBSENSE Final lines sense byte
28	10	CCBCMD Current command for CCB	CCBLRI Line request information
29	12	CCBCSTAT Current status	CCBCSENS Current sense
2A	14	CCBCAC Character address counter	CCBSVSTC Service/status flag byte
2B	16	CCBCLOCK Timer count field	CCBTMADR Time-out routine displacement into branch table
2C	18	CCBACADR Auto-call Address	
2D	1A	CCBOPT CCB option byte 1	CCBOPT2 Option byte 2
2E	1C	CCBSTMOD Set mode byte (output X'46')	CCBLCD Line control definition (LCD) field. High 4 bits contain line control definer, low 4 bits contain 0

Start-Stop Extension

B and C	Hex Displacement	Field Descriptions	
2F	1E	CCBLRC SS longitudinal redundancy check byte	CCBSSC SS control flags byte
30	20	Null byte	For PEP CUBPEPPL PEP flags For EP stand-alone unused
31	22	CCBLGT SS line group table pointer	
32	24	CCBL2 Level 2 interrupt address	

Binary Synchronous Extension

2F	1E	BSC block check characters	
30	20	For PEP CCBPEPFL PEP flags For EP stand-alone unused	
31	22	CCBSYN BSC EBCDIC or USASCII SYN character	CCBEOT BSC EBCDIC or USASCII EOT character
32	24	CCBL2 Address of current level 2 character service routine	
33	26	CCBFLGB1 Flag byte 1 status	CCBFLGB2 Flag byte 2 terminal type
34	28	CCBL2A1 Lost Data Routing	
35	2A	CCBDLCOM CCB address if dual communications feature is installed (2701 emulation only).	

Station Select Feature Extension (Optional)

2D	2C	CCBSADR Station selection address and station poll address. These two addresses differ in bit position 2	CCBGADR Group selection address

Line Test Control Block (LTS)
(NCP 1 and NCP 2)

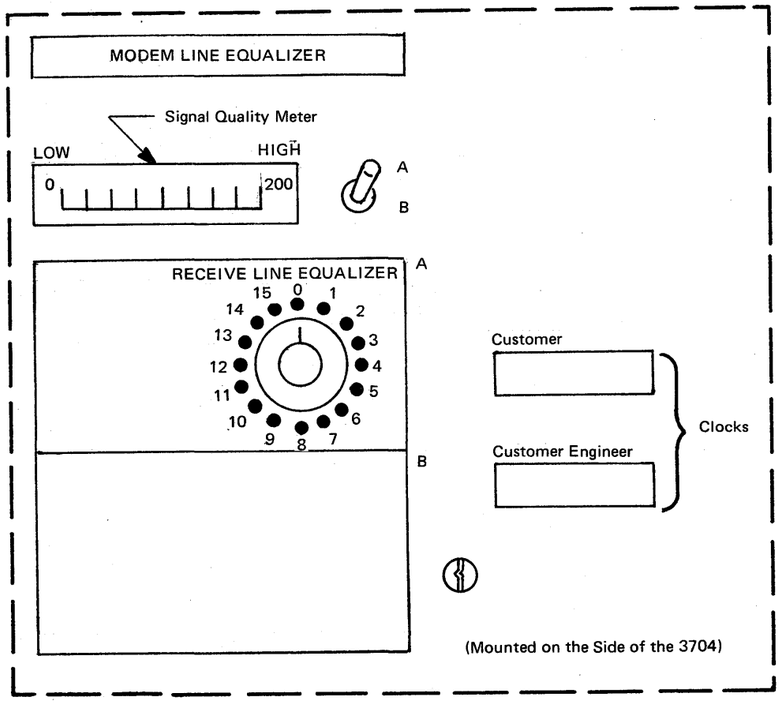
Use this LTS layout with the NCP dynamic display. Hexadecimal Readout Displays B and C are always set to X '4C'.

Hex Displacements	Field Descriptions	
00	LTSCTL Control byte	LTSPDSYN PAD or SYN character for this line.
02	LTSMSDF The system generated Set Mode SDF.	LTSXTPCF The system generated LCD value
04	LTSLNAD The line address of the line being tested.	
06	LTSSVL2 The saved CCBL2 for the line being tested.	
08 0A 0C 0E 10 12 14 16	LTSDIALL Buffer for receive data characters or auto-call dial digits	
18	DLIMETER Counter for non X'FF' data characters when receiving	
1A	DIGCNTR Counter for auto-call dial digits and receive data characters	
1C	LTSACLN Auto-call line address	
1E	LTSL2 Address of entry point for level 2 interrupt	
20	LTSSVL3 Saved level 3 address used in a dial operation.	
22	ALLONES Constant of all ones	

Use this LTS layout with the NCP 3 dynamic display. Hexadecimal Readout Displays B and C are always set to X'4C'.

Hex Displacement	Field Descriptions	
00	LTSCTL Control byte	LTSPDSYN PAD or SYN character for this line.
02	LTSSTMD The system generated set mode SDF.	LTSLCD The system generated LCD value.
04	LTSXLAD The line address of the line being tested.	
06	LTSRLAD Duplex receive line address	
08 0A 0C 0E 10 12 14 16	LTSDIALL Buffer for receive data characters or auto-call dial digits	
18	LTSNFCNT Counter for non X'FF' data characters when receiving	
1A	LTSNOCNT Counter for non X'00' data characters when receiving	
1C	LTSERCNT SDLC (synchronous data link control) receive error counter	
1E	LTSDCNT Counter for auto-call dial digits and receive data characters.	LTSTURN Transmit turn LCD/PCF
20	LTSACLN Auto-call line address	
22	LTSXL2 Transmit Level 2 pointer	
24	LTSRL2 Receive Level 2 pointer	
26	LTSDATAP Transmit buffer pointer	
28	LTSRCC1 Receive compare character 1	LTSRCC2 Receive compare character 2
2A	LTSRCC3 Receive compare character 3	LTSWAP1 Swap transmit buffer 0 compare character
2C	LTSWAP2 Swap transmit buffer 1 compare character	LTSXEND0 Buffer 0 transmit end compare character
2E	LTSXEND1 Buffer 1 transmit end compare character	

Note: The **Unit Protection Key** is not shown in this diagram. It is located halfway down the right side of the 3704 control panel. It allows the operator to enable/disable the control panel switches (except power on/off) with a key controlled switch. The disable position will prevent inadvertent or unauthorized use of the control panel. When in the disable position, the setting of the Storage Address/Register Data switches can be entered as input by the program.



Modem Equalizer Panel

Note: The remote 3704 does not have an Equalizer Panel.

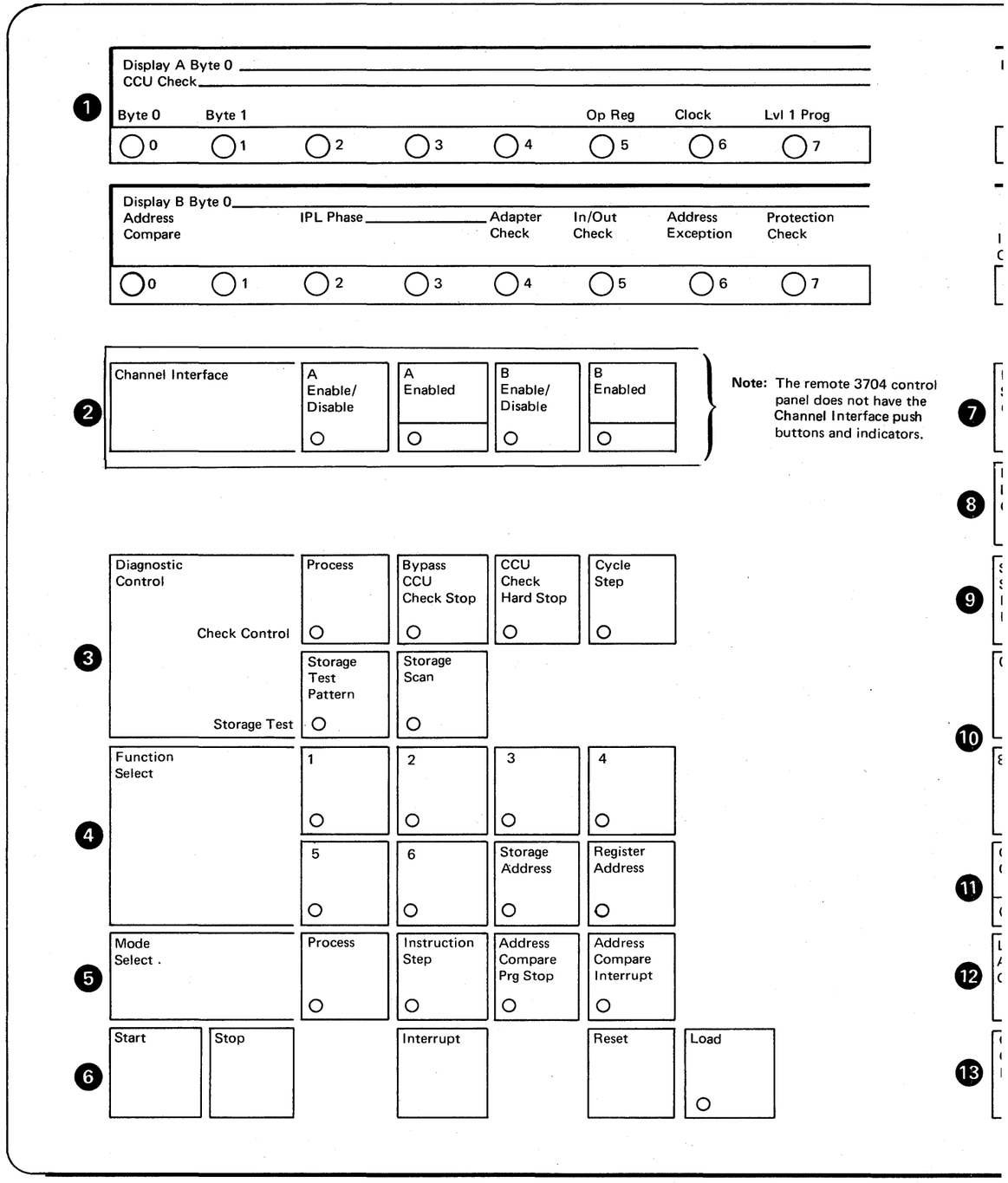


Figure D-1. 3704 Control Panel

APPENDIX D: 3704 CONTROL PANEL DIAGRAM

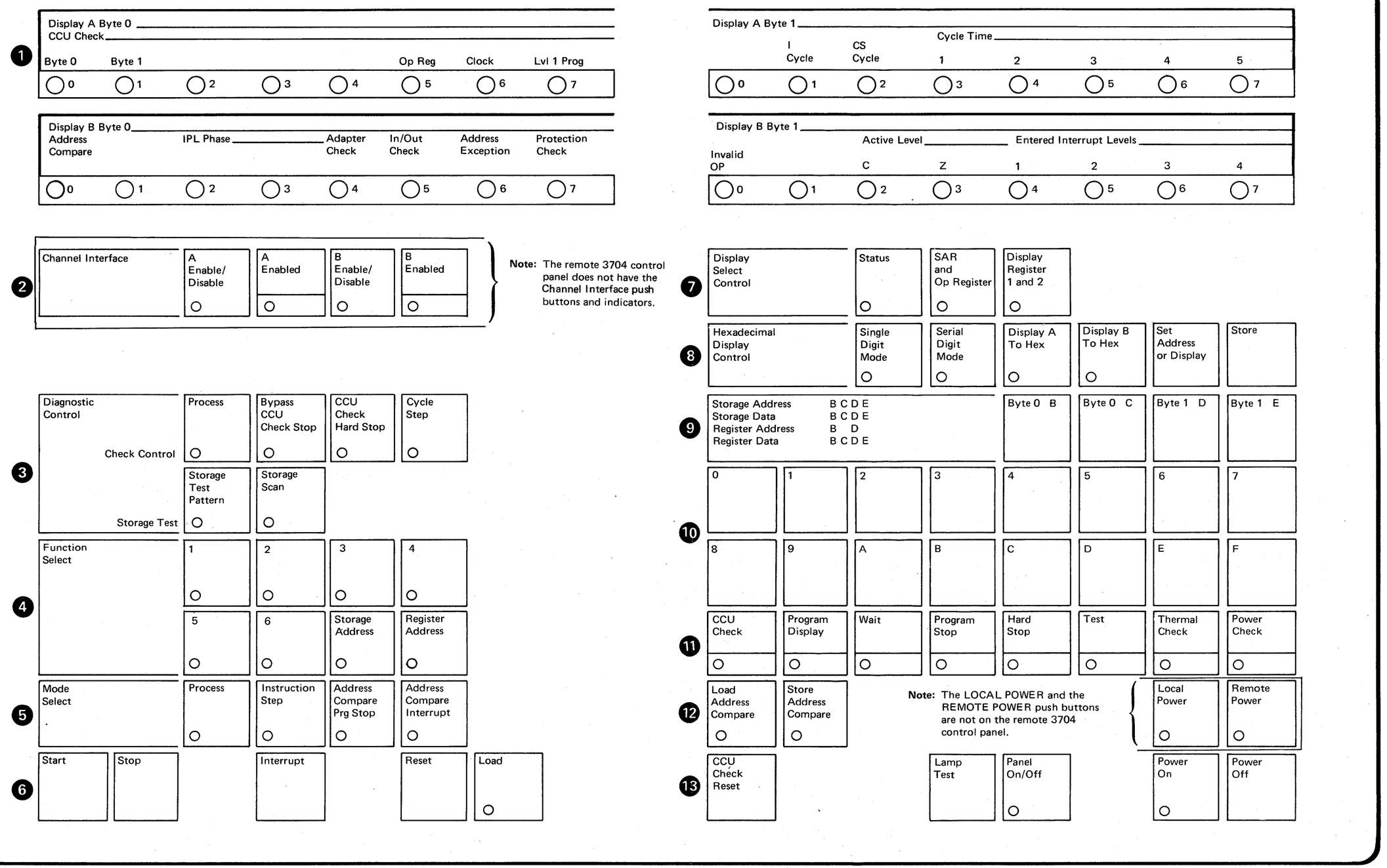


Figure D-1. 3704 Control Panel

Appendix E: 3704 Error Recovery Procedures

The procedures in this section may be performed at the user's option and are provided to assist in determining the cause of and correcting error conditions in the 3704.

If you suspect a problem with the hardware or the control program resident in the 3704, it is to your advantage to determine, as closely as possible, the source of the failure before calling your service representative. This often reduces the length of the service call and eliminates calls to the wrong service representative.

Defining the problem is sometimes simple, as with CCU checks. The lights on the control panel display CCU check and status information. You can try to reset the error by following the procedure on page 2-19. If this fails, you have a record of the information about the error ready for the service representative when he arrives.

In other cases determining the cause of the error is more difficult and may require that you run additional test procedures.

The first part of this appendix is a simple checklist to use in determining the possible cause of an error. The remaining procedures are modem tests with EP and NCP as well as an equalization procedure to be used for line adjustments. The modem tests check for errors in data transfer that may be caused by a failing modem unit.

Error Recovery Checklist

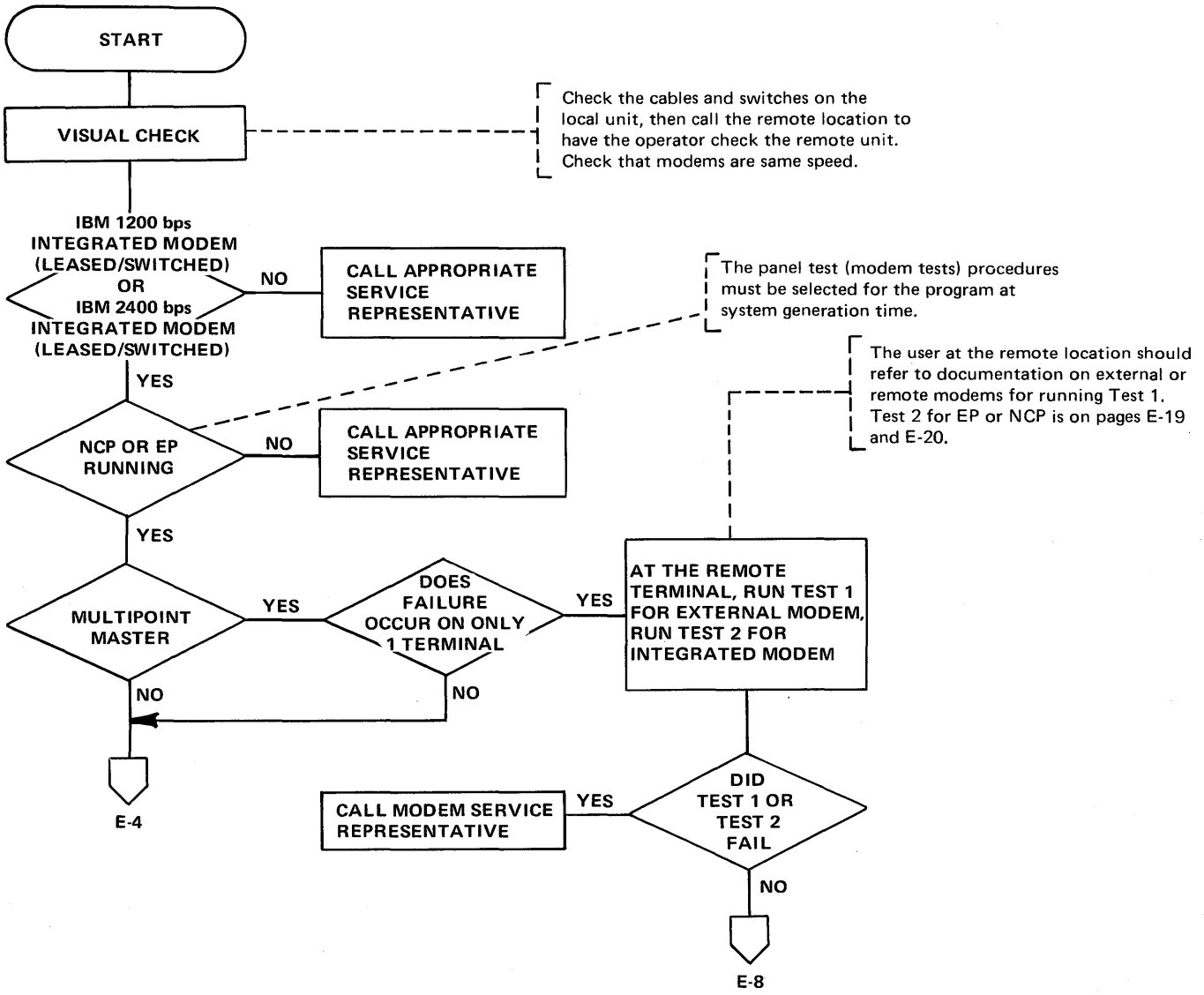
The following steps may be used as a checklist for determining the possible cause of an error condition before calling your Service Representative.

1. Are all control panel switches set to the proper positions and push buttons pressed as directed by the procedure you are following?
2. Has the control panel been properly activated?
3. Have you checked all control panel lights for the proper indications?
4. Is the channel enabled or disabled as the procedure you are following directs?
5. Ensure that all error codes are recorded from DISPLAY A and DISPLAY B on the 3704 panel.

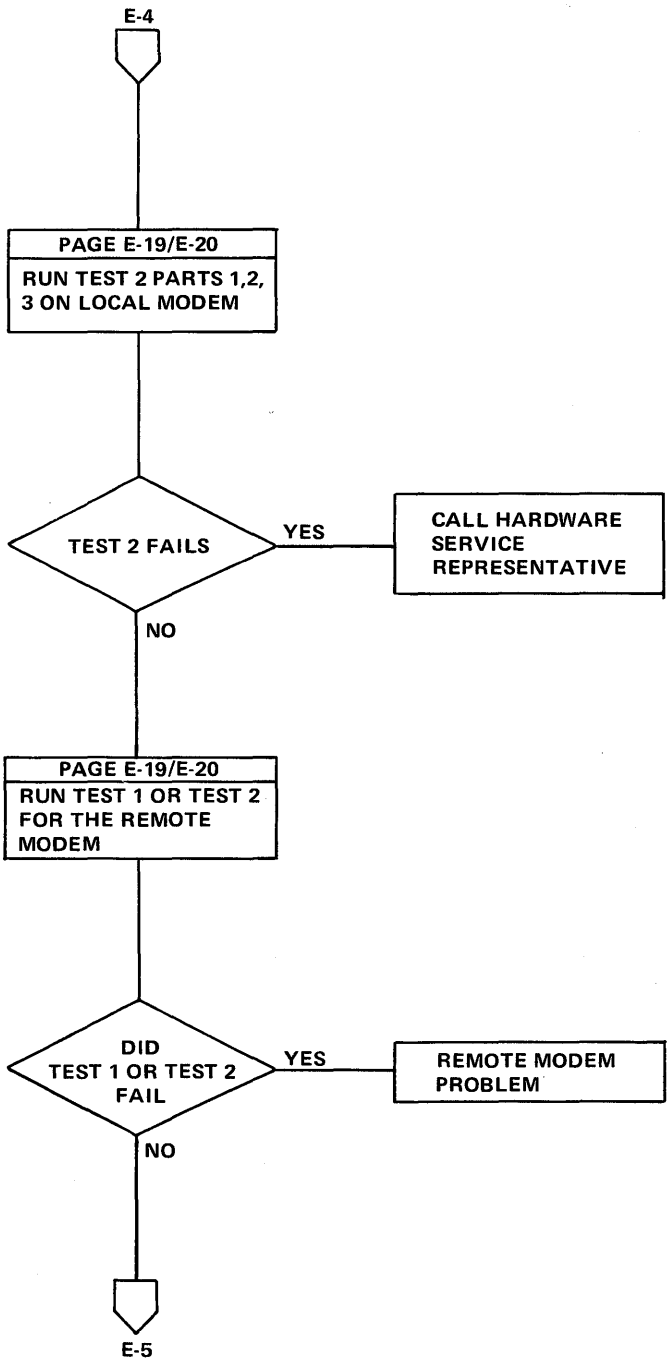
Modem Error Recovery
(Part 1 of 6)

Problem: The CPU operator receives an operator awareness message at the system console or the remote terminal calls and reports no messages received.

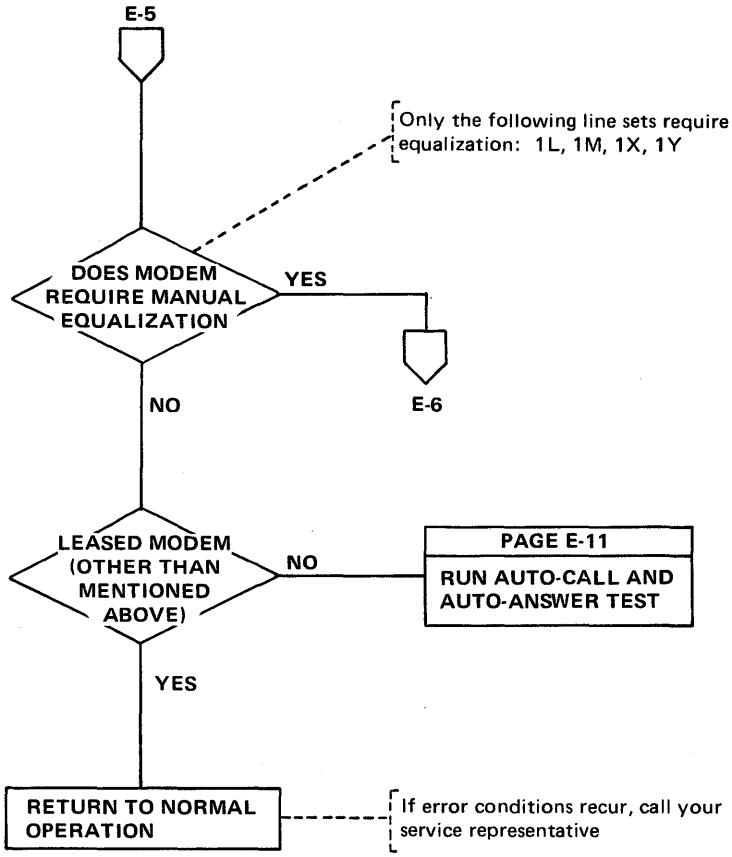
Note: The term remote refers to the modem at the other end. Test 1 for external or remote modems and Test 2 for integrated modems in the controller are modem internal wrap tests.



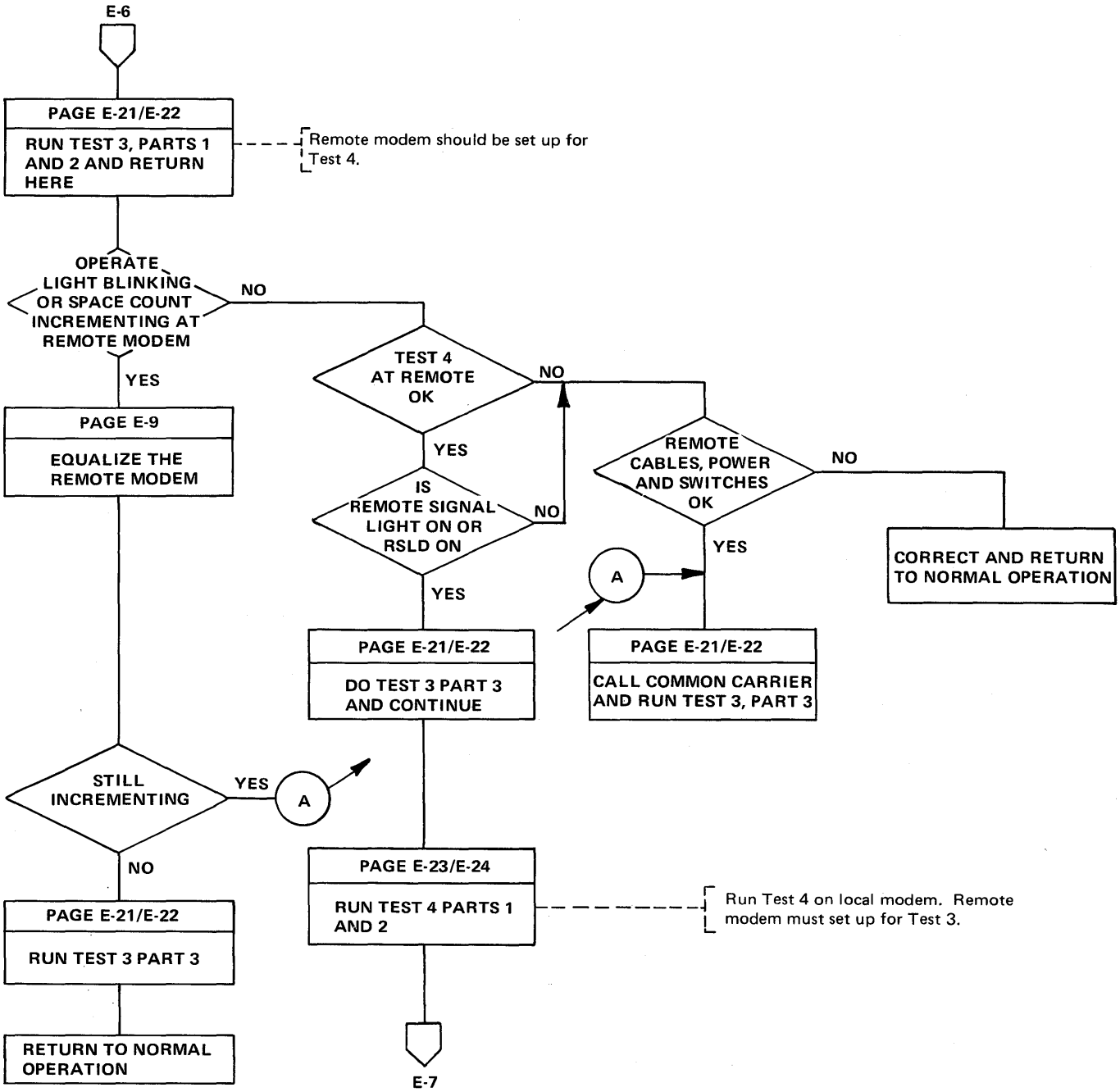
Modem Error Recovery
(Part 2 of 6)



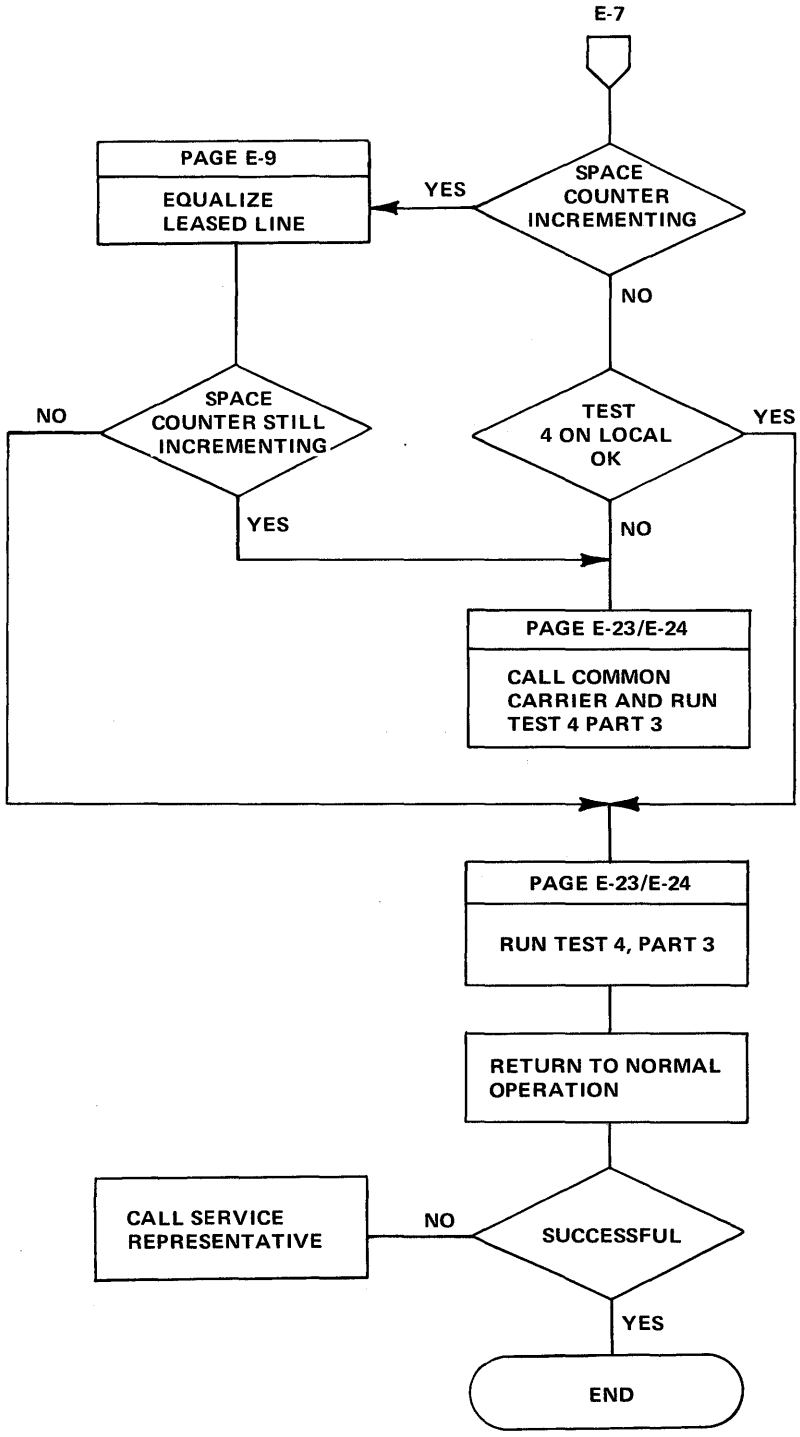
Modem Error Recovery
(Part 3 of 6)

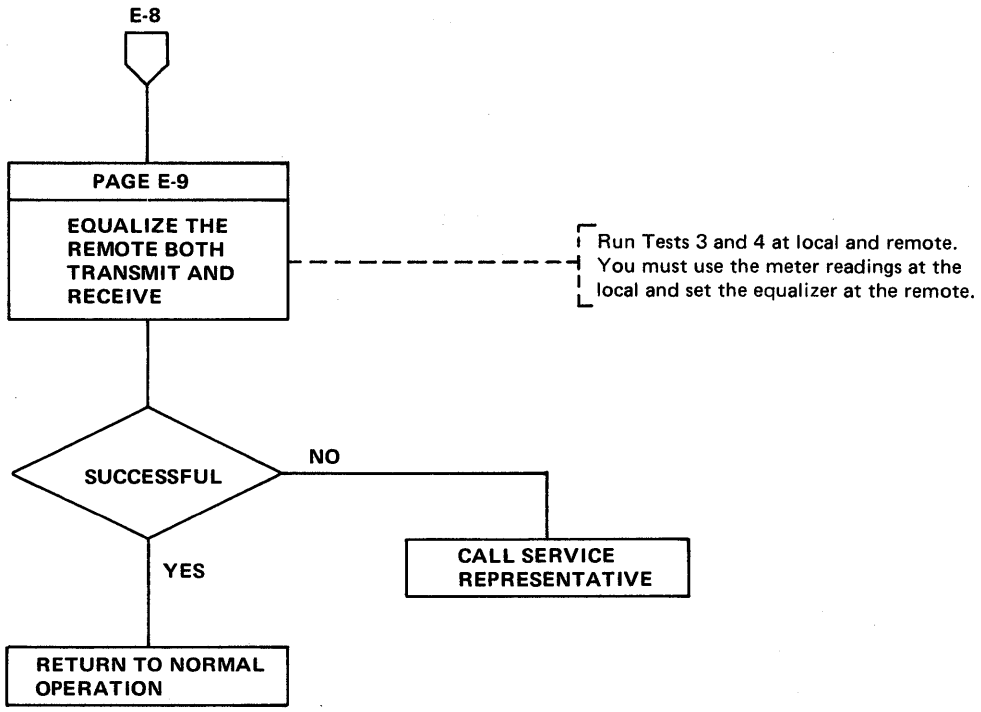


Modem Error Recovery
(Part 4 of 6)



Modem Error Recovery
(Part 5 of 6)




E-8
PAGE E-9
EQUALIZE THE REMOTE BOTH TRANSMIT AND RECEIVE
Run Tests 3 and 4 at local and remote. You must use the meter readings at the local and set the equalizer at the remote.
SUCCESSFUL
NO
YES
CALL SERVICE REPRESENTATIVE
RETURN TO NORMAL OPERATION

IBM 2400/1200 bps Modem Equalization Procedure
(Part 1 of 2)

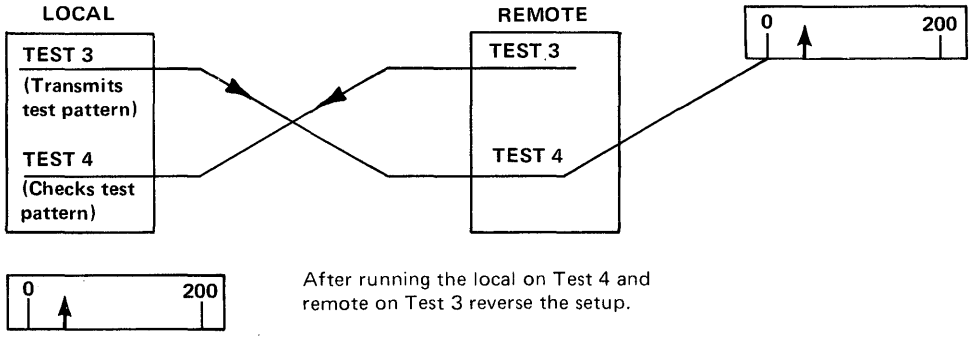
The channel distortions that can be compensated by equalization do not significantly affect 1200 bps speed on the integrated modem or the 3872. Therefore, successful operation at 1200 bps indicates that equalization may allow successful 2400 bps operation. Failures at 1200 bps usually indicate a need for line maintenance by the common carrier. To adjust equalization, first establish the appropriate equalization setup (see diagram **A** or **B**); then turn the Equalizer switch (see diagram - Appendix D) to each marked position successively, noting the meter readings at each position. For the best operation, select the position that has the lowest meter reading. Normal meter readings vary according to the distortion and incidence of noise on a particular channel. Use the meter reading during normal, satisfactory operation as a reference to identify abnormally high, troublesome readings. If a change of equalization does not result in satisfactory operation, line maintenance is required and should be followed by reequalization.

For a quick reference to modems and lines, make a chart similar to the one below. Refer to the control program generation for the line addresses.

Modem Select switch	Line Address (subchannel)
A	_____
B	_____

A POINT-TO-POINT SETUP

Set the Modem Select switch at the 3704 to the desired modem for equalization.



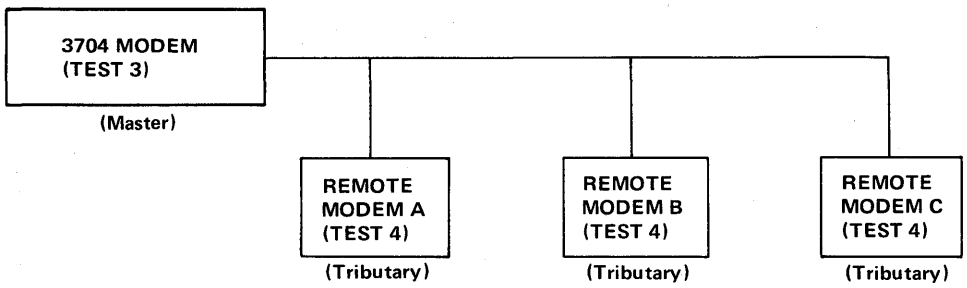
After running the local on Test 4 and remote on Test 3 reverse the setup.

Note: The unit that is in Test 4 must make the equalizing adjustment on a point-to-point setup.

B MULTIPOINT TRIBUTARY SETUP

Receive Equalization for the Remote Modem

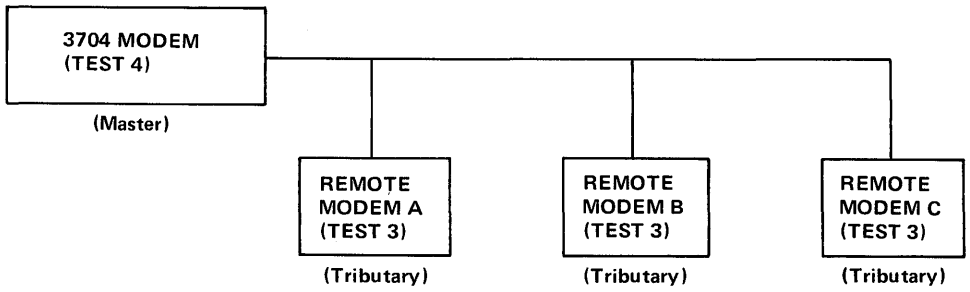
Rotate the Modem Select switch to the desired modem for equalization. Transmit from the 3704 integrated modem (master) in Test 3 to the remote units set in Test 4. Adjust the receive equalizer in each remote modem.



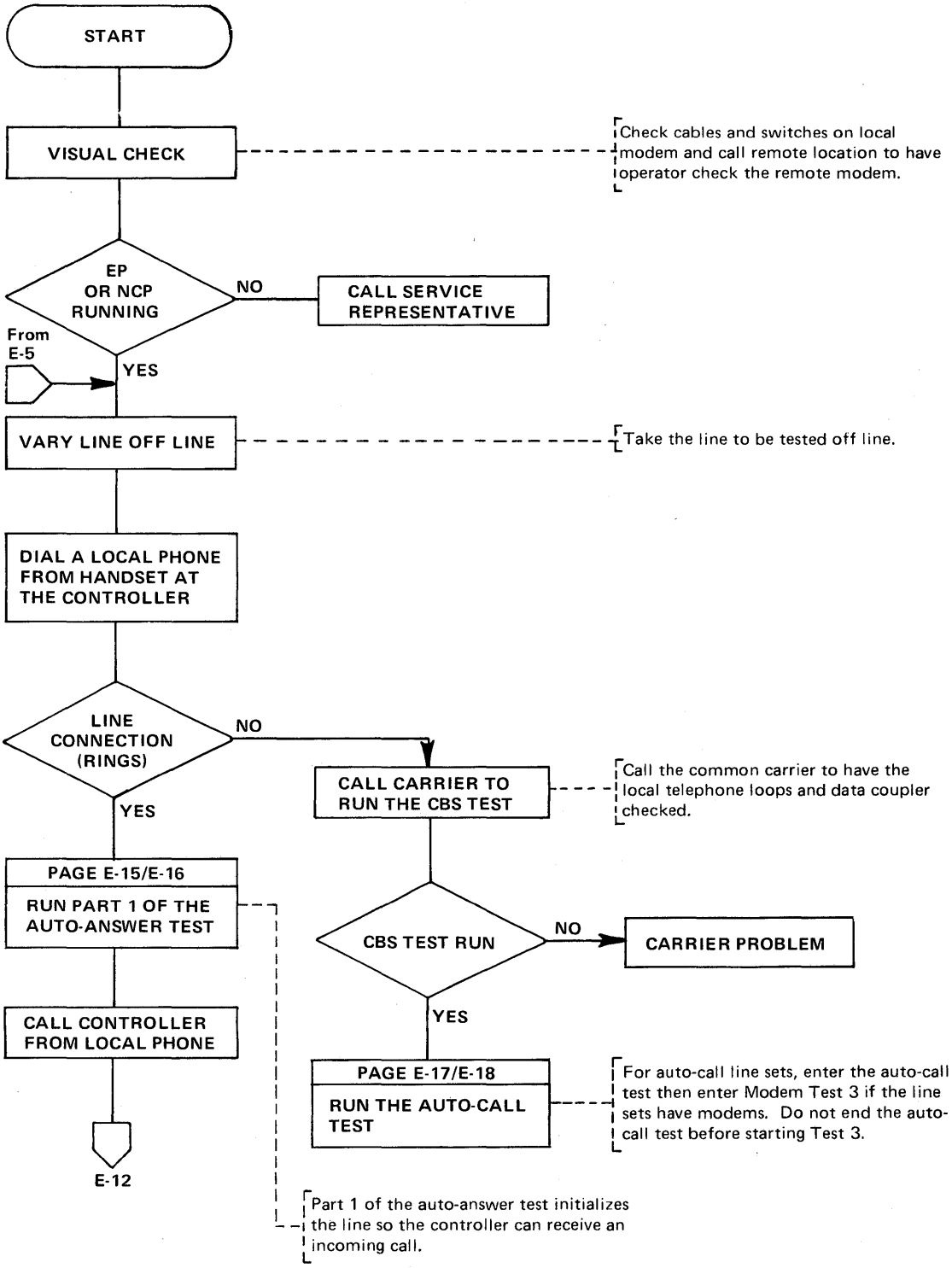
Transmit Equalization for the Remote Modem

Set the Modem Select switch to the desired modem for equalization. Transmit from one remote modem at a time to the master station and adjust the transmit equalizer at the remote modem. Use the Signal Quality Meter at the local modem (master).

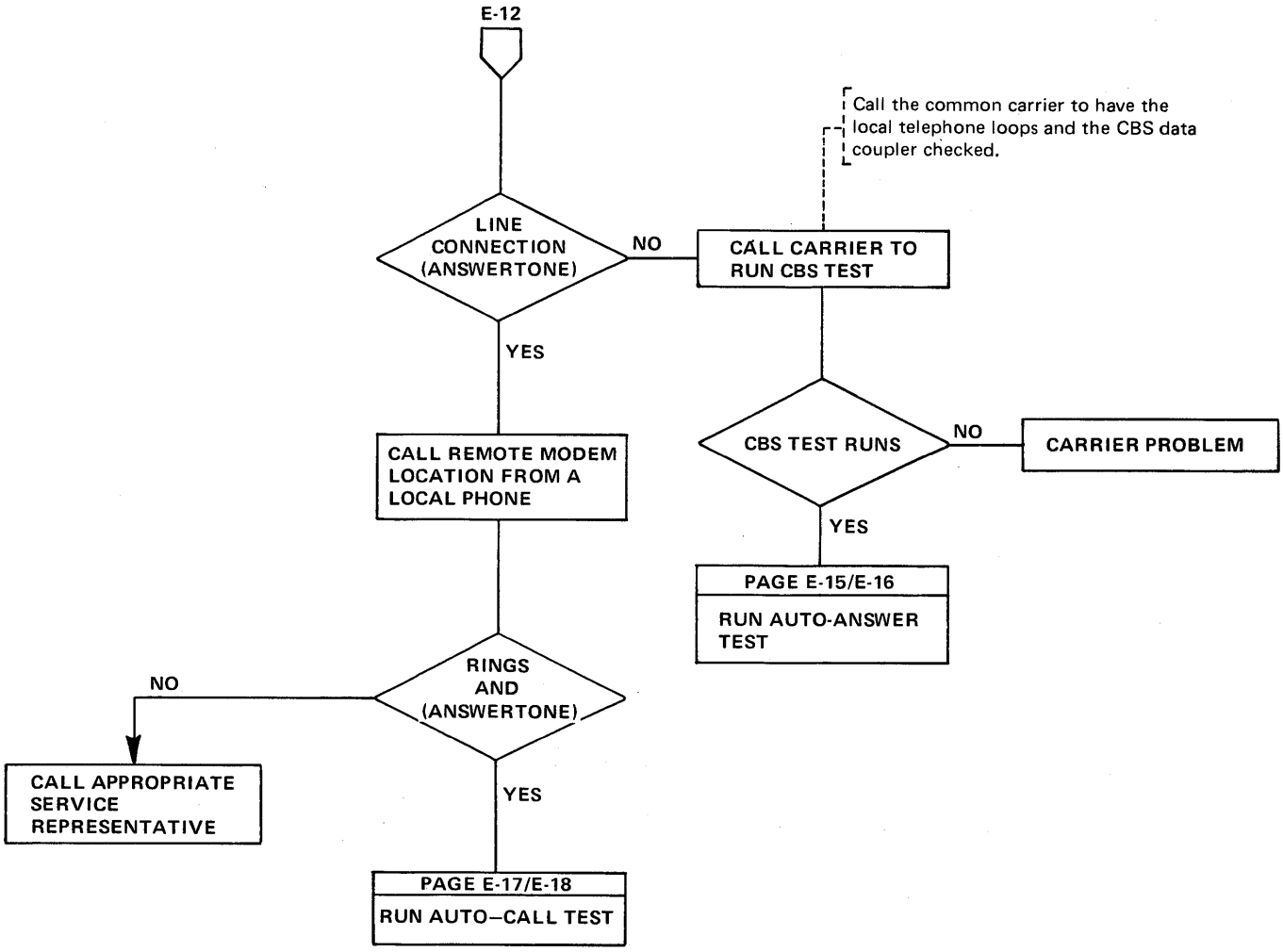
The meter readings for multipoint tributary transmit equalization must be obtained (by separate voice connection) from the operator at the controlling (master) station. There is no equalizer at the controlling (master) station; the adjustment must be made at the remote. The transmit and receive equalizers are at the remote stations.



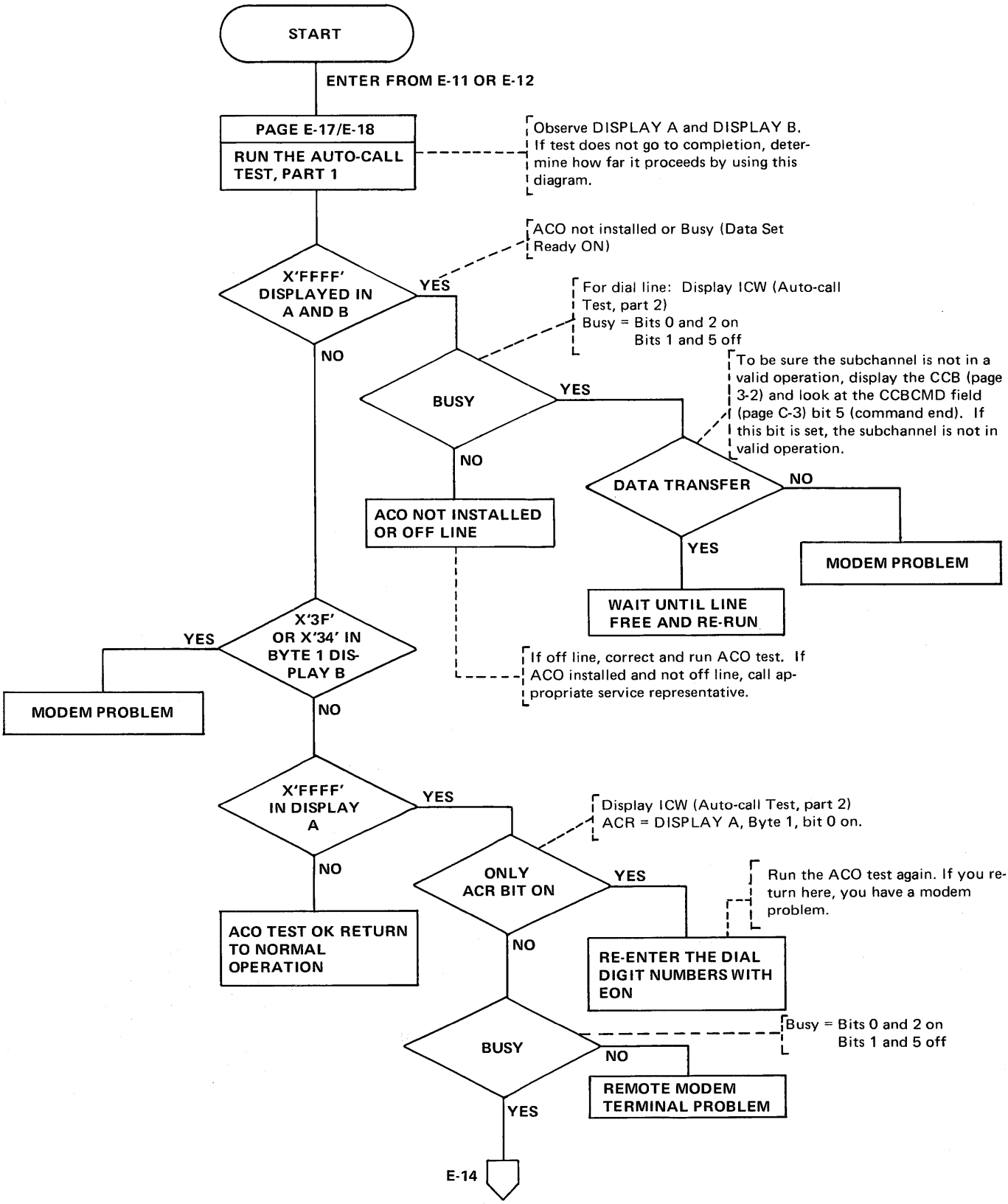
Flow Chart for
Auto-Answer And Auto-Call
Modem Tests
(Part 1 of 2)



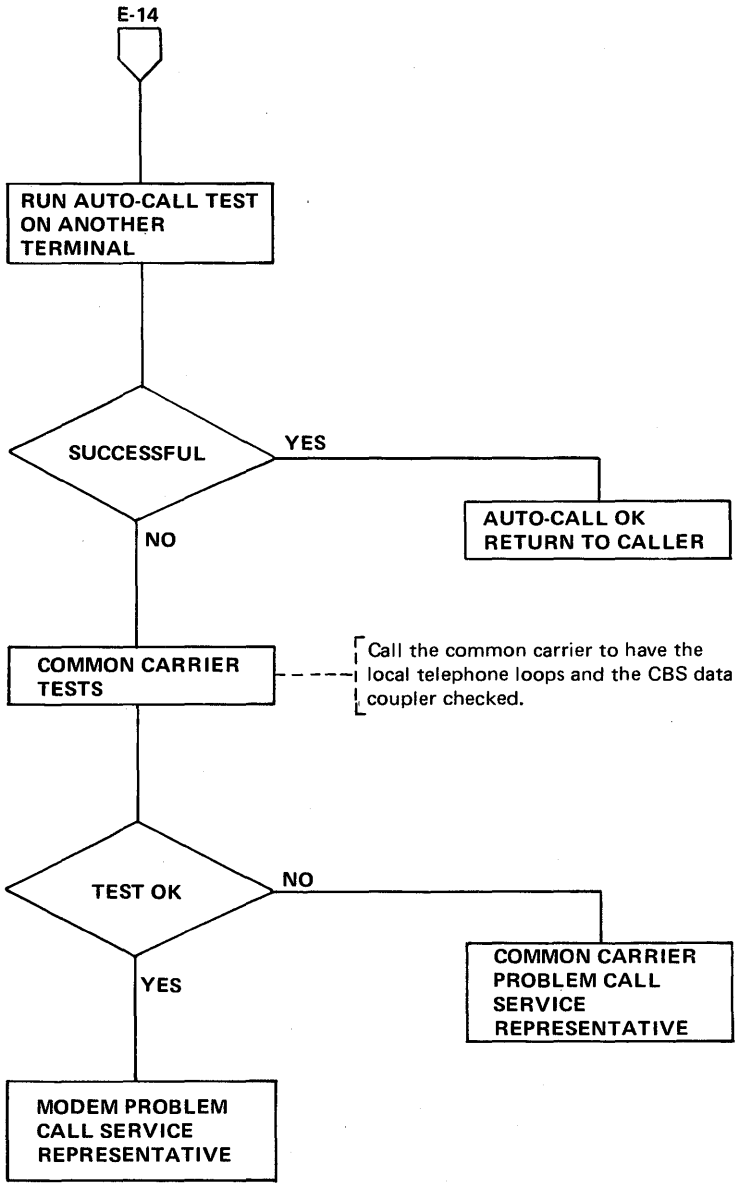
Flowchart for Auto-Answer and Auto-Call Modem Tests (Part 2 of 2)



Flow Chart for Auto-Call (ACO) Tests (Part 1 of 2)



Flow Chart for
Auto-Call (ACO) Tests
(Part 2 of 2)



Auto-Answer Test with EP
(Line Sets 1P, 1Q, 8B, 8D, LIB 9)

FUNCTION SELECT Push Button	HEXADECIMAL READOUT DISPLAYS B	C	D	E		Descriptions
PART 1: SET UP FUNCTION 5	0	0	Subchannel Address		Press INTERRUPT	Initializes the test.
FUNCTION 5	8	0	0	0	Press INTERRUPT	Auto-answer using buffer 0.
PART 2: OBSERVATIONS FUNCTION 6	0	0	Subchannel Address See Note 1.		Do not press INTERRUPT	ICW displayed
PART 3: END OF TEST FUNCTION 5	F	0	X	X	Press INTERRUPT	Ends auto-answer test. Return to flow chart.

Note 1. The status of the data interface lines appears in DISPLAY A, Byte 1. Byte 1, bit 1 (Ring Indicator) should be on momentarily. Then Byte 1, bit 2 (Data Set Ready) should come on indicating that the call has been answered. If data follows, display the CCB or BCB for data information (see page 3-2).

Auto-Answer Test with NCP or NCP/PEP (Line Sets 1P, 1Q, 8B, 8D, LIB 9)

When operating in a PEP environment, place the control panel in NCP mode (page 4-2).

FUNCTION SELECT Push Button	HEXADECIMAL READOUT DISPLAYS B C D E		Descriptions
PART 1: SET UP			
FUNCTION 2	2 NCP Line Address or 2 E EP Subchannel Address	Press INTERRUPT	Initializes the test.
FUNCTION 2	4 6 0 0	Press INTERRUPT	Auto-answer test.
PART 2: OBSERVATIONS	See Note 1		ICW displayed.
FUNCTION 2	4 C 0 8 See Note 2	Press INTERRUPT	LTS field displayed.
PART 3: END OF TEST			
FUNCTION 2	5 0 X X	Press INTERRUPT	Ends the Auto-answer Test. Return to flow chart.

Note 1. The status of the data interface lines appears in DISPLAY B, Byte 1. Bit 1 (Ring Indicator) should be on momentarily. Then bit 2 (Data Set Ready) should come on indicating that the call has been answered.

Note 2. This setting is the displacement (X'08') into the Line Test Control Block to the buffer for receive data characters.

The dial digits are manually entered to test the auto-call unit. By observing the displays, you can see the dialing sequence and the state of the data set leads.

FUNCTION SELECT Push Button	HEXADECIMAL READOUT DISPLAYS B C D E		Descriptions
PART 1: SET UP FUNCTION 5	0 0 Subchannel Address	Press INTERRUPT	Initializes the test.
FUNCTION 5	9 0 0 X See Note 1	Press INTERRUPT	Loads the dial digit from DISPLAY E.
FUNCTION 5	9 0 0 F	Press INTERRUPT	Identifies the end of the dial digits in the buffer.
FUNCTION 5	A 0 0 Y See Note 2	Press INTERRUPT	Performs auto-dial operation.
PART 2: OBSERVATIONS FUNCTION 6	1 0 Subchannel Address See Note 3	Do not press INTERRUPT. Set the function and the sub-channel (auto-call address).	The ICW is displayed.
PART 3: END OF TEST FUNCTION 5	F 0 Subchannel Address	Press INTERRUPT	Ends the ACO Test.

Note 1. X is the dial digit. Enter each dial digit in sequence and press INTERRUPT for each digit to be entered. In applicable cases enter SEP (X'D') characters in the dial sequence when needed for time-outs. If the auto-call unit is wired for End of Number (EON), enter the EON character (X'C') after the dial digits. A maximum of 15 characters and dial digits can be entered for this test.

Note 2. DISPLAY E determines how many dial digits and characters are sent to the ACO. The value of Y has the following meanings:

0-Send all digits and characters entered.
1-Send the first dial digit entered then stop.
2-Send the first two entries (two dial digits or one dial digit and the SEP character), then stop,
↓
etc:
↓
9-Send the first nine entries then stop.

Example: Enter 8 (SEP) 7654321 (EON).

Set display E to 9.
Result: Send 8 (SEP) 7654321 then stop without sending EON
Display E values other than 0 result in Abandon Call and Retry.
You can observe DISPLAY A and DISPLAY B to see the dialing sequence and to determine how far the test proceeds if it does not run to completion.

Note 3. Observe the data set leads in DISPLAY A, Byte 1. If you are in the dial sequence, display the dial line; if in data, display the data line (page 3-2).

The dial digits are manually entered to test the ACO unit. By observing the displays, you can see the dialing sequence and the state of the data set leads.

When operating in a PEP environment, place the control panel in NCP mode (page 4-2).

FUNCTION SELECT Push Button	HEXADECIMAL READOUT DISPLAYS B C D E		Descriptions
PART 1: SET UP FUNCTION 2	2 NCP Line Address or 2 E EP Subchannel Address	Press INTERRUPT	Initializes the test.
FUNCTION 2	4 7 0 X See Note 1	Press INTERRUPT	Loads the dial digit from display E.
FUNCTION 2	4 7 0 F	Press INTERRUPT	Identifies the end of the dial digits in the buffer.
FUNCTION 2	4 8 0 Y See Note 2	Press INTERRUPT	Transmits the dial digits previously loaded to the auto-call unit.
PART 2: OBSERVATIONS FUNCTION 2	See Note 3	Do not press INTERRUPT. Set the function and the sub-channel address	The ICW is displayed.
PART 3: END OF TEST FUNCTION 2	5 0 X X	Press INTERRUPT	Ends the ACO test.

Note 1. X is the dial digit. Enter each dial digit in sequence and press INTERRUPT for each digit to be entered. In applicable cases enter SEP (X'D') characters in the dial sequence when needed for time-outs. If the auto-call unit is wired for End of Number (EON), enter the EON character (X'C') after the dial digits. A maximum of 15 characters and dial digits can be entered for this test.

Note 2. Display E determines how many dial digits and characters are sent to the ACO. The value of Y has the following meanings:

0-Send all digits and characters entered.
1-Send the first dial digit entered then stop.
2-Send the first two entries (two dial digits or one dial digit and the SEP character), then stop.
etc:
9-Send the first nine entries then stop.

Example: Enter 8 (SEP) 7654321 (EON).
Set display E to 9
Result: Send 8 (SEP) 7654321 then stop without sending EON.

Display E values other than 0 result in Abandon Call and Retry. You can observe DISPLAY A and DISPLAY B to see the dialing sequence and to determine how far the test proceeds if it does not run to completion.

Note 3. Observe the auto-call interface lines in DISPLAY B, Byte 1. The LCD field in DISPLAY B, Byte 0 displays X'3' (auto-call) when the auto-call interface lines are displayed in DISPLAY B, Byte 1.

Modem Test 2 (Modem Wrap) with EP (Line Sets 1L, 1M, 1P, 1Q, 8A, 8B, 8C, 8D, LIB 9)

FUNCTION SELECT Push Button	HEXADECIMAL READOUT DISPLAYS B	C	D	E		Descriptions
PART 1: SET UP FUNCTION 5	0	0	Subchannel Address		Press INTERRUPT	Initializes the test.
FUNCTION 5	3	0	7	C/8/0*	Press INTERRUPT	Set mode test.
FUNCTION 5	4	0	7	C/8/0*	Press INTERRUPT	Transmit initial (sends synchronization characters).
FUNCTION 5	6	0	F	F	Press INTERRUPT	Transmit test character and repeat (transmits the characters in displays D and E).
FUNCTION 5	C	1	F	F	Press INTERRUPT	Set receive state, PCF 7.
PART 2: OBSERVATIONS FUNCTION 6	0	0	Subchannel Address See Note 1		Do not press INTERRUPT. Set the function and the subchannel address only	ICW displayed
FUNCTION 5	0	0	Subchannel Address See Note 2		Press INTERRUPT	
PART 3: END OF TEST FUNCTION 5	F	0	Subchannel Address		Press INTERRUPT	Ends Test 2. Return to flow chart.

*For line sets 1L, 1M, 1P, and 1Q set display E to: C for 2400 bps.
8 for 1200 bps.

For line sets 8A, 8B, 8C, 8D, LIB 9 set display E to 0.

Note 1. The ICW is displayed (page 3-2) in DISPLAY A. Observe Byte 1, bits 0, 2, and 3. These bits should be on; any one or all being off indicates a Test 2 failure. If a failure is indicated, skip to part 3 and end the test. If no failure, go to the next step.

Note 2. Observe the space counter in DISPLAY B; if it is incrementing, this is a Test 2 failure. If a failure is indicated, go to part 3 and end the test. If no failure is indicated, go to the next step.

Modem Test 2 (Modem Wrap) with NCP or NCP/PEP (Line Sets 1L, 1M, 1P, 1Q, 8A, 8B, 8C, 8D, 10A, 1X, 1Y, LIB 9)

When operating in a PEP environment, place the control panel in NCP mode (page 4-2).

FUNCTION SELECT Push Button	HEXADECIMAL READOUT DISPLAYS B C D E		Descriptions
PART 1: SET UP FUNCTION 2	2 NCP Line Address or 2 E EP Subchannel Address	Press INTERRUPT	Initializes the test.
FUNCTION 2	4 1 7 C/8/0*	Press INTERRUPT	Set mode test.
FUNCTION 2	4 2 7 C/8/0*	Press INTERRUPT	Transmit Initial (sends synchronization characters)
FUNCTION 2	4 4/E** F F	Press INTERRUPT	Transmit Test character and repeat (transmits the character in displays D and E
FUNCTION 2	4 A F F	Press INTERRUPT	Sets the receive state.
PART 2: OBSERVATIONS FUNCTION 2	See Note 1.	Do not press INTERRUPT.	ICW displayed
FUNCTION 2	4 C 1 8 See Note 2.	Press INTERRUPT	
PART 3: END OF TEST FUNCTION 2	5 0 X X	Press INTERRUPT	Ends Test 2. Return to flow chart.

*For line sets 1L, 1M, 1P, 1Q, 1X, 1Y, set display E to: C for 2400 bps
8 for 1200 bps

For line sets 8A, 8B, 8C, 8D, 10A, LIB 9 set display E to 0.

**Set switch C to: E for SDLC operation
4 for non-SDLC operation

Note 1. The ICW is displayed (page 4-3) in DISPLAY B. Observe Byte 1, bits 0, 2, and 3. These bits should be on; any one or all being off indicates a Test 2 failure. If a failure is indicated, skip to part 3 and end the test. If no failure, go to the next step.

Note 2. This setting is the displacement (X'18') into the Line Test Control Block to the counter for non-X'FF' data characters when receiving. Observe the space counter in DISPLAY A, Bytes 0 and 1. If the counter is incrementing, Test 2 has failed and equalization (page E-9) is required for the remote. Call the Service Representative. If the counter is not incrementing, Test 2 ran successfully.

Modem Test 3 (Transmit All Marks) with EP (Line Sets 1L, 1M, 1P, 1Q, 8A, 8B, 8C, 8D, LIB 9)

For line sets with auto-call and/or auto-answer, use the auto-call (page E-17) or auto-answer (page E-15) test to establish the line connection. Do not end the test. Following the line connection, start Test 3 at the *set mode* test for line sets 1P and 1Q and at the *transmit initial* test for line set 8B and LIB 9.

This test may be used on external modems if the proper set mode information is supplied in the second step of part 1. The set mode information can be determined by displaying the CCBSTMOD field in the CCB (page 3-2).

When using this test, place the modem located at the other end of the line in Test 4.

FUNCTION SELECT Push Button	HEXADECIMAL READOUT DISPLAYS B	C	D	E		Descriptions
PART 1: SET UP FUNCTION 5	0	0	Subchannel Address		Press INTERRUPT	Initializes the test.
FUNCTION 5**	2 or	0	0	0	Press INTERRUPT	Set mode test.
FUNCTION 5	3	0	3	C/8*	Press INTERRUPT	Set mode test.
FUNCTION 5	4	0	X	X	Press INTERRUPT	Transmit initial (sends synchronization characters)
FUNCTION 5 (omit for start-stop terminals)	6	0	F	F	Press INTERRUPT	Transmit test character and repeat (transmits all marks)
PART 2: OBSERVATIONS FUNCTION 6	0	0	Subchannel Address See Note 1.		Do not press INTERRUPT	ICW displayed
PART 3: END OF TEST FUNCTION 5	F	0	X	X	Press INTERRUPT	Ends Test 3. Return to flow chart.

*Set display E to: C for 2400 bps.
8 for 1200 bps.

These settings do not set the diagnostic wrap bit.

**Set displays B and C to 20 for line sets 8A or 8C. Set displays B and C to 30 for line sets 1L, 1M, 1P, and 1Q. Do not set displays B and C for line sets 8B, 8D, and LIB 9.

Note 1. DISPLAY B, Byte 1, bits 0 and 2 should be on; if either bit is off, a local modem failure is indicated. (Bit 0 = clear to send, bit 2 = data set ready.) If both bits are on, go to the next step to end the test.

Modem Test 3 (Transmit All Marks) with NCP or NCP/PEP (Line Sets 1L, 1M, 1P, 1Q, 1X, 1Y, 8A, 8B, 8C, 8D, 10A, and LIB 9.)

For line sets with auto-call and/or auto-answer, use the auto-call or auto-answer test to establish the line connection. Do not end the test. Following the line connection, start Test 3 at the *set mode* test for line sets 1P and 1Q, and at the *transmit initial* test for line sets 8B, 8D and LIB 9.

This test may also be used on external modems if the proper set mode information is supplied in the second step of part 1. The set mode information can be determined by displaying the LTSMSDF field in the LTS (page C-7).

When using this test, place the modem located at the other end of the line in Test 4.

When operating in a PEP environment, place the control panel in NCP mode (page 4-2).

FUNCTION SELECT Push Button	HEXADECIMAL READOUT DISPLAYS B C D E		Descriptions
PART 1: SET UP FUNCTION 2	2 NCP Line Address or 2 E EP Subchannel Address	Press INTERRUPT	Initializes the test.
FUNCTION 2**	4 0 0 0	Press INTERRUPT	Set mode test.
	or		
FUNCTION 2	4 1 3 C/8*	Press INTERRUPT	Set mode test.
FUNCTION 2	4 2 X X	Press INTERRUPT	Transmit initial (sends synchronization characters).
FUNCTION 2 (omit for start-stop terminals)	4 4/E*** F F	Press INTERRUPT	Transmit test character and repeat (transmits all marks).
PART 2: OBSERVATIONS FUNCTION 2	See Note 1	Do not press INTERRUPT	ICW displayed
PART 3: END TEST FUNCTION 2	5 0 0 0	Press INTERRUPT	Ends Test 3. Return to flow chart.

*Set display E to: C for 2400 bps.
8 for 1200 bps.

These settings do not set the diagnostic wrap bit.

**Set displays B and C to 40 for line sets 8A, or 8C. Set displays B and C to 41 for line sets 1L, 1M, 1P, 1Q, 1X, and 1Y. Do not set displays B and C for line sets 8B, 8D, 10A, and LIB 9.

***Set display C to: E for SDLC operation
4 for non - SDLC operation.

Note 1. DISPLAY B, Byte 1, bits 0 and 2 should be on; if either bit is off, a local modem failure is indicated. (Bit 0 = clear to send, bit 2 = data set ready.) If both bits are on, go to the next step to end the test.

Modem Test 4 (Receive All Marks) with EP (Line Sets 1L, 1M, 1P, 1Q, 8A, 8B, 8C, 8D, LIB 9)

For switched line sets, use the auto-call or auto-answer test to establish the line connection. Do not end the test. Following the line connection, start Test 4 at the *set mode* test for line sets 1P and 1Q and at the *transmit initial* test for line sets 8B and LIB 9.

This test may also be used on external modems if the proper set mode information is supplied in the second step of part 1. The set mode information can be determined displaying the CCBSTMOD field in the CCB (page 3-2).

When using this test, place the modem located at the other end of the line in Test 3.

FUNCTION SELECT Push Button	HEXADECIMAL READOUT DISPLAYS B	C	D	E		Descriptions
PART 1: SET UP FUNCTION 5	0	0	Subchannel Address		Press INTERRUPT	Initializes the test.
FUNCTION 5**	2	0	0	0	Press INTERRUPT	Set mode test.
	or					
FUNCTION 5	3	0	3	C/8*	Press INTERRUPT	Set mode test.
FUNCTION 5	4	0	X	X	Press INTERRUPT	Transmit initial (sends synchronization characters).
FUNCTION 5	7	0	F	F	Press INTERRUPT	Transmit Buffer 0 and receive (receive all marks).
PART 2: OBSERVATIONS FUNCTION 6	0	0	Subchannel Address		Do not press INTERRUPT	ICW displayed.
	See Note 1					
FUNCTION 5	0	0	Subchannel Address			
FUNCTION 5	See Note 2					
PART 3: END OF TEST FUNCTION 5	F	0	X	X	Press INTERRUPT	Ends Test 4. Return to flow chart.

*Set display E to: C for 2400 bps.
8 for 1200 bps.

These settings do not set the diagnostic wrap bit.

**Set displays B and C to 20 for line set 8A, or 8C. Set displays B and C to 30 for line sets 1L, 1M, 1P, and 1Q, Do not set displays B and C for line sets 8B, 8D, and LIB 9.

*Set switch E to: C for 2400 bps.
8 for 1200 bps.

These settings do not set the diagnostic wrap bit.

Note 1. The data set leads in DISPLAY A, Byte 1, bits 2 and 3 should be on; if either or both are off, this indicates a Test 4 failure. (Bit 2 = data set ready, bit 3 = receive line signal detected.) If the failure indication is Byte 1, bit 2, end Test 4 and restart at Test 2. If you return to this point, you have a local modem problem. If the failure is Byte 1, bit 3, recheck both local and remote modem cables and run Test 1 for external and remote modems or Test 2 for integrated modems; if they run successfully you probably have a common carrier problem and should end Test 4. If both bits are on, go on to the next step.

Note 2. Display the space counter in DISPLAY B, Byte 1; if the counter is incrementing, this is a failure and you should equalize the remote modem (leased lines) (page E-9). If the space counter is not incrementing, Test 4 has run successfully.

Modem Test 4 (Receive All Marks) with NCP or NCP/PEP (Line Sets 1L, 1M, 1P, 1Q, 1X, 1Y, 8A, 8B, 8C, 8D, 10A, LIB 9).

For line sets with auto-call and/or auto-answer, use the auto-call or auto-answer test to establish the line connection. Do not end the test. Following the line connection, start Test 4 at the *set mode* test for line sets 1P and 1Q, and at the *transmit initial* test for line set 8B and LIB 9.

This test may also be used on external modems if the proper set mode information is supplied in the second step of part 1. The set mode information can be determined by displaying the LTSMSDF field in the LTS (page C-7)

When using this test, place the modem located at the other end of the line in Test 3.

When operating in a PEP environment, place the control panel in NCP mode (page 4-2)

FUNCTION SELECT Push Button	HEXADECIMAL READOUT DISPLAYS B	C	D	E		Descriptions
PART 1: SET UP FUNCTION 2	2	NCP Line Address**			Press INTERRUPT	Initializes the test.
	2	E	EP Subchannel Address			
FUNCTION 2***	4	0	0	0	Press INTERRUPT	Set mode test.
	or					
FUNCTION 2	4	1	3	C/8*	Press INTERRUPT	Set mode test.
FUNCTION 2	4	2	X	X	Press INTERRUPT	Transmit initial (sends synchronization characters)
FUNCTION 2	4	5	F	F	Press INTERRUPT	Transmits test character and turns to receive
PART 2: OBSERVATIONS FUNCTION 2		See Note 1.			Do not press INTERRUPT	ICW displayed
FUNCTION 2	4	C	1	8	Press INTERRUPT	LTS field displayed
		See Note 2				
PART 3: END OF TEST FUNCTION 2	5	0	0	0	Press INTERRUPT	Ends Test 4. Return to flow chart.

*Set DISPLAY E to: C for 2400 bps.
8 for 1200 bps.

These settings do not set the diagnostic wrap bit.

**For duplex line sets 1X and 1Y set displays C, D, and E to the NCP transmit line address.

***Set displays B and C to 40 for line sets 8A or 8C. Set B and C to 41 for line sets 1L, 1M, 1P, 1Q, 1X, and 1Y. Do not set displays B and C for line sets 8B, 8D, 10A, and LIB 9.

Note 1. The data set leads displayed in DISPLAY B, Byte 1, bits 2 and 3 should be on; if either or both are off, this indicates a Test 4 failure. (Bit 2 = data set ready, bit 3 = receive line signal detected.) If the failure indication is Byte 1, bit 2, end Test 4 and restart at Test 2. If you return to this point, you have a local modem problem. If the failure is Byte 1, bit 3, recheck both local and remote modem cables and run Test 1 for external and remote modems or Test 2 for integrated modems; if they run successfully, you probably have a common carrier problem and should end Test 4. If both bits are on, go on to the next step.

Note 2. This setting is the displacement (X'18') into the Line Test Control Block to the counter for non-X'FF' data characters when receiving. Observe the space counter in DISPLAY A Bytes 0 and 1. If the counter is incrementing, Test 4 has failed and equalization (page E-9) is required for the remote modem (leased lines). If the counter is not incrementing, Test 4 ran successfully.

SDLC Link Test with NCP or NCP/PEP (for NCP V4M1 only)

This test may be used on all SDLC lines connected to SDLC terminals supporting the link test function.

When operating in a PEP environment, place the control panel in NCP mode (see procedure on page 4-2).

FUNCTION SELECT Push Button	HEXADECIMAL READOUT DISPLAYS B	C	D	E		Descriptions
FUNCTION 2	2	NCP line address*			Press INTERRUPT	Initializes the test.
FUNCTION 2	4	0	0	0	Press INTERRUPT	Set mode to line
FUNCTION 2	4	2	0	0	Press INTERRUPT	Set transmit initial
FUNCTION 2	5	8	0	0	Press INTERRUPT	Initialize buffer 0 offset value
FUNCTION 2	5	1	X	X**	Press INTERRUPT	Store data in buffer 0
FUNCTION 2	5	B	0	0	Press INTERRUPT	Accumulate SDLC CRC characters on buffer 0.
FUNCTION 2	5	C	0	1	Press INTERRUPT	Set receive mode byte for SDLC CRC accumulation on receive.
FUNCTION 2	4	F	0	0***	Press INTERRUPT	Transmit buffer 0
FUNCTION 2	5	0	0	0	Press INTERRUPT	End test

*For duplex line sets, set hexadecimal readout displays C, D and E to the transmit line address.

**With function 51, you may enter the following SDLC test commands as well as optional data, if desired, in data switches D and E: XX = 7E, address, F3, and/or optional data. This data is entered sequentially and you must press the INTERRUPT push button each time the data is entered.

***If you run this test on a low speed half-duplex line, DISPLAYS A and B may alternate between transmitting and receiving; however, if a high speed and/or duplex line is used, the Displays will probably remain in one state.

disabled. Pertaining to a state of the central processing unit that prevents the occurrence of certain types of interruptions.

dynamic display. In the communications controllers, a representation of data in DISPLAY A and DISPLAY B that is continuously updated by the control program.

enabled. Pertaining to a state of the central processing unit that allows the occurrence of certain types of interruptions.

equalization. Compensation for the attenuation (signal loss) increase with frequency.

external modem. A modem that is powered independently and connected to a data processing machine or terminal by cables.

ICW (Interface Control Word). The communications link for a line between the 3704 control program and the line interface hardware.

integrated modem. A modem unit that is built inside the 3704.

longitudinal redundancy check. A system of error control based on the formation of a block check following preset rules.

modem. A device that modulates and demodulates signals transmitted over communication facilities.

program-dependent function. A function that is controlled by program code.

program-independent function. A function that does not require program code in order to be executed.

access method support 1-1
activating/deactivating the control panel 2-8
activating the line trace
  EP 3-7
  NCP/PEP 4-16
activating/deactivating the level 2 and/or level 3
  line trace
  EP 3-9
  NCP/PEP 4-18
addressing
  set address or display for registers 2-25
  set address or display for storage 2-27
address compare
  load address compare 2-30
  store address compare 2-29
address trace facility (NCP) 4-10
advanced control panel procedures
  (see control panel procedures)
aids for reading the display lights C-1
allow additional register range bit 4-7
auto-answer test
  EP E-15
  NCP E-16
auto-answer and auto-call tests
  flow chart for auto-answer and auto-call
  modem tests E-11
auto-call test
  EP E-17
  NCP E-18
auto-shutdown
  network shutdown 4-8

basic control panel procedures
  (see control panel procedures)
BCB display
  (see displays)
BCB layout
  type 1 scanner bit control block (EP) C-2

CCB display
  (see displays)
CCB layout C-3
CCU check
  bypassing 5-2
  resetting a CCU check 2-19
  types of B-1
CCU CHECK light 5-1
CCU CHECK RESET push button 5-1
channel end/device end
  generating channel end/device end (EP) (local only) 3-6
channel interface
  enabling/disabling the channel interface
  (local only) 2-9
CHANNEL INTERFACE push buttons (local only) 5-1
character control block (CCB) C-3
character entry
  single digit mode 2-23
  serial ditit mode 2-24
check lights (functions)
  DISPLAY A B-1
  DISPLAY B B-1
control panel
  activating/deactivating the control panel 2-8
  description 5-1
  diagram D-1
  setting the control panel mode with PEP 4-2
control panel procedures
  program - independent 2-1
    advanced 2-21
    basic 2-3
  EP 3-1
  NCP 4-1
control program
  EP 3-1
  initial program load 2-10
  NCP 4-1
conversion table C-1

deactivating the level 2 line trace (local only)
  activating/deactivating the level 2 and/or
    level 3 line trace
  EP 3-9
  NCP/PEP 4-18
DIAGNOSTIC CONTROL push buttons 5-2
disabling the channel interface 2-9
DISPLAY A
  check lights B-1
  function 5-2
  status lights B-1
DISPLAY B
  check lights B-1
  function 5-2
  status lights B-1
DISPLAY SELECT CONTROL push buttons 5-3
displays
  BCB (EP) (dynamic) (local only) 3-2
  CCB (EP) (dynamic) (local only) 3-2
  display registers 1 and 2 (program display) 2-34
  ICW (EP) (dynamic) (local only) 3-2
  ICW (NCP) (dynamic) 4-3
  Operation (OP) Register 2-31

registers 2-25
registers (NCP) (dynamic) 4-4
status 2-18
storage 2-27
storage (EP) (dynamic) (local only) 3-5
storage (NCP) (dynamic) 4-6
Storage Address Register (SAR) 2-31
display lights
aids for reading the display lights C-1
displaying 3704 status 2-18
displaying display registers 1 and 2 (program display) 2-34
displaying the Storage Address Register (SAR) and the Operation (OP) Register 2-31
dynamic displays
definition of G-1
(see also displays)
dynamic display of an ICW (NCP) 4-3
dynamic display of an ICW, CCB, or BCB (EP) (local only) 3-2
dynamic display of registers (NCP) 4-5
dynamic display of storage
EP (local only) 3-5
NCP 4-6

Emulation Program (EP)
function 1-1
(see also control panel procedures)
enabling/disabling the channel interface (local only) 2-9
equalization E-9
error recovery checklist E-2
error recovery procedures E-1

flow chart for auto-call test E-13
flow chart for auto-answer and auto-call modem tests E-11
FUNCTION SELECT push buttons 5-3

generating channel end/device end (EP) (local only) 3-6

HARD STOP light 5-5
HEXADECIMAL DISPLAY CONTROL push buttons 5-5
HEXADECIMAL KEYBOARD 5-5
Hexadecimal Readout Displays 5-6

IBM 2701 Data Adapter Unit 1-1
IBM 2702 Transmission Control Unit 1-1
IBM 2703 Transmission Control Unit 1-1
ICW display
(see displays)
initial program load (IPL)
local 2-10
remote 2-12
initial test
with IPL 2-10
instruction step 2-22
INTERRUPT push button 5-6

lamp test 2-16
LAMP TEST push button 5-6
light emitting diode
replacing a light emitting diode 2-17
line test control block (LTS)
NCP 1 and NCP 2 C-5
NCP 3 C-6
line test function (panel test)
EP 3-10
NCP 4-19
line trace (EP) (local only)
activating/deactivating the level 2 and/or level 3 line trace 3-9
activating the level 2 line trace 3-7
deactivating the level 2 line trace 3-9
line trace (NCP/PEP) (Local only)
activating the level 2 line trace 4-16
activating/deactivating the level 2 and/or level 3 line trace 4-18
deactivating the level 2 line trace 4-17
link test (SDLC) E-25
LOAD push button 5-6
load address compare 2-30
LOAD ADDRESS COMPARE push button 5-7
loader program 2-10
loading the control program
(see initial program load)
LOCAL POWER push button (local only) 5-7

MODE SELECT push buttons 5-7
modem error recovery E-3
modem equalization E-9
modem test 2
EP E-19
NCP E-20
modem test 3
EP E-21
NCP E-22
modem test 4
EP E-23
NCP E-24
modem wrap
(see modem test 2)

Network Control Program (NCP)
function of 1-1
(see also control panel procedures)
network shutdown 4-8

Operation (OP) Register display 2-31

PANEL ON/OFF push button 5-7
panel test
(see line test function)
power check (resetting) 2-7
POWER CHECK light 5-7

power off 2-6
POWER OFF push button 5-8
power on 2-5
POWER ON push button 5-8
preparing the 3704 2-4
PROGRAM DISPLAY light 5-8
program-independent control panel procedures
(see control panel procedures)
PROGRAM STOP light 5-8

receive all marks
(see modem test 4)
register
address A-1
storing data in a register
(see also displays)
REMOTE POWER push button (local only) 5-8
replacing a light emitting diode 2-13
RESET push button 5-8
resetting a CCU check 2-19
resetting a power check 2-7

SDLC Link Test with NCP or NCP/PEP E-25
serial digit mode
(see character entry)
SET ADDRESS/DISPLAY push button 5-9
set address or display for registers 2-25
set address or display for storage 2-27
setting the control panel mode with PEP 4-2
single digit mode
(see character entry)
START push button 5-9
status lights
DISPLAY A B-1
DISPLAY B B-1
displaying 3704 status 2-18
STOP push button 5-9
STORAGE ADDRESS DATA push buttons 5-6
storage scan 2-33
storage test pattern 2-32
store address compare 2-29
STORE ADDRESS COMPARE push button 5-10
STORE push button 5-9
storing data in a register 2-21
storing data in a storage location 2-28

TEST light
thermal check
resetting a power check 2-7
THERMAL CHECK light 5-10
trace, address (NCP) 4-10
trace, line (EP) (local only)
(see line trace)
trace, line (NCP/PEP) (Local only)
(see line trace)
transmit all marks
(see modem test 3)
turning power off 2-6
turning power on 2-5
type 1 scanner bit control block C-2

WAIT light 5-10
wrap test
(see modem test 2)

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Controller Control Panel

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Title page, Edition notice	4-3, 4-4	Appendix D
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3-11, 3-12	4-17, 4-18	
3-13, 3-14	4-23, 4-24	
3-15, 3-16	5-1, 5-2	
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4-1, 4-2	E-23, E-24	

A change to the text is indicated by a vertical line to the left of the change.

Summary of Amendments

This Technical Newsletter updates the modem test procedures in Appendix E to include line set type 8C (leased) and line set type 8D (switched). These line sets include the 1200 bps integrated modem with a bi-directional interrupt signal. In addition, a description of the Unit Protection Key has been added to Section 5 and its location on the control panel has been indicated on the control panel diagram in Appendix D. Examples of addressing and polling a start-stop terminal have been added to the EP line test procedure in Section 3. Minor editorial and technical changes have been made in this newsletter where applicable.

Note: Please file this letter at the back of the publication to provide a record of changes.

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Summary of Amendments

This Technical Newsletter updates the line test procedure to reflect the added subfunctions for Version 4 Modification 1 of the Network Control Program. The SDLC link test procedure (to be used only with V4M1 of the Network Control Program) has been added to Appendix E. This procedure may be used to test all SDLC lines connected to SDLC terminals supporting this function. Minor editorial and technical changes have been made in this newsletter where applicable.

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