IBM MAINTENANCE DIAGNOSTIC PROGRAM

IBM 3705 COMMUNICATIONS CONTROLLER

INTERNAL FUNCTIONAL TEST LOADER,

DIAGNOSTIC CONTROL MODULE, PANEL LINE TEST, and

INITIAL TEST

DATE: 3/7/80

PREFACE

This manual contains information pertaining to the Internal Functional Test Loader, T3705A, the Diagnostic Control Module (DCM), X3705ACA, the Internal Functional Tests (IFTs), X3705ABA-X3705JBA, and the Initial Test, X3705ADA.

The material in this manual was previously released in D99-3705A which has been replaced by:

IBM Maintenance Diagnostic Program Channel Adapter and Wrap All Lines On-line test, D99-3705C.

IBM Maintenance Diagnostic Program Internal Functional Test Loader, Diagnostic Control Module, Panel Line Test, and Initial Tests, D99-3705D

IBM Maintenance Diagnostic Program Internal Functional Tests Symptom Indexes, D99-3705E.

Chapter 1 contains information about the IFT Loader T3705A. Chapter 2 describes the Diagnostic Control Module X3705ACA and provides operational instructions. Chapter 3 provides information about the Internal Functional Tests describing their use and operation with the DCM. This chapter also explains how to use the Symptom Indexes contained in D99-3705E. Chapter 4 provides a general description of the Initial Tests and instructions for loading and operating the test programs. Also included is a discussion of how to use the Initial Test Symptom Index contained in Appendix C.

Operating instructions and examples of using the panel line test is included in Chapeter 5. The panel line test is a stand-alone version of the NCP-4 line test function.

Appendix A contains the Configuration Data Set (CDS) required by the IFT Loader, DCM, and IFT. Appendix B contains a listing of stops originating from the DCM and includes a discussion of the action required at each stop.

The initial test symptom index has been incorporated into this

manual in Appendix C.

The Manual Routine Indexes previously found at the beginning of the Symptom Indexes with manual intervention routines have been combined and incorporated into Appendix D.

Companion manuals that should be referred to are:

IBM Maintenance Diagnostic Programs IFT Symptom Index, D99-3705E.

IBM 3705 Communications Controller Theory Maintenance Manual, SY27-0107.

Prerequisite manuals that should be referred to are:

DOS OLTEP SRL, GC24-5086.

IBM System/360 Operating System On-Line Test Executive Program, GC28-6650.

OLTSEP Operators Guide, D99-SEPDT.

Guide to Using the IBM 3705 Communications Contoller Control Panel, GA27-3087.

SUMMARY OF AMMENDMENTS FOR D99-3705D-01

Miscellaneous changes were made in several places in the manual. Chapter 5 was changed to add paragraph 5.6 Panel Line Test Error Stops which was left out of the first edition.

Appendix D was changed to include a type 2 communication scanner routine X6F2 which was added to the type 2 communication scanner in Release 9.0.

SUMMARY OF AMMENDMENTS FOR D99-3705D-02

This version of the manual was released via DCL. Changes for this version were made in Appendix A and were indicated by change bars to the left of changed text.

SUMMARY OF AMMENDMENTS FOR D99-3705D-03

Changes are incoporated in the panel line test procedures in Chapter 5.

Appendix A has been changed to reflect Configuration Data Set changes required for several RPQs.

SUMMARY OF AMMENDMENTS FOR D99-3705D-05

This edition incorporates DCL-3705D-04.

The information and error messages issued by the IFT Loader in Chapter 1 have been modified to improve clarity.

Several changes were made to Configuration Data Set description in Appendix A for the new models J,K,L of the 3705 and the addition of several RPQ's.

The Initial Test Symptom Index in Appendix C has been changed to reflect 20 bit data flow.

Appendix E has been added and it contains examples of IFT runs.

SUMMARY OF AMMENDMENTS FOR D99-3705D-06

This edition provides an updated Configuration Data Set Description.

In addition, the page numbers listed in the Manual Intervention Routine Index have been corrected so that they agree with the page numbers in the D99-3705E document.

This intentionally left blank.

CONTENTS

This intentionally left blank.

1.0 IFT LOADER

1.1 T3705A IFT LOADER

The IFT Loader (T3705A) executes in the host CPU under control of the on-line test executive (OLTEP/OLTSEP) and controls loading diagnostic programs into 3705 main storage. T3705A in the host and ROS code in the 3705 cause the first module X3705AAA (type 1 or type 4 Channel Adapter) or X3705ABA (type 2 or type 3 Channel Adapter) to be loaded beginning at storage location X'00400'. Control of the 3705 is passed to the module and either the Initial Test or the Diagnostic Control Module loads into the 3705 depending upon the request made to OLTEP/OLTSEP in the options field. ("ext=nynn" causes the Initial Test to load and "ext=nnnn" causes the DCM to load.)

The IFT Loader has a built-in error loop. The program is assembled with a retry count of 10. This count can be modified, using the EL (N) option available through OLTEP or OLTSEP. If, during the retry, the operation is successful, the IFT Loader continues to load the IFT. If the retry count is exhausted, the loading of the IFT is aborted.

1.1.1 T3705A IFT LOADER REQUIREMENTS

When the IFT Loader is under control of DOS/OLTEP, the timer must be assigned to the partition in which OLTEP is executing.

The type 1 or type 4 Channel Adapter Loader X3705AAA and the type 2 or type 3 Channel Adapter Loader X3705ABA attempt to disable the 3705 interface with a diagnostic DISABLE command each time the Initial Test, the DCM, or an IFT is loaded. The 'clock out' line must drop before the 3705 can go off-line. This line drops when the host CPU STOP push button is pressed or when the CPU enters the wait state.

The IFT Loader depends upon 'clock out' dropping so the 3705 can go off-line automatically. An operating situation under OS or DOS could result in maximum use of the CPU. This situation delays the wait state and inhibits the running of the IFTs until the 3705 goes off-line. During this time, the OLT prints a message indicating that it is waiting for the 3705 to disable its channel interface. At the same time, the 3705 loaders display an equivalent code in the display lights. Refer to "Description of the Panel Displays at the 3705 During Load".

1.1.2 T3705A IFT LOADER USE PROCEDURES AND OPERATOR INSTRUCTIONS

Error printouts occur when the IFT Loader detects an error. The print out contains all pertinent information about the error that can be obtained by the IFT Loader. Bypass Printing Channel Errors option inhibits the error printout. Refer to the DOS OLTEP SRL, GC24-5086, the IBM System/360 Operating System On-line Test Executive Program, GC28-6650, or the OLTSEP Operator's Guide, D99-SEPDT for a description of the error printouts.

Various operator-type messages can appear during operation of the IFT loader. The messages provide operator guidance in getting diagnostic programs into 3705 main storage.

- THE STATUS OF THE 3705 CANNOT BE DETERMINED. **WARNING** CONTINUATION WILL CAUSE THE ENTIRE 3705 TO BECOME UNAVAILABLE. ENTER 'C' TO CANCEL OR 'P' TO PROCEED.

The OLT cannot determine the status (offline or stopline) of the 3705. If the OLT is allowed to continue, the OLT destroys the program in 3705 storage. The CE has the responsibility for continuing by responding with a "C" or "P", as follows:

```
r id, 'C' (for Cancel)
     or
r id, 'P' (for Proceed)
```

Any other response results in the program repeating the last line of the above message. If, after five responses, the program has not received either a C or P, it prints:

INVALID RESPONSE AFTER 5 REQUESTS.

The program assumes the response of 'C' and terminates the OLT.

ALL 3705 ADDRESSES ARE NOT STOPPED OR OFFLINE. **WARNING** CONTINUATION WILL CAUSE THE ENTIRE 3705 TO BECOME UNAVAILABLE. ENTER 'C' TO CANCEL, 'P' TO PROCEED, OR 'R' TO RETRY.

The OLT has been notified by the executive that all 3705 addresses are not offline or stopped. If the OLT is allowed to continue, it destroys the contents and operational characteristics of the 3705. The CE is given the opportunity to make all addresses available to the OLT using standard system facilities. He also has the responsibility

for continuing by responding with a 'C', 'P', or 'R', as follows:

```
r id, 'C' (for Cancel)
      or
r id,'P'  (for Proceed)
      or
r id,'R'  (for Retry)
```

The difference between a 'P' and 'R' response is (1) P means PROCEED, regardless of the offline or online status of the 3705 address and (2) R means that the operator has been taking the addresses offline and wants the program to verify that all units are now available to the OLT.

Any other response results in the program repeating the last line of the above message. If, after five responses, the program has not received either a C, P, or R, it will print:

INVALID RESPONSE AFTER 5 REQUESTS

The program assumes the response of 'C' and terminates the OLT.

| BAD RC YY FROM XXXXXXX

The IFT Loader has requested a function of the executive driver, and the driver is incapable of performing the request. This may be because of an invalid parameter list or an error that occurred while the executive driver was performing the request. XXXXXXX is the name of the function being requested, and YY is the code returned by the executive program. The XXXXXXX field is filled by the IFT Loader to give the name of the requested function. This message is a diagnostic programming aid. If it occurs, a dump and other available information should be submitted with an APAR (Authorized Program Analysis Report).

Following messages are available on hard copy to describe failures and the operation that was attempted when a failure occurs:

| BAD CC SIO

| FAILED TO INTRPT

| BAD STATUS ON SIO

| NOP CMD FOR 3705 LOAD BUTTON

| RD CMD FOR IFT REQ

| WRT CMD TO WRITE DATA

| WRT CMD FOR LAST BLOCK

| WRT IPL CMD SENDING LOADER

| WRT CMD SENDING CONTROL WORD

If the DCM has already been loaded, the program indicates that the CE can make a request at the 3705. If the DCM has not been loaded, the program starts over by requesting the CE to press the LOAD push button on the 3705.

| PRESS LOAD ON 3705

This message occurs when the IFT Loader is initially started or in the event of loss of control. It constitutes the beginning of the IFT Loader and provides the synchronization between the 3705 and the host CPU.

The CE is allowed approximately 30 seconds to press the LOAD push button at the 3705. This message repeats every 30 seconds until the LOAD push button is pressed.

AWAITING 3705 INTERFACE DISABLE

The IFT Loader has transferred an IFT to the 3705 and is waiting for the 3705 to go off-line. This message repeats every 20 seconds until the 3705 channel interface is disabled and the 3705 begins executing the IFT.

If this message occurs continuously and the IFT'S are not executing, the 3705 is either unable to go off-line after the IFT'S have been loaded, or unable to get back on-line after the IFT'S have completed execution. A CPU-bound system can cause this problem.

Pressing the STOP and then the START push buttons on the CPU console drops the 'clock out' line long enough for the 3705 to go off-line. Entering the wait state accomplishes this also.

ENTER IFT REQUEST AT 3705

The IFT Loader has loaded the DCM in the 3705, and the DCM should now be ready for an IFT request.

| 3705 LOADED WITH IFT X3705@@@

This message appears when an IFT module has been successfully transferred to the 3705 without any errors being detected.

X3705@@@ is the ID of the IFT module that was loaded. Refer to "Data Set Name and IFT Function Chart", in this section, for module IDs assigned to the IFTs.

| ERP USED ON MOD X3705@@@

Each output operation to the 3705 is attempted up to ten times (unless modified by option EL (N)), if an error occurs. If the operation being attempted is performed before the count is exhausted, the OLT considers the data transfer successful and continues loading the IFT. This message warns the CE that errors occurred while loading the IFT.

| X3705@@@ IN ERROR,ABORT LOAD

This message occurs when the retry count (normally 10) is exhausted and the error is still occurring. The IFT loader assumes loss of control and restarts at the beginning. Refer to the printout "ERP USED ON MOD X3705@@@".

WAITING FOR IFT COMPLETION

This message occurs every 20 seconds after an IFT has been loaded in the 3705. Most of the IFTs disable the 3705. The IFT Loader is in a loop issuing a NOP command to the 3705. If it receives condition code (CC)=03, 3705 interface not enabled, it prints this message and waits another 20 seconds. When the IFT enables the 3705, the IFT Loader continues running.

| INVALID PLINK MOD

The IFT Loader has detected an error in the requested module - an address in the module was on an odd boundary. The IFT Loader returns to the read command to allow the CE to enter another request at the

3705.

MOD X3705@@@ NOT IN OLTLIB

The IFT Loader has received an IFT request through a Read command, but the characters received do not request a module contained in OLTLIB. The IFT Loader returns to the read command to allow the CE to enter another request at the 3705.

Refer to "Requesting IFTs", in this section, for information on entering the IFT request at the 3705.

If the request is valid, the IFT module name X3705@@@ must be added to the OLTEP/OLTSEP Library before the IFT can be loaded.

1.1.2.1 DESCRIPTION OF CONTROL PANEL DISPLAY DURING LOAD

Display A shows the number of valid channel commands (Read, Write, IPL, Write, Break, or Sense) that occurred during the loading of a module. This count is dynamically updated each time a Device End (DE) is presented to end a good channel transfer. Display B shows various errors or run indications, as follows:

1.1.2.1.1 X3705AAA Type 1 or type 4 Channel Adapter Load Module Control Panel Displays

Display B	Definition
00FE	Awaiting type 1 or type 4 channel interface disable
00FF	Awaiting type 1 or type 4 channel interface enable
FF00	Awaiting type 1 or type 4 channel level 3 interrupt.
0000	All other times

A hard stop at location TAR=06D6 indicates that the wrong loader is being used for the channel; register X'79' bit 1.6 must be on if a type 1 or type 4 channel adapter is in the first frame position. (A CDS error could also cause this stop.) A hard stop at location

TAR=0668 indicates an error detected during loader operation.

1.1.2.1.2 X3705ABA Type 2 or type 3 Channel Adapter Load Module Control Panel Displays

Display B Definition

00FE Awaiting type 2 or type 3 CA interface disable

00FF Awaiting type 2 or type 3 CA interface enable

a. Normal "awaiting channel adapter level 3 interrupt" indications.

Display B Definition

FF01 Awaiting the level 3 request on entry from ROS. The DE ending the IPL command is presented when this level 3 is presented.

FF04 Read command ended properly. Awaiting level 3 interrupt for the CW Write (Control Word Write) command.

FF05 CW Write command ended properly. Awaiting level 3 interrupt for the data Write command.

FF06 Data Write command ended properly. Awaiting level 3 interrupt for the next CW Write or a Write Break command.

b. Abnormal "awaiting channel adapter level 3 interrupt" indications occur if the Bypass Hard Stop option is selected in the test request and an error is detected by the 3705 type 2 or type 3 channel adapter loader code. A two-phase recovery is attempted in this situation. The error is reset and a program level 3 interrupt is requested to re-setup the INCWAR and OUTCWAR. The program code re-enters the level 3 wait loop to await the next command.

In the following list, X is byte 1 bits 0-3 of display B.

X = 3 for the "awaiting program requested level 3 interrupt"

phase just described.

X = 1 for the "awaiting level 3 interrupt" for the next command after an error was detected.

Display B Definition

FFX1 Awaiting the next level 3 interrupt, after detecting a level 3 interrupt from the wrong channel adapter.

FFX2 Awaiting the next level 3 interrupt, after detecting a level 1 CCU request.

FFX3 Awaiting the next level 3 interrupt after detecting a type 2 CA level 1 request.

FFX4 Awaiting the next level 3 interrupt, after being unable to set the 'INCWAR valid' latch.

FFX5 Awaiting the next level 3 interrupt, after being unable to set the 'OUTCWAR valid' latch.

FFX6 Awaiting the next level 3 interrupt, after detecting and resetting the 'selective/system reset' latch.

FFX7 Awaiting the next level 3 interrupt, after detecting an invalid CSBAR value at the end of a data transfer.

FFX8 Awaiting the next level 3 interrupt, after detecting an invalid count (non-zero) in the CA count register, at the end of a data transfer.

c. Error stop indications occur if the Bypass Hard Stop option is not selected in the test request and an error is detected by the 3705 type 2 or type 3 Channel Adapter code.

Display B Definition

001Z These display codes are defined in the same way as the error conditions under "Abnormal awaiting channel adapter level 3 interrupt indications", preceding. A hard stop occurs prior to entering the level 3 wait loop. Z corresponds to byte 1, bits 4-7, of display B, as defined in "Abnormal awaiting channel adapter level 3 interrupt

indications", preceding.

A hard stop at the location where TAR contains X'06D6' indicates that the wrong loader is being used for the channel; register X'79' bit 1.6 must be a zero if the type 2 or type 3 channel adapter is in the first frame position. A CDS error could also cause this stop.

This intentionally left blank.

2.0 DIAGNOSTIC CONTROL MODULE X3705ACA

2.1 X3705ACA DIAGNOSTIC CONTROL MODULE DESCRIPTION AND PURPOSE

The diagnostic control module (DCM) provides functions for requesting, loading, and controlling the internal functional tests (IFTs), for interfacing the IFTs with the control panel, and for displaying error information and setting up scoping loops. The functions provided are:

- Routine selection
- Manual intervention routines
- Abort control
- Control panel interface
- Routine execution
- Error control information
- Scope synchronization

2.1.0.1 ROUTINE SELECTION

The routine selection facility allows selection of:

- One routine of one IFT - for a single adapter or for all adapters tested by this IFT.
- All the routines of one IFT - for a single adapter or for all adapters tested by this IFT.
- All the routines of all IFTs for all adapters.
- Bypassing or including manual intervention routines in the request. The CE sense switch, "include manual intervention routines", controls this option.
- Bypassing or including problem definition routines in the request. The CE sense switch, "problem definition mode", controls this option.

- Repeating a routine X times before the next routine is executed. If this option is not selected, the routines are executed sequentially. The range of X is from 1 to 256 and X can be displayed and set from the panel. The preset value of X is 128. The CE sense switch, "Repeat Each Routine X Times", controls this option.

- Continuously cycling the entire request, whether for one routine or for all routines. The CE sense switch, "cycle on request", controls this option.

- Stopping before the execution of each routine. This allows the operator time to prepare for the execution of the routine; for example, time to set up an address compare stop for a location within the routine. Panel utilities can also be used at this time. The CE sense switch, "halt before execution", controls this option.

2.1.0.2 MANUAL INTERVENTION ROUTINES

Manual intervention routines can be bypassed or included in the request via sense switch, "include manual intervention routines".

Manual intervention stops are indicated by a display code (display B contains X'FXXX') that refers to the symptom index. Display B, byte 0, bits 0-3 is X'F' for all manual intervention stops.

Data can be entered by the STORAGE ADDRESS/REGISTER DATA switches on the control panel and the routine continues after the stop.

2.1.0.3 ABORT CONTROL

The abort control facility allows abortion of one routine of a request or of an entire request.

The abort function causes the DCM to abort the current routine or the entire current request. To abort a request or routine:

1. Set the DISPLAY/FUNCTION SELECT switch to FUNCTION 6 (Abort position).

2. Set STORAGE ADDRESS/REGISTER DATA switches B, C, D, and E according to the following:

   Routine Abort - Any one of the switches to a value other than 'F'.

   Request Abort - All of the switches to 'F'.

3. Press the INTERRUPT push button if the program has not stopped. Press the START push button if the HARD STOP light is on.

4. The PROGRAM DISPLAY light must be on, if not, see "Determining Why PROGRAM DISPLAY Is Not On". Request abort should set X'80F2' in display B and should set the next routine number in display A. Request Abort must be used to abort the routine permanently.

2.1.0.4 CONTROL PANEL INTERFACE

The DCM uses the control panel to display all the codes listed in the symptom indexes of the IFT. All references to displays A and B are for bytes 0 and 1 only, unless byte X is specified in the stop or error code. The DCM can display:

Adapter, IFT, and routine number
IFT routine error codes
IFT routine manual intervention codes
DCM operator guidance codes
DCM error codes
Panel utility displays

The DCM allows the input of manual intervention data and selection of panel utilities (such as set/reset/display CE sense switches) by the control panel.

The adapter, IFT, and routine are displayed in display A when the IFT is executing and when an error stop occurs. The display is formatted with the first Hex digit in byte 0 being the adapter, the second Hex digit is the IFT, and byte 1 is the routine number.

When an IFT is stopped for an error , display B contains the error code formatted with the first Hex digit in byte 0 being zero, the second Hex digit is a loop count, and byte 1 is the error code. If the first Hex digit in display B byte 0 is X'F', a manual intervention routine stop occurred and the program is awaiting a response.

DCM operator codes are identified by either display A being X'0000' or X'FFFF'. The first Hex digit in display B is X'8' for either DCM operator guidance or DCM error codes. However, DCM error codes have the adapter, IFT, and routine number displayed in display A.

Panel utility displays are variable depending upon the control panel switch settings.

2.1.0.5 ROUTINE EXECUTION

The routines are executed sequentially, by section. For example, if IFT 6 has two sections and tests two adapters, the sequence is:

Adapter 1, IFT 6, Section 1

Adapter 2, IFT 6, Section 1

Adapter 1, IFT 6, Section 2

Adapter 2, IFT 6, Section 2

The DCM displays the following information at the beginning of each routine (byte X is 0):

Display A
- Byte 0
  - Bits 0-3 = Number of adapter being tested
  - Bits 4-7 = Number of active IFT
- Byte 1
  - Bits 0-7 = Number of active routine

Display B
- Byte 0
  - Bits 0-4 = 0
  - Bits 5-7 = Low order three bits of the error counter
- Byte 1 = 0

At the completion of a request, the displays indicate that the

request was either aborted, completed with no errors detected, or completed with errors detected.

2.1.0.6 ERROR CONTROL INFORMATION

The DCM stops and displays error codes for detected failures. The error codes are listed in a symptom index in APPENDIX B. Other error information may be available in registers or storage locations as listed in the description of the error code in the symptom index.

The DCM allows a bypass of the error stop when a failure is detected via the "bypass error stop" CE sense switch. The error code is displayed even if the stop is bypassed.

The DCM allows selection of a desired failure to loop on. Two loop options are available. The Loop on First Error option causes the smallest possible loop internal to the routine. The Restart Routine on First Error option restarts the current routine. The scoping loop continues, whether the failure occurs again or not. The CE sense switches, "loop on first error" and "restart routine on first error", control these options. The DCM stops and displays error codes for any new failure while it is a scoping loop.

The DCM allows a bypass of the error stop when a new failure is detected while the DCM is in a scoping loop. The error codes for the new error is not displayed so that it will not interfere with the original error code display. The CE Sense switch, "bypass new error stops", controls this option.

Failures detected in a pretest routine block automatically cause looping in the pretest block. This prevents execution of the routine without the proper setup; therefore, the scope picture for the test function of the routine is traced only when the setup is proper.

The DCM increments an error counter when a failure is detected. The counter range is from 0 to 127, with an overflow indicator. The low-order three bits of this counter are shown in the error count display in display B. The counter is reset to zero for each new request.

2.1.0.7 SCOPE SYNCHRONIZATION

The DCM controls scope sync pulses on two test pins. Scope sync point 1 (01A-B3M2P10) is used to sync on the beginning of each routine or on

the hardware setup block when the DCM is in a scoping loop. Scope sync point 2 (01A-B3M2P13) is used to sync on the test function of a test routine.

Test pins 1 and 2 may be used together to count repetitions of the test function. Test pin 1 is used to trigger the scope, and the delayed sweep is used to count the number of pulses (each pulse represents one repetition) on test pin 2.

See "Setting Up a Scoping Loop" in this section for information on establishing a scoping loop for a failure.

The STORAGE ADDRESS/REGISTER DATA switches on the control panel can also be used to establish a sync reference on a test pin (01A-B3P2S09), at any location in any IFT routine or in the DCM. A sync pulse is caused when the address for fetch or store (controlled by the LOAD/STORE ADDRESS COMPARE switch) is the same as the address in the STORAGE ADDRESS/REGISTER DATA switches.

2.1.0.8 CONTINUING FROM AN ERROR STOP OR MANUAL INTERVENTION STOP

The continue function causes the test routine to proceed from the point of the stop. It may also allow for data input to the test routine. The displays must indicate either a DCM stop code, an error stop code, or a manual intervention stop code to use this function.

1. Set the DISPLAY/FUNCTION SELECT switch to FUNCTION 5.

2. If the code in the displays is for manual intervention (display B byte 0=X'F0'), set the STORAGE ADDRESS/REGISTER DATA switches as specified in the symptom index for the IFT being run.

3. Press the START push button.

4. The PROGRAM DISPLAY light must be on. If it is not, see "Determining Why PROGRAM DISPLAY Light Is Not On".

5. Display B is set to zeros; however, it may not display the zeros long enough for them to be visible.

2.2.1 PANEL UTILITIES

The panel utilities provide the CE with the ability to perform DCM utility functions. The DCM utilities such as setting or resetting CE

switches, displaying storage, and displaying registers.

The panel utilities can be used only when the DCM is executing in 3705 storage. The DCM overrides panel utility displays if the executing routine requires a display. Displays are required for Manual Intervention routines and error stops that are not bypassed.

2.2.1.1 REFRESH LAST DCM DISPLAY CODE

This utility function restores in displays A and B the last code displayed by the DCM (excluding displays made by panel utilities). If another panel utility is active, this function cannot be set up. See "Stop Panel Utility".

1. Set the DISPLAY/FUNCTION SELECT switch to FUNCTION 1.

2. Set the STORAGE ADDRESS/REGISTER DATA switch B to '0'.

3. Press the INTERRUPT push button if the program is running. Press START push button if the HARD STOP light is on.

4. If the START push button was pressed after a hard stop display, the PROGRAM DISPLAY and HARD STOP lights must be on. (If they are not see "Determining Why PROGRAM DISPLAY Light Is Not On".)

5. Displays A and B contain the codes last displayed by the DCM.

2.2.1.2 CONTINUOUS DISPLAY WITHOUT TEST

This utility function continuously displays the contents of a specified storage location or register address. The display occurs at each timer interrupt (about 10 times per second) and the data displayed is not tested for any required conditions. The display is bypassed if the DCM is stopped for an error stop, manual intervention stop, or DCM code, or if the DISPLAY/FUNCTION SELECT switch is not in FUNCTION 1, 2, or 3. If another panel utility is active, this function cannot be set up. (See "Stop Panel Utility".)

1. Set the DISPLAY/FUNCTION SELECT switch to FUNCTION 1.

2. Set the STORAGE ADDRESS/REGISTER DATA switch B to "2".

3. Press the INTERRUPT push button if the program is running. Press the START push button if the HARD STOP light is on.

4. If the START push button was pressed after a hard stop display, the PROGRAM DISPLAY and HARD STOP lights must be on. (Otherwise, see "Determining Why PROGRAM DISPLAY Light Is Not On".)

5. Display A should be X'0000' and display B should be X'8066'. See the symptom index for other values.

6. Select the type of display:

Type of Display	DISPLAY/FUNCTION SELECT Switch
Storage	STORAGE ADDRESS Position
Register	REGISTER ADDRESS Position

7. Select the address to display:

Type of Display	STORAGE ADDRESS/REGISTER DATA Switches
Storage	Address in switches A, B, C, D, E
Register	Address in switches B and D

8. Press the START push button if the HARD STOP light is on. Press the INTERRUPT push button if the program is running.

9. If the START push button was pressed after a hard stop display, the PROGRAM DISPLAY and HARD STOP lights must be on". If they are not, see "Determining Why PROGRAM DISPLAY Light Is Not On.

10. Display A should be X'0000' and Display B should be X'8068' to indicate that the setup is complete. See the symptom indexes in D99-3705E for other values.

11. If the HARD STOP light is on, set the DISPLAY/FUNCTION SELECT switch to 5 and press the START push button to continue. Otherwise, do as requested in the original stop code.

12. Set the DISPLAY/FUNCTION SELECT switch to FUNCTION 1, 2, or 3, for the display to be made during each timer interrupt.

13. The utility is active until stopped. (See "Stop Panel Utility.)

2.2.1.3 CONTINUOUS DISPLAY WITH TEST

This utility function continuously displays the contents of a specified storage location or register address. The display appears during each timer interrupt.

The data displayed is tested with a mask and an expected bit pattern (a single bit or a number of bits of the data may be tested). If the data is not equal to the expected data, the DCM causes a hard stop. The mask is ANDed with the data. The expected data is EXCLUSIVE ORed with the result of the AND. If the result is not zero, a hard stop occurs. Turn the DISPLAY/FUNCTION SELECT switch to FUNCTION 5 and press the START push button to continue.

This display is bypassed if the DCM is stopped for either an error stop, a manual intervention stop, a DCM code, or if the DISPLAY/FUNCTION SELECT switch is not set to FUNCTION 1, 2, or 3.

Although the display function may be bypassed because of the DISPLAY/FUNCTION SELECT switch position or a stop code display, the test data function is performed as long as the utility is active.

This utility cannot be set up if another panel utility is active. See "Stop Panel Utility".

1. Set the display/FUNCTION SELECT switch to FUNCTION 1.

2. Set the STORAGE ADDRESS/REGISTER DATA switch B to 3.

3. Press the INTERRUPT push button if the program is running. Press the START push button if the HARD STOP light is on.

4. If the START push button was pressed after a hard stop display, the PROGRAM DISPLAY and HARD STOP lights must be on. (If they are not, see "Determining Why PROGRAM DISPLAY Light Is Not On".)

5. Display A should be X'0000' and display B should be X'8064'. See the symptom index for other values.

6. Enter the mask to be used to test the data in the STORAGE ADDRESS/REGISTER DATA switches.

7. Press the START push button if the HARD STOP light is on. Press the INTERRUPT push button if the program is running.

8. If the START push button was pressed after a hard stop display, the PROGRAM DISPLAY and HARD STOP lights must be on. Display A should be X'0000' and display B should be '8065'.

9. Enter the expected data in the STORAGE ADDRESS/REGISTER DATA switches.

10. Press the START push button if the HARD STOP light is on. Press the INTERRUPT push button if the program is running.

11. If the START push button was pressed after a hard stop display, the PROGRAM DISPLAY and HARD STOP lights must be on and display A should be X'0000' and display B should be X'8066'.

12. If the HARD STOP light is on, set the DISPLAY/FUNCTION SELECT switch to 5 and press the START push button to continue or to do what was requested by the original stop code.

13. The DISPLAY/FUNCTION SELECT switch must be set to FUNCTION 1, 2, or 3 to make the display during each timer interrupt.

14. The utility is active until stopped. (See "Stop Panel Utility".)

Example:

Set the switches as follows to display the contents of storage location X'1888' at every timer interrupt, and to hard stop if bit 0.0 is a 1:

Display B Code	Function	STORAGE ADDRESS/REGISTER DATA Switches A B C D E
8064	Enter mask	0 8 0 0 0
8065	Enter expected data	0 0 0 0 0
8066	Enter storage or register address	0 1 8 8 8 with DISPLAY/FUNCTION SELECT in STORAGE ADDRESS position

2.2.1.4 ADDRESS COMPARE DISPLAY WITHOUT TEST

This utility function displays the contents of a specified storage location or register address. The display appears when the address compare interrupt occurs. The data displayed is not tested for any required conditions. (See "LOAD/STORE Address Compare Switch" in the IBM 3705 Communications Controller Theory Maintenance Manual, SY27-0107).

The display is bypassed if the DCM is stopped for an error stop, manual intervention stop, DCM code, or if the DISPLAY/FUNCTION SELECT switch is not in FUNCTION 1, 2, or 3.

If another panel utility is active, this function cannot be set up. (See "Stop Panel Utility".)

1. Set the DISPLAY/FUNCTION SELECT switch to FUNCTION 1.

2. Set the STORAGE ADDRESS/REGISTER DATA switch B to 4.

3 - 12. Same as steps 3 - 12 of "Continuous Display Without Test".

13. Set up for either a load or a store address compare operation. Set the STORAGE ADDRESS/REGISTER DATA switches to the storage address where the compare is to be made. Set the MODE SELECT switch to ADDRESS COMPARE INTERRUPT. The display can be stopped and started with the MODE SELECT switch.

2.2.1.5 ADDRESS COMPARE DISPLAY WITH TEST

This utility function displays the contents of a specified storage location or register address. The display appears when the address compare interrupt occurs.

The data that is displayed is tested with a "mask and expected bit" pattern (a single bit or a number of bits of data may be tested). If the data is not equal to the expected data, the DCM makes a hard stop. Turn the DISPLAY/FUNCTION SELECT switch to FUNCTION 5 and press the START push button to continue.

The display is bypassed if the DCM is stopped for either an error stop, manual intervention stop, a DCM code, or if the DISPLAY/FUNCTION SELECT switch is not set to FUNCTION 1, 2, or 3.

If another panel utility function is active, this function cannot be set up. (see "Stop Panel Utility".)

1. Set the DISPLAY/FUNCTION SELECT switch to FUNCTION 1 (utility position).

2. Set the STORAGE ADDRESS/REGISTER DATA switch B to 5.

3 - 18. Same as steps 3 - 18 of "Continuous Display Without Test" previously defined.

19. Set up either a load or store address compare operation. Set the STORAGE ADDRESS/REGISTER DATA switches to the storage address where the compare is to be made. Set the MODE SELECT switch to ADDRESS COMPARE INTERRUPT. The display can be stopped and started with the MODE SELECT switch.

Example:

To display the contents of register X'15' after the instruction at location X'1924' has been executed and to make a hard stop if bits 1.1 and 1.2 of register X'15' are zero:

Display B Code	Function	STORAGE ADDRESS/REGISTER DATA Switches A B C D E
8064	Enter mask	0 0 0 6 0
8065	Enter expected data	0 0 0 6 0
8066	Enter storage or register address	0 1 0 5 0 with DISPLAY/FUNCTION SELECT in REGISTER ADDRESS position

Set up either a load or a store address compare interrupt. Set the STORAGE ADDRESS/REGISTER DATA switches to X'01924' and set the MODE SELECT switch to ADDRESS COMPARE INTERRUPT.

CAUTION on using THE ADDRESS COMPARE INTERRUPT

If the address compare interrupt is used, either in the 3705 DCM utilities or while running the 3705 Initial Test IFTs, unexpected errors may occur. Some of the tests cause intentional parity errors

and CCU checks by means of an Output X'78' which affects the next instruction cycle. Some of the tests are time dependent and the extra time needed to handle the address compare interrupt causes errors. The level 1 interrupt that occurs for the address interrupt may be reported as an error by some tests and may not cause errors in other tests depending upon when the address compare interrupt occurs.

2.2.1.6 SET OR DISPLAY REPEAT COUNT

This utility function displays or changes the repeat count. The repeat count determines the number of times each routine is executed before proceeding to the next routine, when the CE sense switch "repeat each routine X times" is set. The allowed range of the repeat count (X) is from 0 to 255 (0 is treated as 256).

If another panel utility function is active, this function cannot be set up. (See "Stop Panel Utility".)

1. Set the DISPLAY/FUNCTION SELECT switch to FUNCTION 1.

2. Set the STORAGE ADDRESS/REGISTER DATA switches to the following positions (dash indicates that that switch may be set to any position):

	ADDRESS/DATA Switch A B C D E
Set Count	- 6 - H H
Display Count	- 7 - - -

Where HH is the desired value of the repeat count in Hex.

3. Press the INTERRUPT push button on the control panel if the program is running. Press the START push button if the HARD STOP light is on.

4. If the START push button was pressed after a hard stop, the PROGRAM DISPLAY and HARD STOP lights must be on. (If they are not, see "Determining Why PROGRAM DISPLAY Light Is Not On".)

5. Display A should be X'0000' and display B should be X'60HH' or X'70HH', where HH is the value of the repeat count. See the symptom index for other values. If the HARD STOP light is on, set the DISPLAY/FUNCTION SELECT switch to 5 and press the START

push button to continue.

2.2.1.7 SET, RESET, DISPLAY CE SENSE SWITCHES

CE sense switches to control execution of the IFTs may be set and reset with the ADDRESS/DATA switches by using this panel utility, or upon reaching part 2 of the IFT request. See step 6 in "Requesting and Terminating IFTS".

2.2.1.7.1 Bypass New Error Stops Sense Switch

This switch causes the DCM to bypass new error stops while looping on a selected error code. If this switch is not set, the DCM stops for new errors detected during the loop.

2.2.1.7.2 Wait Before Continuing Sense Switch

This switch causes the DCM to wait after the INTERRUPT or START push buttons are pressed (with display B containing X'806F'). The wait allows the operator to alter the STORAGE ADDRESS/REGISTER DATA switches for address compare or other uses. The DCM continues from the wait when the DISPLAY/FUNCTION SELECT switch is changed to FUNCTION 5 and the START push button is pressed.

2.2.1.7.3 Problem Definition Mode Sense Switch

This switch causes a manual intervention code to be displayed in display B. The user must look in the appropriate IFT symptom index to determine the correct setup procedure. This mode gives the operator control over running lengthy CCU Storage Protect IFT routines.

2.2.1.7.4 Restart Routine on First Error Sense Switch

This switch causes the DCM to restart the current routine when the first error is detected. Once this sense switch is set, the DCM restarts the routine at the point of the first error detected even though the error may not occur on subsequent restarts. This switch may be set when the routine is stopped to display an error code and must be reset to exit the routine.

2.2.1.7.5 Loop on First Error Sense Switch

This switch causes the DCM to loop the routine on the first error detected. The loop taken by this option is the smallest possible loop within the rountine. Once this sense switch is set, the DCM loops the routine at the point of the first error detected even though the error is not detected on subsequent loops. This switch may be set when the routine is stopped to display and error code and must be reset to exit the routine.

2.2.1.7.6 Bypass Error Stop Sense Switch

This switch causes the DCM not to stop for error displays unless it is a new error display. This must be set with the restart routine on first error and the loop on first error to cause continuous looping. If this switch is not set with the restart and loop switches, the DCM stops with the error displayed each time the error is detected. For intermittent problems, this switch can be used to determine the relative time between failures.

2.2.1.6.7 Cycle on Request Sense Switch

This switch causes the DCM to repeat the requested IFT routine or group of routines until the switch is reset.

2.2.1.7.8 Include Manual Intervention Routines Sense Switch:

This switch causes the manual intervention routines to be included in the requested IFT.

2.2.1.7.9 Repeat each routine Sense Switch

This switch causes the DCM to repeat each routine the number of times specified by a repeat count. The requested routine repeats 128 times unless the repeat count is changed by the user. See "Set or Display Repeat Count" to change the repeat count.

2.2.1.7.10 Halt before execution Sense Switch

This switch causes the DCM to halt before executing each test routine.

2.2.1.8 SETTING CE SENSE SWITCHES

Any of the switches may be set or reset separately. The switches can be displayed, one byte at a time.

If another panel utility function is active, this function cannot be set up. (See "Stop Panel Utility".)

1. Set the DISPLAY/FUNCTION SELECT switch to FUNCTION 1.

2. Set the STORAGE ADDRESS/REGISTER DATA switches to the following positions (dash indicates that that switch may be set to any position):

	ADDRESS/DATA Switches A B C D E
Set switches in byte S	- 9 S M M
Reset switches in byte S	- A S M M

where: S = 0 or 1 for the desired byte
MM = the bit position of the switches to be set or reset.
If MM = 00, the selected byte of the switches will be displayed, but not changed.
X = set to 0 when multiple CE sense switches are not desired.

Byte 0	MM
Bypass New Error Stops	X1
Wait before continuing.	8X

Byte1

Problem Definition Mode	X1
Restart Routine on First Error	X2
Loop on First Error	X4
Bypass Error Stop	X8
Cycle on Request	1X
Include Manual Intervention Routines	2X
Repeat Each Routine N Times	4X
Halt Before Execution	8X

Combine the above for the value of MM.

3. Press the INTERRUPT push button if the program is running. Press the START push button if the HARD STOP light is on.

4. If the START push button was pressed after a hard stop display, the PROGRAM DISPLAY and HARD STOP lights must be on. (If they are not, see "Determining Why PROGRAM DISPLAY Light Is Not On".)

5. Display A should be X'0000' and display B should be '9SMM' or

'ASMM', where S is the byte of the switches and MM is the value of the switches. If the HARD STOP light is on, set the DISPLAY/FUNCTION SELECT switch to FUNCTION 5 and press the START push button to continue or respond as requested by the last stop code.

2.2.1.9 STOP PANEL UTILITY

This utility function allows stopping the setup of a utility or stopping an active utility.

1. Set the DISPLAY/FUNCTION SELECT switch to FUNCTION 1.

2. Set the STORAGE ADDRESS/REGISTER DATA switch B to 1.

3. Press the INTERRUPT push button on the control panel if the program is running. Press the START push button if the HARD STOP light is on.

4. If the START push button was pressed after a hard stop display, the PROGRAM DISPLAY and HARD STOP lights must be on. (If they are not, see "Determining Why PROGRAM DISPLAY Light Is Not On".)

5. Display A should be X'0000' and display B should be 8060. See the symptom index for other values. If the HARD STOP light is on, set the DISPLAY/FUNCTION SELECT switch to 5 and press the START push button to continue or do what was requested from previous stop code.

2.2.1.10 DYNAMIC COMMUNICATIONS TO ROUTINES

This utility function allows communication with executing routines. The data entered by this utility function is stored in the DCM control table and may be referred to by any executing routine. Each routine that uses this facility has a description in the symptom index for the data to be entered and its use.

1. Set the DISPLAY/FUNCTION SELECT switch to FUNCTION 1.

2. Set the STORAGE ADDRESS/REGISTER DATA switches to the following positions (dash indicates that that switch may be set to any position.)

ADDRESS/DATA SWITCHES.

```
A B C D E
- D X X X
```

The XXX is the data that is to be passed to the routine.

3. Press the INTERRUPT push button if the program is running. Press the START push button if the HARD STOP light is on.

4. Display B will be set to the data entered.

5. If the START push button was pressed after a hard stop display, the HARD STOP light should be on, and the DCM is ready for your next input.

2.2.1.11 DISPLAY STORAGE OR REGISTER CONTENTS

This utility function allows displaying a selected storage location or register via a program display. The maintenance cycle steal is not used. Because the push button interrupt handler uses the registers, register displays in the program level at which this utility function was requested may not agree with the display obtained by the maintenance cycle steal panel display. Also, requested display locations are not checked for validity and can cause input/output checks or address exception checks.

1. Select the type of display:

Type of Display	DISPLAY/FUNCTION SELECT Switch
Storage	Function position 2
Register	Function position 3

2. Select the address to display:

Type of Display	STORAGE ADDRESS/REGISTER DATA Switches
Storage	Address in switches A, B, C, D, E
Register	Address in switches B and D

3. Press the INTERRUPT push button if the program is running. Press the START push button if the HARD STOP light is on.

4. If the START push button was pressed after a hard stop display,

the PROGRAM DISPLAY and HARD STOP lights must be on. If they are not, see "Determining Why PROGRAM DISPLAY Light Is Not On".

5. Display A should contain the requested storage or register address. Display B should contain the contents of the requested address. See the symptom indexes in D99-3705E for other values.

2.2.2 SUMMARY OF DISPLAY/FUNCTION SELECT SWITCH POSITIONS

The DISPLAY/FUNCTION SELECT switch is tested by the DCM when the INTERRUPT push button is pressed and every time the START push button is pressed after a stop code is displayed. The following summarizes the functions that can be selected (a dash indicates that the switch is not used):

DISPLAY/FUNCTION SELECT Position	ADDRESS/DATA Switches A B C D E	FUNCTION
STORAGE ADDRESS	Y Y Y Y Y	Display location YYYYY
REGISTER ADDRESS	- R - R -	Display register RR
FUNCTION 1	- 0 - - -	Refresh last DCM display
	- 1 - - -	Stop panel utilities
	- 2 - - -	Set up continuous display without test
	- 3 - - -	Set up continuous display with test
	- 4 - - -	Set up address compare display without test
	- 5 - - -	Set up address compare display with test
	- 6 - H H	Set repeat count to HH
	- 7 - - -	Display repeat count
	- 9 S M M	Set CE sense switches
	- A S M M	Reset CE sense switches
	- A S 0 0	Display CE sense switches (S=0 for byte 0 of switches 1 for byte 1 of switches MM=selected bits to set or reset.)
	- D X X X	Dynamic communications to routines

	A B C D E	
FUNCTION 2	X X X X X	Display storage contents at (P=Adapter Number 1=IFT Number XXXXX.
FUNCTION 3	- R - R -	Display register contents of register RR
FUNCTION 4	- P I R R - M M M M	Part 1 of request Part 2 of request RR=Routine Number MMMM=CE sense switches)
FUNCTION 5	V W X Y Z	Continue from the error stop or manual intervention stop. (If it is an error stop, VWXYZ is not used. If it is a manual intervention stop, VWXYZ is used by the routine as specified in the symptom index.)
FUNCTION 6	- F F F F - - - - -	Abort total request Abort current routine
FUNCTION 1,2,3		Utility display positions
FUNCTION 4,5,6		DCM displays of routine codes (Stop codes are displayed when the switch is set to one of the FUNCTION positions (1 to 6).

Byte 0 CE Sense Switches	M M
Bypass New Error Stops	X 1
Wait before continuing	8 X

Byte 1 CE Sense Switches	M M
Problem Definition Mode	X 1
Restart Routine on First Error	X 2
Loop on First Error	X 4
Bypass Error Stop	X 8
Cycle on Request	1 X

Include Manual Intervention Routines	2 X
Repeat Each Routine N Times	4 X
Halt Before Execution	8 X

Where X is set to 0 when multiple CE sense switches are not desired.

2.2.3 SETTING UP A SCOPING LOOP

The DCM and IFTs provide two looping options for detected failures.

Loop on First Error selects the smallest possible loop within the IFT. The loop includes the hardware set up, pretest, set scope sync point 2, test, analysis, and error display. The loop for this option normally takes less time to execute than the Restart on First Error option. The loop continues, whether or not the error occurs again.

Restart Routine on First Error selects a loop that starts at the beginning of a routine, continues the routine to the point where the error is first detected, and restarts the routine again. The loop for this option requires more time; however, it may be required for sequence-sensitive failures. The loop continues, whether or not the error occurs again.

Use the continue function to continue from the error stop after selecting the looping option. The time required to stop on the error code again indicates the length of the loop. Repeat this process several times using the longest length of time.

To obtain continuous running loops, the "bypass error stop" CE sense switch must also be set.

If an error other than the one selected for looping occurs, the DCM stops to display the new error code. To bypass stops for other errors, set the "bypass new error stop" CE sense switch.

When the scoping loop is running correctly, the scoping indicator (display B, bit 0.4) blinks at the rate of 3.2 seconds (1.6 seconds on and 1.6 seconds off). Display B (byte 0, bits 5, 6, 7) is incremented by one, for each error detected. This error counter (together with the loop time) indicates whether the failure is solid or intermittent. Other information is also displayed. Display A shows the adapter, IFT, and routine number. Display B (byte 0, bits 0-3 and byte 1) shows the error code being looped on.

2.2.4 DETERMINING WHY THE PROGRAM DISPLAY LIGHT IS NOT ON

When the DCM displays data in displays A and B, the PROGRAM DISPLAY light is turned on. Failure of the PROGRAM DISPLAY light to turn on may be diagnosed by the following:

1. Does the LAMP TEST light turn on the PROGRAM DISPLAY light? If not, replace the PROGRAM DISPLAY bulb.

2. Is the HARD STOP light on?

   If yes, is the CCU CHECK light on?

   If not on, the 'hard stop' latch was set by the DCM or IFT. Determine the active program level, the IAR value of the level, and the program that the IAR relates to. Reload program and try again.

   If the CCU CHECK light is on and if the LEVEL 1 PROGRAM CHECK light is on also, reload the program and retry.

   If it is not on, determine the cause of the hardware check that caused the hard stop. Check display A, byte 0 with the DISPLAY/FUNCTION switch set to STATUS.

3. If the PROGRAM STOP light on, press the START push button and check the other panel switches.

4. Other possible causes:

   - Level 3 interrupt level has been masked. To unmask:

     a. Stop the program.

     b. Display register X'7F', store X'00010' in register X'7F'.

     c. Start the program.

   - The request bit for the INTERRUPT push button is failing. To test:

     a. Stop the program.

b. Press the INTERRUPT push button.

c. Display register X'7F'. Bit 0.6 should be on.

d. Start the program.

Displaying data in displays A and B does not turn on the PROGRAM DISPLAY light.

To test:

a. Display a storage location.

b. Turn the DISPLAY/FUNCTION SELECT switch to FUNCTION 1.

c. Press the INTERRUPT push button if the program is running, or the START push button if the program is stopped.

d. Display A should display to the address entered. Display B should display to the contents of the storage location addressed.

e. The PROGRAM DISPLAY lights should be on and the HARD STOP light should be on if the DCM was previously stopped on a display code.

5. If the above techniques fail, reload the DCM. The initial display of X'FFFF' should cause the PROGRAM DISPLAY light to turn on. If it does, the problem is a program failure; if not, the problem is a hardware problem.

3.0 INTERNAL FUNCTIONAL TEST

3.1 INTERNAL FUNCTIONAL TEST DESCRIPTION AND PURPOSE

The IFTs are a set of diagnostic programs designed to aid in detecting 3705 hardware failures. There is a separate IFT for each major component of the 3705. The IFTs currently available are:

Central Control Unit
Storage
Type 1 Channel Adapter
Type 2 Channel Adapter
Type 1 Communication Scanner
Type 2 Communication Scanner
Type 3 Communication Scanner
Type 4 Channel Adapter

3.1.1 GENERAL STRUCTURE OF IFTS

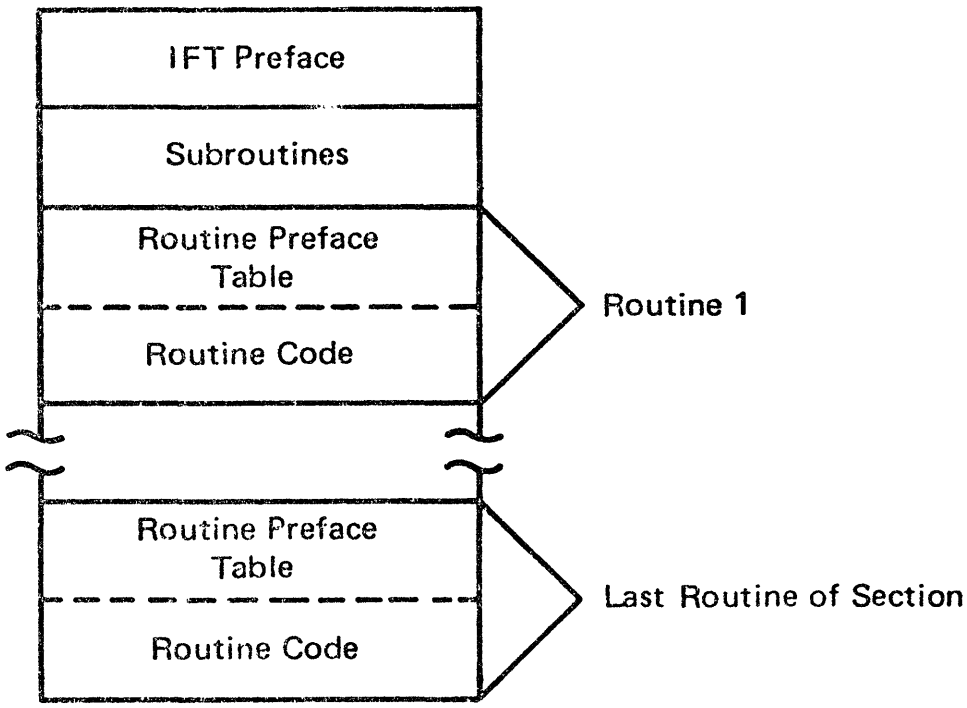
Each Internal Functional Test (IFT) is made up of an IFT preface table, routine preface tables, routines, subroutines, and interrupt handlers.

An IFT is loaded into a 10K-byte area. IFTs larger than 10K are broken into self-contained modules (subroutines and interrupt handlers are duplicated) called sections. The sections must be numbered sequentially.

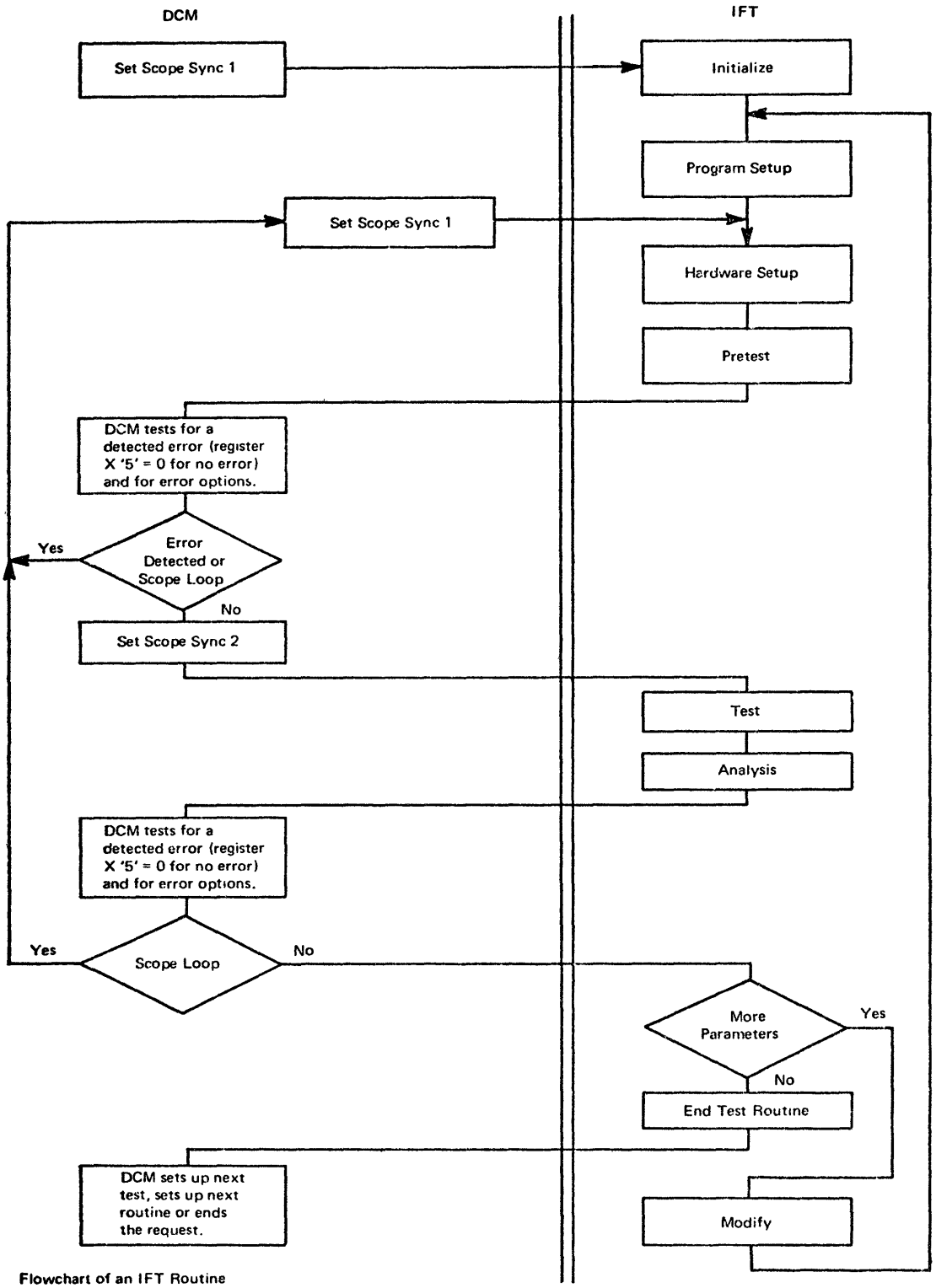
The IFT preface table contains IFT dependent data: the IFT number, section number, the address of the preface of the first routine, and the address of level 1, 2, 3, and 4 interrupt handlers.

The routine preface (one at the beginning of each routine) contains the routine number, flags to identify manual intervention and problem definition routines, the abort subroutine address, and the address of the preface of the next routine. If this routine is the last of the section, the preface address is X'FFFE'. If this is the last IFT routine, the preface address is X'FFFF'.

The routine provides the test functions for the IFT.



IFT Structure



Flowchart of an IFT Routine

The basic routine blocks are:

- Initialize
- Program setup
- Hardware setup
- Pretest
- Set scope sync 2
- Test
- Analysis
- Test for more parameters
- Modify
- End routine

Initialize establishes parameters, address, and pointers that may be modified during execution of the routine. This block is entered on the first pass and performs such hardware operations as adapter reset. Modify may be used to alter the initial parameters, addresses, and pointers for subsequent passes.

Program setup prepares the other blocks of the routine for execution by setting up or modifing parameters and addresses.

Hardware set-up prepares the hardware for test. This block sets registers, latches, etc. according to the initial parameters.

Pretest tests for correct hardware setup. Error codes displayed by this block indicate other routines should be run to test the hardware setup conditions.

Set scope sync two causes a sync pulse to become available at the scope sync pin number two. This sync pulse provides a constant reference point at the beginning of the test.

Test completes the steps necessary to test the hardware. This block causes the hardware to execute the functions being tested.

Analysis checks the results of the test block and causes the DCM to display error codes.

More parameters determines if additional test iterations are to be taken.

Modify parameters modifies pointers and addresses for any additional iterations of the test.

End routine terminates the routine and returns control to the DCM.

3.2.2 DCM/IFT INTERFACE

3.2.2.1 LOADING AND RUNNING THE IFTS

To request the IFT Loader (T3705A) to load the IFTs, OLTEP or OLTSEP must be running in the IBM System/360 or System/370. The user must have the proper configuration data set (CDS) already cataloged with the remainder of the system. See "3705 CDS Card Format".

Refer to the DOS OLTEP SRL, GC24-5086, the IBM System/360 Operating System On-line Test Executive Program, GC28-6650, or the OLTSEP Operator's Guide, D99-SEPDT, for information on how to invoke OLTEP or OLTSEP in the IBM System/360 or System/370.

When OLTEP or OLTSEP causes a console printer message of:

```
r ID 'ENTER DEV/TEST/OPT/'
```

respond with:

```
r ID,'XXX/3705A/nfe,ext=ABCD/'
```

where:

XXX = the channel and unit address of the 3705 (native attachment address)

ABCD = four operating options provided by the OLT and IFT Loader. Correct entries are Y (for YES) or N (for NO). Any other entry results in the program assuming Y. The options are defined as follows:

A = OLT Bypass Printing Channel Errors

B = Run Initial Test

C = Run 3705 Loader with Error Checking

D = Bypass Hard Stop on loader Error in 3705 and Retry

If the response to the DEV/TEST/OPT/ message does not include an ext= parameter, the OLT defaults to ext=yyyy. Because the first 'y' indicates no print of channel errors, only the terminate message prints if a channel error occurs.

The IFT is controlled by requests received from the 3705 during a read command. The characters received from the 3705 determine the IFT to be loaded. Some situations can develop that force the IFT Loader back to the beginning. These situations are identified in "REQUESTING AND TERMINATING IFTs", in paragraph 3.3.1.

3.2.2.2 DATA SET NAME AND IFT FUNCTION CHART

Data Set Name	CE Request	IFT Function
X3705AAA	-	Type 1 Channel Adapter Load Module
X3705ABA	-	Type 2 Channel Adapter Load Module
X3705ACA	-	DCM
X3705ADA	-	Initial Test, section 1
X3705AEA	-	Initial Test, section 2
X3705BAA	11RR	CCU Section 1
X3705BBA	-	CCU Section 2
X3705BCA	-	CCU Section 3
X3705CAA	P2RR	Storage Section 1
X3705CBA	-	Storage Section 2
X3705DAA	P3RR	Type 1 Channel Adapter, Section 1
X3705EAA	P4RR	Type 2 Channel Adapter, Section 1
X3705EBA	-	Type 2 Channel Adapter, Section 2
X3705FAA	15RR	Type 1 Communication Scanner, Section 1
X3705FBA	-	Type 1 Communication scanner, Section 2
X3705FCA	-	Type 1 Communication Scanner, Section 3
X3705FDA	-	Type 1 Communication Scanner, Section 4
X3705FEA	-	Type 1 Communication Scanner, Section 5
X3705FFA	-	Type 1 Communication Scanner, Section 6
X3705GAA	P6RR	Type 2 Communication Scanner, Section 1
X3705GBA	-	Type 2 Communication Scanner, Section 2
X3705GCA	-	Type 2 Communication Scanner, Section 3
X3705GDA	-	Type 2 Communication Scanner, Section 4
X3705GEA	-	Type 2 Communication Scanner, Section 5
X3705GFA	-	Type 2 Communication Scanner, Section 6
X3705GGA	-	Type 2 Communication Scanner, Section 7
X3705HAA	P7RR	Type 3 Communication Scanner, Section 1
X3705HBA	-	Type 3 Communication Scanner, Section 2
X3705HCA	-	Type 3 Communication Scanner, Section 3
X3705HDA	-	Type 3 Communication Scanner, Section 4
X3705HEA	-	Type 3 Communication Scanner, Section 5
X3705HFA	-	Type 3 Communication Scanner, Section 6
X3705HGA	-	Type 3 Communication Scanner, Section 7
X3705HHA	-	Type 3 Communication Scanner, Section 8
X3705HIA	-	Type 3 Communication Scanner, Section 9
X3705HJA	-	Type 3 Communication Scanner, Section 10
X3705JAA	P9RR	Type 4 Channel Adapter, Section 1
X3705JBA	-	Type 4 Channel Adapter, Section 2
X3705KAA	-	Panel Line Test, Section 1
X3705KBA	-	Panel Line Test, Section 2

IFTs are requested in the format PIRR. P is the number of the adapter to be tested. If P=0, all adapters for the requested IFT will be tested. I is the IFT number, R is the routine number. See Chapter 5 for instructions on loading and running Panel Line Test, X3705KAA and KBA.

IFT modules have several segments depending upon the size of the module. The last character of the data set name changes for each segment of the IFT module. 'A' indicates the first segment; 'B', the second; and so on, for as many segments as necessary for the entire IFT module.

The CCU IFTs turn the CCU CHECK light on and off. Disregard the CCU CHECK light coming on unless a hard stop occurs.

3.3.1 REQUESTING AND TERMINATING IFTS

The DISPLAY/FUNCTION SELECT switch, the STORAGE ADDRESS/REGISTER DATA switches, and the START push button on the control panel of the 3705 are used to enter an IFT request. The IFT request is divided into two parts; part 1 selects the adapter, IFT, and routines, and part 2 selects the CE sense switch options desired. Refer to APPENDIX B for DCM stop codes, description, and required intervention.

Before an IFT request can be made, two conditions must be met:

a. The IFT Loader must be running in the host CPU, and the DCM must be loaded and executing in the 3705.

b. The symptom index description for the current code in display B must indicate that the DCM is ready for part 1 of an IFT request (display A and B contain X'FFFF'). Abort any active request before entering a new request. See "Aborting a Routine or Request".

1. Set the DISPLAY/FUNCTION SELECT switch to FUNCTION 4.

2. IFT request - part 1

   Set the STORAGE ADDRESS/REGISTER DATA switches to select the desired adapter(s), IFT(s), and routine(s). Refer to the data set name and IFT function chart to determine the exact switch settings for a specific request.

	ADDRESS/DATA Switches B C D E
All routines of all IFTs, on all adapters	0 0 0 0
All routines of one IFT (I) on all adapters tested by this IFT	0 I 0 0
All routines of one IFT (I), on one adapter (P)	P I 0 0
One routine (RR) of one IFT (I) on all adapters tested by this IFT	0 I R R
One routine (RR) of one IFT (I), on one adapter (P)	P I R R
To request termination at T3705A (IFT loader) and IFT.	F 0 X X

3. Press the START push button.

4. The PROGRAM and HARD STOP lights must be on. If they are not, see "Determining Why PROGRAM DISPLAY Light Is Not On".

5. The DCM should be ready for part 2 of the request (display A contains X'FFFF' and display B contains X'8002'). If it is not, perform the action necessary to correct the problem indicated in the symptom index. See "Using the Symptom Index for IFTs" in paragraph 3.3.4.

6. IFT request - part 2

   Set the STORAGE ADDRESS/REGISTER DATA switches according to the desired CE sense switch setting. Combine values for the actual switch value or set switches to zeros if no CE sense switches are to be set on. The relationship between CE sense switches and the ADDRESS/DATA switches is shown in the following chart.

CE Sense Switch	ADDRESS/DATA Switches B	C	D	E
Problem Definition Mode				1
Restart Routine on First Error				2
Loop on First Error				4
Bypass Error Stop				8
Cycle on Request			1	
Include Manual Intervention Routines			2	
Repeat Each Routine X Times			4	
Halt Before Execution			8	
Bypass New Error Stops		1		
Wait Before Continuing	8			

7. Press the START push button.

8. The PROGRAM DISPLAY light must be on. If it is not, see "Determining Why the PROGRAM DISPLAY Light Is Not On".

9. See the symptom index in APPENDIX B for a description of the code in display B.

3.3.2 USING THE SYMPTOM INDEX FOR IFTS

Displays A and B display codes are described in the symptom index for the IFTs. The symptom indexes for the IFTs are contained in the IBM Maintenance Diagnostic Program - Symptom Index, D99-3705E manual. A reference is given to the page in the IBM 3705 Communications Controller Theory Maintenance Manual, SY27-0107 describing the failing function for many display codes.

The symptom indexes provide an indication of the suspected failing card. The list of suspected cards is not exhaustive and may not indicate the exact failing part. However, the suspected card has enough effect on the failure to be singled out as suspect. If after replacing the suspected card, the failure presists, scoping signals into and out of the indicated card will probably be helpful in locating the exact cause of the failure.

A useful technique that may be used is to record the card location indicated when an error is detected. Continue the IFT to the next routine (via FUNCTION 6) and record any indicated cards called for errors occuring. After several routines have been tried with error stops, suspect the card with the highest recurrence of indications as

the most probable cause of the error.

The following control panel conditions must exist, for the displays to indicate DCM or IFT errors:

1. The LOAD light must be off. If it is on, see the error displays for the ROS, initial test, or IFT Loader.

2. The TEST light must be on. If it is off, and the LOAD light is on, see item 1. If it is off, and the LOAD light is off, see the error displays for the IFT Loader.

3. The DISPLAY/FUNCTION SELECT switch is set to FUNCTION 4, 5, or 6. If it is not set to FUNCTION 4, 5, or 6, see "Refresh Last DCM Display Code".

4. PROGRAM DISPLAY light must be on. If it is off, see "Determining Why PROGRAM DISPLAY Light Is Not On".

The symptom index display format is:

```
Display A  =  P I R R
Display B  =  T S K K
```

Where each character represents a four bit Hex digit (byte X is not used).

```
P  = Number of adapter being tested
I  = Number of the active IFT
RR = Number of the active routine
T  = Type of display code
S  = Scoping indicator and error counter
KK = Code reference in symptom index
```

Use the following procedure to find a code in the IFT symptom index:

```
Is T equal to 8 (display B first Hex digit)?
No     Yes
|      |
|      See the DCM symptom index (Appendix B) for a description
|      of the display.  Display A indicates which adapter, which
|      IFT, and which routine is active.  Display A equal X'FFFF'
|      indicates the DCM is ready to accept a new request.
|
```

Is T equal to 0 (display B first Hex digit)?

No / Yes

The IFT has detected an error and an error code is displayed. The I field (display A second Hex digit) indicates the IFT Symptom Index to see.

T	I	Symptom Index	Page No
0	1	D99-3705E	1.1
0	2	D99-3705E	2.1
0	3	D99-3705E	3.1
0	4	D99-3705E	4.1
0	5	D99-3705E	5.0.1
0	6	D99-3705E	6.0.1
0	7	D99-3705E	7.0.1
0	9	D99-3705E	8.1

Is T equal to 1 or 2 (display B first Hex digit)?

No / Yes

A pretest error or a error common to the IFT routines has been detected; 1 indicates pretest, 2 indicates common error. The I field (display A second Hex digit) indicates the IFT Symptom Index to see.

T	I	Symptom Index	Page No
1/2	1	D99-3705E	1.17
1/2	2	D99-3705E	2.3
1/2	3	D99-3705E	3.4
1/2	4	D99-3705E	4.18
1/2	5	D99-3705E	5.0.150
1/2	6	D99-3705E	6.2.1
1/2	7	D99-3705E	7.1.272
1/2	9	D99-3705E	8.38

Is T equal to E (display B first Hex digit)?

No — Yes

Information is being displayed. The display indicates either errors or correct operation.

T	I	Symptom Index	Page No
E	1	D99-3705E	1.23
E	5	D99-3705E	5.1.73
E	6	D99-3705E	6.2.2
E	7	D99-3705E	7.1.267

Is T equal to F (display B first Hex digit)?

No — Yes

A manual intervention stop code is being displayed.

T	I	Symptom Index	Page No
F	1	D99-3705E	1.23
F	5	D99-3705E	5.2.1
F	6	D99-3705E	6.2.3
F	7	D99-3705E	7.1.268

Is T equal 6 or 7 (display B first Hex digit)?

No — Yes

See paragraph 2.2.1.6 "Set or Display Repeat Count". This display is from that DCM panel utility.

```
|
Is T equal to 9 or A (display B first Hex digit)?
No    Yes
|     |
|     See paragraph 2.2.1.6 "Set, Reset, Display CE Sense
|     Switches.  This display is from that DCM panel utility.
|
|
Is T equal to B or D (display B first Hex digit)?
No    Yes
|     |
|     See paragraph 2.2.1.9 "Dynamic Communication To
|     Routines.  This display is from that DCM panel utility.
|
|
Ensure that the DCM and IFT loaded properly and that the
required conditions described prior to this procedure were met.
```

3.3.2.1 MANUAL INTERVENTION ROUTINE INDEX

An index of manual intervention routines is located in Appendix D. This index is a reference to D99-3705E Symptom Indexes as an aid in locating manual intervention routines. No running or setting up instructions are provided in this Appendix.

3.3.2.2 SYMPTOM INDEX MASK FIELD AND REGISTER USAGE

The "mask" field specifies the bits being tested. A "0" indicates that bit position is not checked. If the symptom index lists a "mask" field for X'14, X'15', and X'16', the following contents are standard for the registers:

Register X'14' Contains the bits being tested.
Register X'15' Contains the bits in register X'14' in error.
Register X'16' Contains the bit pattern expected in register X'14'.

3.3.2.3 TYPE 3 COMMUNICATION SCANNER IFT SYNC POINT AID

Each time the type 3 communication scanner IFT branches to the subroutine to check the PCF/EPCF state, register X'18' is loaded with the address of the number of character times the subroutine waits for the expected PCF/EPCF state. This address can be used with the address sync capability to provide oscilliscope synchronization points at various addresses in the routine.

To use this facility, display register X'18' at any error stop. The address in register X'18' is two bytes less than the address of the branch and link instruction to the subroutine that tests the state of the PCF/EPCF.

Type 3 communication scanner service aids are described in detail in IBM 3705 Communications Scanner Theory Maintenance Manual, SY27-0107. Refer to these service aids for specific examples for using this facility.

Attempts to calculate addresses for later sync points in the subroutine may lead to unstable results because of the looping in the subroutine and the uncertainity of addresses within the subroutine.

This intentionally left blank.

4.0 INITIAL TEST X3705ADA

4.1 INITIAL TEST PURPOSE AND DESCRIPTION

The 3705 Initial test diagnostic program provides functional testing of the instruction set in each of the five program levels, starting with program level one, then program level two, and so on through program level five.

Each instruction is tested for the:

a) Proper instruction decode.

b) Proper CZ latch setting and resetting.

c) Proper ALU function.

Storage addressing capability is tested by storing a unique pattern at each location in storage, starting at the end of Initial Test and continuing to the last storage location. Storage is then scanned to see that none of the locations were modified.

The functions tested in each routine are listed in the Symptom Index along with appropriate critical register values and the expected CZ latch settings.

At the beginning of this test the functional areas in the CCU hardware, previously tested by the ROS bootstrap program code, are assumed to be operational.

4.1.1 INITIAL TEST LOAD PROCEDURE

The initial test, if not optioned out, is loaded by the Type 1 CA Loader (I.D. X3705AAA) or the Type 2 CA Loader (I.D. X3705ABA) or the Remote Loader Feature and executed prior to loading either the control program or the diagnostic control module (DCM).

4.1.1.1 COMMUNICATIONS CONTROLLER LOADER UTILITY

1. The loader program must be initiated in the host CPU, refer to either the IBM 3705 Communications Controller Emulation Generation and Utilities Guide and Reference Manual, GC30-3002 or the IBM 3705 Communications Controller Network

Control Program Generation and Utilities Guide and Reference Manual, GC30-3000 for instructions on initiating the loader program.

2. 3705 Power must be on

3. The MODE SELECT and DIAGNOSTIC CONTROL switches must be in the PROCESS position.

4. The appropriate channel interface must be enabled.

5. The DISPLAY/FUNCTION SELECT switch may be in any position for this load. However, the STATUS position is suggested.

4.1.1.2 T3705A ON-LINE TEST LOADER

1. The CPU OLT load program must be initiated in the host CPU. See the OLT loader operating instructions.

2. 3705 power must be on.

3. The MODE SELECT and DIAGNOSTIC CONTROL switches must be in the PROCESS position.

4. The appropriate channel interface must be enabled.

5. The DISPLAY/FUNCTION SELECT switch should be in the STATUS position to load the DCM directly. See the CE options for other possible switch settings.

6. The LOAD push button must be pressed.

4.1.1.3 REMOTE PROGRAM LOADER

1. The Remote Loader Feature must be installed.

2. A correctly written disk media must be available.

3. Refer to Chapter 1.2 the Remote Diagnostic Loader Manual, P/N 1857403, for IPL procedures.

4.1.2 NORMAL RUN INDICATIONS

During a normal control program load or DCM load, the following indications signal correct operation:

1. The Entered Interrupt Level panel lights switches from one to five sequentially as the Initial Test routines are run in that level. The level one light turns on again prior to loading the control program or DCM.

2. These panel indicators are on during the Initial Test:

PROGRAM DISPLAY
TEST
LOAD

If the DISPLAY/FUNCTION switch is set to any of the CE option positions (FUNCTION 1-6) the routine number is dynamically displayed in display B, byte 0, and the active program level is displayed in byte 1, bits 4-7.

CAUTION: Due to the rate of progression through the Initial Test routines, the routine number displayed (display B byte 0) may not be visible.

4.1.2.1 CE OPTIONS

The following options are available to the CE for trouble shooting failures:

4.1.2.1.1 Loop On Program Level

Loop on Program level allows the CE to loop the Initial Test under control of the DISPLAY/FUNCTION SELECT switch.

DISPLAY/FUNCTION SELECT SWITCH POSITION	RESULTS
1	loop program level 1
2	" " " 2

3	" " " 3
4	" " " 4
5	" " " 5
6	loop all program levels
Any Other	Run test once through and request the next program.

4.1.2.1.2 Loop On Error

Loop on Error allows the CE to loop the given routine from the location where the error was detected back to the start of the routine. If, on the next pass through the routine an error does not occur, the program will loop from the end of the given routine back to the start. This method tests for intermittent errors.

To Loop on an error after the program stops to display the second error display data, set the DISPLAY/FUNCTION SELECT switch to FUNCTION 5, place the address of the output X'70' instruction that indicated the error in the STORAGE ADDRESS/REGISTER DATA switches and press the START push button. See Failure Indications on how the address of the output X'70' instruction is derived. The program takes the address entered in the data switches and overlays that halfword with a NOP instruction to prevent additional Hard Stops and allows looping.

To Exit the loop, momentarily move the DISPLAY/FUNCTION SELECT switch to any position other than 5. The overlayed output X'70' instruction is restored.

4.1.2.1.3 Display Routine Starting Address

This option allows the CE to display in display A the starting address of the routine in which the error occurred.

When the program stops to display the second error display data and it is desired to display the starting address of the routine, set the DISPLAY/FUNCTION SELECT switch to FUNCTION 5, place the address of the

output X'70' instruction instruction in the STORAGE ADDRESS/REGISTER DATA switches, add X'0001' to the STORAGE ADDRESS/REGISTER DATA switch setting and press the START push button. This turns on a flag to the program which causes the program to stop again with the starting address displayed in display A.

Display bit 1.3 is on at this time to indicate that this option is active.

Once the starting address has been recorded, either exercise the loop on error option by pressing the START push button again or continue testing by setting the DISPLAY/FUNCTION SELECT switch to any position other than 5 and pressing the start pushbutton.

4.1.3.1 ABORT ROUTINE AND CONTINUE TESTING

If a programmed stop occurs and it is not desired to either "Loop on Error" or "Display Routine Starting Address", set the DISPLAY/FUNCTION SELECT switch to any position except FUNCTION 5 and press the START push button. This aborts the current routine and continues testing.

4.1.4.1 FAILURE INDICATIONS

If an error is detected during execution of Initial Test the Wait, Hard Stop, and Program stop indicators turn on. The error is one of two types:

1. CCU Check. These are hardware detected errors, seen in Display A with the DISPLAY/FUNCTION SELECT switch in the STATUS position.

   If a CCU CHECK is detected, it could be a result of the function being tested or it could be a failure of the hardware used to do the testing. Consult the CCU CHECK Analysis Flowchart IBM 3705 COMMUNICATIONS CONTROLLER THEORY MAINTENANCE MANUAL, SY27-0107, Page 0-020) for information and procedure concerning failure.

2. Programmed Stop (No CCU CHECK). Initial Test does an output X'70' (hard stop) to report an error.

   a. If a Programmed Stop occurs and the DISPLAY/FUNCTION SELECT switch is in FUNCTION 1 through 6 display B contains in byte 0 the current routine number (RR) and in byte one bits 4 - 7 the current program level (N).

At this time the CE should record the value of IAR for the current program level, the setting of the CZ latches, and if appropriate the value of register X'5' and/or register X'7'. (Refer to expected results in indicated routine to see if register X'5' and/or register X'7' is used). Current program level is displayed in display B, byte 1, bits 4-7 with DISPLAY/FUNCTION SELECT switch in position one through 6.

General Register 0 is the IAR of the current program level.

b. Subtract two from the IAR value to get the address of the out Stop instruction that indicated the error. This value will be needed for Loop on Error and Display Starting Address options.

c. Press the START push button to display error codes.

d. Select the desired CE option.

4.1.5.1 HOW TO USE THE INITIAL TEST SYMPTOM INDEX

Data displayed in display B defines the routine number, type of error data in display A, and the current program level under test.

D I S P L A Y B

BYTE X	BYTE 0	BYTE 1
Bits 67	Bits 01234567	Bits 01234567
00	XXXXXXXX	000XXXXX
	R R	T N

RR = Routine Number

T = Type of Display Data in Display A

0000 = Error Code or Looping count.
0001 = Starting Address of Routine.

N = Program Level in which error occurred.

1000 = Program Level 1
0100 = Program Level 2
0010 = Program Level 3
0001 = Program Level 4
0000 = Program Level 5

Since the majority of the Initial Test routines run under all five program levels, the Symptom Index refers to a general register for a program level without listing its Hex value. The following chart converts a general register R into its Hex value depending on the value of "N" as previously defined.

"N"	PROGRAM LEVEL	R0 (IAR)	R1	R2	R3	R4	R5	R6	R7
1000	1	X'00'	X'01'	X'02'	X'03'	X'04'	X'05'	X'06'	X'07'
0100	2	X'00'	X'01'	X'02'	X'03'	X'04'	X'05'	X'06'	X'07'
0010	3	X'08'	X'09'	X'0A'	X'0B'	X'0C'	X'0D'	X'0E'	X'0F'
0001	4	X'10'	X'11'	X'12'	X'13'	X'14'	X'15'	X'16'	X'17'
0000	5	X'18'	X'19'	X'1A'	X'1B'	X'1C'	X'1D'	X'1E'	X'1F'

Data displayed in display A defines either the error code, looping count or the routine starting address.

If the program stop light is not on, the data in Display A equals the looping count. If the program stop light is on and display B byte 1, bit 3 is not on, the data in display A equals the error code.

DISPLAY A

BYTE X	BYTE 0	BYTE 1
6 7	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7
0 0	0 0 X X 0 0 0 0	0 0 X X X X X X

If byte 0 bit 2 or 3 is on, the error code is common to many routines and is listed in the back of the Initial Test Symptom Index.

4.1.6.1 TROUBLE SHOOTING HINTS

The majority of the Initial Test routines are straight line code (no looping or subroutines). As a result, by taking the address of a given output X'70' instruction and displaying the starting address of that routine, the CE can use the address compare interrupt capability to pin point the failing instruction. The Symptom Index supplies the critical data and expected CZ latches.

5.0 PANEL LINE TEST T3705L

5.1 T3705L PANEL LINE TEST DESCRIPTION AND PURPOSE

Panel line test T3705L is a standalone version of the Network Control Program 4 (NCP4) line test function. This test is similar to the Emulation Program (EP) panel line test. This routine may be used when neither NCP nor EP is available to test the communications line via the IBM 3705 control panel. This test supports start-stop and BSC lines attached to the type 2 communication scanner and BSC line attached to the type 3 communication scanner.

This test is capable of:

Sending characters continuously.

Addressing a terminal and looking for a valid response.

Polling a terminal and receiving data.

Originating an Autocall operation.

Handling an Autoanswer operation.

The CE has responsibility for entering a line address, the set mode data, building a selection/polling control character scheme, and building a data stream for the test.

5.1.1 T3705L PANEL LINE TEST REQUIREMENTS

This test requires a dedicated IBM 3705 Communications Controller.

Line configuration (CDS) is not required for this test. This test does not run under control of the diagnostic control module (DCM).

Valid addresses must be entered for line testing.

5.2 T3705L PANEL LINE TEST OPERATING PROCEDURES

The following steps explain how to load and run T3705L panel line test:

1. Press the LOAD push button on the IBM 3705.

2. Respond to the DEV/TEST/OPTIONS request message at the host CPU console with

   r 01,'xxx/t3705l/nfe,ext=nnny/'

Where xxx is the IBM 3705 channel address.

FFFF 3. The test light should come on when the test is loaded and ready to execute. Set the DISPLAY/FUNCTION SELECT Switch to FUNCTION 1 to enter the test options. Display A and B should contain X'FFFF'.

00F1 4. Set STORAGE ADDRESS/REGISTER DATA Switch B to 1 and press the INTERRUPT push button. Display A should contain X'00F1'. Enter the line address to be tested as XYYY and press the START push button.

Where YYY represents the desired line ABAR address (ex: 0840) and x indicates one of the following;

Switch B = 0 if testing a type 2 communication scanner.

Switch B = 8 if testing a type 3 communication scanner.

Switch B = C if testing a type 3 communication scanner with 'new sync' lead in the line being tested.

00F2 5. Display A should contain X'00F2'. Enter the set mode data, LCD, and PCF turn character as follows:

STORAGE ADDRESS/REGISTER DATA

```
          Switches
       B   C   D   E
      ____     _   _
        |      |   |
        |      |   -- PCF (turn character)
        |      |      C = transmit turn RTS off
        |      |      D = transmit turn RTS on
        |      |
        |      -- LCD (see table)
        |
        -- Set mode data (see table)
```

Table of SET MODE DATA

Switch B	Switch C	Description
0	0	Select Oscillator 0
0	1	Select Oscillator 1
0	2	Select Oscillator 2
0	3	Select Oscillator 3
0	4	Data Rate Select
0	8	External Clock
1	0	Synchonous Clock
2	0	Data Terminal Ready
4	0	Diagnostic

Table of LCDs

Type 2 Communication Scanner

Hex	Definition
0	SS 9/6
1	
2	SS 8/5
3	Autocall
4	SS 9/7
5	SS 10/7
6	SS 10/8
7	SS 11/8
8	Reserved
9	Reserved
A	Reserved
B	Reserved
C	BSC EBCDIC
D	BSC USASCII
E	Reserved
F	Feedback Check

Type 3 Communication Scanner

Hex	Definition
4	EBCDIC
5	ASCII
6	XPNT ASCII

Press the START push button.

00F3 6. Display A should contain X'00F3'. Enter the control and SYN/PAD characters as follows:

Switches
B C D E

Autocall	2	0	X	X
Monitor RI	1	0	X	X
Duplex	0	8	X	X
Half Duplex	0	0	X	X

Where XX represents a SYN character for BSC operation, or PAD characters for start stop.

Press the START push button.

00F4 7. This step only if Autocall or Duplex was specified in Step 6. Display A should contain X'00F4', enter the Autocall line address. Press the START push button.

00F5 8. This step only if Autocall or Duplex was specified in Step 6. Display A should contain X'00F5'. Enter the Duplex receive line address. Press the START push button.

FFFF 9. Display A and B should contain X'FFFF'. Set the switches as follows:

	Switches			
	B	C	D	E
Init line	2	X	X	X

Where X represents unused data.

Press the INTERRUPT push button.

10. Set the switches as follows:

Switches				
B	C	D	E	
4	0	X	X	Execute a setmode with data specified in Step 5.

Where XX represents the upper scan limit bits for high speed lines.

Press the INTERRUPT push button.

11. Enter the test functions desired according to the following charts. If display A and B contain X'0000', an invalid

entry ocurred.

5.2.1 DEFINITION OF DISPLAY A & B DURING TEST

CONTROL PANEL DISPLAY OUTPUT

Bits	Byte X 6	Byte X 7	Byte 0 0123 4567	Byte 1 0123 4567
DISPLAY A	0	0	xxxx xxxx	xxxx xxxx
ICW Bits	0	0	0--7	8--15
ICW Fields	0	0	SCF	PDF
DISPLAY B	0	0	xxxx xxxx	xxxx xxxx
ICW Bits	0	0	16-23	
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 Remember

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

5.3 TEST FUNCTION CHARTS

5.3.1 TEST FUNCTION CHART 1

Functions	ADDRESS/DATA Switches B and C	ADDRESS/DATA Switches D and E Input Data Byte	Descriptions
Transmit Initial	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	43	Test Character	Reads the test character from ADDRESS/DATA switches 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	44	Test Character	Reads the test character from ADDRESS/DATA switches 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 trans-

			mitted repeatedly.
Transmit Test Character and Turn to Receive	45	Test Character	Reads the test character from ADDRESS/DATA switches 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.
Auto-answer (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.

5.3.2 TEST FUNCTION CHART 2

Functions	ADDRESS/DATA Switches B and C	ADDRESS/DATA Switches D and E Input Data Byte	Descriptions
Dial Digit	47	0 (X) digit	Loads the dial digit from ADDRESS/DATA switch 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 (Buffer 0/1 if reply)	48	(Y) (X) digit	Transmits dial digits previously loaded to the auto-call unit. If switch position 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 completed, 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	49	FF=high rate, 00=low rate	Selects the high or low data rate for a line previously defined in test.
Receive Mode	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.
Change PCF trun character	4B	Turn character	Changes the PCF turn character to the value set in ADDRESS/DATA switch E. DISPLAY D should be set to zero.
Display LTS	4C	Displacement into LTS	Displays two half words of the line test control block (LTS) beginning at the displacement specified in ADDRESS/DATA switches D and E. See Appendix C for a layout of the LTS.
Transmit Buffer 0 or 1	4F	E - 0 (Buffer 0) E - 1 (Buffer 1)	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 zero. 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	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).

5.3.3 TEST FUNCTION CHART 3

Functions	ADDRESS/DATA Switches B and C	ADDRESS/DATA Switches D and E Input Data Byte	Descriptions
Load Buffer 0	51	(XX) digit	The character in switches D and E is stored in a 40 character buffer. Leading PADS and SYNS must be inserted for T3CS also, due to the use of PCF state 'E' during the xmit operation.
Load Buffer 1	52	(XX) digit	Same as "Load Buffer 0" except the character is stored in buffer 1.
Load Receive Compare Character 1	53	(XX) digit	The character in switches D and E is stored as the first receive compare character.
Load Receive Compare Character 2	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	55	(XX) digit	Same as Load Receive Compare Character 1 except the character is stored as the third receive compare character.
Load Swap	56	(XX) digit	The character in

Transmit Buffer 0 Compare Character			switches D and E (XX) is stored as the swap transmit buffer 0 compare character.
Load Swap Transmit Buffer 1 Compare Character	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.
Initialize Buffer 0 Offset	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 bbegin. 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.

5.3.4 TEST FUNCTION CHART 4

Functions	ADDRESS/DATA Switches B and C	ADDRESS/DATA Switches D and E Input Data Byte	Descriptions
Initialize Buffer 1 Offset	59	XX	Same as function 58 except the displacement is for buffer 1.
BSC CRC Accumulation Buffer 0/1	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.
Set Receive Mode Byte	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.

5.4 LTS DESCRIPTION

HEX DISPLACEMENTS	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. This is the receive buffer for a type 2 communication scanner and the address of the receive buffer for a type 3 communication scanner.	
18	LTSNFCNT: Counter for non X'FF' data characters when receiving.	
1A	LTSN0CNT: Counter for non X'00' data characters when receiving.	
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	LTSRRC3: 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

5.5 TEST EXAMPLES

5.5.1 WRITE DATA TO IBM 2770 (BSC LINES)

Step	Functions	ADDRESS/ DATA Switches B C D E		Descriptions
1	Initialize Buffer 0	5 8 0 0	Press INTERRUPT	Sets initial Buffer 0 offset.
2	Initialize Buffer 1	5 9 0 0	Press INTERRUPT	Sets initial Buffer 1 offset.
3	Load Buffer 0	5 1 x x*	Press INTERRUPT	Load buffer 0 with address sequence.
4	Load Buffer 1	5 2 x x**	Press INTERRUPT	Load Buffer 1 with address sequence.
5	Accumulate CRC	5 A 0 1	Press INTERRUPT	Accumulates and stores CRC in buffer 1.
6	Set compare character 1	5 3 3 D	Press INTERRUPT	Sets receive compare character 1.
7	Set swap character 1	5 6 6 1	Press INTERRUPT	Sets first swap character.
8	Set swap character 2 2	5 7 7 0	Press INTERRUPT	Sets second swap character.
9	Transmit initial	4 2 0 0	Press INTERRUPT	Sets transmit state.
10	Transmit Buffer 0	4 F 0 0***	Press INTERRUPT	Transmit from buffer 0.
11	End test	5 0 0 1	Press INTERRUPT	Ends the test.

* xx= X'FF', X'AA', X'32', X'32, X'37', X'FF', X'FF', X'AA',
X'32', X'32', addr, X'2D', X'FF'.

** xx=X'FF', X'FF', X'AA', X'32', X'32', X'02', XE3', X'C5',
X'E2', X'E3', X'40', X'C2', X'D3', X'D6', X'C3', X'D2', X'15',
X'03'.

***'TEST BLOCK' should print out repeatedly on the terminal until
step 11 ends the test.

5.5.2 READING FROM AN IBM 2770 AND ACCUMULATING CRC

Step	Functions	ADDRESS/ DATA Switches B C D E		Descriptions
1				Enter data at the terminal and press the REQUEST key.
2	Initialize Buffer 0	5 8 0 0	Press INTERRUPT	Sets offset for Buffer 0.
3	Load Buffer 0	5 1 x x*	Press INTERRUPT	Loads Buffer 0 with the polling sequence.
4	Set receive mode	5 C 0 2	Press INTERRUPT	Sets receive mode byte to BSC accumulation on receive.
5	Transmit initial	4 2 0 0	Press INTERRUPT	Set transmit state.
6	Transmit Buffer 0	4 F 0 0**	Press INTERRUPT	Transmit from Buffer 0.
7	End test	5 0 0 0	Press INTERRUPT	

*xx= X'FF', X'AA', X'32', X'32', X'FF', X'FF', X'AA', X'32', X'32', addr, addr, X'F0', X'2D', X'FF'

**If data is received properly and the CRC is correct, the line turns around, transmits buffer 0 again and goes into receive mode. The terminal times out.

5.5.3 READING DATA WITH A TWO CHARACTER COMPARE

Step	Functions	ADDRESS/ DATA Switches B C D E		Descriptions
1				Enter ABCD1234 at the terminal and press the REQUEST key.
2	Initialize Buffer 0	5 8 0 0	Press INTERRUPT	Sets Buffer 0 offset.
3	Load Buffer 0	5 1 x x*	Press INTERRUPT	Loads Buffer 0 with the poll sequence.
4	Set Receive mode	5 C 1 0	Press INTERRUPT	Set two character compare on receive
5	Set first compare character	5 3 C 4	Press INTERRUPT	Stores first receive compare character.
6	Set second compare character	5 4 F 1	Press INTERRUPT	Stores second receive compare character.
7	Transmit initial	4 2 0 0	Press INTERRUPT	Sets transmit mode.
8	Transmit Buffer 0	4 F 0 0**	Press INTERRUPT	Transmit from buffer 0.
9	Display LTS	4 C 0 8 4 C 1 2***	Press INTERRUPT	Displays received data.
10	End Test	5 0 0 0	Press INTERRUPT	Ends the test.

* xx = X'AA', X'32', X'32', X'37',X'FF', X'FF', X'AA',
X'32', X'32', addr, addr, X'F0', X'2D' X'FF'.

**If the data is received properly, the line turns around, transmits buffer 0 again and goes into receive mode. The terminal times out.

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

5.5.4 ADDRESSING AN IBM 1050 (S/S TERMINAL) USING BUFFER 0 AND 1

Step	Functions	ADDRESS/ DATA Switches B C D E		Descriptions
1	Initialize Buffer 0	5 8 0 0	Press INTERRUPT	Sets Initial Buffer 0 offset
2	Initialize Buffer 1	5 9 0 0	Press INTERRUPT	Sets Initial Buffer 1 offset
3	Load Buffer 0	5 1 F F	Press INTERRUPT	Loads the PAD character X'FF' in buffer 0
4	Load Buffer 0	5 1 F F	Press INTERRUPT	
5	Load Buffer 0	5 1 7 C	Press INTERRUPT	Loads a circle C character into Buffer 0
6	Load Buffer 0	5 1 A 3	Press INTERRUPT	Loads the terminal address X'A3' into buffer 0
7	Load Buffer	5 1 2 0	Press INTERRUPT	Loads the component select address X'20' into Buffer 0
8	Load Buffer 1	5 2 F F	Press INTERRUPT	Loads the PAD character X'FF' into buffer 1
9	Load Buffer 1	5 2 3 4	Press INTERRUPT	Loads the end of address character X'34' into Buffer 1

10	Load Buffer 1	5 2 X X	Press INTERRUPT	Loads data character X'xx' into buffer 1
11	Load Buffer 1	5 2 5 E	Press INTERRUPT	Loads a circle B character X'5E' into Buffer 1

5.5.4.1 ADDRESSING AN IBM 1050 (CONTINUED)

Step	Functions	ADDRESS/DATA Switches B C D E		Descriptions
12	Load Buffer 1	5 2 y y	Press INTERRUPT	Loads LRC character X'yy' into Buffer 1. If the same data character is entered an even number of times in step 10, the LRC will be a circle B which can be entered for X'yy'.
13	Load Buffer 1 Swap Compare Character	5 7 3 7	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.
14	Transmit	4 F 0 0	Press INTERRUPT	Transmits Buffer 0.

NOTES:

1. After step 11 is executed, Buffer 0 is transmitted to the address of the IBM 1050 terminal. The line is set to receive mode. If the terminal responds with a circle Y (X'37'), the line is set to transmit mode and buffer 1 is transmitted.

2. ADDRESS/DATA switch A is always set to X'0'.

5.5.5 SENDING TO AND RECEIVING FROM A S/S TERMINAL (IBM 2741 OR IBM 3767)

Step	Functions	ADDRESS/ DATA Switches B C D E		Descriptions
1	Initialize Buffer 0	5 8 0 0	Press INTERRUPT	Sets initial Buffer 0 offset
2	Load Buffer 0	5 1 x x*	Press INTERRUPT	Load data into Buffer 0.
3	Set compare character 1	5 3 7 C	Press INTERRUPT	Set receive compare character 1.
4	Transmit Buffer 0	4 F 0 0	Press INTERRUPT	Transmit Buffer 0.

* xx = X'FF', X'AA', X'34', X'1F', X'54', X'20', X'10', X'70', X'08', X'68', X'58', X'38', X'04', X'64', X'6D', X'7C', X'FF'.

0123456789 should print out on the terminal and the terminal will go into transmit mode. Key a message into the IBM 2741 and send it to the IBM 3705. The IBM 3705 should send 0123456789. This sequence can be repeated until the test is terminated.

5.6 PANEL LINE TEST ERROR STOPS

Error stops that may occur in the panel line test are indicated via display A and B. See the following list for a description of the stops and recovery actions required.

Display A	Display B	Description
80FC	80FC	An unexpected level 4 interrupt occurred; only PCI level interrupts are expected. Register X'15' contains the results of an input X'7F' instruction executed when the interrupt occurred. To recover from this stop, the program must be reloaded.
80FE	80FE	An unexpected level 1 interrupt occurred. Register X'01' contains the ORed results of an input X'7E' and an input X'76' instruction executed when the interrupt occurred. If bits 0.1, 0.2, 0.3, or 0.4 are on, a communication scanner level 1 interrupt occurred; pressing the START pushbutton causes the program to attempt a scanner reset and restart. If none of these bits are on, another type level 1 interrupt occurred and the program must be reloaded.
80FF	XXXX	A program or hardware failure caused a branch to storage location X'00000'. Display B contains the address of the instruction causing the branch. To recover, the program must be reloaded.

This intentionally left blank.

APPENDIX A. CONFIGURATION DATA SET (CDS) DESCRIPTION

The Channel Adapter On-Line Test (OLT) and the Internal Functional Tests (IFT), for the 3705 require 3705 hardware definition. The definition is provided in the OLT configuration data set (CDS) for the 3705.

The IFT's for the 3705 are loaded into the 3705 by a host CPU program called the IFT Loader. The IFT loader is an OLT executed under an On-Line Test Executive (OS/TCAM/TOTE, OS/OLTEP,DOS/OLTEP, or OLTSEP). The IFT Loader appends the CDS to the Diagnostic Control Module (DCM) when the DCM is loaded into the 3705. The DCM refers to the CDS as required by the requested IFT.

The storage location of CDS information in the 3705 can be determined by adding the CDS byte location (from CDS Byte Column) to X'F00'.

The 3705 CDS is composed of the following sections:

Channel Data	Data Block Index	Data Blocks
Part 1 Fixed Format	Part 2 Variable Format	

A.1 CONFIGURATION DATA SET PART 1

Part 1 format is fixed and is 28 bytes (X'1B') in length and is defined and punched in Columns 1-67 of Card #1 as follows:

Card	CDS Byte (Hex)	Card Col.	Contents/Description
1		1	Must be blank
		2-4	CDS
		5-9	Blank

	0-3	10-17	Native subchannel unit address in hex (right justified) (example 0000010A) The IFTs load across this channel addr.
	4	18	= 4 if cycle utilization counter RPQ 8Q0058 is installed = C if model J, K, or L (cycle utilization counter and 20 bit data path are installed.)
		19	Blank

Card	CDS Byte (Hex)	Card Col.	Contents/Description
1	5	20-21	Feature code - (CS-Comm. Scanner; CA-Channel Adapter) Enter only the channel adapter defined in card col 10-17.
		20	HEX 8 1=Storage size greater than 64K bytes. 0=Storage size 64K or less. 4 1=NCP used. 0=NCP not used. 2 1=type 4 CA installed. 0=type 4 CA not installed. 1 1=Type 1 CS installed. 0=Type 1 CS not installed.
		21	8 1=Type 2 CS installed. 0=Type 2 CS not installed. 4 1=Type 3 or Type 3 Hi Speed CS installed. 0=type 3 or Type 3 Hi Speed CS not installed. 2 1=Type 1 CA installed. 0=Type 1 CA not installed. 1 1=Type 2 or 3 CA installed. 0=Type 2 or 3 CA not installed.
	6	22-23	= 40 Class Code (terminal control unit)
	7	24-25	= 06 Unit or Type Code(3705)

	8	26-29	Unused, leave blank.
	9	30-31	Flags
		30	= 4 if Device shared with another system, (CPU)
		31	= 4 if Two channel switch is installed on this unit
	0A-0B	32-35	Blank

Card	CDS Byte (Hex)	Card Col.	Contents/Description
1	0C-0D	36-39	The emulator sub-channel (ESC) unit address in Hex of lowest IBM 2701, 2702, or 2703 emulator Line address (determined by CA jumper options - See Range Definition) If Type 2 or 3 CA or if Type 1 or 4 CA in NCP mode only, leave card columns 36 thru 41 blank.
	0E	40-41	Hexadecimal number of contiguous Emulator Line addresses (each address used in testing requires a 2701, 2, 3 CDS entry). - See Range Definition
	0F-13	42-51	Blank (reserved)
	14-1B	52-67	Hexadecimal (EBCDIC) representation of the symbolic name of the Network Control Program (NCP) CDS. This is required by the On Line Terminal Test (OLTT). The symbolic name is assigned by the customer at SYSGEN time. Hex 'C3' (C) is to suffix the NCP CDS symbolic name. Any unused positions in this field should be filled with X'40's. For example: If the NCP symbolic name is 'RTP', then this name will be 'RTPC' and

		the Hex EBCDIC representation would be: D9E3D7C340404040 If no NCP is installed, leave blank.
1C-1D	68-71	Blank (allow CDS Part 2 to start on card 2)
	72	Continuation character (any character except /)
	73-80	Any desired information, ie ID, card count, etc.

A.1.1 RANGE DEFINITION

It is mandatory that each address in the described Emulator address range be defined by a IBM 2701, 2702, or 2703 CDS entry in order to use that address as a test device address. It is recommended that a CDS entry be included for all addresses in the range in order to prevent a 'NO CDS ENTRY' message for each undefined address.

If it is necessary to use a large range of emulator addresses, the following dummy CDS entry can be used for each unused subchannel address to minimize the OLT printouts:

Card Col	2-4	10-17	22-25	52
Punch	CDS	DEV ADDR	4001	/

Part 2 of the CDS has a variable length and is composed of the Index/Data blocks needed to define the hardware. Each hardware feature is referred to by its unique block type (i.e. CCU data block is type A, type 1 channel adapter data block is type B, etc.)

The index block contains 2 bytes for each data block to be defined, one byte to indicate block type and another to indicate the half-word displacement value of the corresponding data block containing the hardware definition. Each data block must start on a halfword boundary.

Communication scanners 3 and 4 are contained on a symbolic CDS entry because of length restrictions. This entry is not punched unless the third or fourth communication scanners are present. This CDS entry is handled by the OLT loader and is not referred to by the CE when entering the 'DEV/TEST/OPT/' parameters.

Following is the format for machine configuration. Punch cards as indicated using CDS card format as provided. The index identifies the hardware installed and provides a pointer to the data block containing the detailed description. If not applicable, an index entry may be left blank, or punched with zeros, but the assigned card columns must be maintained.

After completing the definition of the last line sets of the last LIB installed on the 3705, insert a '/' in that card column that would normally start the next Scanner definition.

Index - Part 2

Card	CDS Byte	Card Col	Contents(Type-Address) Description
			Adapter Number/IFT Number - (00 or blank if not installed) CDS Address of Data Block - pointer to adapter description Block type - data block containing adapter description
2		1-15	Must be blank
	1E-1F	16-19	11 23 (A) CCU
	20-21	20-23	22 23 (A) Storage BSM 2 (Blank if FET storage)
	22-23	24-27	32 23 (A) Storage BSM 3 (Blank if FET storage)
	24-25	28-31	42 23 (A) Storage BSM 4 (Blank if FET storage)
	26-27	32-35	52 23 (A) Storage BSM 5 (Blank if FET storage)
	28-29	36-39	62 23 (A) Storage BSM 6 (Blank if FET storage)
	2A-2B	40-43	72 23 (A) Storage BSM 7 (Blank if FET storage)
	2C-2D	44-47	82 23 (A) Storage BSM 8 (Blank if FET storage)
	2E-2F	48-51	12 23 (A) Storage BSM 1 or FET storage installed
	30-31	52-55	13 22 (B) Type 1 CA in 1st position.
	-	-	14 22 (C) If type 2 or type 3 CA in 1st position.
			19 22 (C) If type 4 CA in 1st position.
	32-33	56-59	24 24 (C) If type 2 or type 3 CA in 2nd position.
			29 24 (C) If type 4 CA in 2nd position.
	34-35	60-63	39 25 (C) If type 4 CA in 3rd position.

	36-37	64-67	49 26 (C) If type 4 CA in 4th position.
	38-39	68-71	Enter one of the following for the communication scanner in the first frame:
			15 27 (D) If type 1 communication scanner is first scanner. This entry may be punched in card col 64-67 without causing an error.
			16 27 (D) If type 2 communication scanner is first scanner
			17 27 (D) If type 3 or type 3 Hi Speed communication scanner is the first scanner
		72	Continuation character (any character except /)

Card	CDS Byte	Card Col	Contents(Type-Address)
3		1-15	Must be blank
	3A-3B	16-19	Enter one of the following for the communication scanner in the second frame:
			26 3D (E) If type 2 communication scanner is the second scanner
			27 3D (E) If type 3 or type 3 Hi Speed communications scanner is the second scanner
	3C-3D	20-23	Enter one of the following for the communication scanner in the third frame:
			36 91 (E) If type 2 communication scanner is the third scanner
			37 91 (E) If type 3 or type 3 Hi Speed communications scanner is the third scanner
	3E-3F	24-27	Enter one of the following for the communication scanner in the fourth frame:

		46 B0 (E)	If type 2 communication scanner is the fourth scanner
		47 B0 (E)	If type 3 or type 3 Hi Speed communication scanner is the fourth scanner
40-41	28-31	Blank (reserved)	
42-43	32-35	FFFF End of index	

The definition of each block type follows.

A.2.0 CHANNEL ADAPTER BLOCKS

A.2.1.0 FIRST CHANNEL ADAPTER DEFINITION - BLOCK C -

This CDS block defines the channel adapter in the first machine
This may be a type 1, 2, 3, or 4 channel adapter.

Card	Block Addr	CDS Byte	Card Col	Contents
3	C00	44	36-37	NSC unit address - interface A
	C01	45	38	Governor speed for cycle steal (normally jumpered for 277K bytes for type 2 or 3 CA) = 0 if type 1 or type 4 channel adapter The following is for type 2 or 3 channel adapter when EC 318882 is not installed. = 1 if 49K bytes = 2 if 92K bytes = 3 if 188K bytes = 4 if 277K bytes The following is for type 2 or 3 channel adapter when EC 318882 is installed. = 9 if 49K bytes = A if 92K bytes = B if 188K bytes = C if 277K bytes
			39	= 1 This data block is for 1st machine frame channel adapter.

A.2.1.1 CCU DEFINITION - BLOCK A -

This CDS block defines the central control unit.

Card	Block Addr	CDS Byte	Card Col	Contents
3		*** CCU - BLOCK ***		
	A00	46	40-41	Define storage type and size
				The following is for Bridge storage:
				= 01 if 16K = 02 if 48K = 03 if 80K = 04 if 112K = 05 if 144K = 06 if 176K = 07 if 208K = 08 if 240K
				The following is for FET storage:
				= 81 if 32K = 82 if 64K = 83 if 96K = 84 if 128K = 85 if 160K = 86 if 192K = 87 if 224K = 88 if 256K = 8A if 320K = 8C if 380K = 8E if 448K = 90 if 512K
		47	42-43	Defines RPQ Features.

Card	Block Addr	CDS Byte	Card Col	Comments
	A01	47	42	= 0 if no RPQ's
			43	= 0 If no RPQ's
				= 1 If RPQ 858655 installed.
				= 2 If RPQ 858911 installed.
				= 6 If RPQ's 858911 and MK5393 are installed.

A.2.1.2 SECOND CHANNEL ADAPTER DEFINITION - BLOCK C -

This CDS block defines the channel adapter in the second position. The channel adapter in this position may be type 2, 3, or 4.

Card	Block Addr	CDS Byte	Card Col	Contents
3	C00	48	44-45	Native sub-channel (NSC) unit address - Interface A
	C01	49	46	Governor speed for cycle steal (normally jumpered for 277K bytes for type 2 or 3 CA) = 0 if type 4 channel adapter The following is for type 2 or 3 channel adapter when EC 318882 is not installed. = 1 if 49K bytes = 2 if 92K bytes = 3 if 188K bytes = 4 if 277K bytes The following is for type 2 or 3 channel adapter when EC 318882 is installed. = 9 if 49K bytes = A if 92K bytes = B if 188K bytes = C if 277K bytes
			47	= 1 If the 2nd Channel Adapter is a Type 4 and is located in the 1st machine frame. = 2 If 2nd Channel Adapter is a Type 2 or 3 Channel Adapter. If the 2nd Channel Adapter is a Type 4 in the 2nd machine frame.

A.2.1.3 THIRD CHANNEL ADAPTER - BLOCK C - SECOND MACHINE FRAME

This CDS block defines the third channel adapter which must be located in the second machine frame. The adapter can only be type 4.

Card	Block Addr	CDS Byte	Card Col	Contents
3	C00	4A	48-49	NSC unit address - interface A
	C01	4B	50	Governor speed for cycle steal
				= 0 For type 4 channel adapter
			51	= 2 This data block is for 2nd machine frame channel adapter.

A.2.1.4 FOURTH TYPE 4 CHANNEL ADAPTER - BLOCK C - SECOND MACHINE FRAME

(Leave this block blank if no CA installed).

Card	Block Addr	CDS Byte	Card Col	Contents
3	C00	4C	52-53	NSC unit address - interface A
	C01	4D	54	Governor speed for cycle steal
				= 0 For type 4 channel adapter
			55	= 2 This data block is for 2nd machine frame channel adapter.

A.2.1.5 FIRST COMMUNICATION SCANNER DEFINITION - BLOCK D

This CDS block defines the first communication scanner installed. The scanner may be type 1, 2, or 3.

The definition of each block type follows.

Card	Block Addr	CDS Byte	Card Col	Contents
3	D00	4E	56-57	CS type defined by this block.
			56	= 8 if type 1 communication scanner. = 4 if type 2 communication scanner. = 3 if type 3 Hi-Speed communication scanner. = 2 if type 3 communication scanner.
			57	= 0 first CS address bits.
	D01	4F-50	58-61	Blank
		51	62-63	RPQ description Byte.
			62	= 0 (reserved spare)
			63	= 0 If no RPQ's
				The following is for type 2 scanner:
				= 1 if RPQ 858657 = 2 if RPQ 858680 = 4 if RPQ 858678 = 8 if RPQ S30114
				The following is for type 3 scanner:
				= 1 if RPQ 858912 = 2 if RPQ EH4100

D02	52	64-65	Speed of oscillator position 1 (osc 00) Multi-speed clock with type 3 communication scanner has 150, 600, and 1200 bps oscillator.

Code	Speed	
00	If not installed	
01	45.5 BPS	
03	50.0	
05	56.89	
07	74.2	
09	75.0	
0B	100.0	
0D	110.0	
0F	134.5	
11	150.0	
13	200.0	
14	300.0	
15	600.0	
16	950.0	
17	1200.0	
18	1050.0	RPQ (M02116)
19	2000.0	
1B	2400.0	

Ref OSC postion 1 Definition for the following:

D03	53	66-67	Speed of oscillator position 2 (osc 01)
D04	54	68-69	Speed of oscillator position 3 (osc 02)
D05	55	70-71	Speed of oscillator position 4 (osc 03)
		72	Continuation character (any character except /)
		73-80	Any desired data (ref card 1)

Card	Block Addr	CDS Byte	Card Col	Contents
4			1-15	Must be blank

D06	56	16-17	Code = LIB type - position 1 = 00 if not installed = 01 if Type 1 = 02 if Type 2 = 03 if Type 3 etc. = 0A if Type 10 = 0B if Type 11 = 0C if Type 12
D07	57	18-19	Code = LIB Type - position 2
D08	58	20-21	Code = LIB Type - position 3
D09	59	22-23	Code = LIB type - position 4 Not vaild for type 3 scanner.
D0A	5A-61	24-39	Code for line set types installed in LIB position 1
D0A	5A	24-25	Lines 0 & 1
D0B	5B	26-27	Lines 2 & 3
D0C	5C	28-29	Lines 4 & 5
D0D	5D	30-31	Lines 6 & 7
D0E	5E	32-33	Lines 8 & 9
D0F	5F	34-35	Lines A & B
D10	60	36-37	Lines C & D
D11	61	38-39	Lines E & F

Code	Line Set Type	
00		None. Use this code to define a pair of line addresses that are not used or not installed.
01	A	(e.g. 1a, 2a, 3a, 4a, etc.) Use this code to define a pair of installed line addresses for a LIB type that does not have a line set type specified. (e.g. LIB type 7)
02	B	(e.g. 1b, 3b, 4b, etc.)
03	C	(e.g. 1c, 4c, etc.)
04	D	
05	E	
06	F	

	07	G or GA
	08	H
	0A	J
	0B	K
	0D	S
	0E0E	T or TA (must define 2 partitions for each line set)
	0F0F	U (must define 2 partitions for each line set)
	10	W
	1313	Z (must define 2 partitions for each line set)
	30	ALC RPQ (858657) type 2 scanner only
	34	Reverse Chan RPQ (858664) type 2 scanner only
	38	X-Y Plotter RPQ (858663) type 2 scanner only
	39	N jumpered for medium speed operation (9600 bits per second or less)
	3A3A	N jumpered for high speed operation (greater than 9600 bits per second, must define 2 partitions)

D12	62-69	40-55	Line set type codes installed in LIB position 2 lines 0-F (refer to LIB 1)
D13	6A-71	56-71	Line set type codes installed in LIB position 3 lines 0-F (refer to LIB 1)
		72	Continuation character (any character except /)
		73-80	Any desired data (Ref card 1)

Card	Block Addr	CDS Byte	Card Col	Contents
5			1-15	Must be blank
		72-79	16-31	Code for line set types installed in LIB position 4 lines 0-F (refer to LIB 1) Not valid for type 3 scanner.

A.2.2 TYPE 2 OR 3 COMMUNICATION SCANNER - SECOND SCANNER BLOCK E

The type 2 or type 3 scanner defined by block type E is identical to block type D except for the installed position and number of LIBs available. Refer to block D for the format. If no scanner is installed in this position and no further data blocks are required, punch a slash (/) in the 1st column of this block and omit the continuation character for this card to end the CDS (no further punching is required).

Card	Addr	Byte	Col	Contents
5	E00	7A	32-33	CS defined by this block
			32	= 4 If type 2 communication scanner 3 If type 3 Hi-Speed Communication Scanner 2 If type 3 communication scanner
			33	= 1 CS address bits for 2nd Scanner.
	E01	7B-7C	34-37	Blank
		7D	38-39	RPQ Definition Byte (Refer to CS1)
	E02	7E-81	40-47	Oscillator speed codes
	E06	82-87	48-59	LIB type codes
	E0C	88-8D	60-71	LIB position 1 line set types lines 0-B
			72	Continuation character (any character except /)
			73-80	Any Desired Data (Ref card 1)

Card	Block Addr	CDS Byte	Card Col	Contents
6			1-15	Must be blank
		8E-8F	16-19	LIB position 1 line set types lines C-F

	E10	90-97	20-35	LIB position 2 line set types lines 0-F
	E14	98-9F	36-51	LIB position 3 line set types lines 0-F
	E18	A0-A7	52-67	LIB position 4 line set types lines 0-F
	E1C	A8-A9	68-71	LIB position 5 line set types lines 0-3 Not valid for type 3 scanner.
			72	Continuation Character (any character except /)
			73-80	Any desired data (See card 1)
7			1-15	Must be blank
		AA-AF	16-27	LIB position 5 line set types lines 4-F Not valid for type 3 scanner.
	E20	B0-B7	28-43	LIB position 6 line set types lines 0-F Not valid for type 3 scanner.
		B8-BC	44-53	Blank
		BD-C2	54-65	C3E4F3F7F0F5 if communication scanner is installed in frame 3 or 4.
		C3-C4	66-69	Hexadecimal representation of unique two digit identification number assigned by the CE to this CDS. Example: ID number 01 would be - "F0F1". IF a 3rd or 4th CS is installed, this number must be the same as that in col. 42-43 of the symbolic CDS entry.
			70	Slash (/)
			73-80	Any desired data (ref. card 1)

A.2.3 SYMBOLIC CDS ENTRY FOR COMMUNICATION SCANNERS 3 AND 4

This CDS entry is necessary only when the third or fourth communication scanners are present. The symbolic name of this CDS will be the characters CU3705 plus a unique two digit identification number. An example would be "CU370501". This CDS entry will only be used by T3705A. NO Reference to this CDS entry should ever be made with the "Device/TEST/OPT/" parameter. This CDS entry must be placed directly behind the first CDS entry for this device.

Card	Block Addr	CDS Byte	Card Col	Contents/Description
1			1	Must be blank
			2-4	CDS
			5-21	Blank
			22-23	= 40 class code
			24-25	= 06 unit or type code
			26-29	Blank
			30-31	= 08
			32-35	Blank
			36-41	= CU3705
			42-43	= Two digit identification of this box's CDS. Example: 01
			44-71	Blank
			72	Continuation character (any character except /)
			73-80	Any desired data (Ref card 1)

A.2.3.1 TYPE 2 OR 3 COMMUNICATION SCANNER - THIRD SCANNER BLOCK E

Refer to the note in second scanner.

Card	Block Addr	CDS Byte	Card Col	Contents
2			1-15	Must be blank
	E00	122	16-17	Installed CS configuration
			16	= 4 If type 2 communication scanner = 3 If type 3 Hi-Speed communication scanner = 2 If type 3 communication scanner
			17	= 2 (CS Adr bits for 3rd Scanner)
		123-124	18-21	Blank
		125	22-23	RPQ definition byte (refer to CS1)
	E02	126-129	24-31	Oscillator speed codes
	E06	12A-12F	32-43	LIB type codes
	E0C	130-137	44-59	LIB position 1 line set types lines 0-F
	E12	138-13D	60-71	LIB position 2 line set types lines 0-B
			72	Continuation character (any character except /)
			73-80	Any desired data (refer to card 1)

Card	Block Addr	CDS Byte	Card Col	Contents
3			1-15	Must be blank
		13E-13F	16-19	LIB postion 2 line set types lines C-F
	E14	140-147	20-35	LIB position 3 line set types lines 0-F
	E18	148-14F	36-51	LIB position 4 line set types lines 0-F
	E1C	150-157	52-67	LIB position 5 line set types lines 0-F

				Not valid for type 3 scanner.
	E20	158-159	68-71	LIB position 6 line set types lines 0-3 Not valid for type 3 scanner.
			72	Continuation character (any character except /)
			73-80	Any desired data (Ref card 1)
4			1-15	Must be blank
		15A-15F	16-27	LIB position 6 line set types lines 4-F Not valid for type 3 scanner.

A.2.3.2 TYPE 2 OR 3 COMMUNICATION SCANNER - FOURTH SCANNNER BLOCK E

Refer to the note in the second scanner

Card	Addr	Byte	Col	Contents
	E00	160	28-29	Installed CS configuration
			28	= 4 If type 2 communication scanner = 3 If type 3 Hi-Speed communication scanner = 2 If type 3 communication scanner
			29	= 3 (CS Adr bits for 4th Scanner)
		161-162	30-33	Blank
		163	34-35	RPQ definition byte (refer to CS1)
	E02	164-167	36-43	Oscillator speed codes
	E06	168-16D	44-55	LIB type codes
	E0C	16E-175	56-71	LIB position 1 line set types lines 0-F
			72	Continuation character (any character except /)
			73-80	Any desired data (Ref card 1)

Card	Block Addr	CDS Byte	Card Col	Contents
5			1-15	Must be blank
	E12	176-17D	16-31	LIB position 2 line set types lines 0-F
	E14	17E-185	32-47	LIB position 3 line set types lines 0-F
	E18	186-18D	48-63	LIB position 4 line set types lines 0-F
	E1C	18E-18F	64-71	LIB position 5 line set types lines 0-7 Not valid for type 3 scanner.
			72	Continuation character (any character except /)
			73-80	Any desired data (Ref card 1)

Card	Block Addr	CDS Byte	Card Col	Contents
6			1-15	Must be blank
		190-195	16-23	LIB position 5 line set types lines 8-F Not valid for type 3 scanner.
	E20	196-19D	24-39	LIB position 6 line set types lines 0-F Not valid for type 3 scanner.
			40	SLASH (/) End of CDS

The punched card format of the 3705 CDS is as follows:

Card 1	1	Blank
	2-4	CDS
	5-9	Blanks
	10-25	Bytes 0 to 7 of the CDS (one Hex character per column)

	26-29	Blanks (becomes byte 8 of CDS)
	30-31	Flags (byte 9 of CDS)
	32-51	Zeros (bytes 10-19 (X'0A'-X'13') of CDS)
	52-67	Symbolic name of CDS for network control program (bytes 20-27 (X'14'-X'1B) of CDS)
	68-71	First two bytes of variable data (bytes 28-29 (X'1C'-X'1D') of CDS)
	72	Continuation character (any character except /)
	73-80	Any desired information, such as machine ID, card count, etc.
Card 2	1-15	Blanks
	16-71	Bytes 30-57 (X'1E'-X'39') of the CDS (one Hex character per column)
	72	Continuation character (any character except /)
	73-80	Any desired data (refer to Card 1)

Cards 3-6 Same format as Card 2.

Card 3	CDS bytes 58-85 (X'3A'-X'55')
Card 4	CDS bytes 86-113 (X'56'-X'71')
Card 5	CDS bytes 114-141 (X'72'-X'8D')
Card 6	CDS bytes 142-169 (X'8E'-X'A9')
Card 7	1-15 Blanks

	16-69	CDS bytes 170-196 (X'AA'-X'C4')
	70	Slash (/)
	71-72	Blanks
	73-80	Any desired data (refer to Card 1)

A.2.4.1 SYMBOLIC CDS ENTRY COMMUNICATION SCANNERS 3 AND 4

Card	Addr	Byte	Col	Contents
Card 1			1	Blank
			2-4	CDS
			5-21	Blank
			22-25	4006
			26-29	Blank
			30-31	08
			32-35	Blank
			36-41	CU3705
			42-43	A unique two digit identification number assigned to the 3705 CDS.
			44-71	Blank
			72	Contination character (any character)
			73-80	Any desired data (refer to Card 1)

Cards 2-5 Same format as Card 2 of first CDS.

Card 2		CDS Bytes	290-317	(X'122'-X'13D')
Card 3		CDS Bytes	318-345	(X'13E'-X'159')
Card 4		CDS Bytes	346-373	(X'15A'-X'175')
Card 5		CDS Bytes	374-401	(X'176'-X'18F')
Card 6	1-15	Blank		
	16-39	CDS Bytes	402-413	(X'190'-X'19D')
	40	Slash (/)		
	41-72	Blanks		
	73-80	Any desired data (refer to Card 1)		

A.3 TOTE UNIT CONFIGURATOR

The 3705 Unit Configurator requires an interface to Telecommunications On-Line Test Executive (TOTE), a sub-task of TCAM. When a TCAM MCP, message control program, is running, a configurator request message (CRM) may be entered at the system console or a remote terminal defined in the MCP.

The following is an example of a configurator request message at the system console when a MCP named TEST is running:

```
F TEST,OLT=SYSCON///CONFIG/
```

Refer to the OS TCAM User's Guide, GC30-2025 for more detail on the functions of TOTE.

The TOTE configurator issues the following messages:

```
IED211I ON-LINE TESTING ACTIVE
IED3351                    ***CONTROL TERMINAL ID IS 01***
IED280I CONFIGURATOR STARTED
*00 IED282D ENTER FUNCTION: ADD,CHANGE,DELETE,EXHIBIT, OR NONE
```

Respond with: r 00,'add' if the CDS does not exist, 'change' to alter an existing CDS, etc. Exhibit provides a display of an existing CDS.

After the above response, the TOTE Configurator requests a line address or a symbolic terminal name. To configure a 3705 with more than 2 scanners, requires two configure runs. The second run is called a CDS extension. When adding or changing the CDS, 'CU3705XX' where XX is a 2-digit alphanumeric entry.

To define the main part of the CDS without a CDS in the CDS library, respond to the above question with the native address on the 3705.

Respond with:

r 00,'00a' for example.

The next question from the TOTE Configurator is:

```
*00 IED316D IS THE DEVICE TO BE CONFIGURED A 3704?  Reply YES OR NO.
```

Respond with:

r 00,'NO'

The next question from the 3705 Unit Configurator

'IS THIS CONFIG AN EXTENSION?'

Respond to the first part with: r 00,'N' or 'NO'. Respond to the second part with: r 00,'yes'.

Information needed for Unit Configuration is:

Is the device shared?
Is the two channel switch present?
Is the first channel adapter type 1 or 2?
Is a second channel adapter installed?
What type is the first channel adapter?
The lowest emulator line address.
What is the number of contiguous emulator lines installed.
Does an NCP have a symbolic name for the line being configured?
The letter 'C' is to suffix the NCP CDS symbolic name.

For example:
If the NCP symbolic name is 'RTP', the NCP CDS symbolic name will be 'RTPC'.

The three digit model number of the 3705, (eg. D07). Two digit address for channel 1 interface A. Two digit address for channel 2 interface A (if applicable). Governor speed for channel adapters. Oscillator speeds. What is the type of the first scanner? RPQ definition for CCU, and scanners? How many scanners? LIB types for each scanner? Line set types for each LIB. Two digit suffix for symbolic name of extended CDS (if applicable).

When the question sequence following appears:

REFER TO THE CDS GUIDE FOR LINE SET TYPE CODES REFER TO INSTALLATION INSTRUCTIONS FOR RPQ DEFINITION ENTER 00 FOR LINE SETS NOT INSTALLED *0 IED136D ENTER 8 (2 DIGIT) CODES FOR LIB 1 LINE SETS

Respond with eight two digit codes defining the line set types for

LIB 1. The example response following is for eight line sets type A in LIB 1.

```
r 00,'0101010101010101'
```

When the 3705 Unit Configurator Module receives the response, control returns to the TOTE Configurator. If the library data set, into which the new CDS is to be placed, is date protected, the following message prints out at the terminal or console:

```
*XX IEC107D E 190,YYYYYY,TEST,ZZZZZZ
```

In this message, XX is the message ID, 190 is the address where the OLT library disk pack is mounted, YYYYYY is the serial number of the disk pack mounted, TEST is the name of the MCP, ZZZZZZ is the DSNAME of the OLT library.

If this message occurs, respond with r xx,'u'.

To add or alter a CDS extension at the 'Enter Function' request of the TOTE configurator, the following message appears:

```
*00 IED304D IS THIS A CDS EXTENSION CONFIGURATION?
```

A.4 UNIT CONFIGURATOR UNDER OLTSEP AND OLTEP

Configuration data set (CDS) generation or alteration under OLTSEP may be invoked by entering a test request message to run T3700GEN. Alter an existing CDS by including EXT=CHANGE in the option field. A new CDS may be generated by not using the EXT option.

CDS can be generated or altered for the following areas of testing.

3705	2770	RFT's
3704	2780	NCP
1050	2792	
2740	3270	
2741	3780	

Examples of test request messages showing how to invoke CDS generation and alteration are:

```
R 01,'00D/3700GEN/NFE/'
R 01,'00D/3700GEN/NFE,EXT=CHANGE/'
```

The address portion of the above messages must be that of the card punch. When the generation of the CDS is complete T3700GEN punches the CDS cards. The cards can be used to replace the old cards or be added in the CDS deck for the OLTSEP system to be changed. Then the final step would be to do the CONFIG run under SOSP.

A.4.1 OPERATOR MESSAGES

After entering the test request message (TRM) for T3700GEN, prompting questions direct the operator. Each line of message to the console device is given a number required by OLT directives. The messages used are self explanatory and are only listed to verify that the message is a unit configurator message.

The 3 digit numbers preceding each message on the console are assigned to the following areas of CDS development.

3705	Msg Numbers 508-557, 583-621 and 640-662
3704	Msg Numbers 558-582 and 665-699
NCP	Msg Numbers 293-351
1050	Msg Numbers 356-402
2740	Msg Numbers 416-468

2741	Msg Numbers 469-502
RFT's	Msg Numbers 200-248
RFT's 2770	Msg Numbers 249-264
RFT's 2780	Msg Numbers 265-270
RFT's 3780	Msg Numbers 270-275
RFT's 3792	Msg Numbers 276-280
RFT's 3270	Msg Numbers 280-285

The following is a typical message at a console device:

```
04 SEP101D 508 IS THIS DEVICE SHARED?
```

Respond with either r 04,'YES' or r 04,'NO'

The following information is needed for 3705 CDS generation.

Is the device shared?
Is a two channel switch present?
What type is the first channel adapter?
Is there a 2nd channel adapter?
Are there emulator lines to define?
The lowest emulator line address.
The number of contiguous emulator lines.
Does an NCP have a symbolic name for the line being configured?
The letter 'C' is to suffix the NCP CDS symbolic name.

For example:
If the NCP symbolic name is 'RTP', the NCP CDS symbolic name will be 'RTPC'.

The model number of the 3705.
Two digit address for channel 1 interface A.
Two digit address for channel 2 interface A (if applicable).
Governor speed for channel adapters.
Oscillator speeds.
What type is the first communication scanner?
RPQ definition for CCU, and scanners?
How many scanners?
LIB types for each scanner?
Line set types for each LIB.
Two digit suffix for symbolic name of extended CDS (if applicable).

When the following question sequence appears:

```
     REFER TO THE CDS GUIDE FOR LINE SET TYPE CODES
     REFER TO INSTALLATION INSTRUCTIONS FOR RPQ DEFINITION
     ENTER 00 FOR LINE SETS NOT INSTALLED
*****00 IED136D ENTER 8 (2 DIGIT) CODES FOR LIB 1 LINE SETS
```

Respond with eight two digit codes defining the line set types in LIB 1. The example response following is for eight line sets type A in LIB 1.

```
r 00,'0101010101010101'
```

For information applicable to terminal CDS development, see IBM Maintenance Diagnostic Program On-Line Terminal Test User's Guide, D99-2705B.

THIS PAGE INTENTIONALLY LEFT BLANK.

APPENDIX B DIAGNOSTIC CONTROL MODULE SYMPTOM INDEX

Display A Code	Display B Code	Description of Display Code	Manual Intervention Required
FFFF	8000	Enter Part 1 of an IFT request.	Set DISPLAY/FUNCTION SELECT switch to FUNCTION 4. Set Storage Address/Register Data switches. Switch Description B Adapter number Example: Switch B = 1 for channel adapter one; = 3 for type 2 communication scanner number 3; = 0 for all of the adapters tested by the IFT requested. C IFT NO. = 0 for all IFT's = 1 for CCU IFT = 2 for storage IFT = 3 for type 1 channel adapter IFT = 4 for type 2 channel adapter IFT = 5 for type 1 communication scanner IFT = 6 for type 2 communication scanner IFT. = 7 for type 3 communication scanner IFT

= 9 for type 4 channel adapter IFT

D&E Routine Number
= 00 for all routines of the selected IFT
= 01 for only routine one etc.

Press control panel START push button.

FFFF	8001	Error on entering part 1 of request.	DISPLAY/FUNCTION SELECT switch not in FUNCTION 4. Re-enter part 1.
FFFF	8002	Enter part 2 of an IFT request.	Set DISPLAY/FUNCTION SELECT switch to FUNCTION 4. Select CE sense switches according to the following (combine for actual switch values):

Switch	B	C	D	E
Problem definition mode.	.	.	.	1
Restart routine on first error.	.	.	.	2
Loop on first error.	.	.	.	4
Bypass error stop.	.	.	.	8
Cycle on request.	.	.	1	.
Include manual intervention routines.	.	.	2	.
Repeat each routine X times	.	.	4	.
Halt before execution.	.	.	8	.
Bypass new error stops.	.	1	.	.
Wait before continuing.	8	.	.	.

Press control panel START push button.

FFFF	8003	Error on entering	DISPLAY/FUNCTION SELECT switch

		part 2 of request.	not in FUNCTION 4. Re-enter part 2. See stop 8002 for procedure to enter part 2.
FFFF	8004	Requested IFT number is not defined in the configuration data set (CDS).	Enter part 1 again. Reg X'15' bits 0.4-0.7 = Requested IFT number. See stop 8000 for procedure to enter part 1 of request.
FFFF	8005	Request IFT number was found but the requested adapter number is not defined in the Configuration Data Set.	Reg X'15' bits 0.0-0.3 = requested adapter number. Enter part 1 of request again. See stop 8000 for procedure to enter part 1.
FFFF	8006	IFT number or section number in the IFT Preface of the IFT loaded is not correct.	The wrong IFT was loaded or the numbers in the preface are wrong. Reg X'13' = Loaded IFT/ Section number. byte 0 = IFT number byte 1 = Section number Reg X'15' = IFT/Section Number desired (In IFT preface of IFT loaded) byte 0 = IFT number byte 1 = Section number Check the messages at System/360 or 370 console for further error messages concerning this IFT load request. Re-enter part 1 of request. See stop 8000 for procedure to enter part 1.
FFFF	8007	The requested routine number was not found in any of the routine prefaces of the requested IFT.	Reg X'15' (Byte 1) = Requested routine number. Enter part 1 of request again. See stop 8000 for procedure to enter part 1.

XXXX	8008	The DCM has halted before executing the routine number in Display A.	To execute the routine, set the DISPLAY/FUNCTION SELECT switch to the FUNCTION 5 (continue) and press the control panel START push button. Note - this stop occurred because CE Sense switch "Halt before execution" is on.
XXXX	8009	DISPLAY/FUNCTION SELECT switch was not in the FUNCTION 5 (continue) to continue from a halt before execution.	Set the switch and try again.
XXXX	800A	DISPLAY/FUNCTION SELECT switch was not in the FUNCTION 5 (continue) or FUNCTION 6 (abort) when a request was made to continue from an error stop or a manual intervention stop.	Set the switch and try again.
XXXX	8X11	Group 0 IAR is not the active IAR.	Set the DISPLAY/FUNCTION SELECT switch to the STATUS position. If level 1 is not entered, a program error has occurred on the highest level entered that has caused a branch to the DCM level 1 interrupt handler. If level 1 is entered, there is a failure in the hardware that selects Group 0 registers when level 1 is active. To recover, reload.

XXXX 8X12 A level 1 Interrupt has occurred for an adapter not being tested by the IFT Routine.

Reg X'05' = X = address of error data. X to X + 6 valid. Reset the error condition, then select FUNCTION 5 (continue) or FUNCTION 6 (abort) and press the START push button.

address data

X level 1 Interrupt request bits tested:
byte 0
bit 1 = Type 1, 2, or 3 CS # 1 level 1
bit 2 = Type 2 or 3 CS # 2 level 1
bit 3 = Type 2 or 3 CS # 3
bit 4 = Type 2 or 3 CS # 4 level 1
bit 5 = Type 1, 2, 3, or 4 CA 1 CA # 1 level 1
bit 6 = Type 2, 3, or 4 CA # 2 level 1

X+2 Interrupted level
byte 1
bit 0 = level 2
bit 1 = level 3
bit 2 = level 4
bit 3 = level 5

X+4/X+6 Lagging address reg. Address of instruction when interrupt occurred or address of last valid instruction before

			interrupt occurred. X+8/X+A Data in local store register (R field) address by the input or output instruction. X+C Input/output instruction that failed. Bits 0.1 to 0.3 and bits 1.0 to 1.3 = external register. Bits 1.4 to 1.5 = C for input, = 4 for output
XXXX	8X13	A level 1 interrupt has occurred for an input/output check.	Reg X'05' = X = address of error data. X to X+C valid. See definition in 8X12. Select FUNCTION 5 (continue) or FUNCTION 6 (abort) then press the START push button.
XXXX	8X14	The DCM level 1 interrupt handler attempted to reset the Input/Output Check defined in 8X13 and the input/ output check request bit (Reg X'7E', bit 1.2) did not reset.	Select FUNCTION 5 (continue) or 6 (abort) and press the START push button to retry the reset.
XXXX	8X15	A level 1 interrupt has occurred for a protection check.	Reg X'05' = X = address of error data. X to X+6 valid. See definition in 8X12. Select FUNCTION 5 (continue) or FUNCTION 6 (abort) and press the START push button.

XXXX	8X16	A level 1 interrupt has occurred for an address exception check.	Reg X'05' = X = address of error data. X to X+6 valid. See definition in 8X12. Select FUNCTIONS 5 (continue) or FUNCTION 6 (abort) and press the START push button.
XXXX	8X17	A level 1 interrupt has occurred for an invalid op check.	Reg X'05' = X = address of error data. X to X+6 valid. See definition in 8X12. Select FUNCTION 5 (continue) or FUNCTION 6 (abort) and press the START push button.
XXXX	8X18	The DCM level 1 interrupt handler attempted to reset the protection check, address exception, or invalid Op check defined above and the request bit (Reg X'7E', bit 1.1, 1.3, or 1.4) did not reset.	Select FUNCTION 5 (continue) and press the START push button to retry the reset.
XXXX	8X19	A level 1 interrupt has occurred for an IPL request. An IPL request should cause a ROS load.	Reg X'05' = X = address of error data. X is valid. See definition in 8X12. Select FUNCTION 5 (continue) and press the START push button.
XXXX	8X1A	The DCM level 1 interrupt handler attempted to reset the IPL request defined in 8X19 and the request bit (Reg X'7E', bit 1.6) did not reset.	Select FUNCTION 5 (continue) and press the START push button to exit level 1 if "Loop on first error" CE sense switch is not on. If "loop on first error" switch is on, the program will try to reset again.
XXXX	8X1B	The DCM is unable to exit interrupt level 1 after being loaded	Run initial test that checks instruction execution at each level.

		and given control (for the first time) on level 1.	
XXXX	8X20	An unexpected level 2 interrupt has occurred.	Use the control panel to determine cause and to reset the cause. Then set select FUNCTION 5 (continue) or 6 (abort) and press the START push button. Reg X'76' and Reg X'7E' define request bits.
XXXX	8X31	A level 3 interrupt has occurred for an adapter not being tested by the IFT routine (INTERRUPT push button and timer interrupts are expected and do not cause this error).	Reg X'0D' = x = address of error data. Addr Data X level 3 interrupt request bits tested Bit 1.2 = Type 2 or 3 CA # 2 Bit 0.3 = Type 1 or 4 CA Data/Status Bit 1.4 = Type 1, 2, 3, or 4 CA # 1 Initial Reset the level 3 adapter interrupt condition. Select FUNCTION 5 (continue) or FUNCTION 6 (abort) and press the START push button.
XXXX	8X32	A level 3 interrupt has occurred for an unexpected PCI level 3 interrupt.	Reg X'0D' = X = address of error data. See stop 8031 for data meaning. Select FUNCTION 5 (continue) and press the START push button to allow program to attempt to reset the PCI level 3.

XXXX	8X33	The DCM level 3 interrupt Handler attempted to reset the PCI level 3 defined above and the PCI level 3 request bit (Reg X'7F', bit 1.6) did not reset.	Select FUNCTION 5 (continue) and press the START push button to allow the program to try to reset the PCI level 3 again.
XXXX	8X34	The DCM level 3 interrupt handler attempted to reset the interval timer interrupt request bit and the request bit (Reg X'7F', bit 1.5) did not reset.	Select FUNCTION 5 (continue) and press the START push button to cause the DCM to try to reset again.
XXXX	8X35	The DCM level 3 interrupt Handler attempted to reset the INTERRUPT push button request and the request bit (Reg X'7F', bit 0.6) did not reset.	Press the START push button to cause DCM to try to reset again.
XXXX	8X40	An unexpected level 4 interrupt has occurred.	NOTE: PCI Level 4 is set DCM and should be on all the time except while some CCU IFT routines are running. Use the control panel to determine cause and to reset the cause before using continue function. Reg X'7F' defines the request bits.
0000	8060	Requested utility function performed.	If hard stop light is on, set up other utility functions or select FUNCTION 5 (continue) or FUNCTION 6 (abort) and press the START push button. (If previous stop was code 8000 through 8007 select FUNCTION 4 (request) and complete your

			request). If the INTERRUPT push button used was to do the utility function, this display code is for information only and the program should still be running.
0000	8061	The request for a panel utility is not correct.	Check switch positions and try again. Possibilities: Switch B is not set for a valid Possibilities: utility request code. Switch C is not set to 0 or 1 for Byte 0 or 1 on a CE Switch Request.
0000	8062	The test condition specified has not been met.	The following registers of the active level contain these parameters: Register - X '01' R1=address tested R3=contents of address R5=error bits If the status indicates that level 1 is active, Register 1, Register 3, and Register 5 = registers X'01', X'03', and X'05'. If the status indicates that level 3 is active, Register 1, Register 3, and Register 5 = registers X'09', X'0B', and X'0D'. Select function to terminate utility, to continue, etc. press the START push button.

0000	8064	Enter the mask in the STORAGE ADDRESS/ REGISTER DATA switches for testing the contents of the address to display, press the START push button if the hard stop light is on.	Press the INTERRUPT push button if the program is running.
0000	8065	Enter the expected data in the STORAGE ADDRESS/ REGISTER DATA switches for testing the contents of the address to display, then press the START push button if the hard stop light is on.	Press the INTERRUPT push button if the program is running.
0000	8066	Enter the address to display.	Set the DISPLAY/FUNCTION SELECT switch to: A storage address to display contents of storage location. * register address to display contents of register. Set the STORAGE ADDRESS/ REGISTER DATA switches to: ABCDE=storage address B/D =register address Press the START push button if the hard stop light is on. Press the INTERRUPT push button if the program is running.

0000	8067	DISPLAY/FUNCTION SELECT switch not set to Storage Address or Register Address for code 8066.	Retry with initial utility request.
0000	8068	Set up for display is complete.	If the hard stop light is on, select FUNCTION 5 (continue) and press the START push button to continue. (If previous stop code was 8000 through 8007 select FUNCTION 4 (request) and complete the request. If the program is running this display code is for information only.
XXXX	806F	The DCM has halted due to CE sense switch wait before continuing being on.	This pause may be used to execute the utility functions or to change the STORAGE ADDRESS/ REGISTER DATA switches for address compare use. Select FUNCTION 5 (continue) and press the START push button to continue.
FFFF	80F0	Test request is finished and no errors were detected. The DCM is ready to accept a new request.	See stop 8000 for procedure to enter request.
FFFF	80F1	Test request is finished and errors were detected. The DCM is ready to accept a new request.	See stop 8000 for procedure to enter request.
FFFF	80F2	Test was aborted by the operator.	Ready to accept a new request. See stop 8000 for procedure to enter request.

XXXX	80FF	A program or hardware failure has caused a branch to storage location zero.	See interrupt entered indicator to determine interrupt level. Display A is the address of instruction that caused the branch to location zero if level 1 is not active. (The address also is in register 5 of the active level.) Analyze the program registers, etc. to determine why the branch occurred. Reload the DCM to recover from this error.
FFFF	FFFF	DCM is loaded and ready for first IFT request.	See FFFF 8000 for request procedure. Models with over 64K of storage should also have both bits of byte X in Display B on.

This intentionally left blank.

APPENDIX C INITIAL TEST SYMPTOM INDEX

This intentionally left blank.

APPENDIX C: INITIAL TEST SYMPTOM INDEX

IBM 3705 COMMUNICATIONS CONTROLLER
INITIAL TEST SYMPTOM INDEX

	ERROR	FUNCTION TESTED and	Level 'N' PRIOR TO TEST	EXPEC'TD RESULTS IN LEVEL 'N'	RESULTING CZ	SUSPECTED CARD	FEALD	FETMM	
0108	XXXX	Registers X'02', X'04', and X'06' are tested to verify data patterns FF, 00, AA, and 55.							
	0001	XR R2,R2 failed to clear Byte 0.	R2(0)=XX	R2(0)=00	01	Note 2			
	0002	XR R2,R2 failed to clear Byte 1.	R2(0)=XX	R2(1)=00	01	Note 2			
	0003	LH R2,SAVE failed to load R2 Byte 0 with all ones.	R2(0)=00	R2(0)=FF	11	Note 2			
	0004	LH R2,SAVE failed to load R2 Byte 1 with all ones.	R2(1)=00	R2(1)=FF	11	Note 2			
	0005	LH R2,SAVE2 failed to load R2 Byte 0 with X'55'.	R2(0)=FF	R2(0)=55	11	Note 2			
	0006	LH R2,SAVE2 failed to load R2 Byte 1 with X'55'.	R2(1)=FF	R2(1)=55	11	Note 2			
	0007	LH R2,SAVE3 failed to load R2 Byte 0 with X'AA'.	R2(0)=55	R2(0)=AA	11	Note 2			
	0008	LH R2,SAVE3 failed to load R2 Byte 0 with X'AA'.	R2(1)=55	R2(1)=AA	11	Note 2			
	0009	Register X'04' Byte 0 failed to load the correct data.		R4(0)=Actual R5(0)=Expected	11	Note 2			
	000A	Register X'04' Byte 1 failed to load the correct data.		R4(1)=Actual R5(0)=Expected	11	Note 2			
	000B	Register X'06' Byte 0 failed to load the correct data.		R6(0)=Actual R5(0)=Expected	11	Note 2			
	000C	Register X'06' Byte 1 failed to load the correct data.		R6(1)=Actual R6(0)=Expected	11	Note 2			
0208	XXXX	Test to verify that input X'70' defines a valid maximum address. Test last valid storage address (max. 64K). Storage size indicated in Reg X'70' is incorrect.		R6=Maximum address as calculated from input X'70'					If actual storage size is greater than 64K, X'FFFF' will be used in lieu of actual max. address.
0308	XXXX	Error Correction Routine - This routine runs on 3705-II Only. Ability to correct single bit errors, detect double bit errors, diagnostic reg reset.							
	0001	Error correction failed to reset data bit forced to 1 via diagnostic Reg.		R6=Expected data R4=Bits in error	01				
	0002	Error correction failed to set data bit forced to 0 via diagnostic Reg.		R6=Expected data R3=Bits in error	01				
	0003	Failed to detect double bit error.		R3=Expected R6=Actual					

ROUT	ERROR CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPEC'TD RESULTS IN LEVEL 'N' REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(s)	FEALD PAGE	FETMM PAGE	COMMENTS
	0004	Diagnostic reg. did not Reset or test mode did not set. Reset of test mode should reset the diagnostic reg.		R1=Expected R3=Actual	01				
0408	XXXX	Addressing test Address is stored as data and verified to be correct address.							
	0001	Data at address does not match address		R1=Expected R5=Actual	01				Problem may be ... check items concerning stora...
0508	XXXX	Storage Test - 3704 only, bypassed if 3705. No error stops should occur in this routine		N/A					If this error occ... verify that input X'79' byte 1, bit 5=1
0608	XXXX	Storage Test - 3704 Only. No error stops should occur in this routine		N/A					See comments for routine 0508.
0708	XXXX	Storage Test - Store zeros in background of ones.							
	0001	Background pattern was destroyed. Addressing problem suspected.		R1=Test address R2=Exp. (Background) R5=Bits in error					If this error occurs, bypass the running of Initial Test and load the storage IFT.
	0002	Store and then load a test pattern.		R1=Test address R4=Expected R5=Bits in error.					If this error occurs, bypass the running of Initial Test and load the storage IFT.
	0003	Load test pattern again to test restore capability		R1=Test address R4=Expected R3=Bits in error.					If this error occurs, bypass the running of Initial Test and load the storage IFT.
	0004	Parity bit failed.		R1=Test address					If this error occurs, bypass the running of Initial Test and load the storage IFT.
0808	XXXX	Storage Test - Store ones in background of zeros.							
	0001	Background pattern was destroyed. Addressing problem suspected.		R1=Test address R2=Exp. (Background) R5=Bits in error					
	0002	Store and then load a test pattern		R1=Test address R4=Expected R5=Bits in error					
	0003	Load test pattern again to test restore capability		R1=Test address R4=Expected R3=Bits in error					

ROUT	ERROR CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPEC'TD RESULTS IN LEVEL 'N' REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(s)	FEALD PAGE	FETMM PAGE	COMMENTS
0908	XXXX	Program Relocation This Routine is used to relocate test to address X'2000'. No error stops should occur.							
0A08	XXXX	Storage Test 0 - 2K. Store zeros in background of ones							
	0001	Background pattern was destroyed. Addressing problem suspected.		R1=Test address R2=Exp. (Background) R5=Bits in error.					
	0002	Store and then load a test pattern.		R1=Test address R4=Expected R5=Bits in error					
	0003	Load test pattern again to test restore capability		R1=Test address R4=Expected R3=Bits in error					
	0004	Parity bit failed		R1=Test address					
0B08	XXXX	Storage Test 0-2K. Store ones in background of zeros.							
	0001	Background pattern was destroyed. Addressing problem suspected.		R1=Test address R2=Exp. (Background) R5=Bits in error					
	0002	Store and then load a test pattern.		R1=Test address R4=Expected R5=Bits in error					
	0003	Load test pattern again to test restore capability		R1=Test address R4=Expected R3=Bits in error					
0C08	XXXX	Program Relocation All data relocated by Routine 0908 will be relocated back to '0000 - 0FFE' and control will be passed to the C. E. Loop Option subroutine. No error stops should occur.							
100N	XXXX	Branch Instruction Test.							
	0001	Branch with a displacement of two failed to branch around error stop.	N/A	N/A	01	AB3H2	CD002	6-640	Decode Failure
	0002	Prior to issuing the Branch, R1 was loaded with zeros to set the CZ latches. After branching, the CZ latches are tested to verify that the Branch did not alter the CZ latches.	R1(1)=00	R1(1)=00	01	AB3G2	CZxxx	6-640	C,Z Latch Failure
	0003	Same as 0001 above.	N/A	N/A	10	AB3H2	CD002	6-640	Decode Failure
	0004	Same as 0002 above except R1(1) is loaded with all ones to set the CZ latches to 10.				AB3G2	CZxxx	6-640	C,Z Latch Failure
110N	XXXX	LRI and BB Pattern Testing.							

POUT	ERROR CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPECTED RESULTS IN LEVEL 'N' REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(s)	FEALD PAGE	FETMM PAGE	COMMENTS
	0001	R1(1) is loaded with X'05' using LRI, then R1(1) is XOR with X'05'.	R1(1)=05	R1(1)=00	01	AB3H2	CD002	6-170	Decode Failure
	0002	R1(1) is loaded with all ones and the CZ latches are tested.	R1(1)=00	R1(1)=FF	10	AB3G2	CZxxx	6-170	C,Z Latch Failure
	0003	A series of branch on bit (BB) instructions is performed on R1(1). One of the eight BB failed to branch.	R1(1)=FF	R1(1)=FF	10	AB3H2	CD002	6-6 0	Decode Failure
	0004	BB instruction(s) altered the CZ latches.	R1(1)=FF	R1(1)=FF	10	AB3G2	CZxxx	6-6[illegible]	C,Z Latch Failure
	0005	R1(0) is loaded with X'00' and then the CZ latches are tested for 01.	R1(0)=XX	R1(0)=00	01	AB3H2 AB3G2	CD002 CZxxx	6-170	Decode Failure C,Z Latch Failure
	0006	A series of BB instructions is performed on R1(0). One of the eight BB branched on a zero or previous LRI failed.	R1(0)=00	R1(0)=00	01	AB3H2	CD002	6-6[illegible] 6-170	Decode Failure
	0007	BB instruction altered the CZ latches.	R1(0)=00	R1(0)=00	01	AB3G2	CZxxx	6-6[illegible]	C,Z Latch Failure
	0008	R1(0) is loaded with X'FF' and then the CZ latches are tested for 10.	R1(0)=00	R1(0)=FF	10	AB3H2	CD002	6-170	Decode Failure
	0009	A series of BB instructions is performed on R1(0). One of the eight BB failed to branch.	R1(0)=FF	R1(0)=FF	10	AB3H2	CD002	6-66[illegible]	Decode Failure
	000A	BB instruction altered the CZ latches.	R1(0)=FF	R1(0)=FF	10	AB3G2	CZxxx	6-66[illegible]	C,Z Latch Failure
	000B	R1(1) is loaded with all zeros and the CZ latches are tested for 01.	R1(1)=FF	R1(1)=00	01	AB3G2	CZxxx	6-17[illegible]	C,Z Latch Failure
	000C	A series of BB instructions is performed on R1(1). One of the eight BB branched on a zero or previous LRI failed.	R1(1)=00	R1(1)=00	01	AB3H2	CD002	6-66[illegible] 6-170	Decode Failure
	000D	BB instruction altered the CZ latches.	R1(1)=00	R1(1)=00	01	AB3G2	CZxxx	6-66[illegible]	C,Z Latch Failure
120N	XXXX	XRI Instruction Testing							
	0001	XRI or Z latch failed.	R1(1)=0C	R1(1)=00	01	AB3H2 AB3J2 AB3G2	CDxxx CA003 CZXXX	6-170	
	0002	XRI or C latch failed when R1(1) is XOR with all ones.	R1(1)=00	R1(1)=FF	10	AB3J2 AB3H2 AB3G2	CA003 CDxxx CZxxx	6-170	ALU Control Failure Decode Failure C,Z Latch Failure
	0003	XRI above failed to produce the correct data. Testing is done with BB INSTRUCTIONS.		R1(1)=FF		See Note 2		6-170 6-66[illegible]	See Note 2 for Bit bit failures
	0004	XRI failed to set Z latch.	R1(1)=FF	R1(1)=00	01	See Note 2		6-170	See Note 2 for Bit Failures
	0005	XRI above failed to produce correct data. Testing done with BB Instructions.		R1(1)=00	01	See Note 2		6-170	See Note 2 for Bit Failures

ROUT	ERROR CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPEC'TD RESULTS IN LEVEL 'N' REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(s)	FEALD PAGE	FETT1 PAGE	COMMENTS
	0006	XRI or C Latch failed.	R1(0)=FF	R1(0)=FF	10	See Note 2		6-170	See Note 2 for Bit Failures
	0007	XRI above failed to produce correct data. Testing done with BB instructions.		R1(0)=FF	10	See Note 2		6-170	See Note 2 for Bit Failures
	0008	XRI failed to set Z latch.	R1(1)=00	R1(1)=00	01	See Note 2		6-170	See Note 2
	0009	Above XRI failed to produce correct data.		R1(1)=00	01	See Note 2		6-170	See Note 2
130N	XXXX	ARI Instruction Test.							
	0001	ARI decode or CZ failure	R1(1)=0E	R1(1)=00	10	AB3G2 AB3J2	CZ002 CA002	6-170	Decode Failure ALU CTL Failure
	0002	ARI or CZ latch failure adding zero's.	R1(0)=FF	R1(0)=FF	00	AB3G2 AB3J2	CZxxx CA002	6-170	CZ Latch Failure
	0003	Above ARI modified high byte. Testing by XRI	R1(0)=FF	R1(0)=00	01	See Note 2		6-170	See Note 2 for Bit Failures
	0004	ARI or C latch failure adding zero's.	R1(1)=00	R1(1)=00	01	See Note 2		6-170	
	0005	Above ARI modified low byte. Testing by XRI.	-	R1(1)=00	01	See Note 2		6-170	
	0006	CZ latch failure adding all ones.	R1(1)=00	R1(1)=FF	00	See Note 2		6-170	
	0007	ARI above, failed to produce correct result. Testing by XRI.	-	R1(1)=00	01	See Note 2		6-170	
	0008	ARI CZ latch failure adding all ones to all ones.	R1(1)=FF	R1(1)=FE	10	See Note 2		6-170	
	0009	Above ARI failed to produce correct result. Testing by XRI.	-	R1(1)=00	01	See Note 2		6-170	
150N	XXXX	Data Flow Path Byte One, Zero's Pattern Sensitivity							XRI, BB, BCL and BZL instructions are used to verify bit sensitivity
	0001	XRI or CZ latch failure	R1(1)=00	R1(1)=01	10	See Note 2		6-170	
	0002	Above XRI failed to produce correct result. Testing by BB.	-	R1(1)=01	10	See Note 2		6-170 6-660	Any failure in this routine, see Note 2
	0003	XRI failed to set Z latch	R1(1)=01	R1(1)=00	01	See Note 2		6-170	
	0004	XRI or CZ latch failure	R1(1)=00	R1(1)=02	10	See Note 2		6-170	
	0005	Above XRI failed to produce correct result. Testing by BB.	-	R1(1)=02	10	See Note 2		6-170 6-660	
	0006	XRI failed to set Z latch	R1(1)=02	R1(1)=00	01	See Note 2		6-170	
	0007	XRI or CZ latch failure	R1(1)=00	R1(1)=04	10	See Note 2		6-170	
	0008	Above XRI failed to produce correct result. Testing by BB.	-	R1(1)=04	10	See Note 2		6-170	
	0009	XRI failed to set Z latch	R1(1)=04	R1(1)=00	01	See Note 2		6-170	
	000A	XRI or CZ latch failure	R1(1)=00	R1(1)=08	10	See Note 2		6-170	

ROUT	ERROR CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPEC'TD RESULTS IN LEVEL 'N' REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(s)	FEALD PAGE	FETMM PAGE	COMMENTS
	000B	Above XRI failed to produce correct results. Testing by BB.	-	R1(1)=08	10	See Note 2		6-170	
	000C	XRI failed to set Z latch	R1(1)=08	R1(1)=00	01	See Note 2		6-170	
	000D	XRI or CZ latch failure	R1(1)=00	R1(1)=10	10	See Note 2		6-170	
	000E	Above XRI failed to produce correct result. Testing by BB.	-	R1(1)=10	10	See Note 2		6-170	
	000F	XRI failed to set Z latch	R1(1)=10	R1(1)=00	01	See Note 2		6-170	
	0010	XRI or C,Z latch failure	R1(1)=00	R1(1)=20	10	See Note 2		6-170	
	0011	Above XRI failed to produce correct result. Testing by BB.	-	R1(1)=20	10	See Note 2		6-170	
	0012	XRI failed to set Z latch	R1(1)=20	R1(1)=00	01	See Note 2		6-170	
	0013	XRI or C,Z latch failure	R1(1)=00	R1(1)=40	10	See Note 2		6-170	
	0014	Above XRI failed to produce correct result. Testing by BB.	-	R1(1)=40	10	See Note 2		6-170	
	0015	XRI failed to set Z latch	R1(1)=40	R1(1)=00	01	See Note 2		6-170	
	0016	XRI or C,Z latch failure	R1(1)=00	R1(1)=80	10	See Note 2		6-170	
	0017	Above XRI failed to produce correct result. Testing by BB.	-	R1(1)=80	10	See Note 2		6-170	
	0018	XRI failed to set Z latch	R1(1)=80	R1(1)=00	01	See Note 2		6-170	
	0019	XRI or C,Z latch failure	R1(1)=00	R1(1)=AA	10	See Note 2		6-170	
	001A	Above XRI failed to produce correct result. Testing by B and BB.	-	R1(1)=AA	10	See Note 2		6-170	
	001B	XRI failed to set Z latch	R1(1)=AA	R1(1)=00	01	See Note 2		6-170	
160N	XXXX	Data Flow Path Bypass, One's Pattern Sensitivity							XRI, BB, BCL and BZL instructions are used to verify bit sensitivity
	0001	XRI or CZ latch failure	R1(1)=00	R1(1)=FE	10	See Note 2		6-170	
	0002	Above XRI failed to produce correct result. Testing by BB.	-	R1(1)=FE	10	See Note 2		6-170	Any failure in this routine, See Note 2
	0003	XRI failed to se Z latch	R1(1)=FE	R1(1)=00	01	See Note 2		6-170	
	0004	XRI or C,Z latch failure	R1(1)=00	R1(1)=FD	10	See Note 2		6-170	
	0005	Above XRI failed to produce correct result. Testing by BB.	-	R1(1)=FD	10	See Note 2		6-170	
	0006	XRI failed to set Z latch	R1(1)=FD	R1(1)=00	01	See Note 2		6-170	
	0007	XRI or C, Z latch failure	R1(1)=00	R1(1)=FB	10	See Note 2		6-170	
	0008	Above XRI failed to produce correct result. Testing by BB.	-	R1(1)=FB	10	See Note 2		6-170	
	0009	XRI failed to set Z latch	R1(1)=FB	R1(1)=00	01	See Note 2		6-170	
	000A	XRI or C, Z latch failure	R1(1)=00	R1(1)=F7	10	See Note 2		6-170	

ROUT	ERROR CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPECTED RESULTS IN LEVEL 'N' REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(s)	FEALD PAGE	FETMM PAGE	COMMENTS
	000B	Above XRI failed to produce correct result. Testing by BB.		R1(1)=F7	10	See Note 2		6-170	
	000C	XRI failed to set Z latch	R1(1)=F7	R1(1)=00	01	See Note 2		6-170	
180N	XXXX	Data Flow Path Byte Zero, One's Pattern Sensitivity							XRI, BB, BCL and BZL instructions are used to verify bit sensitivity
	0001	XRI or C,Z latch failure	R1(0)=00	R1(0)=EF	10	See Note 2		6-170	
	0002	Above XRI failed to produce correct result. Testing by BB.	-	R1(0)=EF	10	See Note 2		6-170	Any Failure in this Routine, See Note 2
	0003	XRI failed to set Z latch	R1(0)=EF	R1(0)=00	01	See Note 2		6-170	
	0004	XRI or C,Z latch failure	R1(0)=00	R1(0)=DF	10	See Note 2		6-170	
	0005	Above XRI failed to produce correct result. Testing by BB.	-	R1(0)=DF	10	See Note 2		6-170	
	0006	XRI failed to set Z latch	R1(0)=DF	R1(0)=00	01	See Note 2		6-170	
	0007	XRI or C,Z latch failure	R1(0)=00	R1(0)=BF	10	See Note 2		6-170	
	0008	Above XRI failed to produce correct result. Testing done by BB.	-	R1(0)=BF	10	See Note 2		6-170	
	0009	XRI failed to set Z latch	R1(0)-BF	R1(0)=00	01	See Note 2		6-170	
	000A	XRI or C,Z latch failure	R1(0)=00	R1(0)=7F	10	See Note 2		6-170	
	000B	Above XRI failed to produce correct result. Testing done by BB.	-	R1(0)=7F	10	See Note 2		6-170	
	000C	XRI failed to set Z latch	R1(0)=7F	R1(0)=00	01	See Note 2		6-170	
190N	XXXX	Data Flow Path Byte Zero Zero's Pattern Sensitivity							XRI, BB, BCL and BZL instructions are used to verify bit sensitivity
	0001	XRI or C,Z latch failure	R1(0)=00	R1(0)=01	10				
	0002	Above XRI failed to produce correct result. Testing done by BB.	-	R1(0)=01	10	See Note 2		6-170	
	0003	XRI failed to set Z latch	R1(0)=01	R1(0)=00	01	See Note 2		6-170	
	0004	XRI or CZ latch failure	R1(0)=00	R1(0)=02	10	See Note 2		6-170	
	0005	Above XRI failed to produce correct result. Testing by BB.	-	R1(0)=02	10	See Note 2		6-170	
	0006	XRI failed to set Z latch	R1(0)=02	R1(0)=00	01	See Note 2		6-170	
	0007	XRI or C,Z latch failure	R1(0)=00	R1(0)=04	10	See Note 2		6-170	
	0008	Above XRI failed to produce correct result. Testing by BB.	-	R1(0)=04	10	See Note 2		6-170	
	0009	XRI failed to set Z latch	R1(0)=04	R1(0)=00	01	See Note 2		6-170	
	000A	XRI or C,Z latch failure	R1(0)=00	R1(0)=08	10	See Note 2		6-170	

ROUT	ERROR CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPEC'TD. RESULTS IN LEVEL 'N' REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(s)	FEALD PAGE	FETMM PAGE	COMMENTS
	000B	Above XRI failed to produce correct result. Testing by BB.	-	R1(0)=08	10	See Note 2		6-170	
	000C	XRI failed to set Z latch	R1(0)=08	R1(0)=00	01	See Note 2		6-170	
	000D	XRI or C,Z latch failure	R1(0)=00	R1(0)=55	10	See Note 2		6-170	
	000E	Above XRI failed to produce correct result. Testing by BB.	-	R1(0)=55	10	See Note 2		6-170	
	000F	XRI failed to set Z latch	R1(0)=55	R1(0)=00	01	See Note 2		6-170	
1B0N	XXXX	ORI Instruction Test							
	0001	ORI decode failure. Low byte containing 09 was ORI with 05. Result tested by XRI.	R1(1)=09	R1(1)=00	01	AB3H2 AB3J2	CD002 CA003	6-170	Decode Failure ALU Control Failure
	0002	ORI or C,Z latch failure	R1(1)=00	R1(1)=FF	10	AB3G2	CZxxx	6-170	C,Z Latch Failure
	0003	Above ORI failed to produce correct result. Testing by XRI.	R1(1)=FF	R1(1)=00	01	See Note 2		6-170	See Note 2 for Bit Failures in this Routine
	0004	ORI or C,Z latch failure	R1(1)=00	R1(1)=00	01	See Note 2		6-170	
	0005	Above ORI failed to produce correct result. Testing by XRI.	R1(1)=00	R1(1)=00	01	See Note 2		6-170	
	0006	ORI or C,Z latch failure	R1(0)=FF	R1(0)=FF	10	See Note 2		6-170	
	0007	Above ORI failed to produce correct result. Testing by XRI.	R1(0)=FF	R1(0)=00	01	See Note 2		6-170	
	0008	ORI or C,Z latch failure FF was ORI with FF	R1(0)=00	R1(0)=FF	10	See Note 2		6-170	
	0009	ORI above failed to produce correct result. Tested by XRI.	R1(0)=FF	R1(0)=00	01	See Note 2		6-170	
1C0N	XXXX	NRI Instruction Test							
	0001	NRI decode failure. 09 was NRI with 05. Result was tested by XRI.	R1(1)=09 R1(1)=05 R1(1)=01	R1(1)=00	01	AB3H2 AB3J2	CD002 CA002	6-170	Decode Failure ALU Control Fail
	0002	NRI or C,Z latch failure 00 was NRI with 00	R1(1)=00	R1(1)=00	01	AB3G2	CZxxx	6-170	C,Z Latch Failure
	0003	Above NRI failed to produce correct result. Tested by XRI.	R1(1)=00	R1(1)=00	01	See Note 2		6-170	
	0004	NRI or C,Z latch failure FF was NRI with FF	R1(0)=FF	R1(0)=FF	10	See Note 2		6-170	
	0005	Above NRI failed to produce correct result. Tested by XRI.	R1(0)=FF	R1(0)=00	01	See Note 2		6-170	
	0006	NRI or C,Z latch failure FF was NRI with 00	R1(1)=FF	R1(1)=00	01	See Note 2		6-170	
	0007	NRI above failed to produce correct result.	R1(1)=00	R1(1)=00	01	See Note 2		6-170	
	0008	NRI or C,Z latch failure FF was NRI with 00	R1(0)=00	R1(0)=00	01	See Note 2		6-170	

ROUT	ERROR CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPEC'TD RESULTS IN LEVEL 'N' REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(s)	FEALD PAGE	FETMM PAGE	COMMENTS
	0009	Above NRI failed to produce correct result. Tested by XRI.	R1(0)=00	R1(0)=00	01	See Note 2		6-170	
1D0N	XXXX	TRM Instruction Test							
	0001	TRM decode failure. Tested by XRI. TRM mask was 05.	R1(1)=09	R1(1)=00	01	AB3H2 AB3J2	CDxxx CA002	6-170	Decode failure ALU control failure
	0002	TRM or C,Z latch failure TRM Mask was FF	R1(1)=FF	R1(1)=FF	10	AB3K2 AB3G2	CL003 CZxxx	6-170	LS control failure C,Z latch failure
	0003	Above TRM modified R1 low Tested by XRI	R1(1)=FF	R1(1)=00	01	See Note 2		6-170	See note 2 for Bit failure
	0004	TRM or C,Z latch failure TRM Mask was 00	R1(0)=FF	R1(0)=FF	01	See Note 2		6-170	
	0005	Above TRM modified R1 high Tested by XRI	R1(0)=FF	R1(0)=00	01	See Note 2		6-170	
	0006	TRM or C,Z latch failure TRM Mask was FF	R1(1)=00	R1(1)=00	01	See Note 2		6-170	
	0007	Above TRM modified R1 low	R1(1)=00	R1(1)=00	01	See Note 2		6-170	
1E0N	XXXX	SRI Instruction Test				AB3H2	CD002	6-170	Decode failure
	0001	SRI Decode failure SRI 05 from 09. Result tested by XRI	R1(1)=09 R1(1)=05 R1(1)=04	R1(1)=00	01	AB3J2 AB3G2	CA003 CZxxx	6-170	ALU control failure C,Z latch failure
	0002	SRI or C,Z latch failure SRI 00 from FF	R1(0)=FF	R1(0)=FF	00	See Note 2		6-170	
	0003	SRI above failed to produce correct result. Tested by XRI	R1(0)=FF	R1(0)=00	01	See Note 2		6-170	
	0004	SRI or C,Z latch failure SRI Mask was 00	R1(0)=00	R1(0)=00	01	See Note 2		6-170	
	0005	Above SRI failed to produce correct result. Testing by XRI	R1(0)=00	R1(0)=00	01	See Note 2		6-170	
	0006	SRI or C,Z latch failure	R1(1)=FF	R1(1)=00	01	See Note 2		6-170	
	0007	Above SRI failed to produce correct result. Testing by XRI	R1(1)=00	R1(1)=00	01	See Note 2		6-170	
	0008	SRI or C,Z latch failure SRI Mask was FF	R1(1)=00	R1=FF01	10	See Note 2		6-170	
	0009	Above SRI failed to produce correct result. Testing by XRI instructions.	R1=FF01	R1=0000	01	See Note 2		6-170	
1F0N	XXXX	CRI Instruction Test							
	0001	CRI decode failure CRI Mask was 05. Testing by XRI.	R1(1)=09 R1(1)=09	R1(1)=00	01	AB3H2 AB3J2 AB3K2	CD002 CA003 CL003	6-170	Decode failure ALU control failure LS control failure
	0002	CRI or C,Z latch failure CRI Mask was FF	R1(1)=FF	R1(1)=FF	01	AB3G2	CZxxx	6-170	C,Z latch failure
	0003	Above CRI modified R1 low. Testing by XRI	R1(1)=FF	R1(1)=00	01	See Note 2		6-170	
	0004	CRI or C,Z latch failure CRI Mask was FF	R1(1)=00	R1(1)=00	10	See Note 2		6-170	

ROUT	ERROR CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPEC'TD RESULTS IN LEVEL 'N' REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(S)	FEALD PAGE	FEIMM PAGE	COMMENTS
	0005	Above CRI modified R1 low Testing by XRI	R1(1)=00	R1(1)=00	01	See Note 2		6-170	
	0006	CRI or C,Z latch failure CRI Mask was FE	R1(1)=FF	R1(0)=FF	00	See Note 2		6-170	
	0007	Above CRI modified R1 high. Testing by XRI	R1(0)=FF	R1(0)=00	01	See Note 2		6-170	
200N	XXXX	LCR Instruction Test							
	0001	LCR decode failure. Testing by XRI.	R1(1)=09 R1(1)=05	R3(1)=05 R1(1)=00	01	AB3H2 AB3J2	CD002 CAxxx	6-220 6-170	Decode Failure ALU Controls failure
	0002	Above LCR modified R3 low. Testing by XRI.	R3(1)=05 R3(1)=FF	R3(1)=00	01	AB3G2	CZxxx	6-220 6-170	C,Z Latch failure. See note 2 for bit failures.
	0003	LCR or C,Z latch failure	R3(0)=XX R3(1)=01	R3(0)=01	00	See Note 2		6-220	
	0004	LCR above failed to produce correct result. Testing by XRI.	R3(0)=01	R3(0)=00	01	See Note 2		6-220 6-170	
	0005	LCR or C,Z latch failure	R3(1)=02 R3(0)=00	R3(0)=02	00	See Note 2		6-220	
	0006	Above LCR failed to produce correct result. Testing by XRI.	R3(0)=02	R3(0)=00	01	See Note 2		6-220 6-170	
	0007	LCR or C,Z latch failure	R3(1)=04 R3(0)=00	R3(0)=04	00	See Note 2		6-220	
	0008	Above LCR failed to produce correct result. Testing by XRI.	R3(0)=04	R3(0)=00	01	See Note 2		6-220 6-170	
	0009	LCR or C,Z latch failure	R3(1)=08 R3(0)=00	R3(0)=08	00	See Note 2		6-220	
	000A	Above LCR failed to produce correct result. Testing by XRI.	R3(0)=08	R3(0)=00	01	See Note 2		6-220 6-170	
	000B	LCR or C,Z latch failure	R3(1)=10 R3(0)=00	R3(0)=10	00	See Note 2		6-220	
	000C	Above LCR failed to produce correct results. Testing by XRI.	R3(0)=10	R3(0)=00	01	See Note 2		6-220 6-170	
	000D	LCR or C,Z latch failure	R3(1)=20 R3(0)=00	R3(0)=20	00	See Note 2		6-220	
	000E	Above LCR failed to produce correct result. Testing by XRI.	R3(0)=20	R3(0)=00	01	See Note 2		6-220 6-170	
	000F	LCR or C,Z latch failure	R3(1)=40 R3(0)=00	R3(0)=40	00	See Note 2		6-220	
	0010	Above LCR failed to produce correct result. Testing by XRI.	R3(0)=40	R3(0)=00	01	See Note 2		6-220 6-170	
	0011	LCR or C,Z latch failure	R3(1)=80 R3(0)=00	R3(0)=80	00	See Note 2		6-220	
	0012	Above LCR failed to produce correct result. Testing by XRI.	R3(0)=80	R3(0)=00	01	See Note 2		6-220 6-170	

ROUT	ERROR CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPECTED RESULTS IN LEVEL 'N' REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(s)	FEALD PAGE	FETMM PAGE	COMMENTS
	0013	LCR or C,Z latch failure	R3(1)=7F R3(0)=00	R3(0)=7F	00	See Note 2		6-220	
	0014	Above LCR failed to produce correct result. Testing by XRI.	R3(0)=7F	R3(0)=00	01	See Note 2		6-220 6-170	
	0015	LCR or C,Z latch failure	R3(1)=BF R3(0)=00	R3(0)=BF	00	See Note 2		6-220	
	0016	Above LCR failed to produce correct result. Testing by XRI.	R3(0)=BF	R3(0)=00	01	See Note 2		6-220 6-170	
	0017	LCR or C,Z latch failure	R3(1)=DF R3(0)=00	R3(0)=DF	00	See Note 2		6-220	
	0018	Above LCR failed to produce correct result. Testing by XRI.	R3(0)=DF	R3(0)=00	01	See Note 2		6-220 6-170	
	0019	LCR or C,Z latch failure	R3(1)=EF R3(0)=00	R3(0)=EF	00	See Note 2		6-220	
	001A	Above LCR failed to produce correct result. Testing by XRI.	R3(0)=EF	R3(0)=00	01	See Note 2		6-220 6-170	
	001B	LCR or C,Z latch failure	R3(1)=F7 R3(0)=00	R3(0)=F7	00	See Note 2		6-220	
	001C	Above LCR failed to produce correct result. Testing by XRI.	R3(0)=F7	R3(0)=00	01	See Note 2		6-220 6-170	
	001D	LCR or C,Z latch failure	R3(1)=FB R3(0)=00	R3(0)=FB	00	See Note 2		6-220	
	001E	Above LCR failed to produce correct result. Testing by XRI.	R3(0)=FB	R3(0)=00	01	See Note 2		6-220 6-170	
	001F	LCR or C,Z latch failure	R3(1)=FD R3(0)=00	R3(0)=FD	00	See Note 2		6-220	
	0020	Above LCR failed to produce correct result. Testing by XRI.	R3(0)=FD	R3(0)=00	01	See Note 2		6-220 6-170	
	0021	LCR or C,Z latch failure	R3(1)=FE R3(0)=00	R3(0)=FE	00	See Note 2		6-220	
	0022	Above LCR failed to produce correct result. Testing by XRI.	R3(0)=FE	R3(0)=00	01	See Note 2		6-220 6-170	
	0023	LCR or C,Z latch failure 2 LCR instructions used. R3 high to R3 high sets CZ=00 R3 low to R3 high sets CZ=11	R3(1)=00 R3(0)=FE	R3(0)=00	11	See Note 2		6-220	
	0024	Above LCRs failed to produce correct result. Testing by XRI.	R3(0)=00	R3(0)=00	01	See Note 2		6-220 6-170	
	0025	LCR or C,Z latch failure	R3(1)=FF R3(0)=00	R3(0)=FF	10	See Note 2		6-220	
	0026	Above LCR failed to produce correct result. Testing by XRI.	R3(0)=FF	R3(0)=00	01	See Note 2		6-220 6-170	
	0027	LCR or C,Z latch failure	R3(1)=AA R3(0)=00	R3(0)=AA	10	See Note 2		6-220	

ROUT	ERROR CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPEC'TD RESULTS IN LEVEL 'N' REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(s)	FEALD PAGE	FETMM PAGE	COMMENTS
	0028	Above LCR failed to produce correct result. Testing by XRI.	R3(0)=AA	R3(0)=00	01	See Note 2		6-220 6-170	
	0029	LCR or C,Z latch failure	R3(1)=55 R3(0)=00	R3(0)=55	10	See Note 2		6-220	
	002A	Above LCR failed to produce correct result. Testing by XRI.	R3(0)=55	R3(0)=00	01	See Note 2		6-220 6-170	
	002B	LCR or C,Z latch failure. Result tested by XRI.	R3(1)=FE R1(1)=00	R1(1)=FE R1(1)=00	01	See Note 2		6-220 6-170	
	002C	LCR failure. Result tested by XRI.	R3(0)=00 R1(0)=FF	R1(0)=00 R1(0)=00	01	See Note 2		6-220 6-170	
	002D	LCR failure. Result tested by XRI.	R3(0)=00 R1(0)=FF	R1(0)=00	01	See Note 2		6-220 6-170	
220N	XXXX	Branching Test							
	0001	BZL, Pos. Displacement ALU Failure			11	AB3G2	CZxxx	6-640	C,Z Latch Failure
	0002	B, Neg. Displacement ALU Failure			11	AB3J2	CAxxx	6-640	ALU Controls Failure
	0003	BCL, Neg. Displacement ALU Failure			11	See Note 2		6-640	See Note 2 for Bit Failures
	0004	BZL , Neg Displacement			11	See Note 2		6-640	
	0005	BCL, BZL, B, BB Failure			11	See Note 2		6-640 6-660	
230N	XXXX	ACR Instruction Test							
	0001	ACR decode failure. Result OE is tested by XRI.	R3(1)=05 R1(1)=09	R1(1)=0E R1(1)=00	01	AB3H2 AB3J2	CDxxx CAxxx	6-220 6-170	Decode Failure ALU Controls Failure See Note 2 for Bit Failures
	0002	ACR or C,Z latch failure	R3(1)=01 R1(0)=F7	R1(0)=F8	00	AB3G2	CZxxx	6-220	C,Z Latch Failure
	0003	Above ACR did not produce correct result. Testing by XRI.	R1(0)=F8	R1(0)=00	01	See Note 2		6-220 6-170	
	0004	ACR or C latch failure ACR R3 high with R3 low,CZ=00 ACR R1 low with R3 high,CZ=11	R1(1)=81 R3=7F01	R3=7F80 R3=0080	11	See Note 2		6-220	
	0005	Above ACR, Z latch failure				See Note 2		6-220	
	0006	Above ACR, failed to produce correct data in R3 low. Testing by XRI.	R3(1)=80	R3(1)=00	01	See Note 2		6-220 6-170	
	0007	Above ACR failed to produce correct data in R3 high. Testing by XRI.	R3(0)=00	R3(0)=00	01	See Note 2		6-220 6-170	
	0008	Above ACR MODIFIED CONTENTS of R1(1). Testing by XRI.	R1(1)=81	R1(1)=00	01	See Note 2		6-220 6-170	
	0009	Above ACR modified contents of R1(0). Testing by XRI.	R1(0)=FF	R1(0)=00	01	See Note 2		6-220 6-170	
	000A	ACR or C,Z latch failure ACR R1 high with R1 high	R1(0)=FF	R1(0)=FE	10	See Note 2		6-220	

ROUT	ERROR CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPEC'TD RESULTS IN LEVEL 'N' REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(s)	FEALD PAGE	FETMM PAGE	COMMENTS
	000B	Above ACR failed to produce correct result. Testing by XRI.	R1(0)=FE	R1(0)=00	01	See Note 2		6-220 6-170	
	000C	ACR failed to produce correct result when ACR R1 low with R3 low. Result tested by XRI.	R1(1)=00 R3(1)=FF	R3(1)=FF	00	See Note 2		6-220 6-170	
240N	XXXX	OCR Instruction Test							
	0001	OCR decode failure Testing by XRI.	R3(1)=05 R1(1)=00	R1(1)=00 R1(1)=00	01	AB3H2 AB3J2	CDxxx CA003	6-220 6-170	Decode Failure ALU Controls Failure See Note 2 for Bit Failures
	0002	OCR or C,Z latch failure	R3(1)=CC R1(0)=33	R1(0)=FF	10	AB3G2	CZxxx	6-220	C,Z latch failure
	0003	Above OCR failed to produce correct result. Testing by CRI.	R1(0)=FF	R1(0)=FF	01	See Note 2		6-220 6-170	
	0004	OCR or C,Z latch failure	R3(0)=00 R1(1)=00	R1(1)=00	01	See Note 2		6-220	
	0005	Above OCR failed to produce correct result. Testing by CRI.	R1(1)=00	R1(1)=00	01	See Note 2		6-220 6-170	
	0006	OCR or C,Z latch failure Testing by CRI	R1(0)=FF	R1(0)=FF	01	See Note 2		6-220 6-170	
250N	XXXX	NCR Instruction Test							
	0001	NCR decode failure Testing by XRI	R3(1)=05 R1(1)=09	R1(1)=01 R1(1)=00	01	AB3H2 AB3J2	CD002 CAxxx	6-220 6-170	Decode Failure ALU Controls Failure See Note 2 for Bit Failures
	0002	NCR or C,Z latch failure	R3(0)=FF R1(1)=FF	R1(1)=FF	10	AB3G2	CZxxx	6-220	C,Z Latch Failure
	0003	NCR above failed to produce correct result. Testing by CRI.	R1(1)=FF	R1(1)=FF	01	See Note 2		6-220 6-170	
	0004	NCR or C,Z latch failure	R1(1)=FF R1(0)=00	R1(0)=00	01	See Note 2		6-220	
	0005	Above NCR failed to produce correct result. Testing by CRI.	R1(0)=00	R1(0)=00	01	See Note 2		6-220 6-170	
260N	XXXX	XCR Instruction Test							
	0001	XCR instruction decode testing by XRI.	R3(1)=05 R1(1)=09	R1(1)=0C R1(1)=00	01	AB3H2 AB3J2	CD002 CA003	6-220 6-170	Decode Failure ALU Controls Failure See Note 2 for Bit Failures
	0002	XCR or C,Z latch failure	R1(0)=FF R1(1)=00	R1(1)=FF	10	AB3G2	CZxxx	6-220	C,Z Latch Failure
	0003	Above XCR failed to produce correct result. Testing by CRI.	R1(1)=FF	R1(1)=FF	01	See Note 2		6-220 6-170	
	0004	XCR or C,Z latch failure	R1(1)=FF R3(0)=FF	R3(0)=00	01	See Note 2		6-220	

ROUT	ERROR CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPEC'TD RESULTS IN LEVEL 'N' REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(s)	FEALD PAGE	FETMM PAGE	COMMENTS
	0005	XCR above failed to produce correct result.	R3(0)=00	R3(0)=00	01	See Note 2		6-220	
270N	XXXX	SCR Instruction Test							
	0001	SCR decode failure Testing by XRI	R3(1)=05 R1(1)=09	 R1(1)=04 R1(1)=00	 01	AB3H2 AB3J2	CD002 CA003	6-220 6-170	Decode Failure ALU Controls Failure
	0002	SCR or C,Z latch failure	R1(0)=FF R3(0)=00	 R3(0)=01	 10	AB3G2	CZxxx	6-220	C,Z Latch Failure
	0003	Above SCR failed to produce correct result. Testing by XRI.	R3(0)=01	R3(0)=00		See Note 2		6-220 6-170	
	0004	SCR or C,Z latch failure	R1(0)=FF R3(0)=FF	 R3(0)=00	 01	See Note 2		6-220	
	0005	Above SCR failed to produce correct result. Testing by XRI.	R3(0)=00	R3(0)=00	01	See Note 2		6-220 6-170	
280N	XXXX	CCR Instruction Test	R3(1)=05						
	0001	CCR decode failure. Testing by XRI.	R1(1)=09	R1(1)=09 P1(1)=00	 01	AB3H2 AB3J2	CD002 CA003	6-220 6-170	Decode Failure ALU Controls Failure
	0002	CCR or C,Z latch failure	R3(1)=FF R3(0)=00	 R3(0)=00	 10	AB3G2	CZxxx	6-220	C,Z Latch Failure
	0003	Above CCR modified R3 high Testing by XRI.	R3(0)=00	R3(0)=00	01	See Note 2		6-220 6-170	
	0004	CCR or C,Z latch failure	R1(0)=FF R3(1)=FF	 R3(1)=FF	 01	See Note 2		6-220	
	0005	Above CCR modified R3 low. Testing by XRI.	R3(1)=FF	R3(1)=00	01	See Note 2		6-220 6-170	
290N	XXXX	LCOR Instruction Test							
	0001	LCOR decode failure Testing by XRI.	R3(1)=05 R1(1)=09	 R1(1)=02 R1(1)=00	 01	AB3H2 AB3J2	CD002 CAxxx	6-220 6-170	Decode Failure ALU Controls Failure
	0002	LCOR or C,Z latch failure LCOR R3 high into R3 high	R3(0)=FF	R3(0)=7F	10	See Note 2		6-220	
	0003	Above LCOR failed to produce correct result. Testing by XRI.	R3(0)=7F	R3(0)=00	01	See Note 2		6-220 6-170	
	0004	LCOR or C,Z latch failure LCOR R1 low into R1 low.	R1(1)=00	R1(1)=00	01	See Note 2		6-220	
	0005	Above LCOR failed to produce correct result. Testing by CRI.	R1(1)=00	R1(1)=00	01	See Note 2		6-220	
2A0N	XXXX	LHR Instruction Test							
	0001	LHR decode failure. Testing by XRI.	R3(1)=05 R1(1)=09	 R1(1)=05 R1(1)=00	 01	AB3H2 AB3J2	CD003 CA001	6-220 6-170	Decode Failure ALU Controls Failure
2B0N	XXXX	SHR Instruction Test							
	0001	SHR decode failure. Result tested by XRI.	R3(1)=05 R1(1)=09	 R1(1)=04 R1(1)=00	 01	AB3H2 AB3J2	CD003 CA003	6-220 6-170	Decode Failure ALU Controls Failure

ROUT	ERROR CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPEC'TD RESULTS IN LEVEL 'N' REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(s)	PEALD PAGE	PETMM PAGE	COMMENTS
	0002	SHR or C,Z latch failure	R1=0100 R3=0000	R3=FF00	10	AB3G2	CZxxx	6-220	C,Z latch
	0003	Above SHR failed to produce correct result. Testing by XRI.	R3(0)=FF	R3(0)=00	01	See Note 2		6-220 6-170	
	0004	Above SHR failed to produce correct result. Testing by XRI.	R3(1)=00	R3(1)=00	01	See Note 2		6-220 6-170	
	0005	SHR or C,Z latch failure	R3=FF00 R1=FF00	R1=0000	01	See Note 2		6-220	
	0006	SHR or C,Z latch failure	R1=01FF R3=FF00	R3=FD01	00	See Note 2		6-220	
	0007	SHR above failed to produce correct result. Testing by XRI.	R3(0)=FD	R3(0)=00	01	See Note 2		6-220 6-170	
	0008	SHR above failed to produce correct result. Testing by XRI.	R3(1)=01	R3(1)=00	01	See Note 2		6-220 6-170	
2C0N	XXXX	CHR Instruction Test							
	0001	CHR decode failure Testing by XRI	R3(1)=05 R1(1)=09	R1(1)=09 R1(1)=00	01	AB3H2 AB3J2	CD003 CAxxx	6-220 6-170	Decode Failure ALU Control Failure
2E0N	XXXX	Byte 0 and 1 data flow pattern sensitivity test. This routine loops 256 times. The first test pattern is FF00 and each successive pass adds one to byte 1 and subtracts one from byte 0 so that the last test pattern is 00FF.							See Note 2 for Bit Failures
	0001	LHR instruction is used to move R3 data into R1. The CZ latches are tested for 10.	R3=NOT 0	R1=R3	10	See Note 2		6-220	
	0002	LHR data transfer is tested by XORing data in R1 and R3 byte 0. Byte 0 data failed to transfer.	R1=R3	R3(0)=00	01	See Note 2		6-220	R3(0)=Bits that failed
	0003	LHR data transfer is tested by XORing data in R1 and R3 byte 1. Byte 1 data failed to transfer.	R1(1)=R3(1)	R3(1)=00	01	See Note 2		6-220	R3(1)=Bits that failed
	0004	CHR instruction is tested by comparing R1 and R3.	R1=R3	R1=R3 R3=Test Pattern	01	See Note 2		6-220	
2F0N	XXXX	Byte 0 and 1 data flow pattern sensitivity test 2 of 2.							
	0001	LHR instruction is used to move R1 data into R3. The CZ latches are tested for 01.	R1=0000 R3=FFFF	R3=0000	01	See Note 2		6-220	
	0002	CHR instruction is used to test data transfer	R1=0000 R3=0000	R1=0000 R3=0000	01	See Note 2		6-220	

ROUT	ERROR CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPEC'TD RESULTS IN LEVEL 'N' REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(s)	FEALD PAGE	FRIM PAGE	COMMENTS
	0003	CHR instruction is tested for correct CZ latches when data is unequal.	R1=0000 R5=FFFF	R1=0000	10	See Note 2		6-220	Note 1
	0004	The data in R3(1) is tested to verify error codes 0001 and 0002 above.	R3=0000	R3(1)=00	01	See Note 2		6-220	R3(1)=Bits in error
	0005	The data in R3(0) is tested to verify codes 0001 and 0002 above.	R3=0000	R3(0)=00	01	See Note 2		6-220	R3(0)=Bits in error
310N	XXXX	Add Halfword Instruction Testing. AHR							
	0001	AHR R1,R3 A basic AHR instruction is executed and the results are tested by XORing	R1(1)=09 R3(1)=05 R1(1)=0E	R1(1)=00	01	AB3H2 AB3J2	CDxxx CAxxx	6-220 6-220	R1(1)=Bits in error Decode ALU Controls
	0002	R1 is added to R1. The C,Z latches are tested for 01.	R1=0000	R1=0000	01	AB3G2	CZxxx	6-220	C,Z latches
	0003	AHR should have caused an overflow. The Z latch is tested.	R3=FF00 R5=0100	R3=0000	11	See Note 2		6-220	Note 1
	0004	Same instruction as 0003 The C latch is tested.		R3=0000	11	See Note 2		6-220	
	0005	CHR is used to verify the data in R3	R1=0000 R3=0000	R1=0000 R3=0000	01	See Note 2		6-220	
	0006	AHR instruction is tested for CZ latches 00	R3=0001 R1=FFFE	R1=FFFF	00	See Note 2		6-220	
	0007	The data in R1 is verified by using XRI Byte 1 failed.	R1=FFFF	R1(1)=00	01	See Note 2		6-220 6-170	R1(1)=Bits in error
	0008	Same as 0007 except Byte 0 failed	R1=FF00	R1(0)=00	01	See Note 2		6-220 6-170	R1(0)=Bits in error
320N	XXXX	OHR Instruction Testing							
	0001	OHR R1,R3 R1 data is tested by XRI. Instruction failed.	R1(1)=09 R3(1)=05 R1(1)=0D	R1(1)=00	01	AB3H2 AB3J2	CD003 CA003	6-220 6-170	Decode Failure ALU Controls Failure See Note 2 for Bit Failures
	0002	OHR R5, R5 CZ latches are tested for 10.	R5=55AA	R5=55AA	10	AB3G2	CZxxx	6-220	Note 1 C,Z latches.
	0003	The data in R5 is verified by comparing R5 with R1 using CHR.	R1=55AA R3=55AA	same same	01	See Note 2		6-220	
	0004	OHR R5,R3 CZ latches are tested for 10.	R3=AA55 R5=55AA	R5=FFFF	10	See Note 2		6-220 6-170	Note 1
	0005	The data in R5 is verified by comparing using CRI. Byte 0 data failed.	R5=FFFF	R5=FFFF	01	See Note 2		6-220 6-170	Note 1
	0006	Same as 0005 above except byte 1 data failed.	R5=FFFF	R5=FFFF	01	See Note 2		6-220 6-170	Note 1
	0007	OHR R1,R1 CZ latches are tested for 01.	R1=0000	R1=0000	01	See Note 2		6-220	

ROUT	ERROR CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPEC'TD RESULTS IN LEVEL 'N' REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(s)	FEALD PAGE	FETMM PAGE	COMMENTS
	0008	Using CRI, the data in R1 is verified. Byte 0 data failed.	R1=0000	R1=0000	01	See Note 2		6-220	
	0009	Using CRI, the data in R1 is verified. Byte 1 data failed.	R1=0000	R1=0000	01	See Note 2		6-220	
330N	XXXX	NHR Instruction Testing							
	0001	NHR R1, R3 R1 data is tested by XRI. Instruction failed.	R1(1)=09 R3(1)=05 R1(1)=01	R1(1)=00	01	AB3H2 AB3J2	CD0C3 CA002	6-220 6-170	Decode Failure ALU Controls Failure
	0002	NHR R1,R5 CZ latches are tested for 10	R1=AA55 R5=FFFF	R1=AA55	10	AB3G2	CZxxx	6-220	C,Z latches
	0003	Using CRI, the data in R1 is verified. Byte 0 data failed.		R1=AA55	01	See Note 2		6-220 6-170	
	0004	Using CRI, the data in R1 is verified. Byte 1 data failed.		R1=AA55	01	See Note 2		6-220	
	0005	NHR R1,R5 CZ latches are tested for 01.	R1=AA55 R5=55AA	R1=0000	01	See Note 2		6-220	Note 1
	0006	Using CRI, the data in R1 is verified. Byte 0 data failed.		R1=0000	01	See Note 2		6-220 6-170	
	0007	Using CRI, the data in R1 is verified. Byte 1 data failed.		R1=0000	01	See Note 2		6-220 6-170	
	0008	NHR R3, R5 CZ latches are tested for 10.	R3=FFFF R5=55AA	R3=55AA	10	See Note 2		6-220 6-170	Note 1
	0009	Using CRI, the data in R3 is verified. Byte 0 data failed.		R3=55AA	01	See Note 2		6-220 6-170	
	000A	Using CRI, the data in R3 is verified. Byte 1 data failed.		R3=55AA	01	See Note 2		6-220 6-170	
340N	XXXX	XHR Instruction Testing							
	0001	XHR R1, R3 R1 data is tested by XRI. Instruction failed.	R1(1)=09 R3(1)=05 R1(1)=00	R1(1)=00	01	AB3H2 AB3J2	CD003 CA003	6-220 6-170	Decode Failure ALU Controls failure
	0002	XHR R1,R3 CZ latches are tested for 10.	R1=0000 R3=AA55	R1=AA55	10	AB3G2	CZxxx	6-220	C,Z latches
	0003	Using CRI, the data in R1 is verified. Byte 0 data failed.		R1=AA55	01	See Note 2		6-220 6-170	
	0004	Using CRI, the data in R1 is verified. Byte 1 data failed.		R1=AA55	01	See Note 2		6-220	
	0005	XHR R1, R5 CZ latches are tested for 10.	R1=AA55 R5=FFFF	R1=55AA	10	See Note 2		6-220	
	0006	Using CRI, the data in R1 is verified. Byte 0 data failed.		R1=55AA	01	See Note 2		6-220 6-170	

ROUT	ERROR CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPEC'TD RESULTS IN LEVEL 'N' REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(s)	FEALD PAGE	FETMM PAGE	COMMENTS
	0007	Using CRI, the data in R1 is verified. Byte 1 data failed.		R1=55AA	01	See Note 2		6-220 6-170	
	0008	XHR R1, R1 CZ latches are tested for 01.	R1=55AA	R1=0000	01	See Note 2		6-220	
	0009	Using CRI, the data in R1 is verified. Byte 0 data failed.		R1=0000	01	See Note 2		6-220 6-170	
	000A	Using CRI, the data in R1 is verified. Byte 1 data failed.		R1=0000	01	See Note 2		6-220 6-170	
	000B	XHR R3, R3 CZ latches are tested for 01.	R3=AA55	R3=0000	01	See Note 2		6-220	
	000C	Using CHR, the data in R3 is verified. Data failed.		R3=0000	01	See Note 2		6-220	
350N	XXXX	LHOR Instruction Testing							
	0001	LHOR R1, R3 R1 data is tested by XRI. Instruction failed.	R1=XX09 R3=0005 R1=0002	R1(1)=02	01	AB3H2 AB3J2	CD003 CAxxx	6-220 6-170	Decode Failure ALU Controls Failure
	0002	LHOR R1, R1 the CZ latches are tested for 00.	R1=0102	R1=0081	00	AB3G2	CZxxx	6-220	C,Z latches
	0003	Using CRI, the data in R1 is verified. Byte 0 data failed.		R1=0081	01	See Note 2		6-220 6-170	
	0004	Using CRI, the data in R1 is verified. Byte 1 data failed.		R1=0081	01	See Note 2		6-220 6-170	
	0005	LHOR R1, R1 The CZ latches are tested for 10.	R1=0081	R1=0040	10	See Note 2		6-220	
	0006	Same as 0003 above.		R1=0040	01	See Note 2		6-220	
	0007	Same as 0004 above.		R1=0040	01	See Note 2		6-220	
	0008	LHOR R1, R1 C latch failed to set.	R1=0001	R1=0000	11	See Note 2		6-220	
	0009	Same instruction as 0008. Z latch failed to set.		R1=0000	11	See Note 2		6-220	
	000A	R1 data is verified for all zeros. Data failed.		R1=0000	01	See Note 2		6-220	
360N	XXXX	LOR Instruction Testing.							
	0001	LOR R1, R3 R1 data is tested by XRI. Instruction failed.	R1=XX09 R3=XX05 R1=XX02	R1(1)=00	01	AB3H2 AB3J2	CD003 CAxxx	6-220 6-170	Decode Failure ALU Controls Failure
370N	XXXX	AR Instruction Testing.							
	0001	AR R1, R3 R1 data is tested by XRI. Instruction failed.	R1=XX09 R3=XX05 R1=XX0E	R1(1)=00	01	AB3H2 AB3J2	CD003 CAxxx	6-220 6-170	Decode Failure ALU Controls Failure

ROUT	ERROR CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPEC'TD RESULTS IN LEVEL 'N' REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(s)	FEALD PAGE	FETMM PAGE	COMMENTS
380N	XXXX	Byte X data flow pattern sensitivity test using the LOR and AR instructions.						6-220	See Note 2 for Bit Failure
	0001	LOR R1, R1 C latch is tested for an active state.	R1=00001	R1=00000	11	See Note 2		6-220	
	0002	Same instruction. Z latch is tested for an active state.		R1=00000	11	See Note 2		6-220	
	0003	R1 is tested for all zeros. OHR R1, R1	R1=00000	R1=00000	01	See Note 2		6-220	
	0004	AR R1, R1 CZ latches are tested for 00.	R1=0C000 (18) R1=0D000 (20)	R1=18000 18 bit R1=38000 20 bit	00	See Note 2		6-220	
	0005	R1 byte 0 is tested to verify the data.		R1(0)=80	01	See Note 2		6-220	
	0006	R1 byte 1 is tested to verify the data.		R1(1)=00	01	See Note 2		6-220	
	0007	R1 byte X is tested to verify the data. R1 is shifted right one position to move byte X bit 7 into R1(0). CZ latches are tested for 00.	R1=18000 (18) R1=68000 (20) R3=00000	R3=0C000 18 bit R3=34000 20 bit	00	See Note 2		6-220	
	0008	R3 byte 0 is tested to verify the data.		R3(0)=C0 18 bit R3(0)=40 20 bit	01	See Note 2		6-220	
	0009	R3 byte 1 is tested to verify the data.		R3(1)=00	01	See Note 2		6-220	
	000A	AR R1, R1 CZ latches are tested for 00.	R1=18000	R1=30000 18 bit R1=D0000 20 bit	00	See Note 2		6-220	
	000B	R1 byte 0 and byte 1 is tested to verify the data.		R1=30000 18 bit R1=D0000 20 bit	01	See Note 2		6-220	
	000C	R1 is shifted into R3 and R3 is shifted once. This will move byte X data into byte 0. CZ latches are tested for 00.	R1=30000 (18) R1=D0000 (20)	R3=0C000 18 bit R3=34000 20 bit	00	See Note 2		6-220	
	000D	AR R3, R3 AR R3, R3 CZ latches are tested for 00.	R3=0AA00 (18) R3=3AA00 (20)	R3=2A800 18 bit R3=EA800 20 bit	00	See Note 2		6-220	
	000E	LOR R1, R3 CZ latches are tested for 00.	R3=2A800 (18) R3=EA800 (20)	R1=15400 18 bit R1=75400 20 bit	00	See Note 2		6-220	
	000F	R1 byte 0 is tested to verify the data.		R1(0)=54	01	See Note 2		6-220	
	0010	LOR R1, R1 R1 byte 0 is tested to verify the data.	R1=15400 (18) R1=75400 (20)	R1=0AA00 18 bit R1=3AA00 20 bit	01	See Note 2		6-220	
	0011	LOR R1, R1 LOR R1, R1 R1 byte 0 is tested to verify the data.	R1=0AA00 (18) R1=3AA00 (20)	R1=02A80 18 bit R1=0EA80 20 bit R1(0)=2A 18 bit R1(0)=EA 20 bit	01	See Note 2		6-220	
	0012	R1 byte 1 is tested to verify the data.		R1(1)=80	01	See Note 2		6-220	

ROUT	ERROR CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPEC'TD RESULTS IN LEVEL 'N' REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(s)	FEALD PAGE	FETMM PAGE	COMMENTS
3A0N	XXXX	LA Instruction Testing.							
	0001	Using the LA instruction, R1 is loaded with 00509. The XRI instruction is used to verify the data in byte 0. Instruction failed.	R1=00000 R1=00509 R1=00509	R1=00009	01	AB3H2	CD001	6-660	Decode Failure
	0002	LA R3,X'00000' LA altered the CZ latches.	R3=XXXXX	R3=00000	10	AB3G2	CZxxx	6-660	C,Z latches
	0003	R3 is tested to verify the data.		R3=00000	01	See Note 2		6-660	Subroutine test correct byte X data.
	0004	LA R1, X'3FFFF' (18 bit) LA R1, X'FFFFF' (20 bit) LA altered the CZ latches.	R1=00000	R1=3FFFF 18 bit R1=FFFFF 20 bit	01	See Note 2		6-660	
	0005	R1 is tested to verify the data.		R1=3FFFF 18 bit R1=FFFFF 20 bit	01	See Note 2		6-660	Subroutine test correct byte X data.
	0006	LA R1, X'255AA' (18 bit) LA R1, X'A55AA' (20 bit) R1 is tested to verify the data.	R1=3FFFF (18) R1=FFFFF (20)	R1=255AA 18 bit R1=A55AA 20 bit	01	See Note 2		6-660	Subroutine test correct byte X data.
	0007	LA R1, X'1AA55' (18 bit) LA R1, X'7AA55' (20 bit) R1 is tested to verify the data.	R1=255AA (18) R1=A55AA (20)	R1=1AA55 18 bit R1=7AA55 20 bit	01	See Note 2		6-660	Subroutine test correct byte X data.
3B0N	XXXX	Data flow path byte X, 0 and 1 data sensitivity test using the LA Instruction. This routine loops forty times with the LA instruction being updated on each pass.							See Note 2 for Bit Failures
	0001	LA R1, Test Pattern The data in R1 is tested to verify the LA instruction. The actual test of data is CHR R1, R3 where R3 is loaded via test table.		R1=R3	01	See Note 2		6-660 6-220	Subroutine test correct byte X data for 18/20 bit machines.
3C0N	XXXX	LR Instruction Testing							This routine ru only on 18/20 b machines.
	0001	LR R1, R3 R1 data is tested by XRI. Instruction failed.	R1(1)=09 R3(1)=05 R1(1)=05	R1(1)=00	01	AB3H2	CD003	6-220	Decode Failures See Note 2 for Bit Failures
	0002	LR R1, R7 The CZ latches are tested for 01.	R1=3FFFF (18) R1=FFFFF (20) R7=00000	R1=00000	01	AB3G2	CZxxx	6-220	Note 1 C,Z latches
	0003	The data in R1 is tested to verify the LR instruction.		R1=00000	01	See Note 2		6-220	
	0004	LR R1, R7 The CZ latches are tested for 10.	R1=00000 R7=2AA55 (18) R7=AAA55 (20)	R1=2AA55 18 bit R1=AAA55 20 bit	10	See Note 2		6-220	Note 1
	0005	R1 is tested to verify the data.		R1=2AA55 18 bit R1=AAA55 20 bit	01	See Note 2		6-220	Subroutine test correct byte X data.
	0006	LR R1, R7 The CZ latches are tested for 10.	R1=2AA55 (18) R1=AAA55 (20) R7=155AA (18) R7=555AA (20)	R1=155AA 18 bit R1=555AA 20 bit	10	See Note 2		6-220	Note 1

ROUT	ERROR CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPEC'TD RESULTS IN LEVEL 'N' REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(s)	FEALD PAGE	FETMM PAGE	COMMENTS
	0007	R1 is tested to verify the data.		R1=155AA 18 bit R1=555AA 20 bit	01	See Note 2		6-220	Subroutine test correct byte X data.
3D0N	XXXX	Local store register 3 and 5 byte x testing.							This routine runs on 18/20 bit machines only.
	0001	R7 is loaded with data 30000 (18 bit), or F0000 (20 bit) via LA instruction. R7 is moved into R3 and the R3 data is shifted right two positions in order to move byte X data into byte 0. Using CRI the data in R3 byte 0 is tested.	R7=30000 (18) R7=F0000 (20) R3=00000	R3=0C000 18 bit R3=0F000 20 bit	01	See Note 2		6-600 6-220	Note 1
	0002	Same as above except R7 is moved into R5	R7=30000 (18) R7=F0000 (20) R5=00000	R5=0C000 18 bit R5=0F000 20 bit	01	See Note 2		6-600 6-220	Note 1
	0003	Same as 0001 above except R7 is loaded with all zeros.	R7=00000 R3=0C000 (18) R3=0F000 (20)	R3=00000	01	See Note 2		6-600 6-220	Note 1
	0004	Same as 0003 above except R7 is moved into R5.	R7=00000 R5=0C000 (18) R5=0F000 (20)	R5=00000	01	See Note 2		6-660 6-220	Note 1
	0005	Same as 0001 above except R7 is loaded with 20000 (18 bit), A0000 (20 bit)	R7=20000 (18) R7=A0000 (20) R3=00000	R3=08000 18 bit R3=0A000 20 bit	01	See Note 2		6-660 6-220	Note 1
	0006	Same as 0005 above except R7 is moved into R5.	R7=20000 (18) R7=A0000 (20) R5=00000	R5=08000 18 bit R5=0A000 20 bit	01	See Note 2		6-660 6-220	Note 1
	0007	Same as 0001 above except R7 is loaded with 10000 (18 bit), or 50000 (20 bit).	R7=10000 (18) R7=50000 (20) R3=08000 (18) R3=0A000 (20)	R3=04000 18 bit R3=05000 20 bit	01	See Note 2		6-660 6-220	Note 1
	0008	Same as 0007 above except R7 is moved into R5.	R7=10000 (18) R7=50000 (20) R5=08000 (18) R5=0A000 (20)	R5=04000 18 bit R5=05000 20 bit	01	See Note 2		6-660 6-220	Note 1
3E0N	XXXX	OR Instruction Testing.							
	0001	OR R1, R3 R1 data is tested by XRI. Instruction failed.	R1=XXX09 R3=XXX05 R1=XXX0D	R1(1)=00	01	AB3H2 AB3J2	CD003 CA003	6-220	Decode Failure ALU Controls Failure See Note 2 for Bit Failures
	0002	OR R1, R3 The CZ latches are tested for 01.	R1=00000 R3=00000	R1=00000	01	AB3G2	CZxxx	6-220	C,Z latches
	0003	The data in R1 is tested to verify byte 0 and 1		R1=00000	01	See Note 2		6-220	Subroutine test correct byte X data
	0004	OR R1, R3 The CZ latches are tested for 10.	R1=255AA (18) R1=A55AA (20) R3=1AA55 (18) R3=5AA55 (20)	R1=3FFFF 18 bit R1=FFFFF 20 bit	10	See Note 2		6-220	
	0005	The data in R1 is tested to verify byte 0 and 1.		R1=3FFFF	01	See Note 2		6-220	Subroutine test correct byte X data
	0006	OR R1, R3 The CZ latches are tested for 10.	R1=1FFFF (18) R1=5FFFF (20) R3=2FFFF (18) R3=AFFFF (20)	R1=3FFFF 18 bit R1=FFFFF 20 bit	10	See Note 2		6-220	

ROUT	ERROP CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPEC'TD RESULTS IN LEVEL 'N' REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(s)	FEALD PAGE	FETMM PAGE	COMMENTS
	0007	The data in R1 is tested to verify byte 0 and 1.		R1=3FFFF 18 bit R1=FFFFF 20 bit	01	See Note 2		6-220	Subroutine test correct byte X data
	0008	OR R1, R3 This error is for 16 bit machines only. The CZ latches are tested for 01.		R1=0000	01	See Note 2		6-220	
	0009	Same test as 0008 above except this error is for 18/20 bit machines only. The CZ latches are tested for 10.	R1=30000 (18) R1=F0000 (20) R3=30000 (18) R3=F0000 (20)	R1=30000 18 bit R1=F0000 20 bit	10	See Note 2		6-220	
	000A	The data in R1 is tested to verify byte 0 and 1.		R1=30000 18 bit R1=F0000 20 bit	01	See Note 2		6-220	Subroutine test correct byte X data
	000B	OR R1, R3 The CZ latches are tested for 10.	R1=0AA55 R3=055AA	R1=0FFFF	10	See Note 2		6-220	
	000C	The data in R1 is tested to verify byte 0 and 1.		R1=0FFFF	01	See Note 2		6-220	Subroutine test correct byte X data
3F0N	XXXX	NR Instruction Testing							
	0001	NR R1, R3 R1 data is tested by XRI. Instruction failed.	R1=XXX09 R3=XXX05 R1=XXX01	R1(1)=00	01	AB3H2 AB3J2	CD003 CA002	6-220	Decode Failure ALU Controls Failure
	0002	OR R1, R3 This error is for 16 bit machines. The CZ latches are tested for 01.		R1=0000	01	AB3G2	CZxxx	6-220	C,Z latches Bit Failures
	0003	Same test as 0002 except this error is for 18/20 bit machines. The CZ latches are tested for 10.	R1=30000 (18) R1=F0000 (20) R3=30000 (18) R3=F0000 (20)	R1=30000 18 bit R1=F0000 20 bit	10	See Note 2		6-220	
	0004	The data in R1 is tested to verify byte 0 and 1.		R1=30000 18 bit R1=F0000 20 bit	01	See Note 2		6-220	Subroutine test correct byte X data
	0005	NR R1, R3 The CZ latches are tested for 01.	R1=2AA55 (18) R1=AAA55 (20) R3=155AA (18) R3=555AA (20)	R1=00000	01	See Note 2		6-220	
	0006	The data in R1 is tested to verify byte 0 and 1.		R1=00000	01	See Note 2		6-220	Subroutine test correct byte X data
	0007	NR R1, R3 The CZ latches are tested for 01.	R1=155AA (18) R1=555AA (20) R3=2AA55 (18) R3=AAA55 (20)	R1=00000	01	See Note 2		6-220	
	0008	The data in R1 is tested to verify byte 0 and 1		R1=00000	01	See Note 2		6-220	Subroutine test correct byte X data
	0009	NR R1, R3 The CZ latches are tested for 10.	R1=0FFFF R3=0FFFF	R1=0FFFF	10	See Note 2		6-220	
	000A	The data in R1 is tested to verify byte 0 and 1.		R1=0FFFF	01	See Note 2		6-220	Subroutine test correct byte X data
400N	XXXX	XR Instruction Testing							
	0001	XR R1, R3 R1 data is tested by XRI. Instruction failed.	R1=XXX09 R3=XXX05 R1=XXX0C	R1(1)=00	01	AB3H2 AB3J2	CD003 CA003	6-220 6-170	Decode Failure ALU Controls Failure

ROUT	ERROR CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPEC'TD RESULTS IN LEVEL 'N' REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(S)	FEALD PAGE	FETMM PAGE	COMMENTS
	0002	XR R1, R3 The CZ latches are tested for 01.	R1=3AA55 (18) R1=FAA55 (20) R3=3AA55 (18) R3=FAA55 (20)	R1=00000	01	AB3G2	CZxxx	6-220	C,Z latches
	0003	The data in R1 is tested to verify byte 0 and 1.		R1=00000	01	See Note 2		6-220	Subroutine test correct byte X data
	0004	XR R1, R3 This error is for 16 bit machines. The CZ latches failed.		R1=0000	01	See Note 2		6-220	
	0005	Same as 0004 above except that this error is for 18/20 bit machines.	R1=255AA (18) R1=A55AA (20) R3=155AA (18) R3=555AA (20)	R1=30000 18 bit R1=F0000 20 bit	10	See Note 2		6-220	
	0006	The data in R1 is tested to verify byte 0 and 1.		R1=30000 18 bit R1=F0000 20 bit	01	See Note 2		6-220	Subroutine test correct byte X data
	0007	XR R1, R3 This error is for 16 bit machines. The CZ failed.		R1=0000	01	See Note 2		6-220	
	0008	Same as 0007 above except that this error is for 18/20 bit machines.	R1=1AA55 (18) R1=5AA55 (20) R3=2AA55 (18) R3=AAA55 (20)	R1=30000 18 bit R1=F0000 20 bit	10	See Note 2		6-220	
	0009	The data in R1 is tested to verify byte 0 and 1.		R1=30000 18 bit R1=F0000 20 bit	01	See Note 2		6-220	Subroutine test correct byte X data
	000A	XR R1, R3 The CZ failed.	R1=0AA55 R3=055AA	R1=0FFFF	10	See Note 2		6-220	
	000B	The data in R1 is tested to verify byte 0 and 1.		R1=0FFFF	01	See Note 2		6-220	Subroutine test correct byte X data
410N	XXXX	AR Instruction Testing							
	0001	AR R1, R3 This error is for 18/20 bit machines. CZ failed.	R1=2AA55 R3=355AA (18) R3=F55AA (20)	R1=1FFFF	10	AB3H2 AB3J2 AB3G2	CD003 CA002 CZxxx	6-220	Decode Failure ALU Controls Failure C,Z latch
	0002	Same as 0001 above except error is for 16 bit machines.		R1=FFFF	00	See Note 2		6-220	
	0003	The data in R1 is tested to verify byte 0 and 1.		R1=10000	01	See Note 2		6-220	Subroutine test correct byte X data
	0004	AR R1, R3 C latch failed	R1=155AA (18) R1=555AA (20) R3=2AA56 (18) R3=AAA56 (20)	R1=00000	11	See Note 2		6-220	
	0005	Z latch failed		R1=00000	11	See Note 2		6-220	
	0006	The data in R1 is tested to verify byte 0 and 1.		R1=00000	01	See Note 2		6-220	Subroutine test correct byte X data
	0007	AR R1, R3 This error is for 16 bit machine. CZ failed.	R1=1FFFF (18) R1=7FFFF (20) R3=1FFFF (18) R3=7FFFF (20)	R1=FFFE	10	See Note 2		6-220	
	0008	Same as 0007 above except error is for 18/20 bit machines.		R1=3FFFE 18 bit R1=FFFFE 20 bit	00	See Note 2		6-220	
	0009	The data in R1 is tested to verify byte 0 and 1.	R1=3FFFE (18) R1=FFFFE (20)	R1=30000 18 bit R1=F0000 20 bit	01	See Note 2		6-220	Subroutine test correct byte X data

ROUT	ERROR CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPEC'TD RESULTS IN LEVEL 'N' REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(s)	F		COMMENTS
420N	XXX	R Instruction Testing							
		R1, R3 R1 data is tested by XRI. Instruction failed.	R1=00009 R3=00005 R1=00004	R1(1)=00	01				Decode Failure ALU Controls Failure
		R1, R3 Failed.	R1=155AA (18) R1=755AA (20) R3=2AA55 (18) R3=8AA55 (20)	R1=2AB55 18 bit R1=EAB55 20 bit	10		CZxxx	6-220	C,Z latch
	0003	The data in R1 is tested to verify byte 0 and 1.	R1=2AB55 (18) R1=EAB55 (20)	R1=20000 18 bit R1=E0000 20 bit	01	See Note 2		6-220	Subroutine test correct byte X data
	0004	SR R1, R3 CZ failed.	R1=3FFFF (18) R1=FFFFF (20) R3=3FFFF (18) R3=FFFFF (20)	R1=00000	01	See Note 2		6-220	
	0005	The data in R1 is tested to verify byte 0 and 1.	R1=00000	R1=00000	01	See Note 2		6-220	Subroutine test correct byte X data
	0006	SR R1, R3 CZ failed.	R1=055AA (18) R1=755AA (20) R3=1AA55 (18) R3=8AA55 (20)	R1=2AB55 18 bit R1=EAB55 20 bit	10	See Note 2		6-220	
	0007	The data in R1 is tested to verify byte 0 and	R1=2AB55 (18) R1=EAB55 (20)	R1=20000 18 bit R1=E0000 20 bit	01	See Note 2		6-220	Subroutine test correct byte X data
	0008	SR R1, R3 CZ failed.	R1=0AA55 R3=055AA	R1=054AB	00	See Note 2		6-220	
	0009	The data in R1 is tested to verify byte 0 and 1.	R1=054AB	R1=00000	01	See Note 2			Subroutine test correct byte X data
430N	XXXX	CR Instruction Testing							
	0001	CR R1, R3 R1 data is tested by XRI. Instruction failed.	R1=00009 R3=00005	R1(1)=00	01	AB3H2 AB3J2			Failure trols Failure
	0002	CR R1, R3 CZ failed.	R1=15555 (18) R1=55555 (18) R3=2AAAA (18) R3=AAAAA (20)	R1=15555 18 bit R1=55555 20 bit	10	AB3G2			tch
	0003	The data in R1 is tested to verify byte 0 and 1.	R1=15555 (18) R1=55555 (20)	R1=10000 18 bit R1=50000 20 bit	01	See Note 2			broutine test correct byte X data
	0004	CR R1, R3 CZ failed.	R1=355AA (18) R1=755AA (20) R3=355AA (18) R3=755AA (20)	R1=355AA 18 bit R1=755AA 20 bit	01	See Note 2		6-220	
	0005	The data in R1 is tested to verify byte 0 and 1.	R1=355AA (18) R1=755AA (20)	R1=30000 18 bit R1=70000 20 bit	01	See Note 2		6-220	Subroutine test correct byte X data
	0006	CR R1, R3 This error is for 16 bit machines. CZ failed.	R1=25555 (18) R1=A55AA (20) R3=1AAAA (18) R3=5AAAA (20)	R1=25555 18 bit R1=A5555 20 bit	10	See Note 2		6-220	
	0007	Same as 0006 above except this error is for 18/20 bit machines.		R1=2555 R1=A555		See Note 2		6-220	
	0008	The data in R1 is tested to verify byte 0 and 1.	R1=25555 (18) R1=A5555 (20)	R1=20000 18 bit R1=A0000 20 bit	01	See Note 2			routine test correct byte X data
	0009	CR R1, R3 This error is for 16 bit machines. CZ failed.	R1=0AAAA R3=1AAAA (18) R3=5AAAA (20)	R1=AAAA	01	See Note 2			

ROUT	ERROR CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPEC'TD RESULTS 'N' IN LEVEL REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(s)	FEALD PAGE	FETMM PAGE	COMMENTS
	000A	Same as 0009 above except this error is for 18/20 bit machines.		R1=0AAAA	10	See Note 2		6-220	
	000B	The data in R1 is tested to verify byte 0 and 1.	R1=0AAAA	R1=0000	01	See Note 2		6-220	Subroutine test correct byte X data
	000C	CR R1, R3 CZ failed.	R1=0AA55 R3=0AA55	R1=0AA55	01	See Note 2		6-220	
	000D	The data in R1 is tested to verify byte 0 and 1.	R1=0AA55	R1=0000	01	See Note 2		6-220	Subroutine test correct byte X data
440N	XXXX	L Instruction Testing							
	0001	Load R1 with R7 as the base register. CZ failed or load instruction failed.	R1=25AA5 (18) R1=A55AA (20) R7=base register	R1=1A55A 18 bit R1=5A55A 20 bit	10	AB3H2 AB3J2	CDxxx CAxxx	6-390	See Note 1 Decode Failure ALU Controls Failure
	0002	The data in R1 is tested to verify the L instruction.		R1=1A55A 18 bit R1=5A55A 20 bit	01	See Note 2		6-390	See Note 2 for Bit Failures
	0003	Load R1 with R7 as the base register. CZ failed.	R1=1A55A (18) R1=5A55A (20)	R1=25AA5 18 bit R1=A5AA5 20 bit	10	AB3G2	CZxxx	6-390	C,Z latch
	0004	The data in R1 is tested to verify the L instruction.		R1=25AA5 18 bit R1=A5AA5 20 bit	01	See Note 2		6-390	
	0005	Load R1 with R7 as the base register.	R1=3FFFF (18) R1=FFFFF (20)	R1=00000	01	See Note 2		6-390	
	0006	The data in R1 is tested to verify the L instruction.		R1=00000	01	See Note 2		6-390	
450N	XXXX	LH Instruction Testing.							
	0001	Load halfword R1 with R7 as the base register. CZ failed.	R1=2A55A (18) R1=AA55A (20)	R1=05AA5	10	AB3H2 AB3J2	CD003 CA001	6-290	Decode Failure ALU Controls Failure
	0002	The data in R1 is tested to verify the LH instruction.		R1=05AA5	01	See Note 2		6-290	See Note 2 for Bit Failures
	0003	LH R1 with R7 as the base register. CZ failed.	R1=15AA5 (18) R1=55AA5 (20)	R1=0A55A	10	See Note 2		6-290	
	0004	The data in R1 is tested to verify the LH.		R1=0A55A	01	See Note 2		6-290	
	0005	LH - R1 with R7 as the base register. CZ failed.	R1=3FFFF (18) R1=FFFFF (20)	R1=00000	01	See Note 2		6-290	
	0006	The data in R1 is tested to verify the LH.		R1=00000	01	See Note 2		6-290	
460N	XXXX	STH instruction testing R7 is used as the base register.							Note 1
	0001	STH instruction modified the CZ latches		R1=0A55A	01	AB3H2 AB3J2 AB3G2	CD003 CAxxx CZxxx	6-360	Decode Failure ALU Controls Failure C,Z latch
	0002	The data stored above is loaded via an L instruction and compared. STH failed.	R1=3A55A (18) R1=FA55A (20) R3=3A55A (18) R3=FA55A (20)	R3=3A55A 18 bit R3=FA55A 20 bit	01	See Note 2		6-360	
	0003	STH instruction modified the CZ latches.		R1=05AA5	10	See Note 2		6-360	

ROUT	ERROR CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPEC'TD RESULTS IN LEVEL 'N' REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(s)	FEALD PAGE	FETMM PAGE	COMMENTS
	0004	The data stored above is loaded via an L instruction and compared. STH failed.	R1=35AA5 (18) R1=F5AA5 (20) R3=35AA5 (18) R3=F5AA5 (20)	R1=35AA5 18 bit R1=F5AA5 20 bit R3=35AA5 18 bit R3=F5AA5 20 bit	01	See Note 2		6-360 6-390	
470N	XXXX	L using R0 as Operand 1							
	0001	Load R0 with R3 as the base register. Failed to load R0.	N/A	N/A	01	AB3H2 AB3J2	CDxxx CAxxx	6-390	Decode Failure ALU Control
	0002	Load instruction with R0 as Operand 1 altered the CZ latches.	N/A	N/A	01	N/A	CZxxx	6-390	CZ latches
480N	XXXX	L Instruction Test from the Fullword Direct Addressable Area							
	0001	Load R1 from direct addressable area. CZ failed or instruction failed.	R1=00000	R1=3FFFF 18 bit R1=FFFFF 20 bit	10	AB3H2 AB3J2	CDxxx CAxxx	6-390	Decode Failure ALU Control
	0002	The data in R1 is tested to verify the load.		R1=3FFFF 18 bit R1=FFFFF 20 bit	01	See Note 2		6-390	
490N	XXXX	LR (Load Register) using R0 as operand one to ensure that the CZ latches are not affected.							
	0001	LR R0,R5 when R0 is specified as operand one, a branch should occur. LR R0,R5 failed to branch to the address contained in R5.	N/A	N/A	01	AB3H2 AB3J2	CDXXX		
	0002	When R0 is specified as as operand one, the CZ latches should not be altered. This error stop indicates that the CZ latches were altered.	N/A	N/A	01	AB3G2	CZXXX		
4A0N	XXXX	IC (Insert character) Instruction Testing				AB3H2 AB3J2	CD003 CAxxx	6-290	Decode Failure ALU Controls Failure See Note 2 for Bit Failure
	0001	IC R1(1), Test Area 1 CZ failed. R3 is the base register.	R1=300FF	R1=30055	10	See Note 2		6-290	
	0002	The data in R1 is tested to verify the IC instruction.		R1=30055	01	See Note 2		6-290	
	0003	IC R1(0), Test Area 2, Z Latch failed. R3=base register.	R1=3FFFF	R1=300FF	11	See Note 2		6-290	
	0004	Same as 0003 except C latch failed.		R1=300FF	11	See Note 2		6-290	
	0005	The data in R1 is tested to verify the IC instruction.		R1=300FF	01	See Note 2		6-290	
	0006	IC R1(0),Test Area 3 CZ failed. R0=base register.	R1=3FEFE	R1=301FE	00	See Note 2		6-290	
	0007	The data in R1 is tested to verify the IC instruction.		R1=301FE	01	See Note 2		6-290	

ROUT	ERROR CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPEC'TD RESULTS IN LEVEL 'N' REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(s)	FEALD PAGE	FETMM PAGE	COMMENTS
	0008	IC R1(1), Test Area 4 CZ failed. R0=base register.	R1=00000	R1=000AA	10	See Note 2		6-290	
	0009	The data in R1 is tested to verify the IC instruction.		R1=000AA	01	See Note 2		6-290	
4B0N	XXXX	ICT (Insert Character and Count) Instruction Testing. R3 is the base register for this routine.						6-480	
	0001	ICT R1(1), R3 CZ latches were altered by the ICT instruction.	R1=200AA (18) R1=A00AA (20) R3=Base	R1=20055 18 bit R1=A0055 20 bit R3=Base+1 R2=Value of Base	01	AB3H2 AB3J2	CDxxx CAxxx	6-480	Decode Failure ALU Controls Failure See Note 2 for Bit Failures
	0002	The data in R1 is tested to verify the ICT instruction.		R1=20055	01	See Note 2		6-480	
	0003	The address in R3 is tested to verify if the ICT updated the base.	R3=Base+1	R3=Base+1 R2=Base	01	See Note 2		6-480	
	0004	ICT R1(0), R3 CZ latches were altered by ICT instruction.	R1=155FF (18) R1=555FF (20)	R1=1AAFF 18 bit R1=5AAFF 20 bit R3=Base+2 R2=Base	10	See Note 2		6-480	
	0005	The data in R1 is tested to verify the ICT instruction.		R1=1AAFF	01	See Note 2		6-480	
	0006	The address in R3 is tested to verify if the ICT updated the base.		R3=Base+2 R2=Base	01	See Note 2		6-480	
	0007	ICT R1(0), R3 CZ latches were altered by ICT instruction.	R1=00000	R1=0FF00 R3=Base+3 R2=Base	10	See Note 2		6-480	
	0008	The data in R1 is tested.		R1=0FF00	01	See Note 2		6-480	
	0009	The address in R3 is tested.		R3=Base+3 R2=Base	01	See Note 2		6-480	
	000A	ICT R1(1), R3 CZ latches were altered by ICT Instruction.	R1=3FFFF (18) R1=FFFFF (20)	R1=3FF00 18 bit R1=FFF00 20 bit R3=Base+4 R2=Base	01	See Note 2		6-480	
	000B	The data in R1 is tested.		R1=3FF00 18 bit R1=FFF00 20 bit	01	See Note 2		6-480	
	000C	The address in R3 is		R3=Base+4 R2=Base	01	See Note 2		6-480	
4C0N	XXXX	ST (Store Fullword) Instruction Testing.							
	0001	ST R1, Test Area R3 is the base Reg for this test. The CZ latches were altered by the ST instruction.		R1=1A55A 18 bit R1=5A55A 20 bit R3=Base	01	AB3H2	CD003	6-430	Decode Failure See Note 2 for Bit Failures
	0002	The data stored above is loaded and tested.	R7=25AA5 (18) R7=A5AA5 (20)	R1=R7 R1=1A55A 18 bit R1=5A55A 20 bit	01				Note 1
	0003	ST R1, Test Area R3 is the base Reg for this test. The CZ latches were altered by the ST instruction.		R1=25AA5 18 bit R1=A5AA5 20 bit R3=Base	10	N/A	CZxxx	6-430	CZ latches

ROUT	ERROR CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPEC'TD RESULTS IN LEVEL 'N' REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(s)	FEALD PAGE	FETMM PAGE	COMMENTS
	0004	Same as 0002 above.	R7=1A55A (18) R7=5A55A (20)	R1=R7 R1=25AA5 18 bit R1=A5AA5 20 bit	01	See Note 2		6-430	Note 1
	0005	ST R1, Direct Addressable R0 is the base Reg for this test. The CZ latches were altered by the ST.		R1=3FFFF 18 bit R1=FFFFF 20 bit	01	N/A	CZxxx	6-430	CZ latches
	0006	The data stored above is loaded and tested.	R7=00000	R1=R7 R1=3FFFF 18 bit R1=FFFFF 20 bit	01	See Note 2		6-430	Note 1
	0007	Same as 0005 except different data is used.		R1=00000	10	See Note 2		6-430	
	0008	Same as 0006.	R7=3FFFF (18) R7=FFFFF (20)	R1=R7 R1=00000	01	See Note 2		6-430	Note 1
4D0N	XXXX	STH Instruction Testing.				AB3H2	CD003		Decode Failure
	0001	STH R1,Direct Addressable R0 is the base Reg. for this test. The CZ latches were altered by the STH.		R1=FFFF	01	AB3H2	CD003	6-360	Decode Failure
	0002	The data stored above is read out via a L R3 instruction and compared.	R3=0000	R1=R3 R1=FFFF	01	See Note 2		6-360	
	0003	Same as 0001 except different data is used.		R1=0000	10	See Note 2		6-360	
	0004	Same as 0002 except different data is used.	R3=FFFF	R1=R3 R1=0000	01	See Note 2		6-360	
4E0N	XXXX	STC Instruction Testing							
	0001	STC R1(0), Test Area R3 is the base Reg for this test. The CZ latches were altered by the STC.		R1=3AAFF	01	AB3H2	CDxxx	6-330	Decode Failure
	0002	The data stored above is read out and compared.	R7=300FF	R1=R7 R1=0FFAA	01	See Note 2		6-330	Note 1
	0003	STC R1(1), Test Area R3 is the base Reg for this test. The CZ latches were altered by the STC.		R1=3FF55	01	See Note 2		6-330	
	0004	The data stored above is read out and compared.	R7=3AAFF	R1=R7	01	See Note 2		6-330	Note 1
	0005	STC R1(1),Direct Addressable R0 is the base Reg for this test. CZ latches were altered.		R1=2AAFF	10	See Note 2		6-330	
	0006	The data stored above is read out and compared.	R7=30000	R1=R7 R1=0FFFF	01	See Note 2		6-330	Note 1
	0007	STC R1(0),Direct Addressable R0 is the base Reg for this test. CZ latches were altered.		R1=300AA	10	See Note 2		6-330	
	0008	The data stored above is read out and compared.	R7=30000	R1=R7	01	See Note 2		6-330	Note 1
4F0N	XXXX	STCT (Store Character and Count) Instruction Testing.							

POUT	ERROR CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPEC'TD RESULTS IN LEVEL 'N' REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(s)	FEALD PAGE	FETMM PAGE	COMMENTS
	0001	STCT R1(0), R3 The CZ latches were altered by the STCT.	R3=Base	R1=0FFAA R3=Base+1 R2=Value of Base	01	AB3H2 AB3J2	CDxxx CAxxx	6-520	Decode Failure ALU Control Failure
	0002	The data stored above is read out and compared.	R7=30055	R1=R7 R1=3FF55	01	See 0001 Above		6-520	Note 1
	0003	The address in R3 is tested to verify the count function.		R3=Base+1 R2=Base	01	See 0001 Above		6-520	
	0004	STCT R1(1), R3 The CZ latches were altered by the STCT.		R1=3FF00 R3=Base+2 R2=Base	10	See Note 2		6-520	
	0005	The data stored above is read out and compared.	R7=300FF	R1=R7 R1=0FF00	01	See Note 2		6-520	Note 1
	0006	The address in R3 is tested to verify the count function.		R3=Base+2 R2=Base	01	See Note 2		6-520	
500N	XXXX	LOR Instruction Testing for for correct CZ latches. A previous routine tested the instruction decode.							
	0001	LOR R1, R1 CZ latches failed. This error is for 18/20 bit machines only.	R1=2AAAA (18) R1=AAAAA (20)	R1=15555 18 bit R1=55555 20 bit	00	AB3H2 AB3J2 AB4R2	CDxxx CAxxx CF004	6-220	Decode Failure ALU Control Failure Shift Right Failure
	0002	The data in R1 is tested to verify the LOR.		R1=15555 18 bit R1=55555 20 bit	01	See 0001 Above		6-220	
	0003	LOR R1, R1 CZ latches failed. This error is for 18/20 bit machines only.	R1=15555 (18) R1=55555 (20)	R1=0AAAA 18 bit R1=2AAAA 20 bit	10	See Note 2		6-220	
	0004	The data in R1 is tested to verify the LOR.		R1=0AAAA 18 bit R1=2AAAA 20 bit	01	See Note 2		6-220	
	0005	LOR R1, R1 CZ latches failed.	R1=0AAAA (18) R1=2AAAA (20)	R1=05555 18 bit R1=15555 20 bit	00	See Note 2		6-220	
	0006	The data in R1 is tested to verify the LOR.		R1=05555 18 bit R1=15555 20 bit	01	See Note 2		6-220	
	0007	LOR R1, R1 CZ latches failed.	R1=05555 (18) R1=15555 (20)	R1=02AAA 18 bit R1=0AAAA 20 bit	10	See Note 2		6-220	
	0008	The data in R1 is tested to verify the LOR.		R1=02AAA 18 bit R1=0AAAA 20 bit	01	See Note 2		6-220	
510N	XXXX	LOR Instruction Testing for correct CZ latches 2 of 2.							
	0001	LOR R1, R1 CZ latches failed.	R1=00001	R1=00000	11	AB3H2 AB3J2 AB4R2	CDxxx CAxxx CF004	6-220	Decode Failure ALU Control Failure Shift Right Failure
	0002	The data in R1 is tested to verify the LOR.		R1=00000	01	See Note 2		6-220	
530N	XXXX	18/20 Bit ARI Test							
	0001	Failure in Byte X	R1=1FFFF (18) R1=7FFFF (20)	R1=20000 18 bit R1=80000 20 bit	10	AB4J2	DF009	6-170	

ROUT	ERROR CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPEC'TD RESULTS IN LEVEL 'N' REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(s)	FEALD PAGE	FETMM PAGE	COMMENTS
540N	XXXX	18/20 Bit SRI Test							
	0001	Failure in Byte X	R1=00000	R1=3FFFF 18 bit R1=FFFFF 20 bit	10	AB4J2	DF009	6-170	
550N	XXXX	18/20 Bit ACR Test							
	0001	Failure in Byte X	R3(0)=03 R1=2FEFF (18) R1=7FEFF (20)	R1=301FF 18 bit R1=801FF 20 bit	10	AB4J2	DF009	6-220	
560N	XXXX	18/20 Bit SCR Test							
	0001	Failure in Byte X	R3(1)=01 R1=30000 (18) R1=F0000 (20)	R1=2FFFF 18 bit R1-EFFFF 20 bit	01	AB4J2	DFxxx	6-220	Byte X
570N	XXXX	BAL and BALR Instruction Test							
	0001	BAL failed to branch-decode failure.	N/A	N/A	01	AB3H2	CD001 thru CD004	6-570	
	0002	Above BAL altered CZ latch CZ was 01.	N/A	N/A	01	AB3G2		6-570	
	0003	Above BAL failed to store correct value in R3.		R3=IAR link	N/A			6-570	
	0004	BALR failed to branch - Decode Failure.		R3=IAR Link	N/A			6-240	
	0005	Above BALR modified C,Z latches.		N/A	N/A	AB3G2	CZxxx	6-240	
	0006	Above BALR failed to load Reg 1 with correct link address.		R1=IAR link				6-240	
	0007	An invalid Register Decode occurred.	N/A	N/A	N/A	N/A	N/A	6-240	A wild branch occurred or a Local Store Register Decode Failure
580N	XXXX	BCT Instruction Test							
	0001	BCT did not branch - decode failure.	R3=30000	R3=3FFFF	01	AB3H2	CD001 thru CD004	6-680	Count in low byte
	0002	Above BCT did not decrement count.		R3=3FFFF		AB3J2	CAxxx	6-680	ALU control
	0003	BCT above modified the CZ latch.		R3=3FFFF	01	AB3G2	CZxxx	6-680	C,Z latches
	0004	BCT above failed to decrement count.		R3=3FFFF				6-680	Count in high byte
	0005	BCT did not decrement properly.	R3=3FFFF	R3=3FEFF	10	AB3J2	CAxxx	6-680	
	0006	Above BCT failed to branch		R3=3FEFF	10	AB3H2	CDxxx	6-680	Decode
	0007	Above BCT modified CZ latch		R3-3FEFF	10	AB3G2	CZxxx	6-680	C,Z latches
	0008	Above BCT did not decrement.		R3=3FEFF	10	AB3J2	CAxxx	6-680	ALU

ROUT	ERROR CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPEC'TD RESULTS IN LEVEL 'N' REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(s)	FEALD PAGE	FETMM PAGE	COMMENTS
	0009	BCT modified C,Z latch	R1=30001	R1=30000	10	AB3G2	CZxxx	6-680	Count in low byte C,Z latches
	000A	Above BCT failed to decrement count.	R1=30001	R1=30000	10	AB3J2	CAxxx	6-680	Count in low byte ALU
	000B	Above BCT decremented count to zero but branched.		R1=30000	N/A	AB3H2	CDxxx	6-680	Decode
	000C	BCT modified CZ latch.	R1=301FF	R1=300FF	10	AB3G2	CZxxx	6-680	Count in high byte
	000D	Above BCT failed to decrement count.		R1=300FF	N/A	AB3J2	CAxxx	6-680	ALU
	000E	Above BCT branched when count was zero.		R1=300FF	N/A	AB3H2	CDxxx	6-680	Decode
	000F	Above BCT failed to decrement count.		R1=300FF	N/A	AB3J2	CAxxx	6-680	ALU
5A0N	XXXX	Register Decode Test for Current Level Reg.Group. The following tests will load one of the current level "N" general register with data. Then the other six registers are 'ored' together to test for register decode errors. Each of the remaining six should have data = 00000.							
	0001	Register Decode Failure. Group Regs.=00000 except R1.	R1=00001	Same	N/A	AB3K2	CLxxx		Decode Failure for all error codes in this routine.
	0002	LR R1,R1 failed.		R1=00001	N/A	AB3K2	CLxxx	6-220 6-120	
	0003	Register Decode Failure. Group Regs.=00000 except R1.	R1=30101	Smae	N/A	AB3K2	CLxxx	6-220 6-120	
	0004	LRI R1(1) failed.		R1=30101	N/A	AB3K2	CLxxx	6-170 6-120	
	0005	LCR R1(0),R1(1) failed.		R1=30101	N/A	AB3K2	CLxxx	6-220 6-120	
	0006	Register Decode Failure. Group Regs.=00000 except R2.	R2=00002	Same	N/A	AB3K2	CLxxx	6-220 6-120	
	0007	LR R1,R2 failed.		R1=R2 R2=00002	N/A	AB3K2	CLxxx	6-220 6-120	
	0008	Register Decode Failure. Group Regs.=00000 except R3.	R3=00003	Same	N/A	AB3K2	CLxxx	6-120	
	0009	LR R3,R3 failed.		R3=00003	N/A	AB3K2	CLxxx	6-220 6-120	
	000A	Register Decode Failure Group Regs.=00000 except R3.	R3=30303	Same	N/A	AB3K2	CLxxx	6-120	
	000B	LR1 R3(1) failed.		R3=30303		AB3K2	CLxxx	6-120 6-120	
	000C	LCR R3(0),R1(1) failed.		R3=30303		AB3K2	CLxxx	6-220 6-120	

ROUT	ERROR CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPEC'TD RESULTS IN LEVEL 'N' REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(s)	FEALD PAGE	FETMM PAGE	COMMENTS
	000D	Register Decode Failure Group Regs.=00000 except R4.	R4=00004	Same	N/A	AB3K2	CLxxx	6-120	
	000E	LR R1,R4 failed.		R1=R4 R4=00004		AB3K2	CLxxx	6-220 6-120	
5B0N	XXXX	Register Decode Test for current level. Reg.Group See 470n write up.							All error codes routine signify a Decode Failure.
	0001	Register Decode Failure. Group Reg.=00000 Except R5.	R5=00005	Same		AB3K2	CLxxx	6-120	Note 1
	0002	LR R5,R5 failed.		R5=00005		AB3K2	CLxxx	6-220 6-120	Note 1
	0003	Register Decode Failure. Group Regs=00000 Except R5.	R5=20505	Same		AB3K2	CLxxx	6-120	Note 1
	0004	LRI R5(1) failed.		R5=20505		AB3K2	CLxxx	6-170 6-120	Note 1
	0005	LCR R5(0),R5(1) failed.		R5=20505		AB3K2	CLxxx	6-220 6-120	Note 1
	0006	Register Decode Failure. Group Regs.=00000 Expect R6.	R6=00006	Same		AB3K2	CLxxx	6-120	
	0007	LR R1,R6 failed.		R1=R6 R6=00006		AB3K2 AB3K2	CLxxx CLxxx	6-220 6-120	
	0008	Register Decode Failure Group Regs.=00000 Except R7.	R7=00007	Same		AB3K2	CLxxx	6-120	Note 1
	0009	LR R7,R7 failed.		R7=00007		AB3K2	CLxxx	6-220 6-120	
	000A	Register Decode Failure Group Regs.=00000 Except R7.	R7=00707	Same		AB3K2	CLxxx	6-120	Note 1
	000B	LRI R7(1) failed.		R7=00707		AB3K2	CLxxx	6-170 6-120	Note 1
	000C	LCR R7(0),R7(1) failed.		R7=00707		AB3K2	CLxxx	6-220 6-120	Note 1
5C0N	XXXX	Add and subtract pattern sensitivity test this routine loops							BCT count in R3(1) SRI count in R7
	0001	BCT failed to branch or altered CZ latches	N/A	N/A	00	AB3J2	CAxxx	6-680	ARI count in R1
	0002	BCT altered CZ latches	N/A	N/A	00	AB3G2	CZxxx	6-680	C,Z latches
	0003	The ARI and BCT counts are not equal - ALU Failure.				See Note 2		6-170 6-680	
	0004	The ARI and SRI counts are not equal. ALU Failure.				See Note 2		6-170 6-680	
	0005	The C latch set after an SRI instruction when result was not less than zero.			00	AB3H2 AB3G2	CDxxx CAxxx	6-170	

ROUT	ERROR CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPEC'TD RESULTS IN LEVEL 'N' REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(s)	FEALD PAGE	FETMM PAGE	COMMENTS
	0006	SRI failed to set C latch.			00	See Note 2		6-170	
	0007	Z latch set on a non-zero SRI result.			00	See Note 2		6-170	
	0008	Z latch failed to set on overflow ARI result.			11	See Note 2		6-170	
	0009	C latch failed to set on overflow ARI result			11	See Note 2		6-170	
	000A	ARI and BCT counts not equal - ALU Failure.			N/A	See Note 2		6-170 6-680	
	000B	SRI failed to set c latch.			10	See Note 2		6-170	
	000C	ARI did not set Byte X on overflow condition.			01	See Note 2		6-170	
5F0N	XXXX	Input/Output Instruction Decode Test							All input-output to Reg X '79'
	0001	Output Instruction modified C,Z latch.	R7=30300		01	AB3H2	CDxx	6-730	Note 1 All failures in this routine are of decode type.
	0002	Input Instruction modified CZ latch.			01	AB3H2	CDxxx	6-710	
	0003	Input or output X '79' Decode Failure		R3=00300	N/A	AB3H2	CDxxx	6-120	
	0004	Output modified CZ latch.	R7=00000		10	AB3H2	CDxxx	6-730	Note 1
	0005	Input modified CZ latch.			10	AB3H2	CDxxx	6-710	
	0006	Input or output decode failure.		R1=00000	N/A	AB3H2	CDxxx	6-710 6-730	
600N	XXXX	Input Test for CCU Lag. Reg.				AB3H2 AB3M2	CD003 CS001	6-800	
	0001	Input Failure R1=R3 the address previous to inputing LAR.							
620N	XXXX	I/O Register Decode Testing. Level 1 Testing only. Each general register, starting with Level 1 Reg 6 through Level 5 Reg 7, is tested. Testing is done by a subroutine.				AB3K2	CLxxx	6-120	Local Store Register selection Failure See Note 2 for Bit Failures
	0001	OUT R1, Test Reg IN R2, Test Reg Either the "output" or "input" register decode failure.	R1=Output Reg Data	R1=R2 R1=Output Reg Data	N/A	AB3K2	CLxxx	6-120	The failing register can be determined by the data in R1. Bytes 0 and 1 bits 0 - 3 will define the register in Hex. For example 0164 = output to X'06' (Level 1 Reg 6) 11F4=output to X'1F' (Level 5 Reg 7)

ROUT	ERROR CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPEC'TD RESULTS IN LEVEL 'N' REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(S)	FEALD PAGE	FETMM PAGE	COMMENTS
630N	XXXX	I/O Register Pattern Sensitivity Testing. Level 1 testing only. Each of the general registers test above in routine 620N is tested again with 28 different patterns.				AB3K2	CLxxx	6-120	Local Store Register selection failure See Note 2 for Bit Failures
	0001	OUT R1, Test Reg IN R4, Test Reg The data in R2 and R4 failed to compare.		R2=R4 R2=Test Pattern R3=Test Reg Data	N/A	AB3K2	CLxxx	6-120	R3 Bytes 0 and 1 Bits 0-3 defines the register, in Hex
650N	XXXX	Level 1 to Level 2 Setup Test. A subroutine is used to unmask Level, set Diag L2 interrupt and prepares to exit Level 1.				AB3M2	CPxxx		Program Level Failure
	0001	Interrupt requests Group 1 has outstanding bits on. Reg X'7E'		R1=Reg X'7E'	01	AB3M2	CPxxx	6-850	
	0002	Diag L2 interrupt request interrupt bit is not on interrupt request Group 2. Reg X'7F'		R1=Reg X'7F' R1=8004	01	AB3M2	CPxxx	6-850	
660N	XXXX	General Register Setup. Exit Level 1.							
	0001	Same test and error data as that listed above under routine 620N.							
	0002	Exit Instruction failed to exit Level 1.		N/A	N/A	AB3M2	CPxxx	6-750	Program Level Failure.
	0003	The Level 1 exit did not exit to Level 2 but returned to level 1.	N/A	N/A	N/A	AB3M2	CPxxx	6-750	Note 3
	0004	Level 1 exited to Level 3 in lieu of Level 2.	N/A	N/A	N/A	AB3M2	CPxxx	6-750	Note 3
	0005	Level 1 exited to Level 4 in lieu of Level 2.	N/A	N/A	N/A	AB3M2	CPxxx	6-750	Note 3
	0006	Level 1 exited to Level 5 in lieu of Level 2.	N/A	N/A	N/A	AB3M2	CPxxx	6-750	Note 3
670N	XXXX	General Register Interaction testing. Once the basic routines have been run under program Level 2, the general registers for Level 3 R0 through Level 5 R7 are tested to verify that the Level 2 programs did not alter the data previously stored by routine 630N.				AB3K2 AB3M2	CLxxx CPxxx		Register Selection Program Level Failure
	0001	Interaction between Level 2 and some other general register.	R4=Expected Data R2=Actual R1=Input Reg Data		N/A			6-120	The failing register can be determined by the data in R1. Bytes 0 and 1 Bits 0-3 will define the register, in Hex

ROUT	ERROR CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPEC'TD RESULTS IN LEVEL 'N' REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(s)	FFALD PAGE	FETMM PAGE	COMMENTS
690N	XXXX	I/O Register Decode Testing. Level 2 testing only.							
	0001	OUT R1, Test Reg IN R2, Test Reg Register decode failed. Previously tested under program Level 1, must be level sensitive.	R1=Output Reg Data	R1=R2 R1=Output Reg Data	N/A	AB3K2	CLxxx	6-120	R1 Bytes 0 and 1 Bits 0-3 defines the register, in Hex. Register Selection See Note 2 for Bit Failures.
6A0N	XXXX	I/O Register Pattern Sensitivity Testing. Level 2 testing only.				AB3K2	CLxxx		Register Selection See Note 2 for Bit Failures.
	0001	OUT R2, Test Reg IN R4, Test Reg Previously tested under program Level 1, must be level sensitive.		R2=R4 R2=Test Pattern R3=Test Reg Data	N/A	AB3K2	CLxxx		R3 bytes 0 and 1 bit 0-3 defines the register in hex
6C0N	XXXX	Level 2 to Level 3 Setup Test. A subroutine is used to mask Level 2, unmask Level 3, reset diag L2 request interrupt, and prepares to exit Level 2.				AB3M2	CPxxx		Program Level Failure
	0001	Diag L2 interrupt request bit failed to reset.		R1=Reg X'7F'	N/A	AB3M2	CPxxx	6-070	Reg X'7F' byte 0 bit 0 equals Diag L2 request
	0002	PCI L3 interrupt request Bit failed to set. Reg X'7F' Byte 1 Bit 6.		R1=Reg X'7F'	N/A	AB3M2	CPxxx	6-070 6-860	
6D0N	XXXX	General Register Setup. Exit Level 2.							
	0001	Same test and error data as listed above under routine 690N.						6-120	
	0002	Exit instruction failed to exit L2.	N/A	N/A	N/A	AB3M2 AB3K2	CPxxx CLxxx	6-070 6-750	Program Level Failure Register selection
	0003	Level 2 exited to Level 1 in lieu of Level 3.	N/A	N/A	N/A	AB3M2 AB3K2	CPxxx CLxxx	6-070 6-750	Note 3
	0004	Level 2 exited to Level 2 in lieu of Level 3.	N/A	N/A	N/A	AB3M2 AB3K2	CPxxx CLxxx	6-070 6-750	Note 3
	0005	Level 2 exited to Level 4 in lieu of Level 3.	N/A	N/A	N/A	AB3M2 AB3K2	CPxxx CLxxx	6-070 6-750	Note 3
	0006	Level 2 exited to Level 5 in lieu of Level 3.	N/A	N/A	N/A	AB3M2 AB3K2	CPxxx CLxxx	6-070 6-750	Note 3
6F0N	XXXX	General Register Interaction Testing. Once the basic routines have been run under program Level 3, the general registers for Level 4 Reg 0 through Level 1 Reg 7 are tested to verify that the Level 3 programs did not alter the data previously stored by routine 6D0N.				AB3K2 AB3M2	CLxxx CPxxx		Register Selection Program level Failure

ROUT	ERROR CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPEC'TD RESULTS IN LEVEL 'N' REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(s)	FEALD PAGE	FETMM PAGE	COMMENTS
	0001	Interaction between Level 3 and some other general register.		R4=Expected Data R2=Actual R1=Input Reg Data	N/A	AB3K2 AB3M2	CLxxx CPxxx	6-120	R1 bytes 0 and 1 bits 0-3 defines register in Hex
700N	XXXX	I/O Register Decode Testing. Level 3 testing only.				AB3K2	CLxxx		Register Selection
	0001	OUT R1, Test Reg IN R2, Test Reg Register decode failed. Previously tested under program Levels 1 & 2.		R1=R2 R1=Output Reg Data	N/A	AB3K2	CLxxx	6-120	R1 Bytes 0 and 1 bits 0-3 defines the register, in Hex.
710N	XXXX	I/O Register Pattern Sensitivity Testing. Level 3 testing only.				AB3K2	CLxxx		Register Selection See Note 2 for Bit Failure.
	0001	OUT R2, Test Reg IN R4, Test Reg Previously tested under program Level 1 and 2 must be Level sensitive.		R2=R4 R2=Test Pattern R3=Test Reg Data	N/A	AB3K2	CLxxx		R3 bytes 0 and 1 bits 0-3 defines the register, in Hex.
730N	XXXX	Level 3 to Level 4 Setup Test. A subroutine is used to mask Level 3, unmask Level 4, reset PCI L3 request, set PCI L4 request, and prepares to exit Level 3.				AB3M2	CPxxx		Program Level Failure
	0001	PCI L3 interrupt request bit failed to reset. Reg X'7F' byte 1 bit 6.		R1=Reg X'7F'	N/A	AB3M2	CPxxx	6-860	
	0002	PCI L4 interrupt request bit failed to set. Reg X'7F' byte 0 Bit 7.		R1=Reg X'7F'	N/A	AB3M2	CPxxx	6-860	
	0003	Outstanding bits on in Reg X'7F'.		R1=0000	01	AB3M2	CPxxx	8-870	
740N	XXXX	General Register Setup. Exit Level 3.							
	0001	Same test and error data as listed above under routine 700N.						6-120	
	0002	Exit instruction failed to exit L3.	N/A	N/A	N/A	AB3K2 AB3M2	CLxxx CPxxx	6-070 6-750	Register Selection Program Level Failure
	0003	Level 3 exited to Level 1 in lieu of Level 4.		N/A	N/A	AB3K2 AB3M2	CLxxx CPxxx	6-070 6-750	Note 3
	0004	Level 3 exited to Level 2 in lieu of Level 4.		N/A	N/A	AB3K2 AB3M2	CLxxx CPxxx	6-070 6-750	Note 3
	0005	Level 3 exited to Level 3 in lieu of Level 4.		N/A	N/A	AB3K2 AB3M2	CLxxx CPxxx	6-070 6-750	Note 3
	0006	Level 3 exited to Level 5 in lieu of Level 4.		N/A	N/A	AB3K2 AB3M2	CLxxx CPxxx	6-070 6-750	Note 3

ROUT	ERROR CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPEC'TD RESULTS IN LEVEL 'N' REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(s)	FEALD PAGE	FETMM PAGE	COMMENTS
760N	XXXX	I/O Register Interaction Testing. Once the basic routines have been run under program Level 4, the general registers for Level 5 Reg 0 through Level 3 Reg 7 are tested to verify that the Level 4 programs did not alter the data previously stored by routine 740N.				AB3K2 AB3M2	CLxxx CPxxx		Register Selection Program Level failure See Note 2 for Bit Failures
	0001	Interaction between Level 4 and some other general register.		R4=Expected Data R2=Actual R1=Input Reg Data	N/A	AB3K2 AB3M2	CLxxx CPxxx	6-070	R1 bytes 0 and 1 bits 0-3 defines register, in Hex.
770N	XXXX	I/O Register Decode Testing Level 4 testing only.				AB3K2	CLxxx		Register Selection
	0001	OUT R1, Test Reg IN R2, Test Reg Register decode failed. Previously tested under program Levels 1, 2 and 3.		R1=R2 R1=Output Reg Data	N/A	AB3K2	CLxxx	6-120	R1 byte 0 bits 0 Bits 0-3 defines the in Hex.
780N	XXXX	I/O Register Pattern Sensitivity Testing. Level 4 testing only.				AB3K2	CLxxx		Register Selection See Note 2 for Bit Failures
	0001	OUT R2, Test Reg IN R4, Test Reg Previously tested under Program Levels 1, 2, and 3.		R2=R4 R2=Test Pattern R3=Test Reg Data	N/A	AB3K2	CLxxx		R3 Bytes 0 and 1 Bits 0-3 defines the register, in Hex. See Note 2.
7A0N	XXXX	Memory Addressing Test Runs Only under program Level 4.				AB3K2 AB4E2	CLxxx CMxxx		Register Selection Address Exception Failure.
	0001	Invalid fold occurred at address in R1. Fold occurs when maximum address of 64K or 256K is incremented and wraps back to address zero, and is therefore valid only if memory size = 64K or 256K.		R1=Address of fold	N/A	AB3K2 AB4E2	CLxxx CMxxx		
	0002	Fold failed to occur Address determined by input X'70' did not cause fold to address X'0000'. Fold should occur if 64K or 256K.		R1=Address R3=Max Address per X'70'		AB3K2 AB4E2	CLxxx CMxxx		
	0003	Storage size input, Reg X'70' appears to be in error. Address exception was set prior to reaching the maximum address derived from data in Reg X'70'.		R1=Address of error R3=Max Address Derived From X'70'	N/A	AB3K2 AB4E2	CLxxx CMxxx	6-770 6-005	
	0004	Unexpected Level 1 Request Bits in Reg X'7E'.		R7=X'7E'	N/A	AB3K2 AB4E2	CLxxx CMxxx	6-850	
	0005	Failed to set address exception.		R1=Address of error.	N/A	AB3K2 AB4E2	CLxxx CMxxx	6-005	
	0006	Level 1 interrupt but address exception bit is not on. Byte 1 Bit 1 Reg X'7E'.		R3=X'7E'	N/A	AB3K2 AB4E2	CLxxx CMxxx	6-850	

ROUT	ERROR CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPEC'TD RESULTS IN LEVEL 'N' REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(s)	FEALD PAGE	FETMM PAGE	COMMENTS
	0007	Address exception bit failed to reset. Output to Reg. X'77'.		R3=X'7E'	N/A	AB3K2	CLxxx	6-900	
	0008	Data Failure The data stored at each location is its own address value. As a result, R3 equals both the expected data and the address that failed.		R3=Expected R5=Actual	01	AB3K2 AB4E2	CLxxx CMxxx	7-020 7-030	
	0009	Address exception failed to set when attempting to load a halfword from an invalid address.		R3=Address of error	01	AB3K2 AB4E2	CLxxx CMxxx	6-050	
	000A	Address exception error occurred while attempting to load a halfword from a valid address.		R3=Address	N/A	AB3K2 AB4E2	CLxxx CMxxx	6-050	
	000B	An address exception error occurred but failed to trap to Level 1.		R5=Reg X'7E'	N/A	AB3K2 AB4E2	CLxxx CMxxx	6-050	
7B0N	XXXX	Level 4 to Level 5 Setup Test. A subroutine is used to mask Level 4, unmask Level 5, reset PCI L4 request, and prepares to exit Level 4.				AB3M2	CPxxx		Program Level Failure
	0001	Outstanding bits are on in either interrupt request Group 1 or 2 (X'76', X'77'), excluding the timer L3 bit.		R1=the 'OR' of Regs X'7E' X'7F'	N/A	AB3M2	CPxxx	6-810 6-820	
7C0N	XXXX	General Register Setup Exit Level 4.							
	0001	Same test and error data as listed above under routine 770N.							
	0002	Exit instruction failed to exit L4.		N/A	N/A	AB3M2 AB3K2	CPxxx CLxxx	6-070 6-750	Program Level Failure Register Selection
	0003	Level 4 exited to Level 1 in lieu of Level 5.		N/A	N/A	AB3M2 AB3K2	CPxxx CLxxx	6-070 6-750	Note 3
	0004	Level 4 exited to Level 2 in lieu of Level 5.		N/A	N/A	AB3M2 AB3K2	CPxxx CLxxx	6-070 6-750	Note 3
	0005	Level 4 exited to Level 3 in lieu of Level 5.		N/A	N/A	AB3M2 AB3K2	CPxxx CLxxx	6-070 6-750	Note 3
	0006	Level 4 exited to Level 4 in lieu of Level 5.		N/A	N/A	AB3M2 AB3K2	CPxxx CLxxx	6-070 6-750	Note 3
7F0N	XXXX	Level 5 to Level 1 Setup Test. A subroutine is used to mask Level 5 and prepares to return to Level 1.				AB3M2	CPxxx		Program Level ailure
	0001	An "output" instruction is executed under program Level 5 in order to force a Level 1 interrupt. The output failed to set I/O check Level 1 or mask Level 5 failed.		N/A	N/A	AB3M2	CPxxx	6-050	

ROUT	ERROR CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPEC'TD RESULTS IN LEVEL 'N' REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(s)	FEALD PAGE	FETMM PAGE	COMMENTS
	0002	The I/O check above trapped to Level 2 in lieu of Level 1.		N/A	N/A	AB3M2	CPxxx	6-070	
	0003	The I/O check above trapped to Level 3 in lieu of Level 1.		N/A	N/A	AB3M2	CPxxx	6-070	
	0004	The I/O check above trapped to Level 4 in lieu of Level 1.		N/A	N/A	AB3M2	CPxxx	6-070	
800N	XXXX	I/O Register Interaction Testing. Once the basic routines have been run under program Levels 2, 3, 4, and 5, the program makes an additional pass under program Level 1. Then the general registers for Level 3 Reg 0 through Level 5 Reg 7 are tested for any interaction.				AB3K2	CLxxx		Register Selection See Note 2 for Bit Failures
	0001	Interaction did occur.		R4=Expected Data R2=Actual R1=Input Reg Data	N/A	AB3K2	CLxxx		R1 bytes 0 and 1 bits 0-3 defines the register in Hex.
810N	XXXX	Reset Level 1 In/Out Check L1 Test.							
	0001	Output to Reg X'77' with data X'0004' Failed to reset check.		R1=x'7E'	N/A	AB3G2 AB3L2	CQ004 CU014	6-900	Output '77' fail I/O check latch failure
XX0N	1001	Routine continuity error. At the start of a given routine R1 is loaded with a value equal to the given routine number, this value is then compared to a "current routine number" which is read from a table. As a result, should a wild branch(s) occur this trap should catch it.	N/A	R1 should equal R3 R1=Actual R3=Expected	N/A	N/A	N/A		
XX0N	1002	Subroutine to Test Byte X. Since the fullword instructions have not been tested the first couple of passes through this subroutine, the data in R1 is shifted right two places and then tested using XOR halfword.	R1=Actual R3=Expected	R1 should equal R3	01	AB4J2	DFxxx	6-220	'X' Byte Failure
XX0N	2001	Level 5 to Level 1 Interrupt Handler. Unable to reset Level 1 request bits. Output to Reg X'77' With data X'C00C'.		R1=Reg X'7E'	01	AB3G2 AB3M2	CQ004 CPxxx	6-900	Output '77' Fail Program Level Failure
XX0N	2002	Exit from Level 1 Handler Failed. Previously tested.		N/A	N/A	N/A		6-070	

ROUT	ERROR CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPEC'TD RESULTS IN LEVEL 'N' REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(S)	FEALD PAGE	FETMM PAGE	COMMENTS
XX0N	2003	While running under program Level 2, an unexpected Level 1 interrupt occurred.		N/A	N/A	N/A	N/A	6-070	Note 3
XX0N	2004	While running under program Level 2, an unexpected Level 2 interrupt occurred.		N/A	N/A	N/A	N/A	6-070	Note 3
XX0n	2005	While running under program Level 2, an unexpected Level 3 interrupt occurred.		N/A	N/A	N/A	N/A	6-070	Note 3
XX0N	2006	While running under program Level 2, an unexpected Level 4 interrupt occurred.		N/A	N/A	N/A	N/A	6-070	Note 3
XX0N	2008	While running under Level 3, an unexpected Level 1 interrupt occurred.		N/A	N/A	N/A	N/A	6-070	Note 3
XX0N	2009	While running under program Level 3, an unexpected Level 2 interrupt occurred.		N/A	N/A	N/A	N/A	6-070	Note 3
XX0N	200A	While running under program Level 3, an unexpected Level 3 interrupt occurred.		N/A	N/A	N/A	N/A	6-070	Note 3
XX0N	200B	While running under program Level 3, an unexpected Level 4 interrupt occurred.		N/A	N/A	N/A	N/A	6-070	Note 3
XX0N	200D	While running under Program Level 4, an unexpected Level 1 interrupt occurred.		N/A	N/A	N/A	N/A	6-070	Note 3
XX0N	200E	While running under program Level 4, an unexpected Level 2 Interrupt occurred.		N/A	N/A	N/A	N/A	6-070	Note 3
XX0N	200F	While running under program Level 4, an unexpected Level 3 interrupt occurred.		N/A	N/A	N/A	N/A	6-070	Note 3
XX0N	2010	While running under program Level 4, an unexpected Level 4 interrupt occurred.		N/A	N/A	N/A	N/A	6-070	Note 3
XX0N	2012	While running under program Level 5, an unexpected Level 2 interrupt occurred.		N/A	N/A	N/A	N/A	6-070	Note 3

ROUT	ERROR CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPEC'TD RESULTS IN LEVEL 'N' REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(s)	PEALD PAGE	FETMM PAGE	COMMENTS
XX0N	2013	While running under program Level 5, an unexpected Level 3 interrupt occurred.		N/A	N/A	N/A	N/A	6-070	Note 3
XX0N	2014	While running under program Level 5, an unexpected Level 4 interrupt occurred.		N/A	N/A	N/A	N/A	6-070	Note 3
XX0N		Second pass through Level 1 after running test under program Levels 2, 3, 4 and 5.							
	2015	Unexpected Level 1 interrupt occurred.		N/A	N/A	N/A	N/A	6-070	Note 3
	2016	Unexpected Level 2 interrupt occurred.		N/A	N/A	N/A	N/A	6-070	Note 3
	2017	Unexpected Level 3 interrupt occurred.		N/A	N/A	N/A	N/A	6-070	Note 3
	2018	Unexpected Level 4 interrupt occurred.		N/A	N/A	N/A	N/A	6-070	Note 3
	2019	Program level 5 became the active program level while attempting to run under either program level 1, 2, 3, or 4. To determine which level should be active, look at the data in display register B. Bits 1.4 through 1.7 define the program level under test (see page 3-010).		N/A	N/A	N/A	N/A	6-070	Note 3
XX0N	2020	While running under program Level 5, a Level 1 interrupt occurred and the I/O check bit was not on.		N/A	N/A	N/A	N/A	6-070	Note 3
XX0N	2021	Subroutine to handle timer Level 3 interrupts. An attempt to reset the timer bit (X'7F' 1.5) failed. Output X'77' with data X'0040' was used to attempt the reset.	N/A	R7=EXT Reg X'7F'	N/A	A-B3L2	CP007		Note 3

ROUT	ERROR CODE	FUNCTION TESTED and ERROR DESCRIPTION	Level 'N' PRIOR TO TEST INST EXEC	EXPEC'TD RESULTS IN LEVEL 'N' REGISTER	RESULTING CZ LATCHES	SUSPECTED CARD LOCATION(s)	FEALD PAGE	FE'MM PAGE	COMMENTS

NOTE 1: The error reporting subroutine uses registers R5 and R7. As a result, if it is desired to observe the data values expressed for a given error code, the data in R5 and R7 must be recorded at the initial "out stop".

NOTE 2: Use the following chart to determine the suspected card(s) for all ALU or data sensitive errors. The card should be keyed off of the failing bits in the register as defined under "expected results". Once a given instruction is tested for a basic ALU and C-Z Latch setting, that any errors that follow are due to data sensitivity.

BITS IN ERROR	CARD	LOGIC PAGE
Byte X, Bits 4, 5	A-B4S2	DEXXX
Byte X, Bits P, 6, 7	A-B4J2	DFXXX
Byte 0, Bits P, 0, 1	A-B4K2	DGXXX
Byte 0, Bits 2, 3, 4	A-B4L2	DHXXX
Byte 0, Bits 5, 6, 7	A-B4M2	DJXXX
Byte 1, Bits P, 0, 1	A-B4N2	DKXXX
Byte 1, Bits 2, 3, 4	A-B4P2	DLXXX
Byte 1, Bits 5, 6, 7	A-B4Q2	DMXXX

NOTE 3: This error code can not be looped using the Initial Test 'loop on error' option.

APPENDIX D MANUAL INTERVENTION ROUTINE INDEX

D.1 IBM 3705 CENTRAL CONTROL UNIT MANUAL INTERVENTION ROUTINES

The following routines are manual intervention routines for the CCU Internal Functional Test. The page numbers referred to are D99-3705E pages.

ROUT.	FUNCTION TESTED	PAGE NO.	COMMENTS
1156	Storage Protect keys	1.16	See Notes on Page 1.30
1190	Customer Usage Meter	1.22	

D.2 IBM 3705 STORAGE IFT MANUAL INTERVENTION ROUTINES

The following routine is an IBM 3705 storage IFT manual intervention routine. The pages referred to are D99-3705E pages.

ROUT.	FUNCTION TESTED	PAGE NO.	COMMENTS
X209	Storage worst case pattern	2.5	See Page 2.3 to use this routine with the Schmoo test.

D.3 IBM 3705 TYPE 1 COMMUNICATION SCANNER MANUAL INTERVENTION ROUTINES

The following routines are type 1 communication scanner manual intervention routines. The pages referred to are D99-3705E pages.

ROUT.	FUNCTION TESTED	PAGE NO.	COMMENTS
15C8	The four basic functions of integrated Auto-Call units and modems.	5.0.101	Tests: Auto dial only, Auto dial disconnect, Auto dial and transmit marks with disconnect. See Page 5.0.157 for a description of the normal stops when running this routine.
15CA	The three basic functions of integrated modems with	5.0.108	Tests: Auto-answer only, Auto-answer

	the Auto-answer feature		and receive with data checking, and Auto-answer without data checking. See Page 5.0.157 for a description of the normal stops for this routine.
15CE	External data wrap	5.0.113	See Page 5.0.157
15D0	Data set ready active	5.0.126	See Page 5.0.157
15D1	Auto-call EIA receivers and drivers	5.0.127	See Page 5.0.157
15D2	Data set ready inactive	5.0.131	See Page 5.0.157
15D4	Carrier detect active	5.0.132	See Page 5.0.157
15D6	Carrier detect inactive	5.0.133	See Page 5.0.157
15D8	Receive data space	5.0.134	See Page 5.0.157
15DA	Receive data mark	5.0.135	See Page 5.0.157
15DC	Ring indicate active	5.0.136	See Page 5.0.157
15DE	Ring indicate inactive	5.0.136	See Page 5.0.157
15E0	Clear to send	5.0.137	See Page 5.0.157
15E4	New Sync active	5.0.139	See Page 5.0.157
15E6	Telegraph echo check	5.0.140	See Page 5.0.157
15E8	Monitor mode 01	5.0.142	See Page 5.0.157
15EA	Interrupt mode 10	5.0.143	See Page 5.0.157
15F0	SDLC link test	5.0.144	See Page 5.0.157

D.4 IBM 3705 TYPE 2 COMMUNICATION SCANNER MANUAL INTERVENTION ROUTINES

The following routines are manual intervention routines for the type 2 communication scanner IFT. The pages referred to are D99-3705E pages except as indicated.

ROUT.	FUNCTION TESTED	PAGE NO.	COMMENTS

D.5 IBM 3705 TYPE 3 COMMUNICATION SCANNER MANUAL INTERVENTION ROUTINES

The following routines are manual intervention routines of the type 3 communication scanner IFT.
The pages referred to are D99-3705E pages except as indicated.

ROUT.	FUNCTION TESTED	PAGE NO.	COMMENTS
X741	Sets line addresses for testing	7.0.74	Allows changing wrap addresses for scanner wrap tests.
X7A8	Wrap Line sets	7.1.221	
X7F0	SDLC link test	7.1.267	
T3705L	Panel line test	5.1	See Chapter 5 in D99-3705D.

APPENDIX E. IFT RUN EXAMPLES

This example is a sample run of IBM 3705 Internal Functional Tests and Initial Tests. This example assumes that the Channel Adapter OLTs have been run successfully, refer to D99-3705C Appendix B for CA OLT run example.

The request shown test all adapters with all tests excluding Manual Intervention and external wrap routines.

The referenced paragraph numbers provide information to run individual tests using different parameters such as error loops and test loops etc. The referenced paragraphs also provide a starting point when unexpected error stops occur.

The sequence shown assumes OLTEP or OLTSEP is running in the host CPU and the CDS is correct for all adapters. The DIAGNOSTIC CONTROL switch should be set to PROCESS, and the DISPLAY/FUNCTION SELECT switch should be set to STATUS.

SYSTEM COMMUNICATION	NOTES AND REFERENCES
System; ENTER DEV/TEST/OPT	D99-3705D paragraph 3.2.2.1.
reply: 'xxx/3705A/nfe,ext=nyyn/'	This entry request IFTs to be across the channel to the 3705. The ext parameter shown causes the Initial Test to run. Refer to D99-3705D paragraph 3.2.2.1.
System; S T3705A	
System; PRESS LOAD ON 3705	Press LOAD on the 3705, the IFTs will load across the channel after the Initial Test.
System; THE STATUS OF THE 3705 CANNOT BE DETERMINED. WARNING- CONTINUATION WILL CAUSE THE ENTIRE 3705 TO BECOME UNAVAILABLE. ENTER 'C' TO	D99-3705D paragraph 1.1.2 'Initial Messages'. Warning message may or may not occur depending upon operating system.

SYSTEM COMMUNICATION	NOTES AND REFERENCES
CANCEL OR 'P' TO PROCEED.	
Reply; 'p'	
System; 3705 LOADED WITH IFT X3705xxx	D99-3705D paragraph 3.2.2.2. xxx=AAA if loading via a type 1/4 CA; xxx=ABA if loading via type 2/3 CA.
System; 3705 LOADED WITH IFT X3705ADA	Refer to D99-3705D Chapter 4 for Initial Test Description. Initial Test Section 1 is running. See D99-3705D Appendix C for error descriptions.
System; WAITING FOR IFT COMPLETION	This message may occur periodically between sections while the tests are running in the 3705. No action is required.
System; 3705 LOADED WITH IFT X3705AEA	Refer to D99-3705D Chapter 4.0 for Initial Test Description. Initial Test section 2 is running. Refer to D99-3705D Appendix C for error stops.
System; 3705 LOADED WITH IFT X3705ACA	The DCM is now in control of the 3705.
System; ENTER IFT REQUEST AT 3705	Refer to D99-3705D paragraph 3.3.1. Set the FUNCTION/ DISPLAY SELECT switch to FUNCTION 4, DISPLAY A & B should be X'FFFF', HARD-STOP, and PROGRAM DISPLAY lights should be on. Set the STORAGE ADDRESS/DATA switches to X'0000' and press START. DISPLAY B should be X'8002', HARD-STOP

SYSTEM COMMUNICATION	NOTES AND REFERENCES
	and PROGRAM DISPLAY lights should be on. Press START; this procedure selected all tests to run on all adapters.
System; 3705 LOADED WITH IFT X3705BAA	Refer to D99-3705D paragraph 3.2.2 for a list of IFT sections.
System; 3705 LOADED WITH IFT X3705BBA	
System; 3705 LOADED WITH IFT X3705BCA	
System; 3705 LOADED WITH IFT X3705CAA	
System; 3705 LOADED WITH IFT X3705CBA	Beyond this point, the actual modules run depends upon the upon the hardware CDS. A list of all IFT modules is located in D99-3705D paragraph 3.2.2.2. The list in this example only shows the CCU and storage IFT sections. If unexpected error stops occur, refer to D99-3705D paragraph 3.3.2 for an analysis of the display information and for pointers to the correct symptom index in D99-3705E.
System; WAITING FOR IFT COMPLETION	DISPLAY A = X'FFFF' and DISPLAY B = X'80F0' indicates that the IFTs have completed and no errors were detected. Refer to D99-3705D paragraph 3.3.1 to run additional tests. Terminate testing by entering X'F0xx' in the STORAGE ADDRESS/

SYSTEM COMMUNICATION	NOTES AND REFERENCES
	DATA switches and pressing START.
System; T T3705A	

This example does not completely test the LIBs and Line Sets. More in-depth testing can be done using the manual intervention routines referred to in D99-3705D Appendix D. To specifically check line sets, external wrap manual intervention routines can be used. Manual intervention routines can be used to further test storage and customer usage meter.

Interaction between the communication scanner, LIBs, and/or line sets can cause scanner error stops that are caused by the line sets.

IBM/TECHNICAL NEWSLETTER

DCL-3705D-08
D99-3705D-06

IBM MAINTENENCE DIAGNOSTIC PROGRAM
IBM 3705 COMMUNICATIONS CONTROLLER
DIAGNOSTIC CONTROL MODULE, PANEL LINE
TEST, and INITIAL TEST

Page updates are provided for Appendix A, Communications Controller Configuration Data Set description, for editorial corrections.

Remove Pages	Add Pages
D99-3705D-06	DCL-3705D-08
Cover	Cover
v - vi	v - vi
A.5 - A.6	A.5 - A.6
D.1 - D.6	D.1 - D.6

File this cover letter with the manual to provide a record of the change.

IBM Network Products RAS, SCD Laboratory, Dept. G64,
P.O. Box 12295, Research Triangle Park, North Carolina, 27709

SUMMARY OF AMMENDMENTS FOR DCL-3705D-07

This DCL updates the Configuration Data Set Description, Appendix A.

In addition, the Manual Intervention Routine Index, Appendix D, has been updated to include new Type 3 Communication Scanner and Type 4 Channel Adapter Manual Intervention Routines.

Section 3 Symptom Index References were updated to include the new Type 4 Channel Adapter Manual Intervention Routines.

SUMMARY OF AMMENDMENTS FOR DCL-3705D-08

This DCL updates the Configuration Data Set Description, Appendix A page a.6.

A.1.1 RANGE DEFINITION

It is mandatory that each address in the described Emulator address range be defined by a IBM 2701, 2702, or 2703 CDS entry in order to use that address as a test device address. It is recommended that a CDS entry be included for all addresses in the range in order to prevent a 'NO CDS ENTRY' message for each undefined address.

If it is necessary to use a large range of emulator addresses, the following dummy CDS entry can be used for each unused subchannel address to minimize the OLT printouts:

Card Col	2-4	10-17	22-25	52
Punch	CDS	DEV ADDR	4001	/

Part 2 of the CDS has a variable length and is composed of the Index/Data blocks needed to define the hardware. Each hardware feature is referred to by its unique block type (i.e. CCU data block is type A, type 1 channel adapter data block is type B, etc.)

The index block contains 2 bytes for each data block to be defined, one byte to indicate block type and another to indicate the half-word displacement value of the corresponding data block containing the hardware definition. Each data block must start on a halfword boundary.

Communication scanners 3 and 4 are contained on a symbolic CDS entry because of length restrictions. This entry is not punched unless the third or fourth communication scanners are present. This CDS entry is handled by the OLT loader and is not referred to by the CE when entering the 'DEV/TEST/OPT/' parameters.

Following is the format for machine configuration. Punch cards as indicated using CDS card format as provided. The index identifies the hardware installed and provides a pointer to the data block containing the detailed description. If not applicable, an index entry may be left blank, or punched with zeros, but the assigned card columns must be maintained.

After completing the definition of the last line sets of the last LIB installed on the 3705, insert a '/' in that card column that would normally start the next Scanner definition.

Index - Part 2

Card	CDS Byte	Card Col	Contents(Type-Address)
			Adapter Number/IFT Number - (00 or blank if not installed) CDS Address of Data Block - pointer to adapter description Block type - data block containing adapter description Description
2		1-15	Must be blank
	1E-1F	16-19	11 23 (A) CCU
	20-21	20-23	22 23 (A) Storage BSM 2 (Blank if FET storage)
	22-23	24-27	32 23 (A) Storage BSM 3 (Blank if FET storage)
	24-25	28-31	42 23 (A) Storage BSM 4 (Blank if FET storage)
	26-27	32-35	52 23 (A) Storage BSM 5 (Blank if FET storage)
	28-29	36-39	62 23 (A) Storage BSM 6 (Blank if FET storage)
	2A-2B	40-43	72 23 (A) Storage BSM 7 (Blank if FET storage)
	2C-2D	44-47	82 23 (A) Storage BSM 8 (Blank if FET storage)
	2E-2F	48-51	12 23 (A) Storage BSM 1 or FET storage installed
	30-31	52-55	13 22 (C) TYPE 1 CA IN 1ST POSITION.
	-	-	14 22 (C) If type 2 or type 3 CA in 1st position.
			19 22 (C) If type 4 CA in 1st position.
	32-33	56-59	24 24 (C) If type 2 or type 3 CA in 2nd position.
			29 24 (C) If type 4 CA in 2nd position.
	34-35	60-63	39 25 (C) If type 4 CA in 3rd position.

APPENDIX D MANUAL INTERVENTION ROUTINE INDEX

D.1 IBM 3705 CENTRAL CONTROL UNIT MANUAL INTERVENTION ROUTINES

The following routines are manual intervention routines for the CCU Internal Functional Test. The page numbers referred to are D99-3705E pages.

ROUT.	FUNCTION TESTED	PAGE NO.	COMMENTS
1156	Storage Protect keys	1.16	See Notes on Page 1.30
1190	Customer Usage Meter	1.22	

D.2 IBM 3705 STORAGE IFT MANUAL INTERVENTION ROUTINES

The following routine is an IBM 3705 storage IFT manual intervention routine. The pages referred to are D99-3705E pages.

ROUT.	FUNCTION TESTED	PAGE NO.	COMMENTS
X209	Storage worst case pattern	2.5	See Page 2.3 to use this routine with the Schmoo test.

D.3 IBM 3705 TYPE 1 COMMUNICATION SCANNER MANUAL INTERVENTION ROUTINES

The following routines are type 1 communication scanner manual intervention routines. The pages referred to are D99-3705E pages.

ROUT.	FUNCTION TESTED	PAGE NO.	COMMENTS
15C8	The four basic functions of integrated Auto-Call units and modems.	5.0.101	Tests: Auto dial only, Auto dial disconnect, Auto dial and transmit marks with disconnect. See Page 5.0.157 for a description of the normal stops when running this routine.
15CA	The three basic functions of integrated modems with	5.0.108	Tests: Auto-answer only, Auto-answer

	the Auto-answer feature		and receive with data checking, and Auto-answer without data checking. See Page 5.0.157 for a description of the normal stops for this routine.
15CE	External data wrap	5.0.113	See Page 5.0.157
15D0	Data set ready active	5.0.126	See Page 5.0.157
15D1	Auto-call EIA receivers and drivers	5.0.127	See Page 5.0.157
15D2	Data set ready inactive	5.0.131	See Page 5.0.157
15D4	Carrier detect active	5.0.132	See Page 5.0.157
15D6	Carrier detect inactive	5.0.133	See Page 5.0.157
15D8	Receive data space	5.0.134	See Page 5.0.157
15DA	Receive data mark	5.0.135	See Page 5.0.157
15DC	Ring indicate active	5.0.136	See Page 5.0.157
15DE	Ring indicate inactive	5.0.136	See Page 5.0.157
15E0	Clear to send	5.0.137	See Page 5.0.157
15E4	New Sync active	5.0.139	See Page 5.0.157
15E6	Telegraph echo check	5.0.140	See Page 5.0.157
15E8	Monitor mode 01	5.0.142	See Page 5.0.157
15EA	Interrupt mode 10	5.0.143	See Page 5.0.157
15F0	SDLC link test	5.0.144	See Page 5.0.157

D.4 IBM 3705 TYPE 2 COMMUNICATION SCANNER MANUAL INTERVENTION ROUTINES

The following routines are manual intervention routines for the type 2 communication scanner IFT. The pages referred to are D99-3705E pages except as indicated.

ROUT.	FUNCTION TESTED	PAGE NO.	COMMENTS
X690	SABRE RPQ new sync lead	6.1.90	
X694	PCF state X'F' disable	6.1.90	
X698	Transmit test for PCF state X'B'	6.1.92	
X69C	Modem interface	6.1.94	
X6CE	External Wrap	6.1.95	See Page 6.2.3
X6D0	Plotter Adapter RPQ test	6.1.105	
X6F0	SDLC link test	6.1.106	See Page 6.2.3
X6F2	Wrap Line Set Test	6.1.112	Wraps modems, and line sets
X6F6	MODEM INTERFACE CHECK TEST. SEE PAGES 6.1.117 AND 6.1.118.	REQUIRES RPQ S30254.	
T3705L	Panel line test	5.1	See Chapter 5 in D99-3705D

D.5 IBM 3705 TYPE 3 COMMUNICATION SCANNER MANUAL INTERVENTION ROUTINES

The following routines are manual intervention routines of the type 3 communication scanner IFT. The pages referred to are D99-3705E pages except as indicated.

ROUT.	FUNCTION TESTED	PAGE NO.	COMMENTS
X741	Sets line addresses for testing	7.0.74	Allows changing wrap addresses for scanner wrap tests.
X7A8	WRAP LINE SETS	7.1.212	
X7F0	SDLC link test	7.1.267	
X7F1	ICW Test 1	7.1.265	Requires adjustment of -4 VDC in frame containing scanner being tested.
X7F2	ICW Test 2	7.1.267	See X7F1 comment.
X7F3	ICW Test 3	7.1.269	See X7F1 comment.
X7F4	PDF Data Test	7.1.271	See X7F1 comment.
X7F5	PDF Ping Pong Test 1	7.1.271	See X7F1 comment.
X7F6	PDF Ping Pong Test 2	7.1.272	See X7F1 comment.
T3705L	Panel line test	5.1	See Chapter 5 in D99-3705D.

D.6 IBM 3705 TYPE 4 CHANNEL ADAPTER MANUAL INTERVENTION ROUTINES

The following manual intervention routines for the type 4 channel adapter provide tests to detect and isolate intermittent EBM failures. The pages referred to are D99-3705E pages except as indicated.

ROUT.	FUNCTION TESTED	PAGE NO.	COMMENTS
X958	EBM Interference Test 1	8.1.38	Adjustment of -4 VDC in frame containing adapter under test may be necessary.
X959	EBM Interference Test 2	8.1.39	See X958 comment.

X95A	EBM Interference Test 3	8.1.40	See X958 comment.
X95B	EBM Ping Pong Test 1	8.1.41	See X958 comment.
X95C	EBM Ping Pong Test 2	8.1.42	See X958 comment.

IBM/TECHNICAL NEWSLETTER

DCL-3705D-07
D99-3705D-06

IBM MAINTENENCE DIAGNOSTIC PROGRAM
IBM 3705 COMMUNICATIONS CONTROLLER
DIAGNOSTIC CONTROL MODULE, PANEL LINE
TEST, and INITIAL TEST

This Technical Newsletter provides page updates for the Internal Functional Test, Section 3.0, to include new manual intervention routines for testing HDB modules in the Type 3 Communication Scanners and Type 4 Channel Adapters.

Page updates are provided for Appendix A, Communications Controller Configuration Data Set description, for editorial corrections.

Page updates are provided for Appendix D, Manual Intervention Routine Index, to include the new Type 3 Scanner and Type 4 Channel Adapter HDB module test routines.

Remove Pages	Add Pages
D99-3705D-06	DCL-3705D-07
Cover	Cover
ii - vi	ii - vi
ix - x	ix - x
3.7 - 3.14	3.7 - 3.14
A.1 - A.2	A.1 - A.2
A.9 - A.10	A.9 - A.10
A.17 - A.18	A.17 - A.18
D.3 - D.4	D.3 - D.4

File this cover letter with the manual to provide a record of the change.

IBM Network Products RAS, SCD Laboratory, Dept. G64,
P.O. Box 12295, Research Triangle Park, North Carolina, 27709

DCL-3705D-07
D99-3705D-06

IBM MAINTENANCE DIAGNOSTIC PROGRAM

IBM 3705 COMMUNICATIONS CONTROLLER

INTERNAL FUNCTIONAL TEST LOADER,

DIAGNOSTIC CONTROL MODULE, PANEL LINE TEST, and

INITIAL TEST

DATE: 12/12/80

PREFACE

This manual contains information pertaining to the Internal Functional Test Loader, T3705A, the Diagnostic Control Module (DCM), X3705ACA, the Internal Functional Tests (IFTs), X3705ABA-X3705JBA, and the Initial Test, X3705ADA.

The material in this manual was previously released in D99-3705A which has been replaced by:

IBM Maintenance Diagnostic Program Channel Adapter and Wrap All Lines On-line test, D99-3705C.

IBM Maintenance Diagnostic Program Internal Functional Test Loader, Diagnostic Control Module, Panel Line Test, and Initial Tests, D99-3705D

IBM Maintenance Diagnostic Program Internal Functional Tests Symptom Indexes, D99-3705E.

Chapter 1 contains information about the IFT Loader T3705A. Chapter 2 describes the Diagnostic Control Module X3705ACA and provides operational instructions. Chapter 3 provides information about the Internal Functional Tests describing their use and operation with the DCM. This chapter also explains how to use the Symptom Indexes contained in D99-3705E. Chapter 4 provides a general description of the Initial Tests and instructions for loading and operating the test programs. Also included is a discussion of how to use the Initial Test Symptom Index contained in Appendix C.

Operating instructions and examples of using the panel line test is included in Chapeter 5. The panel line test is a stand-alone version of the NCP-4 line test function.

Appendix A contains the Configuration Data Set (CDS) required by the IFT Loader, DCM, and IFT. Appendix B contains a listing of stops originating from the DCM and includes a discussion of the action required at each stop.

The initial test symptom index has been incorporated into this

manual in Appendix C.

The Manual Routine Indexes previously found at the beginning of the Symptom Indexes with manual intervention routines have been combined and incorporated into Appendix D.

Companion manuals that should be referred to are:

IBM Maintenance Diagnostic Programs IFT Symptom Index, D99-3705E.

IBM 3705 Communications Controller Theory Maintenance Manual, SY27-0107.

Prerequisite manuals that should be referred to are:

DOS OLTEP SRL, GC24-5086.

IBM System/360 Operating System On-Line Test Executive Program, GC28-6650.

OLTSEP Operators Guide, D99-SEPDT.

Guide to Using the IBM 3705 Communications Contoller Control Panel, GA27-3087.

SUMMARY OF AMMENDMENTS FOR D99-3705D-01

Miscellaneous changes were made in several places in the manual. Chapter 5 was changed to add paragraph 5.6 Panel Line Test Error Stops which was left out of the first edition.

Appendix D was changed to include a type 2 communication scanner routine X6F2 which was added to the type 2 communication scanner in Release 9.0.

SUMMARY OF AMMENDMENTS FOR D99-3705D-02

This version of the manual was released via DCL. Changes for this version were made in Appendix A and were indicated by change bars to the left of changed text.

SUMMARY OF AMMENDMENTS FOR D99-3705D-03

Changes are incoporated in the panel line test procedures in Chapter 5.

Appendix A has been changed to reflect Configuration Data Set changes required for several RPQs.

SUMMARY OF AMMENDMENTS FOR D99-3705D-05

This edition incorporates DCL-3705D-04.

The information and error messages issued by the IFT Loader in Chapter 1 have been modified to improve clarity.

Several changes were made to Configuration Data Set description in Appendix A for the new models J,K,L of the 3705 and the addition of several RPQ's.

The Initial Test Symptom Index in Appendix C has been changed to reflect 20 bit data flow.

Appendix E has been added and it contains examples of IFT runs.

SUMMARY OF AMMENDMENTS FOR D99-3705D-06

This edition provides an updated Configuration Data Set Description.

In addition, the page numbers listed in the Manual Intervention Routine Index have been corrected so that they agree with the page numbers in the D99-3705E document.

SUMMARY OF AMMENDMENTS FOR DCL-3705D-07

This DCL updates the Configuration Data Set Description, Appendix A.

In addition, the Manual Intervention Routine Index, Appendix D, has been updated to include new Type 3 Communication Scanner and Type 4 Channel Adapter Manual Intervention Routines.

Section 3 Symptom Index References were updated to include the new Type 4 Channel Adapter Manual Intervention Routines.

This intentionally left blank.

3.2.2.2 DATA SET NAME AND IFT FUNCTION CHART

Data Set Name	CE Request	IFT Function
X3705AAA	-	Type 1 Channel Adapter Load Module
X3705ABA	-	Type 2 Channel Adapter Load Module
X3705ACA	-	DCM
X3705ADA	-	Initial Test, section 1
X3705AEA	-	Initial Test, section 2
X3705BAA	11RR	CCU Section 1
X3705BBA	-	CCU Section 2
X3705BCA	-	CCU Section 3
X3705CAA	P2RR	Storage Section 1
X3705CBA	-	Storage Section 2
X3705DAA	P3RR	Type 1 Channel Adapter, Section 1
X3705EAA	P4RR	Type 2 Channel Adapter, Section 1
X3705EBA	-	Type 2 Channel Adapter, Section 2
X3705FAA	15RR	Type 1 Communication Scanner, Section 1
X3705FBA	-	Type 1 Communication scanner, Section 2
X3705FCA	-	Type 1 Communication Scanner, Section 3
X3705FDA	-	Type 1 Communication Scanner, Section 4
X3705FEA	-	Type 1 Communication Scanner, Section 5
X3705FFA	-	Type 1 Communication Scanner, Section 6
X3705GAA	P6RR	Type 2 Communication Scanner, Section 1
X3705GBA	-	Type 2 Communication Scanner, Section 2
X3705GCA	-	Type 2 Communication Scanner, Section 3
X3705GDA	-	Type 2 Communication Scanner, Section 4
X3705GEA	-	Type 2 Communication Scanner, Section 5
X3705GFA	-	Type 2 Communication Scanner, Section 6
X3705GGA	-	Type 2 Communication Scanner, Section 7
X3705HAA	P7RR	Type 3 Communication Scanner, Section 1
X3705HBA	-	Type 3 Communication Scanner, Section 2
X3705HCA	-	Type 3 Communication Scanner, Section 3
X3705HDA	-	Type 3 Communication Scanner, Section 4
X3705HEA	-	Type 3 Communication Scanner, Section 5
X3705HFA	-	Type 3 Communication Scanner, Section 6
X3705HGA	-	Type 3 Communication Scanner, Section 7
X3705HHA	-	Type 3 Communication Scanner, Section 8
X3705HIA	-	Type 3 Communication Scanner, Section 9
X3705HJA	-	Type 3 Communication Scanner, Section 10
X3705HKA	-	Type 3 Communication Scanner, Section 11
X3705JAA	P9RR	Type 4 Channel Adapter, Section 1
X3705JBA	-	Type 4 Channel Adapter, Section 2
X3705KAA	-	Panel Line Test, Section 1
X3705KBA	-	Panel Line Test, Section 2

IFTs are requested in the format PIRR. P is the number of the adapter to be tested. If P=0, all adapters for the requested IFT will be tested. I is the IFT number, R is the routine number. See Chapter 5 for instructions on loading and running Panel Line Test, X3705KAA and KBA.

IFT modules have several segments depending upon the size of the module. The last character of the data set name changes for each segment of the IFT module. 'A' indicates the first segment; 'B', the second; and so on, for as many segments as necessary for the entire IFT module.

The CCU IFTs turn the CCU CHECK light on and off. Disregard the CCU CHECK light coming on unless a hard stop occurs.

3.3.1 REQUESTING AND TERMINATING IFTS

The DISPLAY/FUNCTION SELECT switch, the STORAGE ADDRESS/REGISTER DATA switches, and the START push button on the control panel of the 3705 are used to enter an IFT request. The IFT request is divided into two parts; part 1 selects the adapter, IFT, and routines, and part 2 selects the CE sense switch options desired. Refer to APPENDIX B for DCM stop codes, description, and required intervention.

Before an IFT request can be made, two conditions must be met:

a. The IFT Loader must be running in the host CPU, and the DCM must be loaded and executing in the 3705.

b. The symptom index description for the current code in display B must indicate that the DCM is ready for part 1 of an IFT request (display A and B contain X'FFFF'). Abort any active request before entering a new request. See "Aborting a Routine or Request".

1. Set the DISPLAY/FUNCTION SELECT switch to FUNCTION 4.

2. IFT request - part 1

   Set the STORAGE ADDRESS/REGISTER DATA switches to select the desired adapter(s), IFT(s), and routine(s). Refer to the data set name and IFT function chart to determine the exact switch settings for a specific request.

	ADDRESS/DATA Switches B C D E
All routines of all IFTs, on all adapters	0 0 0 0
All routines of one IFT (I) on all adapters tested by this IFT	0 I 0 0
All routines of one IFT (I), on one adapter (P)	P I 0 0
One routine (RR) of one IFT (I) on all adapters tested by this IFT	0 I R R
One routine (RR) of one IFT (I), on one adapter (P)	P I R R
To request termination at T3705A (IFT loader) and IFT.	F 0 X X

3. Press the START push button.

4. The PROGRAM and HARD STOP lights must be on. If they are not, see "Determining Why PROGRAM DISPLAY Light Is Not On".

5. The DCM should be ready for part 2 of the request (display A contains X'FFFF' and display B contains X'8002'). If it is not, perform the action necessary to correct the problem indicated in the symptom index. See "Using the Symptom Index for IFTs" in paragraph 3.3.4.

6. IFT request - part 2

   Set the STORAGE ADDRESS/REGISTER DATA switches according to the desired CE sense switch setting. Combine values for the actual switch value or set switches to zeros if no CE sense switches are to be set on. The relationship between CE sense switches and the ADDRESS/DATA switches is shown in the following chart.

CE Sense Switch	ADDRESS/DATA Switches B C D E
Problem Definition Mode	- - - 1
Restart Routine on First Error	- - - 2
Loop on First Error	- - - 4
Bypass Error Stop	- - - 8
Cycle on Request	- - 1 -
Include Manual Intervention Routines	- - 2 -
Repeat Each Routine X Times	- - 4 -
Halt Before Execution	- - 8 -
Bypass New Error Stops	- 1 - -
Wait Before Continuing	8 - - -

7. Press the START push button.

8. The PROGRAM DISPLAY light must be on. If it is not, see "Determining Why the PROGRAM DISPLAY Light Is Not On".

9. See the symptom index in APPENDIX B for a description of the code in display B.

3.3.2 USING THE SYMPTOM INDEX FOR IFTS

Displays A and B display codes are described in the symptom index for the IFTs. The symptom indexes for the IFTs are contained in the IBM Maintenance Diagnostic Program - Symptom Index, D99-3705E manual. A reference is given to the page in the IBM 3705 Communications Controller Theory Maintenance Manual, SY27-0107 describing the failing function for many display codes.

The symptom indexes provide an indication of the suspected failing card. The list of suspected cards is not exhaustive and may not indicate the exact failing part. However, the suspected card has enough effect on the failure to be singled out as suspect. If after replacing the suspected card, the failure presists, scoping signals into and out of the indicated card will probably be helpful in locating the exact cause of the failure.

A useful technique that may be used is to record the card location indicated when an error is detected. Continue the IFT to the next routine (via FUNCTION 6) and record any indicated cards called for errors occuring. After several routines have been tried with error stops, suspect the card with the highest recurrence of indications as

the most probable cause of the error.

The following control panel conditions must exist, for the displays to indicate DCM or IFT errors:

1. The LOAD light must be off. If it is on, see the error displays for the ROS, initial test, or IFT Loader.

2. The TEST light must be on. If it is off, and the LOAD light is on, see item 1. If it is off, and the LOAD light is off, see the error displays for the IFT Loader.

3. The DISPLAY/FUNCTION SELECT switch is set to FUNCTION 4, 5, or 6. If it is not set to FUNCTION 4, 5, or 6, see "Refresh Last DCM Display Code".

4. PROGRAM DISPLAY light must be on. If it is off, see "Determining Why PROGRAM DISPLAY Light Is Not On".

The symptom index display format is:

```
Display A  =  P I R R
Display B  =  T S K K
```

Where each character represents a four bit Hex digit (byte X is not used).

```
P  = Number of adapter being tested
I  = Number of the active IFT
RR = Number of the active routine
T  = Type of display code
S  = Scoping indicator and error counter
KK = Code reference in symptom index
```

Use the following procedure to find a code in the IFT symptom index:

```
Is T equal to 8 (display B first Hex digit)?
No     Yes
|      |
|      See the DCM symptom index (Appendix B) for a description
|      of the display.  Display A indicates which adapter, which
|      IFT, and which routine is active.  Display A equal X'FFFF'
|      indicates the DCM is ready to accept a new request.
|
```

Is T equal to 0 (display B first Hex digit)?

No — Yes

The IFT has detected an error and an error code is displayed. The I field (display A second Hex digit) indicates the IFT Symptom Index to see.

T	I	Symptom Index	Page No
0	1	D99-3705E	1.1
0	2	D99-3705E	2.1
0	3	D99-3705E	3.1
0	4	D99-3705E	4.1
0	5	D99-3705E	5.0.1
0	6	D99-3705E	6.0.1
0	7	D99-3705E	7.0.1
0	9	D99-3705E	8.1

Is T equal to 1 or 2 (display B first Hex digit)?

No — Yes

A pretest error or a error common to the IFT routines has been detected; 1 indicates pretest, 2 indicates common error. The I field (display A second Hex digit) indicates the IFT Symptom Index to see.

T	I	Symptom Index	Page No
1/2	1	D99-3705E	1.17
1/2	2	D99-3705E	2.2
1/2	3	D99-3705E	3.4
1/2	4	D99-3705E	4.19
1/2	5	D99-3705E	5.0.150
1/2	6	D99-3705E	6.2.1
1/2	7	D99-3705E	7.1.275
1/2	9	D99-3705E	8.43

Is T equal to E (display B first Hex digit)?

No — Yes

Information is being displayed. The display indicates either errors or correct operation.

T	I	Symptom Index	Page No
E	1	D99-3705E	1.23
E	5	D99-3705E	5.0.155
E	6	D99-3705E	6.2.2
E	7	D99-3705E	7.1.276

Is T equal to F (display B first Hex digit)?

No — Yes

A manual intervention stop code is being displayed.

T	I	Symptom Index	Page No
F	1	D99-3705E	1.23
F	5	D99-3705E	5.1.1
F	6	D99-3705E	6.2.3
F	7	D99-3705E	7.1.277
F	8	D99-3705E	8.39

Is T equal 6 or 7 (display B first Hex digit)?

No — Yes

See paragraph 2.2.1.6 "Set or Display Repeat Count". This display is from that DCM panel utility.

```
|
Is T equal to 9 or A (display B first Hex digit)?
No    Yes
|     |
|     See paragraph 2.2.1.6 "Set, Reset, Display CE Sense
|     Switches.  This display is from that DCM panel utility.
|
|
Is T equal to B or D (display B first Hex digit)?
No    Yes
|     |
|     See paragraph 2.2.1.9 "Dynamic Communication To
|     Routines.  This display is from that DCM panel utility.
|
|
Ensure that the DCM and IFT loaded properly and that the
required conditions described prior to this procedure were met.
```

3.3.2.1 MANUAL INTERVENTION ROUTINE INDEX

An index of manual intervention routines is located in Appendix D. This index is a reference to D99-3705E Symptom Indexes as an aid in locating manual intervention routines. No running or setting up instructions are provided in this Appendix.

3.3.2.2 SYMPTOM INDEX MASK FIELD AND REGISTER USAGE

The "mask" field specifies the bits being tested. A "0" indicates that bit position is not checked. If the symptom index lists a "mask" field for X'14, X'15', and X'16', the following contents are standard for the registers:

Register X'14' Contains the bits being tested.
Register X'15' Contains the bits in register X'14' in error.
Register X'16' Contains the bit pattern expected in register X'14'.

3.3.2.3 TYPE 3 COMMUNICATION SCANNER IFT SYNC POINT AID

Each time the type 3 communication scanner IFT branches to the subroutine to check the PCF/EPCF state, register X'18' is loaded with the address of the number of character times the subroutine waits for the expected PCF/EPCF state. This address can be used with the address sync capability to provide oscilliscope synchronization points at various addresses in the routine.

APPENDIX A. CONFIGURATION DATA SET (CDS) DESCRIPTION

The Channel Adapter On-Line Test (OLT) and the Internal Functional Tests (IFT), for the 3705 require 3705 hardware definition. The definition is provided in the OLT configuration data set (CDS) for the 3705.

The IFT's for the 3705 are loaded into the 3705 by a host CPU program called the IFT Loader. The IFT loader is an OLT executed under an On-Line Test Executive (OS/TCAM/TOTE, OS/OLTEP,DOS/OLTEP, or OLTSEP). The IFT Loader appends the CDS to the Diagnostic Control Module (DCM) when the DCM is loaded into the 3705. The DCM refers to the CDS as required by the requested IFT.

The storage location of CDS information in the 3705 can be determined by adding the CDS byte location (from CDS Byte Column) to X'F00'.

The 3705 CDS is composed of the following sections:

Channel Data	Data Block Index	Data Blocks
Part 1 Fixed Format	Part 2 Variable Format	

A.1 CONFIGURATION DATA SET PART 1

Part 1 format is fixed and is 28 bytes (X'1B') in length and is defined and punched in Columns 1-67 of Card #1 as follows:

Card	CDS Byte (Hex)	Card Col.	Contents/Description
1		1	Must be blank
		2-4	CDS
		5-9	Blank

	0-3	10-17	Native subchannel unit address in hex (right justified) (example 0000010A) The IFTs load across this channel addr.
	4	18	= 4 If model E,F,G or H with RPQ 8Q0058 installed. (cycle utilization counter) = C If model J, K, or L.
		19	Blank

Card	CDS Byte (Hex)	Card Col.	Contents/Description
1	5	20-21	Feature code - (CS-Comm. Scanner; CA-Channel Adapter) Enter only the channel adapter defined in card col 10-17.
		20	HEX 8 1=Storage size greater than 64K bytes. 0=Storage size 64K or less. 4 1=NCP used. 0=NCP not used. 2 1=type 4 CA installed. 0=type 4 CA not installed. 1 1=Type 1 CS installed. 0=Type 1 CS not installed.
		21	8 1=Type 2 CS installed. 0=Type 2 CS not installed. 4 1=Type 3 or Type 3 Hi Speed CS installed. 0=type 3 or Type 3 Hi Speed CS not installed. 2 1=Type 1 CA installed. 0=Type 1 CA not installed. 1 1=Type 2 or 3 CA installed. 0=Type 2 or 3 CA not installed.
	6	22-23	= 40 Class Code (terminal control unit)
	7	24-25	= 06 Unit or Type Code(3705)

A.2.0 CHANNEL ADAPTER BLOCKS

A.2.1.0 FIRST CHANNEL ADAPTER DEFINITION - BLOCK C -

This CDS block defines the channel adapter in the first machine
This may be a type 1, 2, 3, or 4 channel adapter.

Card	Block Addr	CDS Byte	Card Col	Contents
3	C00	44	36-37	NSC unit address - interface A
	C01	45	38	Governor speed for cycle steal (normally jumpered for 277K bytes for type 2 or 3 CA) = 0 if type 1 or type 4 channel adapter The following is for type 2 or 3 channel adapter when EC 318882 is not installed. = 1 if 49K bytes = 2 if 92K bytes = 3 if 188K bytes = 4 if 277K bytes The following is for type 2 or 3 channel adapter when EC 318882 is installed. = 9 if 49K bytes = A if 92K bytes = B if 188K bytes = C if 277K bytes
			39	= 1 This data block is for 1st machine frame channel adapter.

A.2.1.1 CCU DEFINITION - BLOCK A -

This CDS block defines the central control unit.

Card	Block Addr	CDS Byte	Card Col	Contents
3		*** CCU - BLOCK ***		
	A00	46	40-41	Define storage type and size
				The following is for Bridge storage:
				= 01 if 16K = 02 if 48K = 03 if 80K = 04 if 112K = 05 if 144K = 06 if 176K = 07 if 208K = 08 if 240K
				The following is for FET storage:
				= 81 if 32K = 82 if 64K = 83 if 96K = 84 if 128K = 85 if 160K = 86 if 192K = 87 if 224K = 88 if 256K = 8A if 320K = 8C if 384K = 8E if 448K = 90 if 512K
		47	42-43	Defines RPQ Features.

07	G or GA	
08	H	
0A	J	
0B	K	
0D	S	
0E0E	T or TA	(must define 2 partitions for each line set)
0F0F	U	(must define 2 partitions for each line set)
10	W	
1313	Z	(must define 2 partitions for each line set)
30	ALC RPQ (858657) type 2 scanner only	
34	Reverse Chan RPQ (858664) type 2 scanner only	
38	X-Y Plotter RPQ (858663) type 2 scanner only	
39	N/R jumpered for medium speed operation (9600 bits per second or less)	
3A3A	N/R jumpered for high speed operation (greater than 9600 bits per second, must define 2 partitions)	

D12	62-69	40-55	Line set type codes installed in LIB position 2 lines 0-F (refer to LIB 1)
D13	6A-71	56-71	Line set type codes installed in LIB position 3 lines 0-F (refer to LIB 1)
		72	Continuation character (any character except /)
		73-80	Any desired data (Ref card 1)

Card	Block Addr	CDS Byte	Card Col	Contents
5			1-15	Must be blank
		72-79	16-31	Code for line set types installed in LIB position 4 lines 0-F (refer to LIB 1) Not valid for type 3 scanner.

A.2.2 TYPE 2 OR 3 COMMUNICATION SCANNER - SECOND SCANNER BLOCK E

The type 2 or type 3 scanner defined by block type E is identical to block type D except for the installed position and number of LIBs available. Refer to block D for the format. If no scanner is installed in this position and no further data blocks are required, punch a slash (/) in the 1st column of this block and omit the continuation character for this card to end the CDS (no further punching is required).

Card	Addr	Byte	Col	Contents
5	E00	7A	32-33	CS defined by this block
			32	= 4 If type 2 communication scanner 3 If type 3 Hi-Speed Communication Scanner 2 If type 3 communication scanner
			33	= 1 CS address bits for 2nd Scanner.
	E01	7B-7C	34-37	Blank
		7D	38-39	RPQ Definition Byte (Refer to CS1)
	E02	7E-81	40-47	Oscillator speed codes
	E06	82-87	48-59	LIB type codes
	E0C	88-8D	60-71	LIB position 1 line set types lines 0-B
			72	Continuation character (any character except /)
			73-80	Any Desired Data (Ref card 1)

Card	Block Addr	CDS Byte	Card Col	Contents
6			1-15	Must be blank
		8E-8F	16-19	LIB position 1 line set types lines C-F

X690	SABRE RPQ new sync lead	6.1.90	
X694	PCF state X'F' disable	6.1.90	
X698	Transmit test for PCF state X'B'	6.1.92	
X69C	Modem interface	6.1.94	
X6CE	External Wrap	6.1.95	See Page 6.2.3
X6D0	Plotter Adapter RPQ test	6.1.105	
X6F0	SDLC link test	6.1.106	See Page 6.2.3
X6F2	Wrap Line Set Test	6.1.112	Wraps modems, and line sets
T3705L	Panel line test	5.1	See Chapter 5 in D99-3705D

D.5 IBM 3705 TYPE 3 COMMUNICATION SCANNER MANUAL INTERVENTION ROUTINES

The following routines are manual intervention routines of the type 3 communication scanner IFT. The pages referred to are D99-3705E pages except as indicated.

ROUT.	FUNCTION TESTED	PAGE NO.	COMMENTS
X741	Sets line addresses for testing	7.0.74	Allows changing wrap addresses for scanner wrap tests.
X7A8	Wrap Line sets	7.1.221	
X7F0	SDLC link test	7.1.267	
X7F1	ICW Test 1	7.1.265	Requires adjustment of -4 VDC in frame containing scanner being tested.
X7F2	ICW Test 2	7.1.267	See X7F1 comment.
X7F3	ICW Test 3	7.1.269	See X7F1 comment.
X7F4	PDF Data Test	7.1.271	See X7F1 comment.
X7F5	PDF Ping Pong Test 1	7.1.271	See X7F1 comment.

X7F6	PDF Ping Pong Test 2	7.1.272	See X7F1 comment.
T3705L	Panel line test	5.1	See Chapter 5 in D99-3705D.

D.6 IBM 3705 TYPE 4 CHANNEL ADAPTER MANUAL INTERVENTION ROUTINES

The following manual intervention routines for the type 4 channel adapter provide tests to detect and isolate intermittent EBM failures. The pages referred to are D99-3705E pages except as indicated.

ROUT.	FUNCTION TESTED	PAGE NO.	COMMENTS
X958	EBM Interference Test 1	8.1.38	Adjustment of -4 VDC in frame containing adapter under test may be necessary.
X959	EBM Interference Test 2	8.1.39	See X958 comment.
X95A	EBM Interference Test 3	8.1.40	See X958 comment.
X95B	EBM Ping Pong Test 1	8.1.41	See X958 comment.
X95C	EBM Ping Pong Test 2	8.1.42	See X958 comment.