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Communications Interface Driver (CID) System User's Manual

Tom Bratton
Charles Dudas
Mark Schoenthal
Jim Davis
Andrew Leone
Jeffrey Livings

June 1989

DOT/FAA/CT-TN89/36

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16. Abstract

This user's manual for the Communications Interface Driver (CID) systems will be used to describe the operating procedures of the CID.

The CID system is a test tool intended to supply or receive a capacity level of communications messages to and from the air traffic control (ATC) and non-ATC ports of the Mode Select (Mode S) sensor.

The primary intent of the CID user's manual is to guide the user through the operating procedures of the X.25 communications diagnostic (COMMDIAG) and Time-of-Year (TOY) diagnostic programs, the scenario generator and CID initialization (CIDINIT) data base off-line support programs, the CID real-time program and the scenario list (SCLIST) and extraction list (EXLIST) data analysis programs. The manual also includes the procedures to boot the CID system and to handle the required cabling and baud rate switch setup.

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EXECUTIVE SUMMARY

This document describes the operating procedures of the Communications Interface Driver (CID) System.

The operation of the CID is divided into four sections.

The first section covers diagnostics. The two diagnostic programs provided are used to ensure the correct operation of the CID specialized hardware. The programs are the communications diagnostic (COMMDIAG) program and the Time-of-Year (TOY) diagnostic program. These programs provide functions that verify operation from the system level to the individual component level. The diagnostic programs are menu driven. They are intended to be used both on a periodic basis (to ensure correct operation) and in support of hardware fault diagnosis.

The second section describes the off-line support programs. These programs consist of the CID scenario generator and the CID initialization (CIDINIT) data base program.

The third section includes procedures for the CID real-time code execution. The CID uses input files created by off-line support programs to simulate the transfer of messages to and from the air traffic control (ATC) and non-ATC ports of the Mode Select (Mode S) sensor. The CID real-time code uses a data extraction routine to collect information about the transfer of this information.

The final section of the CID contains the data analysis programs. The two data analysis programs (the Scenario List and the Extraction List programs) enable a user to analyze the performance of the CID.

This manual guides the user through the four sections of the CID. It is written for a user with knowledge of the functions of the CID and an understanding of the Concurrent 3230XP host processor.

1. OBJECTIVE.

This manual is written to provide a user, knowledgeable in the intended function of the Communications Interface Driver (CID) System, with the ability to utilize the full functionality of this system. This manual allows the CID user to utilize the described CID support programs to run diagnostics, generate scenarios and initialization files, operate the CID real-time program, and execute the developed off-line data analysis programs.

2. BACKGROUND.

The Federal Aviation Administration (FAA) is procuring the Mode Select (Mode S) Beacon System to replace secondary surveillance radar systems presently in the field. The Mode S System will not only provide secondary radar surveillance but also provide a bidirectional data linking function with the aircraft. The Mode S Sensor is required to transact communication functions between itself and external users. The users consist of air traffic control (ATC) and non-ATC facilities, and aircraft within a sensor's coverage area. The sensor may be the source of communication messages, the destination for communication messages, or (in most cases) an intermediate station for messages being transacted between external users and aircraft. In order to certify the sensor's performance of the communication functions, some type of communication test equipment capable of providing realistic communication loading of the Mode S sensor as defined by FAA-E-2716, "Specification for a Mode Select Beacon System (Mode S) Sensor" is required. The need for this test equipment is satisfied by the CID.

The CID is test equipment provided by the FAA. It is designed to test the Mode S Beacon System ATC and non-ATC communication functions under capacity conditions. The CID consists of hardware and software elements which perform the generation, simulation, and analysis of the ATC and non-ATC messages and protocols.

3. RELATED DOCUMENTS.

DOT/FAA/CT-TN87-41, Functional Requirements of the Communications Interface Driver (CID).

DOT/FAA/CT-TN87-46, Communications Interface Driver (CID) Test Plan.

To be written, ARIES/CID Scenario Generator Description.

FAA-E-2716, Specification for a Mode Select Beacon System (Mode S) Sensor.

FAA-RD-80-14A, The Mode Select (Mode S) Surveillance and Communications, ATC and Non-ATC Link Protocols, and Message Formats.

TM-PA-0018/069/02, Mode S to ATC Communications Link Interface Control Document for the Mode S Beacon System Sensor.

TM-PA-0018/070/02, Mode S to Non-ATC Communications Link Interface Control Document for the Mode S Beacon System Sensor.

4. CID HARDWARE CONFIGURATION REQUIREMENTS.

The CID is a combined software and hardware device which uses a Concurrent 3230XP computer as host. The Concurrent 3230XP has been used to develop, store, test, and execute the CID real-time program and included support programs and files. It is necessary for a user of the CID to understand the Concurrent 3230XP bootup and termination procedures.

It is also required that a user of the CID understand the cabling and baud rate configuration procedures in order to run the diagnostic programs and operate the CID real-time program.

4.1 CONCURRENT 3230XP SYSTEM BOOTUP.

The following procedure is used to boot the Concurrent 3230XP computer:

a. Ensure that there is power to the system:

1. The 'READY' light on the disk drive unit should be lit (the circuit breaker is on the back of the unit).

2. Ensure that the 3230XP computer has access to the disk drive (the 'READ' light on the disk drive unit should not be lit).

3. The 'CPU POWER READY' light on the system switch panel, located on the top of the middle cabinet, should be lit (the key switch needs to be in the 'ON' or 'LOCKED' position). The system switch panel is shown in figure 4-1.

4. Make sure the switch on the console terminal switchbox is in the 'CONSOLE' position.

b. To put the 3230XP processor in the boot mode:

1. Put the key switch in the 'ON' position.
2. Put the 'ENABLE/DISABLE' switch in the 'ENABLE' position.
3. Press the 'INIT' switch.

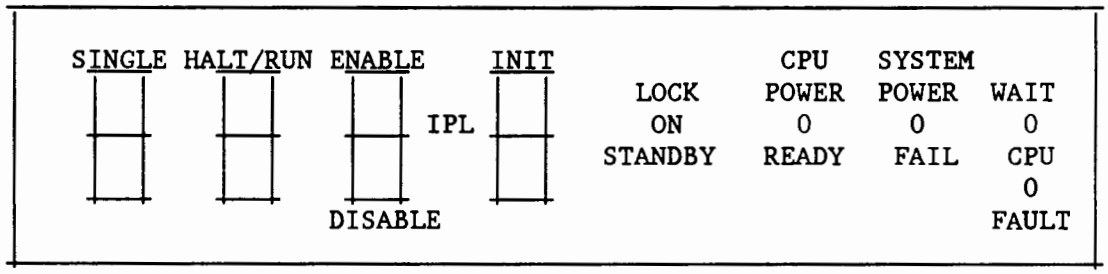

FIGURE 4-1. SYSTEM SWITCH PANEL

c. The 3230XP system console should now have the boot screen displayed as shown below. When the boot screen is not present, repeat step 3.

```
CONCURRENT COMPUTER CORPORATION                IPL 06-298F02R05
      All Rights Reserved                       Copyright 1986

Basic Confidence Test Complete

            Load Menu
              Code        Addresses          Description

         1    2A (42)     0FC 0FB  0F0       19.8MB REMOVABLE
         2    2B (43)     0FC 0FB  0F0       19.8MB FIXED
         3    2C (44)     0FC 0FB  0F0       300MB WINCHESTER
                                   .
                                   .
                                   .
        14    41 (65)     0C5                1600BPI MAG TAPE

Enter 0 for interactive session or ? for HELP.
Entry -
```

The response to 'Entry - ' is '3'.

d. At this point, the system returns with:

```
VOLUME - MT7A
FILENAME -
```

The response to 'FILENAME -' is 'COMM81.OS'

e. The system now does a memory check.

The expected result is:

```
TESTING MEMORY
STARTING LOAD
LOAD COMPLETE

OS32MT08-01.COMM81   LICENSES F-0073
MEMORY TEST IN PROGRESS
END OF MEMORY TEST
UNAVAILABLE MEMORY BLOCKS - 0
```

f. Next the date and time need to be set, use the format below:

```
SET TIME mm/dd/yy,hh:mm:ss <cr>
$CONTINUE <cr>
```

g. The system now attempts to mark the disk drive on-line. When the system encounters an error while attempting to do this, it automatically loads and start the 'FASTCHEK' program. FASTCHEK is a system diagnostic that checks the disk for errors. This diagnostic takes a few minutes to run. Be sure to stay alert and read any messages displayed on the system console. When FASTCHEK is complete, the message "DISC POSSIBLY DAMAGED GET HELP FAST!!" or "COMMUNICATIONS DRIVER SYSTEM IS UP!!" appears on the screen.

h. The system is not booted correctly until the message "COMMUNICATIONS DRIVER SYSTEM IS UP!!" is displayed. When no message or any other message is received, get help since there is a problem.

Once the system is booted, it is considered to be in OS/32 mode. This means that the system accepts OS/32 (the Concurrent 3230XP operating system) commands.

4.1.1 Signing on to the Multi-Terminal Monitor.

To run the off-line support and data analysis programs described in the latter sections, the system must have the multi-terminal monitor program (MTM) loaded and running. This program allows the use of the user terminals connected to the system. MTM is loaded by typing MTMSPL81 onto the system console. In order to use the CID support programs, a user must be 'logged on' to MTM. To run the scenario generator and the CID initialization (CIDINIT) off-line support programs described in section 6, enter (at a MTM terminal only):

```
SIGNON  username,2,<esc>SCEN<esc>
```

To run the off-line data analysis programs described in section 8, enter (at an MTM terminal only):

```
SIGNON  username,158,<esc>DATA<esc>
```

In either case, when the off-line programs are completed, the command 'BYE' should be entered to log off of MTM.

4.2 CID CABLING REQUIREMENTS.

The CID requires that a direct connection is made to the Mode S junction box. The cabling is designed according to the link specification in the TM-PA-0018/069/02, "Mode S to ATC Communications Link Interface Control Document for the Mode S Beacon System Sensor" document. The cabling also conforms to the EIA RS-449 and RS-560 standards. The CID requires two separate sets of null modem cables. One set is a back-to-back cable to self test the transmission and reception of X.25 communication device messages, and the other set is used to interface with Mode S. It is required that all of the X.25 devices be terminated during operation. This is accomplished with either null modem cables or loopback terminators. This allows the CID support programs to operate and process its interrupts normally.

The CID patch panel as shown in figure 4-2, consist of twelve X.25 device connections and three Time-of-Year Receiver (TOY) connections, all of which contain RS-449, 37D-pin male connectors with latching block attachments. The patch panel has the flexibility to connect a direct line to the Mode S system, loop an X.25 device to itself, and connect any two X.25 devices together.

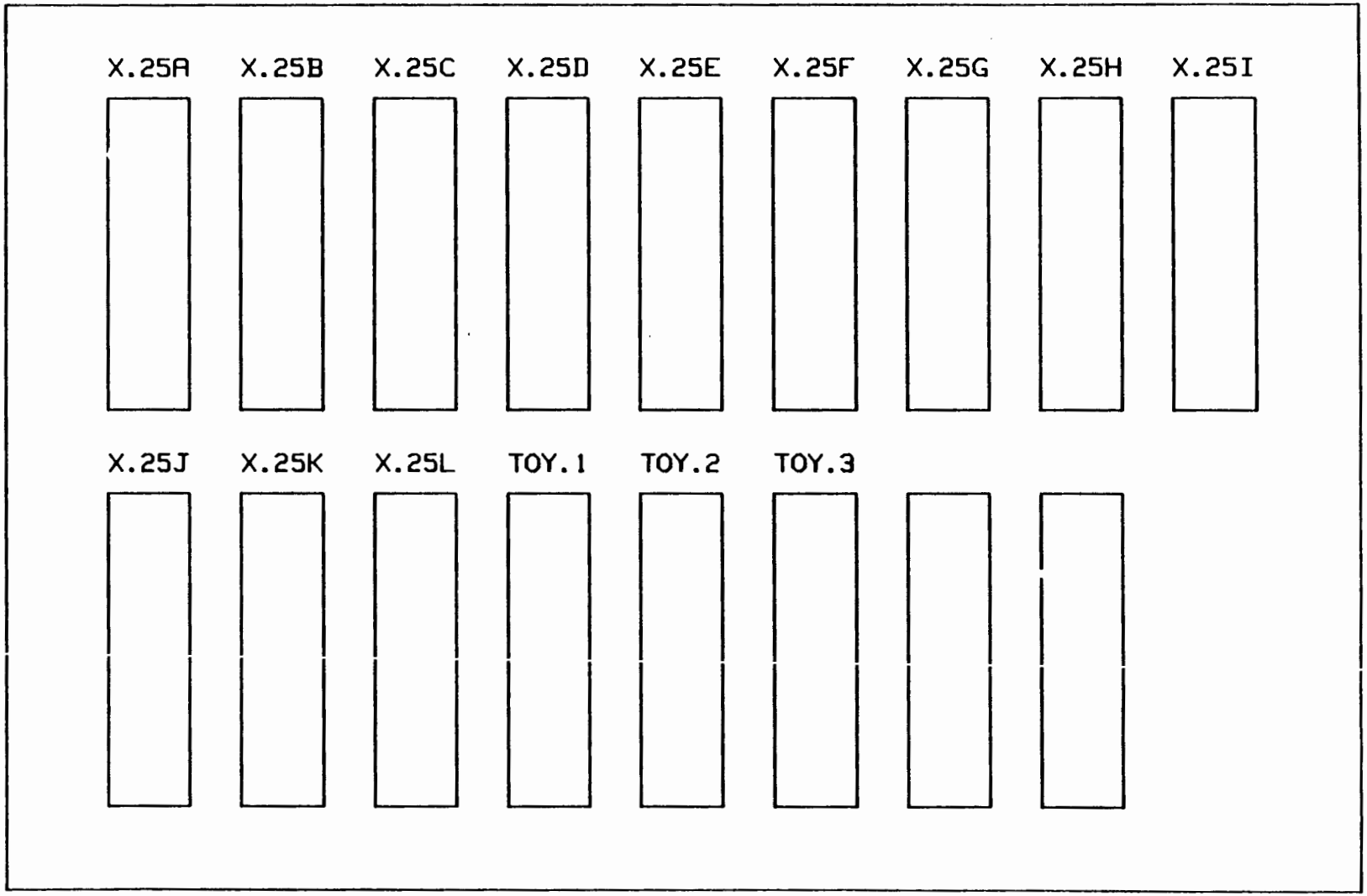

FIGURE 4-2. CID PATCH PANEL CONFIGURATION

The distribution cable from the CID system to the Mode S junction box has a total length of 70 feet. This is well within the drive capability of 200 feet. It is a twisted-pair cable with the appropriate twisted-pair wires joined to the connector. The connector on the CID end of the cable consists of a RS-449, 37D-pin, female connector with a latching shell. The connector on the Mode S end of the cable has a 37D-pin, male connector with a latching-block shell. These 70-foot cables are used for both the X.25 and the TOY devices.

The CID diagnostic's two board communications tests allows the message transfer from one X.25 device to another. This requires the use of an RS-449, null modem, back-to-back cable. The back-to-back cable consist of a 37D-pin, female connector to a 37D-pin, female connector with latching shells at both ends. The null modem cables are normally attached from an even-numbered to an odd-numbered X.25 device connector. A description of the pin and signal configuration is shown in figure 4-3.

```
     4 (SDa)      to      6 (RDa)
     6 (RDa)      to      4 (SDa)
     8 (RTa)      to     17 (TTa)
    17 (TTa)      to      8 (RTa)
    22 (SDb)      to     24 (RDb)
    24 (RDb)      to     22 (SDb)
    26 (RTb)      to     35 (TTb)
    35 (TTb)      to     26 (RTb)
___7 (RTSa)        |     7 (RTSa) ___
/___9 (CTSa)       |     9 (CTSa) ___\
\___13 (RRa)       |     13 (RRa) ___/
 ___15 (IC)        |     15 (IC)  ___
|___19 (SG)        |     19 (SG)  ___|
 ___25 (RTSb)      |     25 (RTSb)___
/___27 (CTSb)      |     27 (CTSb)___\
\___31 (RRb)       |     31 (RRb) ___/
```

FIGURE 4-3. RS-449 NULL MODEM CABLE - PIN CONFIGURATION

The CID diagnostic's loop back communication tests allows for the transmitted data to be looped externally to the X.25 device and back to itself. This is accomplished with the use of an RS-449, external, loopback connector. This terminator is attached to the patch panel or at the end of the distribution cable. The loopback terminators consist of a 37D-pin, female connector with a latching shell. A description of the pin and signal configuration is shown in figure 4-4.

```
 ____4 (SDa)
|____6 (RDa)
 ____8 (RTa)
|____17 (TTa)
 ____22 (SDb)
|____24 (RDb)
 ____26 (RTb)
|____35 (TTb)
 ____7 (RTSa)
/____9 (CTSa)
\____13 (RRa)
 ____15 (IC)
|____19 (SG)
 ____25 (RTSb)
/____27 (CTSb)
\____31 (RRb)
```

FIGURE 4-4. RS-449 EXTERNAL LOOP BACK CONNECTOR - PIN CONFIGURATION

The RS-560 to RS-449, null modem cable is tied from the distribution cable to the Mode S junction box. This cable is used during the normal CID to Mode S operation. One end consists of a 37D-pin, female connector with a latching shell, and the other end has a 25D-pin, female connector with a male-type shell. A description of the pin and signal configuration is shown in figure 4-5.

```
SD(2,14)_________________________RD(6,24)
RD(3,16)_________________________SD(4,22)
RS(4,19)___                      ___RS(7,25)
CS(5,13)___|                     |___CS(9,27)
RR(8,10)___|                     |___RR(13,31)
DM(6,22)___|
                                 ___IC(15)
                                 |___SG(19)
TT(24,11)________________________RT(8,26)
RT(17,9)_________________________TT(17,35)
ST(15,12)___|
LL(18)______n.c.
TM(25)______n.c.
RL(21)______n.c.
SG(7)____________________________SG(19)
Shield(1)________________________Shield(1)
```

FIGURE 4-5. RS-560 TO RS-449 NULL MODEM CABLE - PIN CONFIGURATION

The CID system has a total of 16 70-foot distribution cables, 6 back-to-back null modem cables, 13 RS-560 to RS-449 null modem cables, and 13 loop back terminators. The spare cable parts are included in the total count. The cable configuration for the CID is shown in figure 4-6.

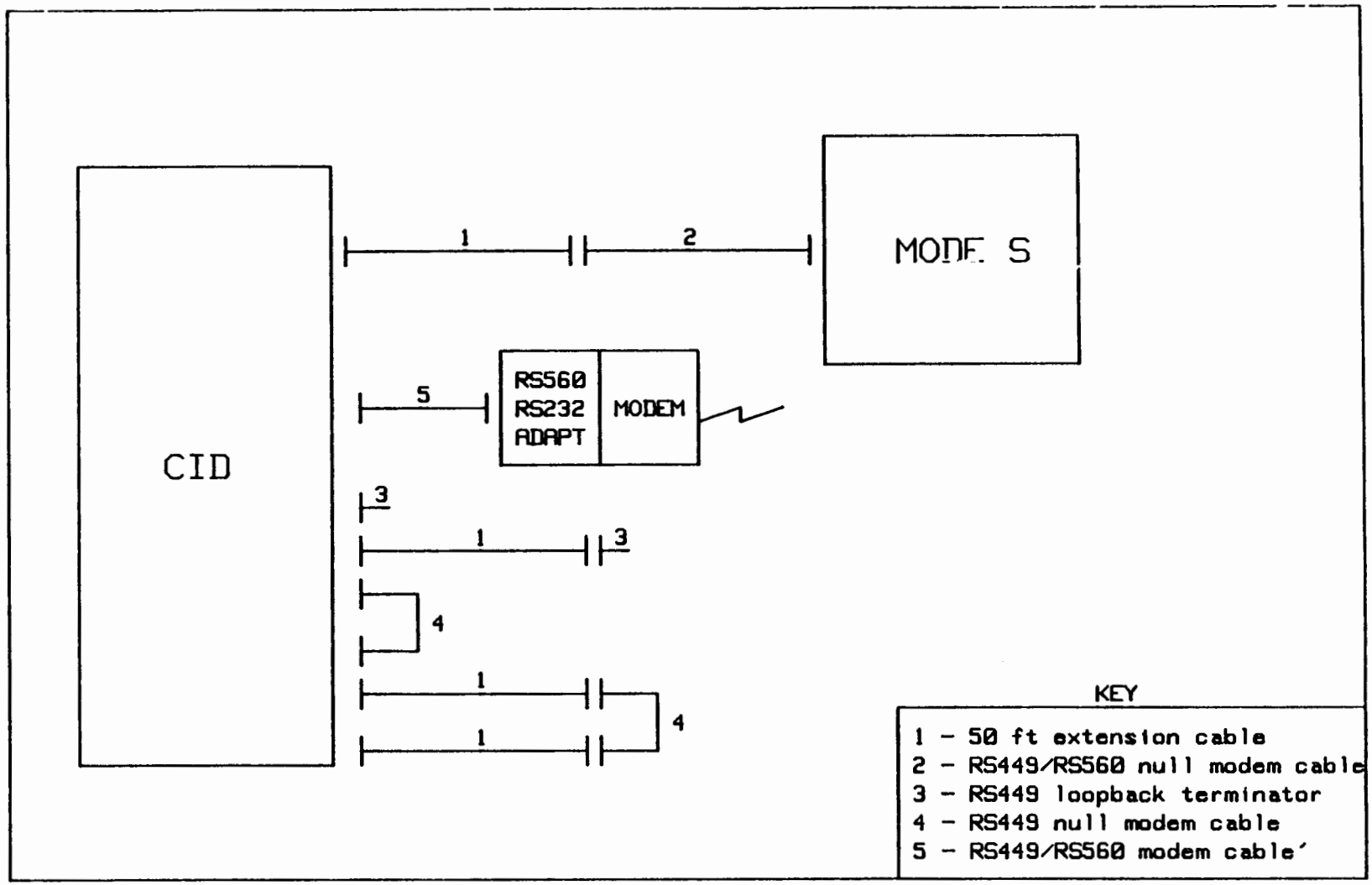

FIGURE 4-6. CID CABLE CONFIGURATION

The CID may be cabled to a Mode S sensor using 9600 baud modems similar to the Penril Alliance V.32. The cable depicted in figure 4-7 defines the RS-449 to RS-560 interconnection cable to be utilized. An active RS-530 to RS-232 adapter, Telebyte model 62-8, must be used. This adapter attached directly to the RS-232 connector on the modem.

```
RD (6,24)_____________________________RD (3,16)
SD (4,22)_____________________________TD (2,14)
RT (8,26)_____________________________RT (17,9)
TT (17,35)____________________________TT (24,11)
RS (7,25)__
CS (9,27)__|
RR (13,31)_|
SG (19_______________________________SG (7)
Shield (1)____________________________Shield (1)
IC (15)____
SG (19)____|
```

FIGURE 4-7. RS-449 TO RS-560 MODEM CABLE PIN CONFIGURATION

4.3 BAUD RATE SETUP.

The CID system contains twelve X.25 communication devices which require that the baud rates are set properly. The Mode S system has six communication ports available to be connected to the CID system. One of the Mode S ports may use one X.25 device at 56 kilobaud (kb) or six X.25 devices at 9600 baud. There may also be a combination of X.25 devices at 9600 or 56-kb rates. The CID device baud rate may be selected by switching the selector switch SW1 at the front of the X.25 board. The switch is labeled from hex '0' to 'F.' The 9600 baud is set up by setting the switch to '5,' and the 56 kb is set up by setting the switch to '8.' The complete settings for the baud rate selector switch are shown in section 5.1.1.17. The link timing measurement (function 20) in the CID diagnostic program can verify at which baud rate the X.25 devices are operating. Upon verifying the baud rate of the devices, the devices will be ready for operation.

4.4 CONCURRENT 3230XP SYSTEM TERMINATION.

Terminating or "killing" the system should be performed any time the system is to be unused for a length of time. With the system in the OS/32 mode (section 4.1), the following commands are needed to "kill" the system:

a. Ensure that all users are logged off the system by typing 'D U', which is a command to display the users currently logged on to the system. Then, and only then, terminate any tasks that are running by typing 'KILL' on the system console.

b. When no tasks are left in system memory (typing 'D M' displays a list of the memory map), type 'MA DSCA:,OFF'. Type 'D D' to confirm the status of the disk drive. At this point, the disk is not accessible to the operating system.

c. Place the 'READ ONLY' switch on the front panel of the disk drive unit in the 'read only' position (the light should be on).

d. Turn off all peripherals (including terminals, tape drives, and printers).

e. Place the system in standby mode by accessing the system control panel referred to in figure 1. On this panel:

1. Place the 'ENABLE/DISABLE' switch in the enable mode.
2. Turn the key switch to the standby position.

or, to save time in re-booting,

1. With the 'ENABLE/DISABLE' switch in the disabled mode, turn the key switch to the standby mode. This allows the next user to:

(a) Turn the 'READ ONLY' switch to the off position (the light should be off).

(b) Turn the key switch to the on position.

(c) Enter 'GO' in response to the message, "POWER FAILURE, RESET PERIPHERALS AND ENTER 'GO,'" which appears on the system console.

5. DIAGNOSTICS PROGRAMS.

To ensure the integrity of the CID specialized hardware, two stand alone diagnostic programs have been developed. The CID X.25 communications diagnostic program (COMMDIAG) is designed to test the twelve X.25 boards installed in the Concurrent 3230XP I/O expansion cabinet and the associated RS449 cables. The TOY diagnostic program is designed to test the TOY receiver hardware. Both of these diagnostic programs are run under OS/32 from the system console.

5.1 CID X.25 COMMDIAG PROGRAM.

The X.25 devices contained within the CID may be tested through the use of the COMMDIAG program. Execution of this program is initiated on the system console by typing 'COMMDIAG'. This program provides a method of completely testing the X.25 devices either individually or as an entire system. The program is menu driven, offering the flexibility for the user to invoke either a complete system test or the individual board or function test.

5.1.1 COMMDIAG Functions.

Individual test functions may be executed through the use of the test components that constitute the complete test product. The menu contains 17 functions. Each of these functions is described in the following paragraphs.

5.1.1.1 Function Zero - List Menu.

The list menu function simply provides the user with a menu that describes the various functions of the COMMDIAG program. This function is executed after the initialization of the COMMDIAG software and may be executed anytime the user wishes to view the menu by typing a zero when a function request is made. The menu is depicted in figure 5-1.

```
 0 -  LIST MENU
 1 -  AUTOMATIC TEST (ALL BOARDS)
 2 -  AUTOMATIC TEST (SINGLE BOARD)
 3 -
 4 -  TWO BOARD COMMUNICATION TEST
 5 -
 6 -
 7 -  LOOP BACK COMMUNICATION TEST
 8 -  D.M.A. DIAGNOSTIC TEST
 9 -  WD-2511 RAM REGISTER TEST
10 -
11 -  RESET HARDWARE
12 -  INITIALIZE HARDWARE AND CONNECT LINK
13 -  DISCONNECT LINK
14 -  LOOK AT WD-2511 REGISTERS
15 -  MODIFY WD-2511 REGISTER
16 -  DISPLAY DEVICE AND LINK STATUS
17 -  RECEIVE MESSAGES
18 -  TRANSMIT MESSAGES
19 -  LOOK AT WD-2511 BUFFERS
20 -  LINK TIMING MEASUREMENT
99 -  TERMINATE DIAGNOSTIC
```

FIGURE 5-1. COMMDIAG FUNCTION MENU

5.1.1.2 Function One - Automatic X.25 System Test.

Function one tests all twelve X.25 boards. These tests consist of a WD-2511 register test, a direct memory access (DMA) interface test, and an X.25 communication test. Each of these tests may be executed individually in functions seven, eight, and nine. These functions are described in later paragraphs of this report. This test does not simply represent the sequential operation of the other system tests. The communication tests are performed simultaneously on all 12 boards. This function may be executed with the X.25 devices operating with baud rates between 4.8 kb and 72 kb. The X.25 devices need not all be operating at the same baud rates as long as they are within the aforementioned baud rate limitations. Normally, function one provides a complete system check of all the communication devices.

The execution of function one requires each device to perform X.25 communication functions. These functions are executed with the transmitter connected to the receiver on each device. This may be accomplished by either an internal connection or an external connection. A query is made of the operator as to whether the external loop back connectors are installed. The response to this question determines the loop back connect mode for operation. The internal connect mode allows a quick check of the system without removing cables to install the loop back connectors. The external loop back mode allows the complete checking of the system from X.25 devices through the RS-449 cables. The loop back connectors may be installed either at the CID interface panel or at the Mode S interface box.

This function is used for the periodic system checks to insure the CID is operational. The execution time for this function is less than 1 minute. The output from function one provides an indication to the number of working X.25 boards and identified the failures. The individual test functions presents a more in-depth analysis into the nature of any prob[illegible] A sample output of function one is presented in figure 5-2. Figure 5-3 depicts an output with a board failure.

```
*13:09:20   COMMDIAG:
*13:09:20   COMMDIAG: ENTER FUNCTION  ** <CR> FOR MENU **
*COMMDIAG>1
*13:09:30   COMMDIAG:
*13:09:30   COMMDIAG: AUTOMATIC SYSTEM TESTING
*13:09:30   COMMDIAG:
*13:09:30   COMMDIAG: ARE EXTERNAL LOOP BACK CONNECTORS INSTALLED (T/F)
*COMMDIAG>F
*13:09:39   COMMDIAG:  RAM REG TEST COMPLETE 0 BOARDS FAILED
*13:09:39   COMMDIAG:  D.M.A.  TEST COMPLETE 0 BOARDS FAILED
*13:09:40   COMMDIAG:  COMM0   TEST COMPLETE 0 BOARDS FAILED
*13:09:40   COMMDIAG:  COMM1   TEST COMPLETE 0 BOARDS FAILED
*13:09:41   COMMDIAG:  COMM2   TEST COMPLETE 0 BOARDS FAILED
*13:09:41   COMMDIAG:  COMM3   TEST COMPLETE 0 BOARDS FAILED
*13:09:43   COMMDIAG:  COMM4   TEST COMPLETE 0 BOARDS FAILED
*13:09:43   COMMDIAG:  COMM5   TEST COMPLETE 0 BOARDS FAILED
*13:09:44   COMMDIAG:  COMM6   TEST COMPLETE 0 BOARDS FAILED
*13:09:44   COMMDIAG:  COMM7   TEST COMPLETE 0 BOARDS FAILED
*13:09:44   COMMDIAG: ENTER FUNCTION  ** <CR> FOR MENU **
*COMMDIAG>
```

FIGURE 5-2. COMMDIAG AUTOMATIC TEST

```
*13:22:35   COMMDIAG:
*13:22:35   COMMDIAG: ENTER FUNCTION  ** <CR> FOR MENU **
*COMMDIAG>1
*13:22:36   COMMDIAG:
*13:22:36   COMMDIAG: AUTOMATIC SYSTEM TESTING
*13:22:36   COMMDIAG:
*13:22:36   COMMDIAG: ARE EXTERNAL LOOP BACK CONNECTORS INSTALLED (T/F)
*COMMDIAG>F
*13:22:38   COMMDIAG:  RAM REG TEST COMPLETE 0 BOARDS FAILED
*13:22:39   COMMDIAG:  D.M.A.  TEST COMPLETE 0 BOARDS FAILED
*13:22:42   COMMDIAG:   COMM0  TEST FAILED ON DEVICE 2
*13:22:42   COMMDIAG:  COMM0   TEST COMPLETE 1 BOARDS FAILED
*13:22:45   COMMDIAG:   COMM1  TEST FAILED ON DEVICE 2
*13:22:45   COMMDIAG:  COMM1   TEST COMPLETE 1 BOARDS FAILED
*13:22:46   COMMDIAG:   COMM2  TEST FAILED ON DEVICE 2
*13:22:46   COMMDIAG:  COMM2   TEST COMPLETE 1 BOARDS FAILED
*13:22:49   COMMDIAG:   COMM3  TEST FAILED ON DEVICE 2
*13:22:49   COMMDIAG:  COMM3   TEST COMPLETE 1 BOARDS FAILED
*13:22:54   COMMDIAG:   COMM4  TEST FAILED ON DEVICE 2
*13:22:54   COMMDIAG:  COMM4   TEST COMPLETE 1 BOARDS FAILED
*13:22:57   COMMDIAG:   COMM5  TEST FAILED ON DEVICE 2
*13:22:57   COMMDIAG:  COMM5   TEST COMPLETE 1 BOARDS FAILED
*13:22:58   COMMDIAG:   COMM6  TEST FAILED ON DEVICE 2
*13:22:58   COMMDIAG:  COMM6   TEST COMPLETE 1 BOARDS FAILED
*13:22:58   COMMDIAG:  COMM7   TEST COMPLETE 0 BOARDS FAILED
*13:22:58   COMMDIAG: ENTER FUNCTION  ** <CR> FOR MENU **
*COMMDIAG>
```

FIGURE 5-3. COMMDIAG AUTOMATIC TEST WITH FAILURE

5.1.1.3 Function Two - Automatic X.25 Board Test.

Function two is identical to function one; however, the tests are performed upon only a single board. These tests consist of a WD-2511 register test, a DMA interface test, and a X.25 communication test. These tests are explained in detail in later paragraphs of this report. The results of this test are similar to function one in that only the success or failure of the device is reported. More in-depth analysis may be obtained through the individual execution of functions seven through nine. Sample outputs of function two are depicted in figure 5-4.

```
*13:10:31   COMMDIAG:
*13:10:31   COMMDIAG: ENTER FUNCTION  ** <CR> FOR MENU **
*COMMDIAG>2
*13:10:36   COMMDIAG:
*13:10:36   COMMDIAG: AUTOMATIC BOARD TESTING
*13:10:36   COMMDIAG:
*13:10:36   COMMDIAG: ENTER DEVICE NUMBER (0-11)
*COMMDIAG>3
*13:10:40   COMMDIAG:
*13:10:40   COMMDIAG: IS THE EXTERNAL LOOP BACK CONNECTOR INSTALLED (T/F)
*COMMDIAG>F
*13:10:42   COMMDIAG:  RAM REG TEST SUCCESSFUL ON DEVICE 3
*13:10:42   COMMDIAG:   D.M.A. TEST SUCCESSFUL ON DEVICE 3
*13:10:42   COMMDIAG:   COMM0  TEST SUCCESSFUL ON DEVICE 3
*13:10:42   COMMDIAG:   COMM1  TEST SUCCESSFUL ON DEVICE 3
*13:10:43   COMMDIAG:   COMM2  TEST SUCCESSFUL ON DEVICE 3
*13:10:43   COMMDIAG:   COMM3  TEST SUCCESSFUL ON DEVICE 3
*13:10:44   COMMDIAG:   COMM4  TEST SUCCESSFUL ON DEVICE 3
*13:10:44   COMMDIAG:   COMM5  TEST SUCCESSFUL ON DEVICE 3
*13:10:44   COMMDIAG:   COMM6  TEST SUCCESSFUL ON DEVICE 3
*13:10:45   COMMDIAG:   COMM7  TEST SUCCESSFUL ON DEVICE 3
*13:10:45   COMMDIAG:
*13:10:45   COMMDIAG: ENTER FUNCTION  ** <CR> FOR MENU **
*COMMDIAG>
```

FIGURE 5-4. COMMDIAG SINGLE BOARD AUTOMATIC TESTING

5.1.1.4 Function Four - Two X.25 Board Interconnect Test.

Function four permits the testing of two X.25 devices. These devices must be connected externally through the RS-449 interface cables. The X.25 devices in the CID system are sequentiality numbered from zero to eleven. Testing via function four requires that any even numbered device be connected to any odd numbered device. The communication tests performed are identical to function seven and described in detail in later paragraphs in this report. A sample execution of function four is depicted in figure 5-5.

```
*13:15:00   COMMDIAG:
*13:15:00   COMMDIAG: ENTER FUNCTION  ** <CR> FOR MENU **
*COMMDIAG>4
*13:15:01   COMMDIAG:
*13:15:01   COMMDIAG:    TWO BOARD COMMUNICATIONS DIAGNOSTIC TEST
*13:15:01   COMMDIAG:
*13:15:01   COMMDIAG: ENTER FIRST DEVICE NUMBER (0-11)
*COMMDIAG>4
*13:15:03   COMMDIAG: ENTER SECOND DEVICE NUMBER (0-11)
*COMMDIAG>5
*13:15:04   COMMDIAG:
*13:15:04   COMMDIAG:  COMM0 - LINK UP
*13:15:04   COMMDIAG:   COMM0  TEST SUCCESSFUL ON DEVICE 4
*13:15:04   COMMDIAG:   COMM0  TEST SUCCESSFUL ON DEVICE 5
*13:15:04   COMMDIAG:  COMM1 - TX SHORT PACKETS
*13:15:04   COMMDIAG:   COMM1  TEST SUCCESSFUL ON DEVICE 4
*13:15:05   COMMDIAG:   COMM1  TEST SUCCESSFUL ON DEVICE 5
*13:15:05   COMMDIAG:  COMM2 - RX SHORT PACKETS
*13:15:05   COMMDIAG:   COMM2  TEST SUCCESSFUL ON DEVICE 5
*13:15:05   COMMDIAG:   COMM2  TEST SUCCESSFUL ON DEVICE 4
*13:15:05   COMMDIAG:  COMM3 - TX LONG PACKETS
*13:15:05   COMMDIAG:   COMM3  TEST SUCCESSFUL ON DEVICE 4
*13:15:05   COMMDIAG:   COMM3  TEST SUCCESSFUL ON DEVICE 5
*13:15:05   COMMDIAG:  COMM4 - RX LONG PACKETS
*13:15:05   COMMDIAG:            ZERO BITS
*13:15:05   COMMDIAG:             ONE BITS
*13:15:05   COMMDIAG:             ODD BITS
*13:15:06   COMMDIAG:            EVEN BITS
*13:15:06   COMMDIAG:          RANDOM BITS
*13:15:06   COMMDIAG:   COMM4  TEST SUCCESSFUL ON DEVICE 5
*13:15:06   COMMDIAG:            ZERO BITS
*13:15:06   COMMDIAG:             ONE BITS
*13:15:06   COMMDIAG:             ODD BITS
*13:15:06   COMMDIAG:            EVEN BITS
*13:15:06   COMMDIAG:          RANDOM BITS
*13:15:06   COMMDIAG:   COMM4  TEST SUCCESSFUL ON DEVICE 4
*13:15:06   COMMDIAG:  COMM5 - TX RANDOM LENGTH PACKETS
*13:15:06   COMMDIAG:   COMM5  TEST SUCCESSFUL ON DEVICE 4
*13:15:07   COMMDIAG:   COMM5  TEST SUCCESSFUL ON DEVICE 5
*13:15:07   COMMDIAG:  COMM6 - RX RANDOM LENGTH PACKETS
*13:15:07   COMMDIAG:   COMM6  TEST SUCCESSFUL ON DEVICE 5
*13:15:07   COMMDIAG:   COMM6  TEST SUCCESSFUL ON DEVICE 4
*13:15:07   COMMDIAG:   COMM7  TEST SUCCESSFUL ON DEVICE 4
*13:15:07   COMMDIAG:   COMM7  TEST SUCCESSFUL ON DEVICE 5
*13:15:07   COMMDIAG: ENTER FUNCTION  ** <CR> FOR MENU **
*COMMDIAG>
```

FIGURE 5-5. COMMDIAG TWO BOARD INTERCONNECT COMMUNICATION TEST

5.1.1.5 Function Five - Longevity Test.

Function five permits the continuous testing of a single X.25 communication device. The device must be connected in the external loopback mode. This may be accomplished by using the external loopback connector or through loopback functions of the modem. This test requires the user to define the device number, line utilization, maximum packet length, and fixed/random packet length condition. A sample of the execution procedure is depicted in figure 5-6. After the procedure is executed, a display of statistics will appear on the second terminal. The statistical display is updated every 4 seconds until the user terminates the test. A sample of the statistical display is depicted in figure 5-7. The operation of function five permits continuous testing of the X.25 device for up to 48 hours.

```
*14:09:20  COMMDIAG:
*14:09:20  COMMDIAG: ENTER FUNCTION   ** <CR> FOR MENU **
*COMMDIAG>5
*14:09:30  COMMDIAG:
*14:09:30  COMMDIAG:  LONGEVITY COMMUNICATION TEST
*14:09:30  COMMDIAG:
*14:09:30  COMMDIAG:  ENTER DEVICE NUMBER (0-11)
*COMMDIAG>1
*14:09:39  COMMDIAG:  ENTER LINE UTILIZATION IN PERCENT (10-80)
*COMMDIAG>50
*14:09:51  COMMDIAG:  ENTER MAXIMUM PACKET LENGTH (50-1000)
*COMMDIAG>500
*14:10:05  COMMDIAG:  FIXED PACKET LENGTH (T/F,<CR>=RANDOMIZE)
*COMMDIAG>T
*14:10:14  COMMDIAG:  <CR> TO TERMINATE TEST
*COMMDIAG>
```

FIGURE 5-6. COMMDIAG LONGEVITY TEST

```
COMMUNICATION LONGEVITY TEST    9.6 KB
   TIME  MM-DD-YY      HH:MM:SS

     1 LINK INITS
     0 FRAME REJ (XMIT)
     0 FRAME REJ (REC)
     0 TX BUFFER FULL
     0 RX BUFFER FULL
     0 S CMD TIMEOUT
     0 REC OVERRUN
     0 TX UNDERRUN
     0 LINK RESETS
     0 WD-2511 STATUS
     0 FCS ERRORS
     0 SHORT FRAMES
     0 T1 EXPIRED
     0 REJ RECEIVED
     0 REJ TRANSMITTED
     0
    50 % UTILIZATION
    60 MINUTES
2341526 BYTE TRANSMITTED
  9346 MESS TRANSMITTED
```

FIGURE 5-7. COMMDIAG LONGEVITY TEST STATISTICS

5.1.1.6 Function Seven - Loop Back Communication Test.

Function seven contains the mainstay of the CID communication testing process. This test may be executed either independently or via functions one or two. The independent mode of execution provides more in-depth analysis of errors detected on the link. This function should only be executed by a skilled technician during the process of debugging system problems.

Function seven consists of seven communication tests. The function is begun with a X.25 link connection test. Once the link is established, a series of short X.25 packets are then transmitted. These short packets are received and analyzed to insure the packet length and packet content agree with the transmitted packets. Then a series of long packets are transmitted. The length of these packets is 648 bytes which exceed the maximum packet used in the CID/Mode S environment. These long packets contain the following various data patterns: all zero bit, all one bit, odd bits set, even bits set, and random bits set. These long packets are received and analyzed to insure the packet length and packet content agree with the transmitted packets. Then a series of various length packets are transmitted. The size of these packets was selected to concur with the various packets used in the CID/Mode S interface. These packets are received and analyzed to insure that packet length and packet content agree with the transmitted packets. Finally, a disconnect is performed and the link status is checked to determine whether the disconnect occurred.

Function seven may be executed either with the external loop back connectors installed or in the internal mode. The operator is queried whether the external loop back connectors are installed. The result of this function is an in-depth output showing each test as it executes with results from each test. A sample output is depicted in figure 5-8. Figure 5-9 depicts an output with a failure.

```
*13:21:03   COMMDIAG:
*13:21:03   COMMDIAG: ENTER FUNCTION  ** <CR> FOR MENU **
*COMMDIAG>7
*13:21:09   COMMDIAG:
*13:21:09   COMMDIAG:    LOOPBACK COMMUNICATIONS DIAGNOSTIC TEST
*13:21:09   COMMDIAG:
*13:21:09   COMMDIAG: TEST ALL TWELVE DEVICES (T/F)
*COMMDIAG>F
*13:21:14   COMMDIAG:
*13:21:14   COMMDIAG: ENTER DEVICE NUMBER (0-11)
*COMMDIAG>5
*13:21:17   COMMDIAG:
*13:21:17   COMMDIAG: IS THE EXTERNAL LOOP BACK CONNECTOR INSTALLED (T/F)
*COMMDIAG>F
*13:21:19   COMMDIAG:
*13:21:19   COMMDIAG:  COMM0 - LINK UP
*13:21:19   COMMDIAG:   COMM0  TEST SUCCESSFUL ON DEVICE 5
*13:21:19   COMMDIAG:  COMM1 - TX SHORT PACKETS
*13:21:19   COMMDIAG:   COMM1  TEST SUCCESSFUL ON DEVICE 5
*13:21:19   COMMDIAG:  COMM2 - RX SHORT PACKETS
*13:21:19   COMMDIAG:   COMM2  TEST SUCCESSFUL ON DEVICE 5
*13:21:20   COMMDIAG:  COMM3 - TX LONG PACKETS
*13:21:20   COMMDIAG:   COMM3  TEST SUCCESSFUL ON DEVICE 5
*13:21:20   COMMDIAG:  COMM4 - RX LONG PACKETS
*13:21:20   COMMDIAG:            ZERO BITS
*13:21:21   COMMDIAG:             ONE BITS
*13:21:21   COMMDIAG:             ODD BITS
*13:21:21   COMMDIAG:            EVEN BITS
*13:21:21   COMMDIAG:          RANDOM BITS
*13:21:21   COMMDIAG:   COMM4  TEST SUCCESSFUL ON DEVICE 5
*13:21:21   COMMDIAG:  COMM5 - TX RANDOM LENGTH PACKETS
*13:21:21   COMMDIAG:   COMM5  TEST SUCCESSFUL ON DEVICE 5
*13:21:21   COMMDIAG:  COMM6 - RX RANDOM LENGTH PACKETS
*13:21:22   COMMDIAG:   COMM6  TEST SUCCESSFUL ON DEVICE 5
*13:21:22   COMMDIAG:   COMM7  TEST SUCCESSFUL ON DEVICE 5
*13:21:22   COMMDIAG: ENTER FUNCTION  ** <CR> FOR MENU **
*COMMDIAG>
```

FIGURE 5-8. COMMDIAG COMMUNICATION TEST

```
*13:20:26   COMMDIAG:
*13:20:26   COMMDIAG: ENTER FUNCTION  ** <CR> FOR MENU **
*COMMDIAG>7
*13:20:35   COMMDIAG:
*13:20:35   COMMDIAG:    LOOPBACK COMMUNICATIONS DIAGNOSTIC TEST
*13:20:35   COMMDIAG:
*13:20:35   COMMDIAG: TEST ALL TWELVE DEVICES (T/F)
*COMMDIAG>F T
*13:20:41   COMMDIAG:
*13:20:41   COMMDIAG: IS THE EXTERNAL LOOP BACK CONNECTOR INSTALLED (T/F)
*COMMDIAG>F
*13:20:43   COMMDIAG:
*13:20:47   COMMDIAG:   COMM0  TEST FAILED ON DEVICE 2
*13:20:47   COMMDIAG:  COMM0   TEST COMPLETE 1 BOARDS FAILED
*13:20:50   COMMDIAG:   COMM1  TEST FAILED ON DEVICE 2
*13:20:50   COMMDIAG:  COMM1   TEST COMPLETE 1 BOARDS FAILED
*13:20:51   COMMDIAG:   COMM2  TEST FAILED ON DEVICE 2
*13:20:51   COMMDIAG:  COMM2   TEST COMPLETE 1 BOARDS FAILED
*13:20:54   COMMDIAG:   COMM3  TEST FAILED ON DEVICE 2
*13:20:54   COMMDIAG:  COMM3   TEST COMPLETE 1 BOARDS FAILED
*13:20:59   COMMDIAG:   COMM4  TEST FAILED ON DEVICE 2
*13:20:59   COMMDIAG:  COMM4   TEST COMPLETE 1 BOARDS FAILED
*13:21:02   COMMDIAG:   COMM5  TEST FAILED ON DEVICE 2
*13:21:02   COMMDIAG:  COMM5   TEST COMPLETE 1 BOARDS FAILED
*13:21:03   COMMDIAG:   COMM6  TEST FAILED ON DEVICE 2
*13:21:03   COMMDIAG:  COMM6   TEST COMPLETE 1 BOARDS FAILED
*13:21:03   COMMDIAG:  COMM7   TEST COMPLETE 0 BOARDS FAILED
*13:21:03   COMMDIAG: ENTER FUNCTION  ** <CR> FOR MENU **
*COMMDIAG>
```

FIGURE 5-9. COMMDIAG COMMUNICATION TEST WITH FAILURES

5.1.1.7 Function Eight - DMA Test.

Function eight is an internal DMA test. The X.25 devices utilize the DMA operation of the Concurrent 3230XP processor for exchange of data to and from the main memory of the processor. This test executes the DMA interface logic on the X.25 devices. Several data patterns are exchanged between main processor memory and the X.25 devices. These patterns include: all bits clear, all bits set, odd bits set, even bits set, and random bits set. When a discrepancy is detected, the expected and received patterns are presented to the operator. A sample output from a normal execution of the function is presented in figures 5-10 and 5-11.

```
*13:23:42   COMMDIAG:
*13:23:42   COMMDIAG: ENTER FUNCTION  ** <CR> FOR MENU **
*COMMDIAG>8
*13:23:43   COMMDIAG:
*13:23:43   COMMDIAG:  D.M.A. DIAGNOSTIC TEST
*13:23:43   COMMDIAG:
*13:23:43   COMMDIAG: TEST ALL TWELVE DEVICES (T/F)
*COMMDIAG>T
*13:23:46   COMMDIAG:
*13:23:47   COMMDIAG:  D.M.A.  TEST COMPLETE 0 BOARDS FAILED
*13:23:47   COMMDIAG: ENTER FUNCTION  ** <CR> FOR MENU **
```

FIGURE 5-10. COMMDIAG DMA TEST

```
*13:23:50   COMMDIAG:
*13:23:50   COMMDIAG: ENTER FUNCTION  ** <CR> FOR MENU **
*COMMDIAG>8
*13:23:50   COMMDIAG:
*13:23:50   COMMDIAG:  D.M.A. DIAGNOSTIC TEST
*13:23:50   COMMDIAG:
*13:23:50   COMMDIAG: TEST ALL TWELVE DEVICES (T/F)
*COMMDIAG>F
*13:23:53   COMMDIAG:
*13:23:53   COMMDIAG: ENTER DEVICE NUMBER (0-11)
*COMMDIAG>5
*13:23:54   COMMDIAG:
*13:23:54   COMMDIAG:    ZERO BITS
*13:23:54   COMMDIAG:     ONE BITS
*13:23:54   COMMDIAG:     ODD BITS
*13:23:54   COMMDIAG:    EVEN BITS
*13:23:55   COMMDIAG:  RANDOM BITS
*13:23:55   COMMDIAG:   D.M.A. TEST SUCCESSFUL ON DEVICE 5
*13:23:55   COMMDIAG: ENTER FUNCTION  ** <CR> FOR MENU **
*COMMDIAG>
```

FIGURE 5-11. COMMDIAG SINGLE BOARD DMA TEST

5.1.1.8 Function Nine - WD-2511 Register Test.

Function nine is an internal data bus test. The X.25 devices utilize the Communication/Multiplex bus of the Concurrent 3230XP processor for exchange of data to and from the Western Digital WD-2511 device. This test executes the Communication/Multiplex logic on the X.25 devices. Several data patterns are exchanged between the processor and the X.25 devices. These patterns include: all bits clear, all bits set, odd bits set, even bits set, and random bits set. When a discrepancy is detected, the expected and received patterns are presented to the operator. A sample output from a normal execution of the function is presented in figures 5-12 and 5-13.

```
*13:24:26   COMMDIAG:
*13:24:26   COMMDIAG: ENTER FUNCTION  ** <CR> FOR MENU **
*COMMDIAG>9
*13:24:27   COMMDIAG:
*13:24:27   COMMDIAG:  WD-2511 RAM REGISTER TEST
*13:24:27   COMMDIAG:
*13:24:27   COMMDIAG: TEST ALL TWELVE DEVICES (T/F)
*COMMDIAG>T
*13:24:29   COMMDIAG:
*13:24:29   COMMDIAG:
*13:24:30   COMMDIAG:  RAM REG TEST COMPLETE 0 BOARDS FAILED
*COMMDIAG>
```

FIGURE 5-12. COMMDIAG WD-2511 REGISTER TEST

```
*13:24:30   COMMDIAG:
*13:24:30   COMMDIAG: ENTER FUNCTION  ** <CR> FOR MENU **
*COMMDIAG>9
*13:24:33   COMMDIAG:
*13:24:33   COMMDIAG:  WD-2511 RAM REGISTER TEST
*13:24:34   COMMDIAG:
*13:24:34   COMMDIAG: TEST ALL TWELVE DEVICES (T/F)
*COMMDIAG>F
*13:24:35   COMMDIAG:
*13:24:35   COMMDIAG: ENTER DEVICE NUMBER (0-11)
*COMMDIAG>5
*13:24:37   COMMDIAG:
*13:24:37   COMMDIAG:    ZERO BITS
*13:24:37   COMMDIAG:     ONE BITS
*13:24:37   COMMDIAG:     ODD BITS
*13:24:37   COMMDIAG:  RANDOM BITS
*13:24:37   COMMDIAG:  RAM REG TEST SUCCESSFUL ON DEVICE 5
*13:24:37   COMMDIAG: ENTER FUNCTION  ** <CR> FOR MENU **
*COMMDIAG>
```

FIGURE 5-13. COMMDIAG SINGLE BOARD WD-2511 REGISTER TEST

5.1.1.9 Function Eleven - Reset X.25 Devices.

Function eleven executes a hardware reset of the Macroclink X.25 devices. This function is normally called via other functions in the menu. It is made available to the operator for the purposes of in-depth system debugging.

5.1.1.10 Function Twelve - Connect X.25 Links.

Function twelve permits the link connection of the X.25 devices. The mode of connecting the X.25 devices varies according to operation. There exist three modes for connection in the diagnostic package: (1) loop back mode, (2) back-to-back mode, (3) and normal mode. Loop back mode allows the X.25 devices to be connected to themselves. Through use of the external loop back connectors, this connection

may be external or internal. Functions one, two, and seven use this mode for their testing. Back-to-back mode allows the interconnection of two X.25 devices as explained in function four. The normal mode allows selection of DTE or DCE states and the connection mode may be active or passive. Active mode may be through the use of SABM or DISC packets. This function is normally called by other functions in the menu. It is made available to the operator for the purposes of in-depth system debugging.

5.1.1.11 Function Thirteen - Disconnect X.25 Links.

Function thirteen allows the X.25 links to be disconnected through the transmission of a DISC. This function is normally called by other functions in the menu. It is made available to the operator for the purposes of in-depth system debugging.

5.1.1.12 Function Fourteen - Examine the WD-2511 Registers.

Function fourteen allows the operator to examine the WD-2511 internal registers. Output from this function is depicted in figure 5-14. It is made available to the operator for the purposes of in-depth system debugging.

```
*13:25:24   COMMDIAG:
*13:25:24   COMMDIAG: ENTER FUNCTION  ** <CR> FOR MENU **
*COMMDIAG>16
*13:25:26   COMMDIAG:   REGISTER    SOFTWARE VALUE    HARDWARE VALUE
*13:25:26   COMMDIAG:                 (WRITTEN)           (READ)
*13:25:26   COMMDIAG:
*13:25:26   COMMDIAG:     0              9A                 9A
*13:25:26   COMMDIAG:     1              10                 10
*13:25:26   COMMDIAG:     2               0                  0
*13:25:26   COMMDIAG:     3               0                  0
*13:25:26   COMMDIAG:     4               0                  0
*13:25:26   COMMDIAG:     5               0                 21
*13:25:26   COMMDIAG:     6               0                  F
*13:25:26   COMMDIAG:     7               0                 63
*13:25:26   COMMDIAG:     8              40                 40
*13:25:27   COMMDIAG:     9              40                 40
*13:25:27   COMMDIAG:     A              80                 80
*13:25:27   COMMDIAG:     B               0                  0
*13:25:27   COMMDIAG:     C               F                  F
*13:25:27   COMMDIAG:     D               0                 FF
*13:25:27   COMMDIAG:     E               3                  3
*13:25:27   COMMDIAG:     F               3                  3
*13:25:27   COMMDIAG:
*13:25:27   COMMDIAG: ENTER FUNCTION  ** <CR> FOR MENU **
*COMMDIAG>
```

FIGURE 5-14. COMMDIAG WD-2511 REGISTER TEST

5.1.1.13 Function Fifteen - Modify WD-2511 Registers.

Function fifteen allows the operator to modify the WD-2511 internal registers. It is made available to the operator for the purposes of in-depth system debugging.

5.1.1.14 Function Sixteen - Display Devices and Link Status.

Function sixteen displays to the operator the current device and communication link status for all twelve X.25 devices in the system. This function may be used to determine that all X.25 boards are currently answering status requests from the Concurrent 3230XP computer system. Also the X.25 link connect/disconnect state is displayed. A sample output of this function is presented in figure 5-15.

```
*13:25:24   COMMDIAG:
*13:25:24   COMMDIAG: ENTER FUNCTION  ** <CR> FOR MENU **
*COMMDIAG>16
*13:25:26   COMMDIAG:   DEVICE   ADDRESS    NET     DMA     LINK
*13:25:26   COMMDIAG:   NUMBER              STATUS  STATUS  STATUS
*13:25:26   COMMDIAG:
*13:25:26   COMMDIAG:     0        50       73      80    CONNECTED
*13:25:26   COMMDIAG:     1        52       D3      80    CONNECTED
*13:25:26   COMMDIAG:     2        54       D3      80    CONNECTED
*13:25:26   COMMDIAG:     3        56       D3      80    CONNECTED
*13:25:26   COMMDIAG:     4        58       F3      80    CONNECTED
*13:25:26   COMMDIAG:     5        5A       53      80    CONNECTED
*13:25:26   COMMDIAG:     6        70       53      80    CONNECTED
*13:25:26   COMMDIAG:     7        72       D3      80    CONNECTED
*13:25:26   COMMDIAG:     8        74       D3      80    CONNECTED
*13:25:27   COMMDIAG:     9        76       D3      80    CONNECTED
*13:25:27   COMMDIAG:    10        78       D3      80    CONNECTED
*13:25:27   COMMDIAG:    11        7A       D3      80    CONNECTED
*13:25:27   COMMDIAG:
*13:25:27   COMMDIAG: ENTER FUNCTION  ** <CR> FOR MENU **
*COMMDIAG>
```

FIGURE 5-15. COMMDIAG DEVICE AND LINK STATUS

5.1.1.15 Function Seventeen - Receive Messages.

Function seventeen allows the operator to receive messages from any X.25 device. The algorithms used in this function are identical to the receive algorithms used in the CID real-time software. The setup for this function must be done manually through the use of functions eleven through thirteen. This function was included to allow the in-depth debugging of the system in a mode identical to the CID real-time software.

5.1.1.16 Function Eighteen - Transmit Messages.

Function eighteen allows the operator to transmit messages from any X.25 device. The algorithms used in this function are identical to the receive algorithms used in the CID real-time software. The setup for this function must be done manually

through the use of functions eleven through thirteen. This function was included to allow the in-depth debugging of the system in a mode identical to the CID real-time software.

5.1.1.17 Function Nineteen - Examine the WD-2511 Buffers.

Function nineteen allows the operator to examine the 3230XP memory used as buffers for the X.25 devices. The setup for this function must be done manually through the use of functions eleven through thirteen. This function was included to allow the in-depth debugging of the system in a mode identical to the CID real-time software.

5.1.1.18 Function Twenty - Link Timing Measurement.

Function twenty measures the rate at which packets are transmitted on the X.25 links. The selection of a baud rate is via a hex switch pack located on the front of each X.25 device. The operator should select the rate according to the table in figure 5-16 and execute this function to verify the rate is set accordingly. This function only displays baud rates from 4.8 kb through 72 kb. Other rates are shown as values below 4.8 kb or values above 72 kb. A sample output from this function is depicted in figure 5-17.

0 - 300 baud	8 - 57.6 Kbaud
1 - 600 baud	9 - 76.8 Kbaud
2 - 1200 baud	A - 115.3 Kbaud
3 - 2400 baud	B - 153.6 Kbaud
4 - 4800 baud	C - 230.4 Kbaud
5 - 9600 baud	D - 460.8 Kbaud
6 - 19.2 Kbaud	E - EXTERNAL
7 - 38.4 Kbaud	F - TEST MODE

FIGURE 5-16. COMMDIAG BAUD RATE SELECTION TABLE

```
13:31:40   COMMDIAG:
13:31:40   COMMDIAG: ENTER FUNCTION  ** <CR> FOR MENU **
*COMMDIAG>20
*13:32:01   COMMDIAG:
*13:32:01   COMMDIAG:    LINK TIMING TEST
*13:32:01   COMMDIAG:
*13:32:02   COMMDIAG: IS THE EXTERNAL LOOP BACK CONNECTOR INSTALLED (T/F)
*COMMDIAG>F
*13:32:02   COMMDIAG:
*13:32:03   COMMDIAG:
*13:32:03   COMMDIAG: LINK TIMING IS PROVIDED TO INSURE THE PROPER
*13:32:03   COMMDIAG: SETTING OF THE CLOCK SELECT SWITCH ON THE X.25
*13:32:03   COMMDIAG: DEVICE, NOT TO PRECISELY MEASURE BAUD RATES
*13:32:03   COMMDIAG:
*13:32:03   COMMDIAG: DEVICE -  0  RATE -   9.6 KILO-BAUD
*13:32:04   COMMDIAG: DEVICE -  1  RATE -   9.6 KILO-BAUD
*13:32:04   COMMDIAG: DEVICE -  2  RATE <<  4.8 KILO-BAUD
*13:32:04   COMMDIAG: DEVICE -  3  RATE <<  4.8 KILO-BAUD
*13:32:04   COMMDIAG: DEVICE -  4  RATE -  19.2 KILO-BAUD
*13:32:04   COMMDIAG: DEVICE -  5  RATE -  19.2 KILO-BAUD
*13:32:04   COMMDIAG: DEVICE -  6  RATE -  38.4 KILO-BAUD
*13:32:04   COMMDIAG: DEVICE -  7  RATE -  56.0 KILO-BAUD
*13:32:04   COMMDIAG: DEVICE -  8  RATE -  56.0 KILO-BAUD
*13:32:04   COMMDIAG: DEVICE -  9  RATE -  76.8 KILO-BAUD
*13:32:04   COMMDIAG: DEVICE - 10  RATE >> 76.8 KILO-BAUD
*13:32:04   COMMDIAG: DEVICE - 11  RATE >> 76.8 KILO-BAUD
*13:32:04   COMMDIAG: ENTER FUNCTION  ** <CR> FOR MENU **
*COMMDIAG>
```

FIGURE 5-17. COMMDIAG LINK TIMING MEASUREMENTS

5.1.2 COMMDIAG Diagnostic Philosophy.

The design of the diagnostic software was accomplished with the following goals:

a. Produce an overall check of the X.25 devices that could be executed quickly to verify system operation.

b. Produce a set of processes that is common to both the diagnostic process and the CID real-time simulation process for the purpose of operating and controlling the X.25 devices.

c. The processes used in the diagnostics for the transmission and reception of X.25 messages is also used for the CID real-time process.

d. Produce additional X.25 analysis processes to permit an in-depth analysis of any link event.

The design of the diagnostics included the following set of support software:

a. X.25 hardware initialization routines
b. X.25 reset routines
c. X.25 link initialization routines
d. X.25 packet transmitter routines
e. X.25 packet receiver routines
f. X.25 link status routines
g. X.25 link disconnect routines
h. X.25 device interrupt service routines

The development of these routines within the diagnostic package afforded the capability of a common library of routines that are also used within the real-time simulation software. This forms a solid relationship between the diagnostic software and the real-time software in that there is an isomorphic link relationship between these two processes. This has assisted us and will continue to assist us in the analysis of link integration especially with the Mode S system.

The normal day-to-day operation of the diagnostic is quite simple. Execution of diagnostic function one provides a complete check of the X.25 devices. When the condition arises where a link is in question, more specific analysis is accomplished through the use of function two for that specific device. By placing the external loop back connector at the Mode S junction box connection of the CID X.25 device, a complete X.25 unit test with interface cabling is provided with either function one or two. When a problem arises in the operation of function one, the flow chart in figure 5-18 should be considered. The diagnostics also afford the capability to execute in-depth analysis of link problems through the use of functions eleven through nineteen.

The speed at which the X.25 lines are driven is a function of a rotary switch on the front edge of these devices. Figure 5-16 describes the various settings for this switch. It is suggested that when changing the baud rate for the X.25 devices, the diagnostic functions one and twenty should be executed to verify system operation and proper switch settings.

5.2 TOY DIAGNOSTIC PROGRAM.

The TOY receiver board operationally receives a set of three half-words of TOY data from an external time source and loads that data into a common area of memory for use by the CID real-time program (section 7.2). The TOY diagnostic program verifies the correct operation of the TOY receiver. The program is run by typing 'TOY' on the system console. Figure 5-19 shows a sample run of this program.

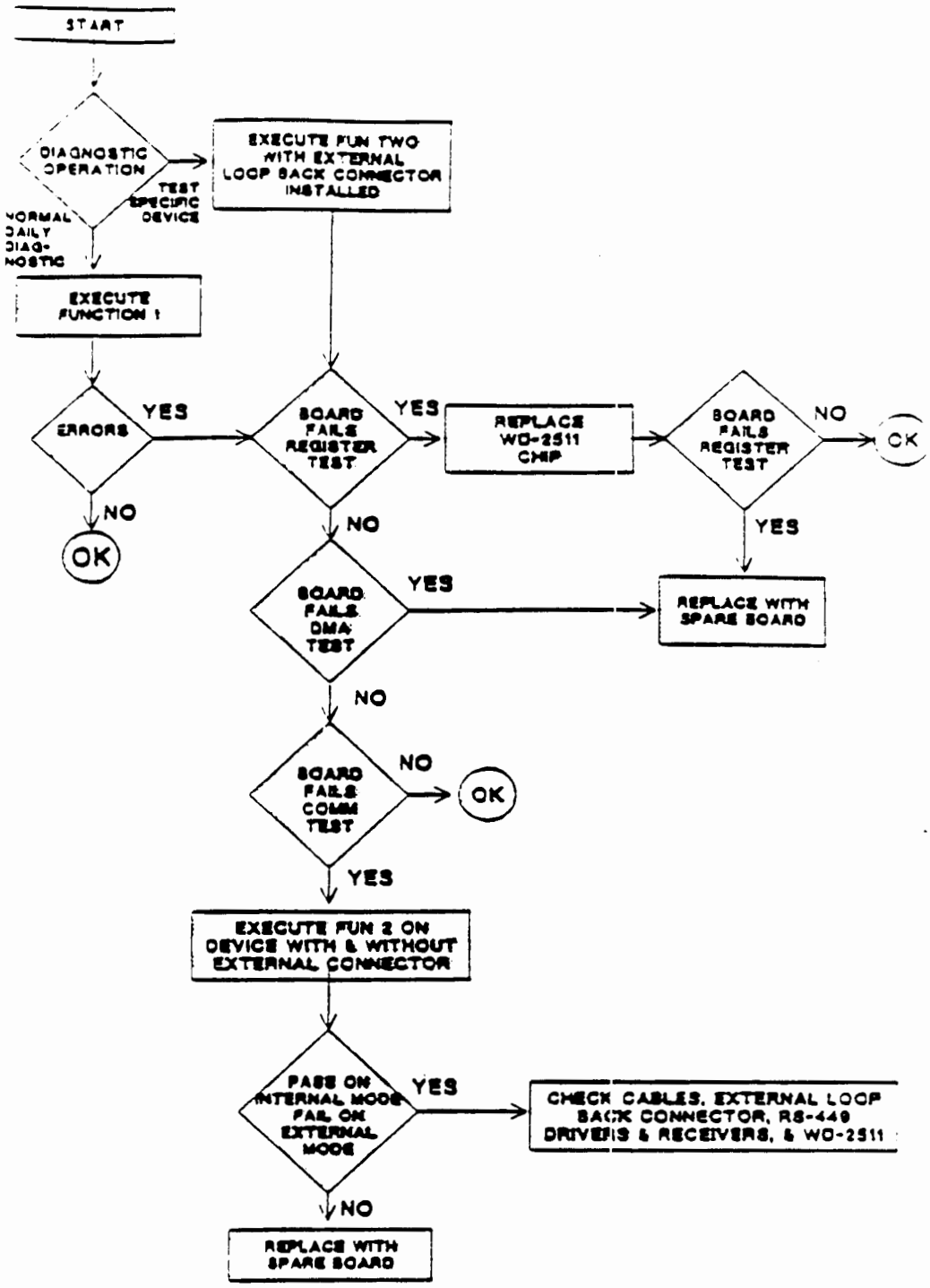

FIGURE 5-18. COMMDIAG DIAGNOSTIC PROCEDURE FLOWCHART

```
*09:06:27   TOY:
*09:06:27   TOY:
*09:06:27   TOY: ***********************************
*09:06:27   TOY: ****   TOY MAINTENANCE MENU   ****
*09:06:27   TOY: ***********************************
*09:06:27   TOY:   1 - VALIDATION
*09:06:27   TOY:   2 - DUMP
*09:06:27   TOY:   3 - HELP
*09:06:27   TOY:   4 - EXIT
*09:06:27   TOY:   5 - DIAG #1
*TOY>1
*09:06:36   TOY:TOY VALIDATION INITIATED
*09:06:36   TOY:
*09:06:36   TOY: Enter validation run mode (for static test only):
*09:06:37   TOY:   N - Normal (default)
*09:06:37   TOY:   S - Single-step
*TOY>N
*09:06:41   TOY:
*09:06:44   TOY:   TOY VALIDATION : CHANNEL-A STATIC TEST SUCCESSFUL
*09:06:46   TOY:   TOY VALIDATION : CHANNEL-A DYNAMIC TEST SUCCESSFUL
*09:06:46   TOY:   TOY VALIDATION COMPLETED
*09:06:46   TOY:
```

FIGURE 5-19. TOY DIAGNOSTIC SAMPLE RUN

The Help function included in the TOY Maintenance Menu contains a brief description of the TOY diagnostic program. The Dump function allows the user to print the data result files after a validation test has been run. The Exit function disables the TOY receiver and terminates the program. The remaining two functions of the TOY Maintenance Menu (validation and diagnostics) are discussed in the following sections.

5.2.1 TOY Validation and Diagnostic Routines.

The two validation routines which test the TOY receiver are (1) the Static Load and Read Test, and (2) the Dynamic Load and Read Test. As shown in figure 5-19, when the validation tests are selected, a secondary prompt is displayed. The single-step operation mode (which only pertains to the Static Load and Read Test) is included for use only by a qualified technician for in-depth debugging. In either case, whether the validation test is run in normal or single-step mode, the result of both the Static and Dynamic tests appears upon completion of the test. The resulting data collected for both tests are stored in a validation dump file for later review and is formatted as shown in figure 5-20.

ROW	REFERENCE DATA ERROR FLAGS			OUTPUT DATA		
1	5555	5555	5555	5555	5555	5555
2	AAAA	AAAA	AAAA	AAAA	AAAA	AAAA
3	0	0	0	0	0	0
4	8000	0	0	8000	0	0
"	"	"	"	"	"	"

FIGURE 5-20. TOY VALIDATION TEST DUMP FORMAT

5.2.1.1 Static Load and Read Test.

The Static Load and Read Test verifies the operation of the TOY receiver while interrupts are disabled. This is accomplished by writing a set of three half-words to the input buffer of the TOY board. Once the data is sent to the board, a command is sent to transfer the data to the output buffer where the three half-words are then to be read back. When the three half-words written to the board do not match the three read back, an error flag marks this set of data for output to both the validation dump file and the summary log.

When no error flags are set during this test, the 'TOY VALIDATION: CHANNEL-A STATIC TEST SUCCESSFUL' message shown in figure 5-19 is displayed. When error flags are set during this test, the same message shown in figure 5-19 is displayed with the word 'SUCCESSFUL' changed to 'FAILURE.'

5.2.1.2 Dynamic Load and Read Test.

The Dynamic Load and Read Test verifies the operation of the TOY receiver while interrupts are enabled. This is accomplished by writing a set of three half-words to the input buffer of the TOY board. After the third word is received by the TOY board, an interrupt is generated causing the ISR to read the first two half-words. When the first two half-words written to the board do not match the two read back, then an error flag marks this set of data for output to both the validation dump file and to the summary log.

When no error flags are set during this test, the 'TOY VALIDATION: CHANNEL-A DYNAMIC TEST SUCCESSFUL' message shown in figure 5-19 is displayed. When error flags are set during this test, the same message is displayed with the word 'SUCCESSFUL' changed to 'FAILURE'.

5.2.1.3 TOY Diagnostic Routine.

The diagnostic routine for the TOY gives the user total control in programming the TOY receiver. This routine is made available to a qualified technician for the purpose of in-depth system debugging.

5.2.2 TOY Diagnostic Philosophy.

When the condition arises where the TOY operation is in question, execution of the validation tests provides a complete check of the TOY device. When the TOY fails the validation tests, more specific analysis is accomplished through the use of the included diagnostic routine. Replacement of the TOY board with the spare is the preferred action when the validation routine detects a failure.

6. OFF-LINE DATA BASE GENERATION PROGRAMS.

The CID requires two off-line programs to create data base files in support of the real-time CID operation. The first program is the CIDINIT data base program. This program provides initialization parameters and default settings for the CID real-time program. The second program, the scenario generator, provides the message scenario used by the CID real-time program. These scenarios consist of both ATC to Mode S and non-ATC to Mode S messages. The size and scope of the scenario generator warrants a separate document to fully discuss the theory and operation of this program.

6.1 CIDINIT DATA BASE PROGRAM.

The CIDINIT data base program builds a file that contains the configuration data required to run the CID real-time program. These data consist of physical line to logical port assignments, X.25 set up parameters, and default text fields for standard uplink and ELM uplink messages. This program also provides a method of bypassing the CID initialization routine's interactive session. All of the values requested during the interactive session can be defined and saved into the CIDINIT data file before a CID simulation is run. This offers the user a method of ensuring that two separate CID simulation runs use the same initialization parameters. CIDINIT is flexible enough to allow the selective definition of the initialization parameters, i.e., the CID interactive session bypasses those queries which are defined within the CIDINIT data base file, but still requests those parameters which are not defined within the file.

CIDINIT is run under MTM. The user must be logged onto a MTM terminal as described in section 4.1.1. The CIDINIT program is then run by simply typing CIDINIT on the MTM terminal. When the program is loaded the CIDINIT Initial Screen will be displayed on the terminal as shown in figure 6-1.

```
(P)rint  an initialization data base file
(M)odify an initialization data base file
(C)reate an initialization data base file
          - or -
<esc><cr> to terminate CIDINIT
```

FIGURE 6-1. CIDINIT INITIAL SCREEN

Only the inputs 'P', 'M', 'C', and <esc><cr> are accepted by the CIDINIT program. When an input error is encountered, simply reselect one of the four options provided.

6.1.1 Printing an Initialization Data Base File.

After the PRINT command is entered, the following query appears as a new screen:

Enter the name of the CID configuration file to be printed.

Enter the filename of a previously created CIDINIT data base file. Since all the CIDINIT data base files are stored on disk in account 2 and are defined as '.CON' files, only an 8-character or less file identifier can be entered. An error in entering the filename causes a re-prompt of the same question. By hitting the spacebar and a carriage return for the filename, the initial CIDINIT function screen is displayed without a file being printed.

When a valid filename is decoded, the initial CIDINIT function screen is displayed with a message above stating that the requested file is spooled to the print queue.

6.1.2 Creating an Initialization Data Base File.

After the CREATE command is selected, the following query appears as a new screen:

Enter the name of the CID configuration file to be created.

Enter the filename of a CIDINIT data base file to be created. When an invalid filename is entered, the same question is asked again. By hitting the spacebar and a carriage return, the 'Create' processing is terminated and the initial CIDINIT function screen is redisplayed.

6.1.3 Modifying an Initialization Data Base File.

When the MODIFY command is selected, the following query appears as a new screen:

Enter the name of the CID configuration file to be modified.

Enter the filename of a CIDINIT data base file to be modified. When a filename is entered which is not present on the system, the same question is asked again. By hitting the space bar and a carriage return for the filename, the 'Modify' processing is terminated and the initial CIDINIT function screen is redisplayed.

6.1.4 Terminating the CIDINIT Program.

No other input is required once the exit command (an <esc><cr> sequence) has been entered.

6.1.5 Using the Modify and Create Functions.

The modify and create functions utilize the same algorithms to lead the user through the rest of the program. The difference between the two routines is in the initialization phase. The create function creates a new file, specified by the user, and initializes the data base to the default settings. The modify function reads a previously defined CIDINT data base file and uses the contents of the data base to initialize the default settings.

Four seperate screens are encountered once the modify or create function is chosen. They are:

a. Current X.25 Device Configuration screen
b. CID Simulation Initialization Settings screen
c. Standard Uplink Default Message screen
d. ELM Uplink Default Message screen

6.1.5.1 Current X.25 Device Configuration Screen.

When entering the Current X.25 Device Configuration function, figure 6-2 appears.

Current X.25 Device Configuration

Dev. #	Port #	Baud Rate
0	1	56 K
1	2	56 K
2	3	56 K
3	4	56 K
4	5	56 K
5	6	56 K
6		
7		
8		
9		
10		
11		

Enter device # to modify, or <esc><cr> for next screen.

FIGURE 6-2. CIDINIT X.25 DEVICE CONFIGURATION SCREEN

The values shown are the initial default values, set when the create function is invoked. In subsequent runs of the CIDINIT program using the modify function, the values which appear are those from the file being modified.

To change the configuration of a device, enter the desired device number. A message containing legal values for a port number appears beneath the title line of the screen. The cursor is then positioned in the port number column of the device selected. After the port number is entered, a message containing the legal values for baud rates appears in place of the port number message. The cursor is then positioned in the baud rate column. When an acceptable baud rate is entered, the cursor moves back to the query at the bottom of the screen, again waiting for input.

In order to remove a device from configuration, a space and a return as input for the port number is needed to "zero out" the selected device number.

There are two configuration requirements of which to be aware. First, only one device per port is allowed to be configured at 56 kb. Second, no more than six devices per port are allowed to be configured at 9600 baud. An error message appears when either of the two requirements is not satisfied.

6.1.5.2 CID Simulation Initialization Settings Screen.

When entering the CID simulation initialization settings function, figure 6-3 appears.

```
        CID Simulation Initialization Settings
        Enter 'NC' for a not configured value

    1  Message Scenario filename          - NC
    2  Track Data filename                - NC
    3  Data extraction status (On/Off)    - On
    4  Scenario Start Time (MM:SS)        - 00:00
    5  Link Rate Test Flag (True/False)   - False

Enter 'M' to modify, or <esc><cr> for next screen
```

FIGURE 6-3. CIDINIT SIMULATION INITIALIZATION SCREEN

The values shown are the default values used when in the create mode. In subsequent runs using the modify function, the values contained in the data base file being modified are used.

To change these settings, enter an 'M' in response to the modify query. The cursor is positioned at the message scenario filename line. Enter either a filename (with no extension, it is assumed that the message scenario files are all in account 2 with the extension '.CID'), a carriage return to accept the current input, or a space and a carriage return to return to the menu screen. The filename entered must meet the OS/32 naming conventions. When an illegal filename is decoded, an error message appears. After a legal filename is decoded, the cursor is positioned at the track data filename question. The same procedure as above is followed.

The third question requires a response of 'on' or 'off'. The string 'NC' is entered when the data extraction status is not to be configured. This will allow the status to be set at CID initialization.

Input to the scenario start-time field can range from 00:00 to 59:59. The string 'NC' is entered when the scenario start time is not to be configured. This will allow the time to be set at CID initialization.

The fifth and final question on this screen pertains to a baud rate test performed during the initialization phase of the CID. This test is currently not provided in the CID real-time program.

To terminate the CID simulation initialization processing screen, enter '<esc><cr>'. Modify the simulation initialization screen by entering 'M'.

6.1.5.3 Standard Uplink Default Message Screen.

When entering the standard uplink default message function, figure 6-4 appears.

Standard Uplink Default Messages (All 28 characters)

```
1  AAAAAAAAAAAAAAAAAAAAAAAAAAAA
2  BBBBBBBBBBBBBBBBBBBBBBBBBBBB
3  CCCCCCCCCCCCCCCCCCCCCCCCCCCC
4  DDDDDDDDDDDDDDDDDDDDDDDDDDDD
5  EEEEEEEEEEEEEEEEEEEEEEEEEEEE
6  FFFFFFFFFFFFFFFFFFFFFFFFFFFF
7  GGGGGGGGGGGGGGGGGGGGGGGGGGGG
8  HHHHHHHHHHHHHHHHHHHHHHHHHHHH
```

Enter default message to modify, or <esc><cr> for next screen.

FIGURE 6-4. CIDINIT STANDARD UPLINK DEFAULT MESSAGE SCREEN

The values shown are the default values used when in the create mode. In subsequent runs using the modify function, the values contained in the data base file being modified are used.

To change these settings, enter the default message number in response to the modify query. The cursor is positioned at the appropriate default message.

Any valid America Standard Code for Information Interchange (ASCII) character is permitted within the 28-character string. Both spaces within the string and carriage returns terminate the string.

To continue the processing of this function, a value from 1 through 8 is entered in response the modify query. An '<esc><cr>' terminates the processing of the standard uplink default message screen.

6.1.5.4 Extended Length Message Uplink Default Message Screen.

When entering the extended length message (ELM) uplink default message function, figure 6-5 appears.

ELM Uplink Default Messages (First 4 segments)

```
1  1111111111111111111111111111111111111111
2  2222222222222222222222222222222222222222
3  3333333333333333333333333333333333333333
4  4444444444444444444444444444444444444444
5  5555555555555555555555555555555555555555
6  6666666666666666666666666666666666666666
7  7777777777777777777777777777777777777777
8  8888888888888888888888888888888888888888
```

Enter default message to modify, or <esc><cr> for next screen.

FIGURE 6-5. CIDINIT ELM UPLINK DEFAULT MESSAGE SCREEN

The values shown are the default values used when in the create mode. In subsequent runs using the modify function, the values contained in the data base file being modified are used.

To change these settings, enter the default block number in response to the modify query. The cursor is positioned at the appropriate default block.

Any valid ASCII character is permitted within the 40-character string. Both spaces within the string and carriage returns terminate the string.

To continue the processing of this function, a value from 1 through 8 is entered in response the modify query. An '<esc><cr>' terminates the processing of the ELM uplink default message screen.

After the final ELM uplink message screen is accepted, the initial CIDINIT function screen (section 6.1) is displayed. All the options initially available are available. Answering '<esc><cr>' in response to this screen terminates the CIDINIT program.

7. CID OPERATION.

The real-time CID program is run from the system console, it requires that:

a. The CIDINIT data base file to be used must be present in account 2.

b. The message scenario file to be used must be present in account 2.

c. The cables linking the CID with the Mode S sensor must be consistent with the goal of the intended CID test.

d. The X.25 device baud rate switches must be consistent with the baud rate settings contained in the CIDINIT data base file being used.

Proceed only when the above requirements are satisfied.

The CID real-time simulation software consist of two mutual exclusive modules ('CID' and 'CID2'). The 'CID' program is the capacity communication program for use with a single sensor. The 'CID2' program includes network management function to allow two Mode S sensors to be connected to a single CID system. The Mode S sensor must be configured with a sensor identification equivalent to the part of the CID unit to which it is connected when using the CID2 program. Otherwise, the operation of 'CID' and 'CID2' are identical.

7.1 CID INITIALIZATION.

The CID program is run by typing 'CID' or 'CID2' on the system console. This command invokes a command substitution string (CSS) (a stored set of operating system commands) to prepare for the real-time CID program. The last operation of the CSS is to load the CID program. When the CSS is complete, the CIDINIT routine's interactive session begins to execute.

The first prompt the CID interactive session displays is a request for the name of a CIDINIT data base file. When an existing filename is entered, this file is read. The data contained within contains the CID configuration set up data plus responses to the CID interactive session. When data within the initialization data base file is not configured or is not valid (i.e., a file requested does not exist or an illegal start time), the interactive session requests a valid response. The following is a list of the questions included in the CID interactive session.

a. Initialization data base filename (an existing file with extension .CON/2)
b. Message Scenario filename (an existing file with extension .CID/2)
c. Track Data filename (an existing file with extension .TRK/2)
d. Scenario start time (00:00 to maximium time of scenario)
e. Initial Data Extraction status (Enabled or Disabled)
f. Link rate test execution (True or False)

7.2 CID REAL-TIME OPERATION.

The CID is operating once the switch on the terminal control box is placed in the control terminal (TER1:) position. The message scenario is read, data extraction extracts data (if requested), the CID status is displayed on the status terminal (TER2:) and the CID function menu appears on the control terminal. All commands to the CID during the real-time operation are in response to the various menus displayed on the control terminal. The status terminal is used solely for the display of statistics.

The CID function menu contains four functions which compute and display CID statistics and errors. Options are included to allow for the display of system statistics, system errors, X.25 statistics, and X.25 errors. Normally, the four display screens update periodically at 4-second intervals. It is possible to freeze the display of information on the screen using the toggling function. The toggling function is executed by first selecting one of the four display functions. When the CID function menu is refreshed on the control terminal, selecting the same function number again freezes the display. Repeating this action enables the periodic update of the status terminal. While the display is frozen, the real-time operation of the CID itself is not affected, i.e., the simulation continues to process the scenarios and collect data.

The CID function menu includes three functions which control the CID. The CID is controlled by modifying the X.25 device status (simulating a configured line going down or coming back up), toggling the data extraction status, and terminating the CID. When a proper response is entered, the appropriate screen is displayed on the status terminal. Depending on the function selected, a sub-menu or additional prompts appear on the control terminal to gather further information from the user.

When a value other than 1 through 9 is entered in response to the CID function menu, an error message is displayed and a legitimate response is again requested.

Figure 7 1 shows the CID function menu as it appears on the control terminal throughout the operation of the CID.

COMMUNICATIONS INTERFACE DRIVER FUNCTION MENU

```
1 - CID STATISTICS
2 - CID ERRORS
3 - X.25 DEVICE STATISTICS
4 - X.25 DEVICE ERRORS
5 - MODIFY X.25 DEVICE STATUS
6 - CREATE A MESSAGE
7 - DISPLAY THE MESSAGE LIST
8 - TOGGLE DATA EXTRACTION
9 - TERMINATE THE CID

PLEASE SELECT A FUNCTION -
```

FIGURE 7-1. CID FUNCTION MENU

7.2.1 CID Statistics.

When function 1 of the CID function menu is selected, the CID statistics screen is displayed on the status terminal. Figure 7-2 shows a display of the CID statistics screen. The number of 'X's in a field relates the number of characters or digits that field contains.

COMMUNICATIONS INTERFACE DRIVER STATUS

```
THE MESSAGE SCENARIO FILE IS XXXXXXXX
THE INITIALIZATION DATABASE FILE IS XXXXXXXX

XX.X   % CPU UTILIZATION                 XXXX - COUNT 1
XX.X   % DATA EXTRACTION UTILIZED        XXXX - COUNT 2
XXXX   TOTAL SYSTEM ERRORS               XXXX - COUNT 3
XXXX   TOTAL X.25 ERRORS                 XXXX - COUNT 4
XXXX   MESSAGE BUFFERS PROCESSED         XXXX - COUNT 5
                                         XXXX - COUNT 6
** DATA EXTRACTION IS XXXABLED **        XXXX - COUNT 7
                                         XXXX - COUNT 8
XXXX   MSGS WITH UNCONFIGURED PORTS      XXXX - COUNT 9
XXXX   MSGS ON THE SAVELIST              XXXX - COUNT 10
XXXX   MSGS LAST OUTPUT FROM SAVELIST    XXXX - COUNT 11
                                         XXXX - COUNT 12
                                         XXXX - COUNT 13

XX:XX - TIME INTO SIMULATION             XX:XX:XX - TIME OF YEAR
```

FIGURE 7-2. CID STATISTICS SCREEN

The message scenario filename, which is entered during CID interactive session or is included in the initialization data base file, is displayed on this screen, as is the initialization data base filename. The 'percent central processing unit

(CPU) utilization' is a measure of the current load on the CPU measured over the period since the last status screen update. The 'data extraction utilization' is a measure of the current load on the internal data extraction software measured over the period since the last status screen update. Both 'total system errors' and 'total X.25 errors' are summations of the itemized errors displayed on the system error and X.25 error screens. The number of 'message buffers processed' is a value which relates the extent of message scenario completion. The data extraction status message informs the user whether data is currently being extracted. The flag is modified by selecting function 8 on the CID Function Menu. The 'messages with unconfigured ports' value is the number of messages encountered by the real-time software which were intended to be dispatched on ports which were not configured in the CIDINIT data base program. The 'messages on the Savelist' value is a tally of messages which were on the Savelist at the time of the status update. The 'messages last output from the Savelist' value reports the number of messages that were removed from the Savelist in the last output message process before the status update. The 'TOY' value reports the current time in hour, minute, and second format. The 'Time into scenario' value reports the number of minutes and seconds into the CID message scenario the real-time software is currently operating.

7.2.2 CID Errors.

When function 2 of the CID function menu is selected, the CID error screen is displayed on the status terminal. Figure 7-3 shows a display of the CID error screen. The number of 'X's in a field relates the number of characters or digits that field contains.

COMMUNICATIONS INTERFACE DRIVER SYSTEM ERRORS

XXXX TOTAL SYSTEM ERRORS	XXXX TOTAL X.25 ERRORS
_____ I/O ERRORS _____	____ INTERNAL DATA BASE ERRORS ____
XXXX Data Extraction I/O	XXXX Savelist Found Empty
XXXX Message Scenario I/O	XXXX Savelist Full
XXXX OPCOMM I/O	
XXXX Extraction Data Lost	
_____ SCENARIO ERRORS _____	_____ PROTOCOL ERRORS _____
XXXX Scenario Buffers Overwritten	XXXX Illegal X.25 Device On Output
XXXX Scenario Buffers Empty	XXXX Packet Byte Length Error
XXXX Bad Port Number In Scenario	XXXX Link Not Active
XX:XX - TIME INTO SIMULATION	XX:XX:XX - TIME OF YEAR

FIGURE 7-3. CID ERROR SCREEN

This screen displays the totals of both the individual system errors of this function and the current total of the X.25 error screen. Also included are four groups of errors; (1) input and output (I/O) errors, (2) scenario errors, (3) internal data base errors, and (4) X.25 protocol errors.

The I/O errors indicate that an error code was received from an I/O request for either data extraction, message scenario input, and operator communications (OPCOMM) I/O. Extraction data lost indicates the number of data extraction buffers lost.

The scenario I/O errors are internal software errors. 'Scenario buffers overwritten' indicates that a buffer containing a message on the Savelist was overwritten before the message could be processed. This can only happen to a message that would have been discarded due to age; however, since the buffer was overwritten there will be no specific extraction for that message. 'Scenario buffers empty' indicates that the output message routine encountered an empty scenario buffer. The 'bad port number in scenario' indicates that the output message routine encountered a message with an illegal port number.

'Savelist found empty' indicates that the output message routine attempted to remove a message from an empty Savelist. 'Savelist full' indicates that the output message routine attempted to save a message and the Savelist was full. An extraction of the discarded message is also made.

'Illegal X.25 device on output' indicates that the output message routine tried to send a message using an illegal device number. 'Packet byte length error' indicates that the output message routine tried to send a message of an illegal byte length. 'Link not active' indicates that the output message routine tried to send a message over an inactive X.25 device.

7.2.3 X.25 Device Statistics.

When function 3 of the CID Function Menu is selected, the X.25 device statistics screen is displayed on the status terminal. Figure 7-4 shows a display of the X.25 Device Statistics screen. The number of 'X's in a field relates the number of characters or digits that field contains.

COMMUNICATIONS INTERFACE DRIVER X.25 STATISTICS

THE INITIALIZATION DATABASE FILE IS XXXXXXXX

DEV #	PORT #	BAUD RATE	-STATUS- DEV	LINK	INPUT BYTES / SECOND	INPUT MSG./ SECOND	OUTPUT BYTES / SECOND	OUTPUT MSG./ SECOND
1	1	9600	A	C	XXXX	XXX	XXXX	XXX
2	1	9600	I	C	XXXX	XXX	XXXX	XXX
3	1	9600	A	C	XXXX	XXX	XXXX	XXX
4	1	9600	A	D				
5	1	9600	A	C	XXXX	XXX	XXXX	XXX
6	1	9600	A	C	XXXX	XXX	XXXX	XXX
7	2	56 K	A	C	XXXX	XXX	XXXX	XXX
8			N					
9			N					
10	4	56 K	A	D				
11			N					
12	6	56 K	A	C	XXXX	XXX	XXXX	XXX

A-ACTIVE I-INACTIVE N-NOT CONFIGURED C-CONNECTED D-DISCONNECTED

XX:XX - TIME INTO SIMULATION XX:XX:XX - TIME OF YEAR

FIGURE 7-4. CID X.25 DEVICE STATISTICS SCREEN

This screen provides a report of the current status of the X.25 devices and the respective message loads. The port number, baud rate, device, and link status fields display information received from the CIDINIT data base file named at the top of the screen. The four columns on the right of the screen breakdown the input and output messages into both bytes per second and messages per second. Since the update time of the statistics correlates to the update time of this screen (once every 4 seconds), it is possible in low-usage scenarios that the messages per second figure is below the one message per second level. In this case, the string '< 1' is displayed. 'Time of year' and 'Time into simulation' values are displayed at the bottom of the screen.

7.2.4 X.25 Device Errors.

When function 4 of the CID function menu is selected, the X.25 device error screen is displayed on the status terminal. Figure 7-5 shows a display of the X.25 device error screen. The number of 'X's in a field relates the number of characters or digits that field contains.

COMMUNICATIONS INTERFACE DRIVER X.25 ERRORS

XXXX TOTAL X.25 ERRORS

DEV #	PORT #	BAUD RATE	-STATUS- DEV	LINK	LINK INITS	FRAME REJECT XMIT	FRAME REJECT RECEIVE	TX MESSAGE LOST	RX BUFFER FULL	OTHER
1	1	9600	A	C	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
1	1	9600	I	C	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
3	1	9600	A	C	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
4	1	9600	A	D	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
5	1	9600	A	C	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
6	1	9600	A	C	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
7	2	56 K	A	C	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
8			N							
9			N							
10	4	56 K	A	D	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
11			N	C						
12	6	56 K	A	C	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX

A-ACTIVE I-INACTIVE N-NOT CONFIGURED C-CONNECTED D-DISCONNECTED

XX:XX - TIME INTO SIMULATION XX:XX:XX - TIME OF YEAR

FIGURE 7-5. CID X.25 DEVICE ERROR SCREEN

The first four values displayed on this screen are the same as that for the X.25 statistics screen discussed in section 7.2.3. The fifth column, 'Link inits', is not considered an error, but an event which needs to be noted. This value should be '1' for each of the X.25 devices configured in the CIDINIT data base file. This value may increment above one when the device initializes itself during a CID run. 'Link inits' are not included in the 'total X.25 error' count.

The five columns on the right side of the screen contain the errors detected for each individual X.25 device. The last column of errors, labeled 'other' contains a summation of five relatively uncommon errors. This total includes, supervisor command timeouts, receiver overruns, transmitter underruns, and link resets.

7.2.5 Modify X.25 Device Status.

When function 5 of the CID function menu is selected, the X.25 device status screen is displayed on the status terminal. Also, the CID function menu is replaced on the control terminal by the screen shown in figure 7-6.

CID MODIFY X.25 DEVICE STATUS
(ENTER <esc><cr> TO EXIT)

MODIFY WHICH X.25 DEVICE (0 - 11) ?

FIGURE 7-6. CID MODIFY X.25 DEVICE SCREEN

When a device is selected which is not configured, an error message is displayed. A request is then made to reselect an X.25 device number. When a device is selected which has a status of 'active,' a verification question is displayed. When the response is 'yes' to the question, the X.25 device status is changed to 'inactive.' When the response is 'no', processing for the X.25 device selected is ended, and then a request to enter a new device number to be modified is made.

When a device is selected which has a status of 'inactive', a verification question is displayed. When the response is 'yes' to the question, the X.25 device status is changed to 'active'. When the response is 'no', processing for the X.25 device selected is ended and a request to enter a new device number to be modified is made.

7.2.6 CID Create A Message Menu.

When function 6 of the CID function menu is selected, the CID function menu is replaced by the CREATE A MESSAGE screen as shown in figure 7-7.

CID CREATE A MESSAGE MENU

1- CREATE A STANDARD UPLINK MESSAGE
2- CREATE AN ELM UPLINK MESSAGE
3- CREATE A REQUEST FOR DOWNLINK DATA MESSAGE
4- CREATE AN ATCRBS ID REQUEST MESSAGE
5- CREATE A MESSAGE CANCELLATION REQUEST MESSAGE
6- CREATE A NON-SPECIFIED TYPE MESSAGE
7- EXIT

ENTER SELECTION - X

FIGURE 7-7. CID CREATE A MESSAGE MENU

This menu allows for ATC-to-Mode S messages to be created in the format as specified in the "Mode S Surveilance and Communications, ATC and Non-ATC Link Protocols, and Message Formats" document, referenced as FAA-RD-80-14A. The individual messages created are sent out on the designated CID port, with a Mode S identification (Id), a message number, and the required format, all assigned by the user. This function will create only messages with type codes of 21,22,23,24, and 25 as specified in the Functional Requirements of the Communications Interface Driver (CID) document, referenced as DOT/FAA/CT-TN87/41.

7.2.6.1 Create A Standard Uplink Message.

When function 1 of the Create a Message menu is selected, the Create a Standard Uplink message screen is displayed at the lower half of the control terminal as shown in figure 7-8.

```
ASSIGNED MESSAGE NUMBER (0-FF)      - XX
X.25 PORT NUMBER (1 - 6)            - X
MODE S ADDRESS (6 DIGIT HEX)        - XXXXXX
PRIORITY (0 - F HEX)                - X
EXPIRATION (0 - 7 SCANS)            - X
ACKNOWLEDGEMENT ( 0 OR 1)           - X
SEGMENT COUNT ( 0 TO 3)             - X
COMM-A MESSAGE TEXT (14 HEX DIGITS)-
 XXXXXXXXXXXXXX XXXXXXXXXXXXXX XXXXXXXXXXXXXX XXXXXXXXXXXXXX

OK TO SEND MESSAGE (YES/NO) ? Y
```

FIGURE 7-8. CREATE A STANDARD UPLINK MESSAGE

The screen will prompt one command line at a time upon entering a valid input and a carriage return. The command lines will appear in the order shown above. The line which notifies the user to enter the escape key to exit the entry can be ignored at this time until all inputs have been entered. When the user types in all input parameters, a prompt to verify if message is ready to be transmitted, will be as in the bottom of figure 7-8. If the user types a "Y" or a carriage return, then the message will be transmitted on the user designated port. If the user types in an "N", then the cursor will appear back to the top of the screen to retype the inputs. The user need not to re-enter all parameters. This can be done by entering the escape key and a carriage return for that command line. The previous values typed in will be saved as his input.

This message requires that a Mode S Id, a message number, a priority field, an expiration field, and an acknowledgement field be transmitted on the designated port.

The segment count value in the above screen is to determine the number of 14 hex digits to transmit. A value of 0 will only request one set of 14 hex digits, a value of 1 will request two sets of 14 hex digits to transmit, and so on.

The message formats can be referenced to FAA-RD-80-14A document.

7.2.6.2 Create An ELM Uplink Message.

When function 2 of the Create a Message menu is selected, the Create an ELM Uplink message screen is displayed at the lower half of the control terminal as shown in figure 7-9.

```
ASSIGNED MESSAGE NUMBER (0-FF)      - XX
X.25 PORT NUMBER (1 - 6)            - X
MODE S ADDRESS (6 DIGIT HEX)        - XXXXXX
PRIORITY (0 - F HEX)                - X
EXPIRATION (0 - 7 SCANS)            - X
# OF SEGMENTS TO SEND (0 - 4)       - X
ELM DEFAULT TEXT BLOCK (1 - 5)      - X

OK TO SEND MESSAGE (YES/NO) ? Y
```

FIGURE 7-9. CREATE AN ELM UPLINK MESSAGE

The operation of this screen is done in the same format as in the Create a Standard Uplink message screen.

This message requires that a Mode S Id, a message number, a priority field, and an expiration field be transmitted on the designated port.

The number of segments to send value in the above screen is to determine the number of 80-bit ELM text to transmit. A value of 0 will only send one set of ELM default text block, a value of 2 will only send two sets of ELM default text block to transmit, and so on.

The ELM default text block value in the above screen is to determine which ELM default text block to transmit. The default text blocks are in an 80-bit segment formats, with a total number of 400 bits per block as shown in figure 7-10 below:

```
Text block 1  -  AAAAAAAAAAAAAAAAAAAA    Text block 2  -  BBBBBBBBBBBBBBBBBBBB
                 BBBBBBBBBBBBBBBBBBBB                     CCCCCCCCCCCCCCCCCCCC
                 CCCCCCCCCCCCCCCCCCCC                     DDDDDDDDDDDDDDDDDDDD
                 DDDDDDDDDDDDDDDDDDDD                     EEEEEEEEEEEEEEEEEEEE
                 EEEEEEEEEEEEEEEEEEEE                     AAAAAAAAAAAAAAAAAAAA

Text block 3  -  CCCCCCCCCCCCCCCCCCCC    Text block 4  -  DDDDDDDDDDDDDDDDDDDD
                 DDDDDDDDDDDDDDDDDDDD                     EEEEEEEEEEEEEEEEEEEE
                 EEEEEEEEEEEEEEEEEEEE                     AAAAAAAAAAAAAAAAAAAA
                 AAAAAAAAAAAAAAAAAAAA                     BBBBBBBBBBBBBBBBBBBB
                 BBBBBBBBBBBBBBBBBBBB                     CCCCCCCCCCCCCCCCCCCC

Text block 5  -  EEEEEEEEEEEEEEEEEEEE
                 AAAAAAAAAAAAAAAAAAAA
                 BBBBBBBBBBBBBBBBBBBB
                 CCCCCCCCCCCCCCCCCCCC
                 DDDDDDDDDDDDDDDDDDDD
```

FIGURE 7-10. ELM DEFAULT TEXT BLOCK

The message formats can be referenced to FAA-RD-80-14A document.

7.2.6.3 Create A Request For Downlink Data Message.

When function 3 of the Create a Message menu is selected, the Create a Request for Downlink Data message is displayed at the lower half of the control terminal as shown in figure 7-11.

```
ASSIGNED MESSAGE NUMBER (0-FF)      - XX
X.25 PORT NUMBER (1 - 6)            - X
MODE S ADDRESS (6 DIGIT HEX)        - XXXXXX
PRIORITY (0 - F HEX)                - X
EXPIRATION (0 - 7 SCANS)            - X
BDS1 AND BDS2 (00 - FF HEX)         - XX

OK TO SEND MESSAGE (YES/NO) ? Y
```

FIGURE 7-11. CREATE A REQUEST FOR DOWNLINK DATA MESSAGE

The operation of this screen is done in the same format as in the Create a Standard Uplink message screen.

This message requires that a Mode S Id, a message number, a priority field, an expiration field, and the bds field be transmitted on the designated port.

The message formats can be referenced to FAA-RD-80-14A document.

7.2.6.4 Create An ATCRBS Id Request Message.

When function 4 of the Create a Message menu is selected, the Create an Air Traffic Control Radar Beacon System (ATCRBS) Id Request message is displayed at the lower half of the control terminal as shown in figure 7-12.

```
ASSIGNED MESSAGE NUMBER (0-FF)      - XX
X.25 PORT NUMBER (1 - 6)            - X
MODE S ADDRESS (6 DIGIT HEX)        - XXXXXX

OK TO SEND MESSAGE (YES/NO) ? Y
```

FIGURE 7-12. CREATE AN ATCRBS ID REQUEST MESSAGE

The operation of this screen is done in the same format as in the Create a Standard Uplink message screen.

This message only requires that a Mode S Id and a message number be transmitted on the designated port.

The message formats can be referenced to FAA-RD-80-14A document.

7.2.6.5 Create A Message Cancellation Request Message.

When function 5 of the Create a Message menu is selected, the Create a Message Cancellation Request message is displayed at the lower half of the control terminal as shown in figure 7-13.

```
ASSIGNED MESSAGE NUMBER (0-FF)        - XX
 X.25 PORT NUMBER (1 - 6)             - X
MODE S ADDRESS (6 DIGIT HEX)          - XXXXXX
REFERENCE MESSAGE NUMBER (0-7F HEX)- XX
REFERENCE TYPE CODE (0-FF HEX)        - XX

OK TO SEND MESSAGE (YES/NO) ? Y
```

FIGURE 7-13. CREATE A MESSAGE CANCELLATION REQUEST MESSAGE

The operation of this screen is done in the same format as in the Create a Standard Uplink message screen.

This message requires that a Mode S Id, a reference message number, and a reference type code be transmitted on the designated port.

The message formats can be referenced to FAA-RD-80-14A document.

7.2.6.6 Create A Nonspecified Type Message.

When function 6 of the Create a Message menu is selected, the Create a Nonspecified Type message is displayed at the lower half of the control terminal as shown in figure 7-14.

```
ASSIGNED MESSAGE NUMBER (0-FF)          - XX
 X.25 PORT NUMBER (1 - 6)               - X
MESSAGE LENGTH IN BYTES (1-14 HEX)      - XX
MESSAGE BIT STREAM (IN HEX)             - XXXXXXXXXXXXXXXXXXXX

OK TO SEND MESSAGE (YES/NO) ? Y
```

FIGURE 7-14. CREATE A NONSPECIFIED TYPE MESSAGE

The operation of this screen is done in the same format as in the Create a Standard Uplink message screen.

This message requires that a message number, but no Mode S Id be transmitted on the designated port. The message length will determine how many hexadecimal (1 to 20 decimal) characters to transmit. If a 1 is entered, then only one hex character is needed to enter, if a 2 is entered, then two hex characters are needed to enter, and so on.

The message formats are not referenced in the FAA-RD-80-14A document. This message is only a user created type message.

7.2.7 Display Message List Option Menu.

When function 7 of the CID function menu is selected, the CID function menu is replaced by the CID DISPLAY MESSAGE LIST OPTION screen as shown in figure 7-15.

CID DISPLAY MESSAGE LIST OPTION MENU

```
1- VIEW A MESSAGE
2- ADD A MODE S ID TO THE SEARCH LIST
3- DELETE A MODE S ID FROM THE SEARCH LIST
4- EXIT PROCESSING

ENTER SELECTION -  X
```

FIGURE 7-15. CID DISPLAY A MESSAGE LIST OPTION MENU

This menu allows for Mode S-to-ATC messages as specified in the "Mode S Surveillance and Communications, ATC and Non-ATC Link Protocols, and Message Formats" document, referenced as FAA-RD-80-14A, be displayed on the status terminal. This function will display only messages with type codes of 31,32,41,42,44, and 45 as specified in the Functional Requirements of the Communications Interface Driver (CID) document, referenced as DOT/FAA/CT-TN87/41. The CID input messages will only be displayed if its Mode S Id matches that of the search list. The user has the ability to add and delete an Id to and from the search list.

When this function is selected from the CID function menu it will also display the CID DISPLAY MESSAGE LIST on the status terminal similar to the one as shown in figure 7-16.

CID DISPLAY MESSAGE LIST

	TIME	MSG #	MODE S ID	MESS TYPE	REF. #	PORT #	LENGTH/QUAL/DI
	04:05	1	XXXXXX	ELM	XXX	XX	XXXX
	04:08	2	XXXXXX	COMB	XXX	XX	XXXX
	04:20	3	XXXXXX	DEL	XXX	XX	DEL
	04:30	4	XXXXXX	DEL	XXX	XX	EXP
	04:40	5	XXXXXX	REJ	XXX	XX	NO ELM
	05:32	6	XXXXXX	REJ	XXX	XX	NOT PR
	05:33	7	XXXXXX	REJ	XXX	XX	NO TGT
=>	05:40	8	XXXXXX	REJ	XXX	XX	NOT RC
	02:01	9	XXXXXX	CAP	XXX	XX	XXXX
	02:03	10	XXXXXX	4096	XXX	XX	XXXX
	02:05	11	XXXXXX	XXXX	XXX	XX	XXXX
	02:06	12	XXXXXX	XXXX	XXX	XX	XXXX
	02:10	13	XXXXXX	XXXX	XXX	XX	XXXX
	02:32	14	XXXXXX	XXXX	XXX	XX	XXXX
	03:00	15	XXXXXX	XXXX	XXX	XX	XXXX
	03:03	16	XXXXXX	XXXX	XXX	XX	XXXX
	03:10	17	XXXXXX	XXXX	XXX	XX	XXXX
	03:32	18	XXXXXX	XXXX	XXX	XX	XXXX
	04:00	19	XXXXXX	XXXX	XXX	XX	XXXX
	04:03	20	XXXXXX	XXXX	XXX	XX	XXXX

FIGURE 7-16. CID DISPLAY MESSAGE LIST SCREEN

The CID Display Message list will display up to 20 messages with a message number associated which each one and a pointer to the most recent occurrence. With each message will be displayed its Mode S Id, message type, reference number, port number, status field, and the time it was input to the CID. Any messages after the first 20 messages will be wrapped around to message number 1.

For the status column (LENGTH/QUAL/DI), if a message was of an ELM type, then the length of the ELM will be displayed. For messages of a COMB type, the segment count of the COMB will be displayed. For messages of a CAP type, the basic capability of the CAP will be displayed. For messages of a 4096 type, the ATCRBS code of the 4096 will be displayed. For messages of a DEL type, if the delivery indicator bit was a 0, then the text 'DEL' will be displayed, or if it was a 1, then it will display the text as 'EXP'. For messages of an REJ type, if the qualifier block was a 0, then the text 'NO TGT' will be displayed, or if it was a 1, then it will display the text as 'NOT RC', or if was a 3, then it will display the text as 'NOT PR', or if it was a 4, then it will display the text as 'NO ELM'.

7.2.7.1 View A Message.

When function 1 of the CID Display a Message List Option menu is selected, the View a Message function is displayed at the lower half of the control terminal similar to the one shown as in figure 7-17.

ENTER MESSAGE NUMBER TO DISPLAY (1 - 20)- XX

TIME	MSG #	MODE S ID	MESS TYPE	REF. #	PORT #	LENGTH/QUAL/DI
04:05	XX	XXXXXX	ELM	XXX	XX	XXXX

ABCDEFGHIJKLMNOPQRSTUVWXYZABCDEFGHIJKLMNOPQRSTUVWXYZABCABCDEFGHIJKLMNOPQ
ABCDEFGHIJKLMNOPQRSTUVWXYZABCABCDEFGHIJKLMNOPQRSTUVWXYZABCDEFGHIJKLMNOPQ
ABCDEFGHIJKLMNOPQRSTUVWXYZABCABCDEFGHIJKLMNOPQRSTUVWXYZABCDEFGHIJKLMNO

FIGURE 7-17. VIEW A MESSAGE SCREEN

This function allows the user select any of those messages displayed on the status terminal and view it in more detail. The message will be displayed exactly as it was on the status terminal, except the entire context of the message will be displayed in hexadecimal just below it as shown above in figure 7-17. If there are no messages displayed on the status screen or at any requested message numbers, or the input is not in decimal, then an error message is displayed and a response to re-enter a message number is requested.

7.2.7.2 Add A Mode S Id To The Search List.

When function 2 of the CID Display a Message List Option menu is selected, the Enter Id To the Search List function is displayed at the lower half of the control terminal similar to the one shown as in figure 7-18.

IDS IN SEARCH LIST - XXXXXX
ENTER ID (6 HEX DIGITS) TO THE SEARCH LIST - XXXXXX

FIGURE 7-18. ENTER ID TO THE SEARCH LIST SCREEN

This function allows the user to enter a Mode S id with a 6-hex digit number to the search list. When an Id is added to the search list, those message that are input to the CID, with the same Id, will be displayed on the CID Display Message List screen as in figure 7-16. To exit this function, the user can enter the escape key and carriage return.

If the Id typed in is less than a 6-hex digits or is not in hex, then an error message is prompted and a response to re-enter the input id is requested. When the id is properly entered to the search list, then the user is directed back to the CID Display a Message List Option menu as shown in figure 7-15. When the user selects to enter the second Mode S Id to the search list after the first Id is entered, the user can view the first Id and enter his second, and so forth. Should the user type in the same Id as any on the search list, then a message will prompt him that it already exist. If the search list is full, an error message will prompt and the user is requested to select another function.

7.2.7.3 Delete A Mode S Id From The Search List.

When function 3 of the CID Display a Message List Option menu is selected, the Enter An Id To Delete from the Search List function is displayed at the lower half of the control terminal similar to the one shown as in figure 7-19.

```
IDS IN SEARCH LIST - XXXXXX
ENTER AN ID TO DELETE FROM THE SEARCH LIST - XXXXXX
```

FIGURE 7-19. ENTER ID TO DELETE FROM THE SEARCH LIST SCREEN

This function allows the user to delete a Mode S Id from the search list. When an Id is deleted from the search list, those messages input to the CID with that corresponding Id will not be displayed on the CID Display Message List screen in figure 7-16. To exit this function, the user can enter the escape key and carriage return.

If the Id typed in is not in hex or the Id does not exist on the search list, then an error message is prompted and a response to re-enter the input Id is requested. When the Id is properly entered to the search list, then the user is directed back to the CID Display a Message List Option menu as shown in figure 7-15. When the user selects to delete the second Mode S Id from the search list after the first Id is deleted, the user can view the first Id deleted and delete his second, and so forth. If the search list is empty, an error message will prompt and the user is requested to select another function.

7.2.8 Data Extraction Control.

When function 8 of the CID function menu is selected, the status of data extraction is toggled. The CID status screen (function 1) is displayed on the status terminal to emphasize this change. When changing the data extraction status from the disabled to the enabled state, an extraction tape must be mounted on the tape drive and the tape drive must be on-line. When the tape drive is not accessible for use, the request to enable data extraction is ignored.

7.2.9 CID Termination.

When function 9 of the CID function menu is selected, the message:

```
OK TO TERMINATE (Y/N) ?
```

appears beneath the CID function menu. When the response is 'no', the CID function menu is displayed on the control terminal. When the response is 'yes', the CID program terminates. The message,

```
***************** CID SYSTEM TERMINATED ****************
****** PLEASE RETURN SWITCH TO CONSOLE POSITION ********
```

is displayed beneath the CID function menu. Once the switch on the control box is turned to the console position, the terminal is once again the system console.

8. CID DATA ANALYSIS.

There are two data analysis routines which are used to analyze the performance of the CID. These programs are the Scenario Lister program (SCLIST) and the Extraction Lister program (EXLIST). SCLIST lists a message scenario file in time-ordered sequence and gives a loading summary of the scenario. EXLIST uses an extraction tape and the message scenario file named on the extraction tape to list the contents of the extraction tape in time order, provide a loading summary of the scenario, and check the extraction tape against the scenario file to determine inconsistencies.

8.1 SCENARIO LIST PROGRAM.

The capabilities of the SCLIST program are listed below.

a. Allows the user to select filter boundaries including:

   1. time
   2. reference number
   3. Mode S ID
   4. port number
   5. typecode

b. Lists the messages within the filter boundaries.

c. Counts the number of bytes and messages per:

   1. typecode within the filter boundaries
   2. port within the filter boundaries
   3. track within the filter boundaries

The SCLIST program must be run under MTM. SCLIST is then loaded by entering 'SCLIST' on a user terminal. Once the program is loaded, the filter boundary screen of figure 8-1 appears.

```
          Filename  :  1 to 8 characters >
              Time  :  00:00:00-24:00:00 >
     Reference #    :    000000-FFFFFF   >
       Mode S Id    :    000000-FFFFFF   >
              Port  :         1-6        >
   All typecodes    :          Y         >
    All log recs    :          Y         >
    List records    :          Y         >
      List stats    :          Y         >
   Verify option    :          N         >
```

FIGURE 8-1. SCLIST AND EXLIST COMMON FILTER SCREEN

In response to this screen, enter a message scenario filename to be processed. When the filename entered is not present on disc, an error message appears and the same information is again requested. After a valid filename is accepted, an

<esc><cr>' can be entered, at any time, to accept the filter boundaries as configured to that point. Otherwise, the cursor is next positioned at the time filter boundary field. The time filter boundary field allows either the initial or final time to be absent. Also, the initial time must not be greater than the final time. The next value to be entered is the reference number. This is a 24-bit hex number used to uniquely identify each message in the scenario. The Mode S Id value is also a 24-bit hex value, used to identify a Mode S target. The port number is a number from one through six used to identify the ATC and non-ATC facilities. Next, all, or a subset of the typecodes may be modified. When 'no' is entered in response to the typecode query, the screens of figures 8-2, 8-3, 8-4, 8-5, and 8-6 appear sequentially. Figures 8-3 and 8-6 are not used in the SCLIST program and are skipped over with a <cr>. As few or as many of the message types can be selected by placing an 'X' next to the desired type. Termination of any of these screens is accomplished by typing an '<esc><cr>' at any time. The next field, the 'All logical records' field is not processed in the SCLIST program. Instead the next field to be processed is the 'List records' field. Enter 'Yes' when a list of the selected logical records is desired. The next field to be processed is the 'List stats' field. Enter 'yes' when a list of the statistics computed by the SCLIST program is desired. The 'Verify option' is skipped in the SCLIST program.

The SCLIST program prints status and error messages on the user terminal as it runs. It also generates a file that has the same name as the message scenario filename on the filter boundary screen of figure 8-1, but has the extension 'scl'. This output file is displayed on the screen by using the 'TYPE' command or it is printed out by using the 'PRINT' command. This file contains a listing, when the list option is selected, and the counts described in the beginning of this section when the list stats option is selected.

Place an 'X' next to the desired message types

<u>ATC-Mode S Messages</u>

Standard Uplink	>
ELM Uplink	>
Request for Downlink Data	>
ATCRBS ID Request	>
Message Cancellation Request	>
Test Message	>
ATC Failure/Recovery Message	>
Data Link Capability Request	>
Sensor failure/Recovery Message	>
Mode S Aircraft Control State Message	>

FIGURE 8-2. SCLIST AND EXLIST ATC-MODE S MESSAGE SCREEN

Place an 'X' next to the desired message types

Mode S-ATC Messages

Message Rejection Delay Notice	>
Uplink Delivery Notice	>
Standard Downlink	>
ELM Downlink	>
Data Link Capability	>
ATCRBS ID Code	>
Test Response Message	>
Track Alert Message	>
Sensor Recovery Notice Messages	>
Status Message	>

FIGURE 8-3. SCLIST AND EXLIST MODE S-ATC MESSAGE SCREEN

Place an 'X' next to the desired message types

Sensor-Sensor Messages

Data Start Message	>
Track Data Message	>
Data Stop Message	>
Data Request Message	>
Cancel Request Message	>
Primary Coordination Message	>
Track Alert Message	>
ATCRBS Data Request Message	>
ATCRBS Track Data Messgage	>
ATCRBS Data Start Message	>
ATCRBS Data Stop Message	>
ATCRBS Cancel Request Message	>
Status Message	>
Adjacent sensor Status Message	>

FIGURE 8-4. SCLIST AND EXLIST SENSOR-SENSOR MESSAGE SCREEN

Place an 'X' next to the desired message types

Non ATC-Mode S Messages

Standard Uplink	>
ELM Uplink	>
Request for Downlink Data	>
Message Cancellation Request	>
Data Link Capability Request	>
Request for Aircraft State	>
Request for Aircraft Position	>

FIGURE 8-5. SCLIST AND EXLIST NON ATC-MODE S MESSAGE SCREEN

Place an 'X' next to the desired message types

Mode S-Non ATC Messages

Message Rejection/Delay Notice	>
Message Rejection Notice w/ Sensor IDs	>
Uplink Delivery Notice	>
Standard Downlink	>
Standard Downlink w/ Position	>
ELM Downlink	>
ELM Downlink with Position	>
Data Link Capability	>
Aircraft State	>
Aircraft Position	>
Track Drop	>
Sensor Recovery Notice Messages	>

FIGURE 8-6. SCLIST AND EXLIST MODE S-NON ATC MESSAGE SCREEN

8.2 DATA EXTRACTION LIST PROGRAM.

The capabilities of the EXLIST program are listed below.

a. Allows the user to select filter boundaries including:

   1. time
   2. reference number
   3. Mode S ID
   4. port number
   5. typecode
   6. logical record

b. Lists the messages within the filter boundaries.

c. Counts the number of bytes and messages per:

1. typecode within the filter boundaries
2. port within the filter boundaries
3. line within the filter boundaries
4. track within the filter boundaries

d. Counts the delta-times between the scenario message and the transmitted output message within the filter boundaries.

e. Verifies that all the messages in the scenario are transmitted.

f. Verifies that all the messages in the scenario are transmitted over the lines assigned to the port referenced within the scenario.

The EXLIST program must be run from an MTM terminal as in section 4.1.1. A CID extraction tape needs to be loaded on the tape drive. The EXLIST program is then loaded by typing 'EXLIST'. On systems with a second tape drive, the EXLIST program can access that drive by using the command 'EXLIST MT2:' to load the program. When the program is loaded, the filter boundary screen of figure 8-1 appears on the user terminal.

The initial filename field of the filter boundary screen is filled with the scenario filename read from the extraction tape. The cursor is then positioned at the time field. The filter boundary screen is then filled as described in section 8.1, the exceptions being that responses are requested for both the 'All log records' and 'Verify option' prompts and the initial time has been defaulted to the actual simulation start time. The 'All log record' prompt requests whether all of the logical record types are to be in the filter. Figure 8-7 shows the logical record filter screen. The 'Verify option' prompt requests whether the verification phase of the EXLIST program shall be run. This verification checks to insure that all scenario messages are accounted for on the extraction tape and that the physical line that each message was sent on is correct given the scenario port number for that message and the port-to-line configuration used during the simulation. Errors found by the verification test are output onto the user's MTM terminal.

Place an 'X' next to the desired logical records

Input Message	>
Output Message	>
Output Message Buffer	>
Output Message Term	>
Old Buffer	>
X.25 Line Configuration	>
X.25 Baud Rate	>
X.25 Default Text	>
Errors	>
X.25 Errors	>
Track Data Name	>
Configuration Name	>
Scenario Name	>
Initial TOY	>

FIGURE 8-7. SCLIST AND EXLIST LOGICAL RECORD TYPE LIST SCREEN

The option to modify the typecode filter boundaries shown in figures 8-2 through 8-7 is maintained, as in SCLIST.

The EXLIST program prints status and error messages on the user terminal as it runs. The program also generates a file that has the same name as the message scenario filename on the filter boundary screen of figure 8-1, but has the extension '.EXL'. This output file is displayed on the screen by using the 'TYPE' command or it is printed out by using the 'PRINT' command. This file contains a listing of messages within the filter boundaries, when the list records option is selected, and the counts described in the beginning of this section when the list statistics option is chosen.

APPENDIX A

DATA EXTRACTION FORMATS

The CID real-time program uses a standard nine-track tape, at a recording density of 1600 BPI to generate data extraction tapes. The physical record size is 8192 Bytes/Record. The logical record size depends on the type of data which is extracted.

Each data extraction logical record contains a 3 word header block. The format number is unique to the type of extraction data written to the tape. The format number and the record size are zero for the last logical record of each physical record. The record size is the number of bytes found in the extracted data. The TOY Time field consists of 48 bits (6 bytes) of data. The entire field is extracted by format numbers 98 and 99. Only the least significant 32 bits (4 bytes) are extracted with each logical record. An example of a data extraction logical record is shown below.

31	15	0
FORMAT NUMBER (FORMAT #)	RECORD SIZE (# OF BYTES)	
SCENARIO TIME (lsb = 1.024 msec)		
TOY TIME (lower 4 bytes)		
.		
EXTRACTED DATA		
.		

A list of all the format numbers used by data extraction is shown in figure A-1.

FORMAT #	DESCRIPTION
10 - 21	Input Message (10 + LINE NUMBER)
30	Output Message
31	Output Buffer
32	Output Terminated
33	Old Buffer
50	X.25 Port Assignments
51	X.25 Baud Rate Assignments
52	X.25 Default Message Contents
91	System Errors
92	X.25 Errors
95	Track Data Filename
96	Initialization Data Base Filename
97	Message Scenario Filename
98	Initial Time of Year
99	Final Time of Year

FIGURE A-1. DATA EXTRACTION LOGICAL RECORD TYPES

31	15	0
FORMAT NUMBER (10 - 21)	RECORD SIZE (LENGTH OF MSG.)	
SCENARIO TIME		
TOY TIME		
INPUT MESSAGE		

FORMAT NUMBER is computed by adding 10 to the LINE NUMBER

FIGURE A-2. INPUT MESSAGE EXTRACTION FORMAT

31	30	23	15	0
FORMAT NUMBER (30)			RECORD SIZE (8 * # OF MSGS.)	
SCENARIO TIME				
TOY TIME				
D	LEN. BYTES	SCENARIO REFERENCE # (OF FIRST MSG)		
LINE (OF FIRST MSG)			CODE (OF FIRST MSG)	
D	LEN. BYTES	SCENARIO REFERENCE # (OF SECOND MSG)		
LINE (OF SECOND MSG)			CODE (OF SECOND MSG)	
D	LEN. BYTES	SCENARIO REFERENCE # (OF LAST MSG)		
LINE (OF LAST MSG)			CODE (OF LAST MSG)	

'D' is the default message flag
'LEN. BYTES' is the length in bytes of each OUTPUT MESSAGE
'CODE' values are; 00 - message sent
1X - message saved
3X - OLD LIST full (message lost)
52 - message too old (message lost)
7X - fatal error (message lost)
'X' is the error code returned by the X.25 ISR where;
2 is BUFFER NOT AVAILABLE
4 is LINK NOT CONNECTED
5 is LINK NOT ACTIVE
8 is PACKET BYTE LENGTH ERROR
9 is ILLEGAL DEVICE NUMBER

FIGURE A-3. OUTPUT MESSAGE EXTRACTION FORMAT

31	15	0
FORMAT NUMBER (31)	RECORD SIZE (4)	
SCENARIO TIME		
TOY TIME		
CODE	SCENARIO BUFFER NUMBER	

'CODE' values are; 0 - GOOD BUFFER
1 - EMPTY BUFFER
2 - BAD BUFFER

FIGURE A-4. OUTPUT NEW BUFFER EXTRACTION FORMAT

31	27	23	19	15	11	7	3	0
FORMAT NUMBER (32)				RECORD SIZE (4)				
SCENARIO TIME								
TOY TIME								
7	F	F	F	F	F	F	F	

FIGURE A-5. OUTPUT TERMINATED EXTRACTION FORMAT

31	15	0
FORMAT NUMBER (33)	RECORD SIZE (4)	
SCENARIO TIME		
TOY TIME		
SCENARIO BUFFER NUMBER	SCENARIO REFERENCE NUMBER	

FIGURE A-6. OLD BUFFER EXTRACTION FORMAT

31	23	15	7	0
FORMAT NUMBER (50)		RECORD SIZE (24)		
SCENARIO TIME				
TOY TIME				
LINE 0 PORT NUMBER		LINE 1 PORT NUMBER		
.		.		
.		.		
.		.		
LINE 10 PORT NUMBER		LINE 11 PORT NUMBER		

'PORT NUMBER' is a value from 1 to 6, or -1 when the line is not configured.

FIGURE A-7. X.25 PORT ASSIGNMENTS EXTRACTION FORMAT

31	23	15	7	0
FORMAT NUMBER (51)		RECORD SIZE (12)		
SCENARIO TIME				
TOY TIME				
LINE 0 BAUD !	LINE 1 BAUD	LINE 2 BAUD !	LINE 3 BAUD	
LINE 4 BAUD !	LINE 5 BAUD	LINE 6 BAUD !	LINE 7 BAUD	
LINE 8 BAUD !	LINE 9 BAUD	LINE 10 BAUD !	LINE 11 BAUD	

'BAUD' is the Baud Rate of the LINE; 0 when 9600 Baud
1 when 56 Kbaud
-1 when the line is not configured

FIGURE A-8. X.25 BAUD RATE ASSIGNMENTS EXTRACTION FORMAT

31	15	0
FORMAT NUMBER (52)	RECORD SIZE (DEF MESS LENGTH)	
SCENARIO TIME		
TOY TIME		
DEFAULT MESSAGE		

'DEF MESS LENGTH' is the length in BYTES of the DEFAULT MESSAGES;
36 is the length of the STANDARD UPLINK
648 is the length of the ELM UPLINK

FIGURE A-9. X.25 DEFAULT MESSAGE EXTRACTION FORMAT

31	15	0
FORMAT NUMBER (91)	RECORD SIZE (120)	
SCENARIO TIME		
TOY TIME		
THIRTY SYSTEM ERROR COUNTS		

ERROR	- DESCRIPTION	ERROR	- DESCRIPTION
1	- EXTRACTION I/O	16	- X.25 PACKET ERROR
2	- MESSAGE SCENARIO I/O	17	- LINK NOT ACTIVE
3	-	18	-
4	- OP COMM I/O	19	-
5	- EXTRACTION MESSAGES LOST	20	-
6	-	21	-
7	-	22	-
8	- SCENARIO BUFFERS OVERWRITE	23	-
9	- EMPTY SCENARIO BUFFERS	24	-
10	- BAD PORT NUMBER FOUND	25	-
11	- ILLEGAL X.25 LINE	26	-
12	- SAVELIST FOUND EMPTY	27	-
13	- SAVELIST FULL	28	-
14	- BAD LINE NUMBER ON INPUT	29	-
15	-	30	-

NOTE- ERRORS ARE CUMULATIVE COUNTERS, THEREFORE INTERVAL ERRORS MAY BE DETERMINED BY THE COMPARISON OF ADJACENT RECORDS.

FIGURE A-10. SYSTEM ERROR EXTRACTION FORMAT

31	23	15	7	0
FORMAT NUMBER (92)		RECORD SIZE (336)		
SCENARIO TIME				
TOY TIME				

(X.25 Device 0)

FCS ERROR	SHORT FRAME	T1 EXPIRATIONS	UNUSED
REJECTION RXd	REJECTION TXd	UNUSED	UNUSED
LINK INITIALIZATIONS		FRAME REJECTS ON TRANSMIT	
FRAME REJECTS ON RECEIVE		TRANSMIT BUFFERS FULL	
RECEIVE BUFFERS FULL		S COMMAND TIME OUT	
RECEIVER UNDERRUN		TRANSMITTER UNDERRUN	
LINK RESETS		UNKNOWN ERRORS	

. . . .
. . . .
. . . .

(X.25 Device 11)

FCS ERROR	SHORT FRAME	T1 EXPIRATIONS	UNUSED
REJECTION RXd	REJECTION TXd	UNUSED	UNUSED
LINK INITIALIZATIONS		FRAME REJECTS ON TRANSMIT	
FRAME REJECTS ON RECEIVE		TRANSMIT BUFFERS FULL	
RECEIVE BUFFERS FULL		S COMMAND TIME OUT	
RECEIVER UNDERRUN		TRANSMITTER UNDERRUN	
LINK RESETS		UNKNOWN ERRORS	

FIGURE A-11. X.25 ERROR EXTRACTION FORMAT

31	15	0
FORMAT NUMBER (95)	RECORD SIZE (8)	
SCENARIO TIME		
TOY TIME		
TRACK DATA FILENAME (FIRST FOUR BYTES)		
TRACK DATA FILENAME (LAST FOUR BYTES)		

FIGURE A-12. TRACK DATA FILENAME EXTRACTION FORMAT

31	15	0
FORMAT NUMBER (96)	RECORD SIZE (8)	
SCENARIO TIME		
TOY TIME		
INITIALIZATION DATA BASE FILENAME (FIRST FOUR BYTES)		
INITIALIZATION DATA BASE FILENAME (LAST FOUR BYTES)		

FIGURE A-13. INITIALIZATION DATA BASE FILENAME EXTRACTION FORMAT

31	15	0
FORMAT NUMBER (97)	RECORD SIZE (8)	
SCENARIO TIME		
TOY TIME		
MESSAGE SCENARIO FILENAME (FIRST FOUR BYTES)		
MESSAGE SCENARIO FILENAME (LAST FOUR BYTES)		

FIGURE A-14. MESSAGE SCENARIO FILENAME EXTRACTION FORMAT

31	15	0
FORMAT NUMBER (98)	RECORD SIZE (8)	
SCENARIO TIME		
TOY TIME		
	TOY TIME (HIGHEST 2 BYTES)	

FIGURE A-15. INITIAL TIME-OF-YEAR EXTRACTION FORMAT

31	15	0
FORMAT NUMBER (99)	RECORD SIZE (8)	
SCENARIO TIME		
TOY TIME		
	TOY TIME (HIGHEST 2 BYTES)	

FIGURE A-16. FINAL TIME-OF-YEAR EXTRACTION FORMAT

31	15	0
FORMAT NUMBER (0)	RECORD SIZE (0)	

FIGURE A-17. END OF PHYSICAL RECORD EXTRACTION FORMAT