

MAGNASTAR C-2000 DIGITAL AIRBORNE TELEPHONE SYSTEM

9.1.10 UNLOCKED ONLINE STATE

This test step is a mode change only. Failure of this mode change will only occur if the MMT is not communicating with the ARTU. This mode change will place the C-2000 back into an operational mode and allow the installer to perform normal system functions.

Symptom: ERROR=> MMT communications failure - timed out.

If this message is displayed in the Radio Responses window then check the cabling between the ARTU and the MMT. If the cabling is correct then press "R" to repeat the test.

-----V4.0A MMT Radio Responses--

Radio software executing in unlocked online state.

+-----VIA MMT Tutorial-----+

INS1A205

Symptom: "Radio software executing in unlocked online state" is not shown

- a) Check MMT cable connection.
- b) Press "R" to repeat test.

Figure 9. 10. Unlocked On-line State MMTI Troubleshoot Screen.

MAGNASTAR C-2000 DIGITAL AIRBORNE TELEPHONE SYSTEM**9.1.11 RECEIVE SIGNAL STRENGTH MEASUREMENT USING GENSTAR GROUND STATION**

This test step is a verification of operational capabilities of the C-2000 if the installer is able to monitor a GTE Airfone Ground Station from the location at which the system is being installed. If communications with a ground station is possible, the Pilot Status screen will indicate that the ARTU is in sync with the ground station Pilot control channel.

```

      ---V4.0A MMT Radio Responses
C-2000 reports status update ENABLED.

      Press F2 to View Status Display
-----
      VIA MMT Tutorial
INSIA115
Symptom: System does not appear to be monitoring a groundstation.
a) Have you waited several minutes for the pilot scanning to complete and
the system to lock on and monitor a groundstation.
b) Are you sure that the location you are currently at will support
communications between the ARTU and the groundstation? Check to see
that this "line of sight" RF system is not blocked, i.e. the antenna
is not blocked by carts, hangers doors being closed or a building in
the way.

      (R)eturn: _
-----
```

Figure 9. RSS Measurement Using GenStar Ground Station MMTI Troubleshoot Screen.

MAGNASTAR C-2000 DIGITAL AIRBORNE TELEPHONE SYSTEM**9.1.12 MMTI Troubleshoot Conclusion**

The MMT installation tutorial is concluded with a troubleshoot screen that provides the telephone number of the MagnaStar "STARLINE". This number can be used to contact MagnaStar personnel concerning questions about the MMT or C-2000 troubleshooting problems. The STARLINE number is 888-246-STAR (7827).

-----V4.0A MMT Radio Responses--

-----VIA MMT Tutorial-----

INS1A116

Please direct questions or comments concerning MMTI operation
to the MagnaStar Engineering department on the STARLINE at
888-246-STAR (7827).

(R)eturn: _

9. 12. MMTI Conclusion Troubleshoot Screen.

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9.2 Additional MMTI Troubleshoot Information

This section provides additional tests that may be used for troubleshooting or system check-out. Tests in this section require the use of the MMTI commanded mode screens. See section 9.3 for information detailing navigation and description of the various MMTI commanded mode screens.

9.2.1 Data Cable Pull Check

The data cable pull check can be a useful test for finding intermittent cable connections between CDBRs or between a CDBR and an ARTU. This test is performed using the MMTI commanded mode. This test involves monitoring debug messages on one of the MMTI status screens while moving the data cables. The performance of this test requires the ARTU to be placed in a "locked offline state" in order to easily review the MMTI debug messages. While in the "locked offline state" the "71 PAB_BIT TASK" debug screen will display a message if the ARTU detects an intermittent connection. The MMTI will display "AMX_IN_SYNC message received from AMX DSP LAN Adr=xx" on the debug screen if an intermittent connection is detected as shown in Figure 9.2.1. The message "DQ2 DSP_ERROR_CODE rcvd from DSP #14, HDRI=100 hex" message will appear every 15 seconds on the debug screen when the ARTU is placed in the proper mode and the correct debug screen selected. If an intermittent connection is detected, check the cable for proper seating, damage, and bad or broken solder joints. Swapping of a CDBR or AIU may be necessary to isolate intermittent or damaged connectors on the units themselves. The steps for performing the data cable pull check are as follows:

- Power up the ARTU and let it complete Built-In-Test.
- Connect the MMT cable to the ARTU and the computer.
- Start the MMTI software and select commanded mode of operation.
- Select the Goto Radio Installation/Test Menu.
- Select the Set Radio Locked/Offline command.
- Press the escape key.
- Goto Radio Maintenance Operations Menus.
- Goto Debug Menu.
- Enable/Disable All Debug Msgs.
- Enable All Debug Msgs.
- Select No to Log Debug messages.
- Press the "F1" key three times to scroll to the 71 PAB_BIT TASK Debug screen.
- The message "DQ2 DSP_ERROR_CODE rcvd from DSP #14, HDRI=100 hex" message will appear every 15 seconds on the debug screen.
- Move cables and look for intermittent connections on the MMTI Debug screen.

```

-----71 PAB_BIT TASK-----
:15:14:28 1 DQ2 DSP_ERROR_CODE rcvd from DSP #14, HDRI = 100 hex
:15:14:43 1 DQ2 DSP_ERROR_CODE rcvd from DSP #14, HDRI = 100 hex
:15:14:58 1 DQ2 DSP_ERROR_CODE rcvd from DSP #14, HDRI = 100 hex
:15:15:13 1 DQ2 DSP_ERROR_CODE rcvd from DSP #14, HDRI = 100 hex
:15:15:19 1 SYNC_NOT message received from AMX DSP, LAN Adr = 0
:15:15:20 1 AMX_IN_SYNC message received from AMX DSP, LAN Adr = 2
:15:15:21 1 AMX_IN_SYNC message received from AMX DSP, LAN Adr = 2
:15:15:28 1 DQ2 DSP_ERROR_CODE rcvd from DSP #14, HDRI = 100 hex
:15:15:43 1 DQ2 DSP_ERROR_CODE rcvd from DSP #14, HDRI = 100 hex
:15:15:58 1 DQ2 DSP_ERROR_CODE rcvd from DSP #14, HDRI = 100 hex
:15:16:10 1 SYNC_NOT message received from AMX DSP, LAN Adr = 0
:15:16:11 1 AMX_IN_SYNC message received from AMX DSP, LAN Adr = 2
:15:16:13 1 DQ2 DSP_ERROR_CODE rcvd from DSP #14, HDRI = 100 hex
:15:16:28 1 DQ2 DSP_ERROR_CODE rcvd from DSP #14, HDRI = 100 hex

```

Figure 9.2. 71 PAB_BIT TASK Debug screen for Data Cable Pull Test.

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To return the C-2000 system to normal operation, use the following steps:

- After completion, press the "F2" three times.
- Press "ESC" several times to return to the C-2000 MMT Main Menu.
- Select the Goto Radio Installation/Test Menu.
- Select the Set Radio UnLocked/Online command.

9.2.2 Fault Counter Check

The fault counter check can be used to view faults stored in non-volatile memory. The ARTU will store faults detected during power-up BIT or operational background BIT. See Figure 9.4.2.2. for a display of the fault counter MMTI screen. The following commands are to be used to display the ARTU fault counters:

- Power up the ARTU and let it complete Built-In-Test.
- Connect the MMT cable to the ARTU and the computer.
- Start the MMTI software and select commanded mode of operation.
- Select the Goto Radio Installation/Test Menu.
- Select the Set Radio Locked/Offline command.
- Press the escape key.
- Select Goto Radio Configuration Menu.
- Select Report Fault Counters

9.2.3 Flight Test Log

The flight test log can be a useful tool for identifying problems in a dynamic environment. By saving software debug information in a log, the information can be reviewed at a later time. By saving the information on a disk it can be sent to MagnaStar Engineering for review. The following steps are used to enable the Flight Test Log:

- Power up the ARTU and let it complete Built-In-Test.
- Connect the MMT cable to the ARTU and the computer.
- Start the MMTI software and select commanded mode of operation.
- Select Goto Radio Maintenance Operations Menus.
- Select Goto Debug Menu.
- Select Enable/Disable All Debug Msgs.
- Select Enable All Debug Msgs.
- Respond "Yes" to Log Debug messages to the hard disk.
- Enter a filename to identify the debug log file.
- Respond "No" to the store TSC status updates.
- Respond "No" to the store Pilot status updates.

In order to conserve computer memory, the debug log should be closed after completion of the flight test. The following steps will close the flight test debug log:

- Select Enable/Disable All Debug Msgs.
- Select Disable All Debug Msgs.
- Respond "Yes" to close the debug file on the hard disk.

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9.2.4 L-Band Interference Tests

Because the C-2000 system operates in the 850-900 MHz range, interference between the C-2000 and L-Band equipment (i.e. DME, Transponder, TCAS) can occur if there is not enough isolation between antennas. Testing for interference can be done by making the C-2000 equipment transmit. By monitoring the Receiver Signal Strength (RSS) value reported in the Radio Status screen while the ARTU is transmitting, it can be determined if the L-Band equipment interferes with the C-2000 system.

The simplest test method is to use the MMT1 installation test mode and to stop at the Receive Signal Strength test step. By not connecting up the loop around test box, no signal level should be reported above the nominal no signal value. Frequency agile devices like DMEs must be tuned and transmit across the whole operating frequency range to assure that there are no frequency dependent interference problems. If any change occurs in the RSS value then there is interference from external equipment. The nominal no signal value of the RSS can be determined by disconnecting the receive coax cable from the ARTU and viewing the RSS value on the Radio Status screen. See section 6.3.12 for the Receive Signal Strength Measurement test procedure.

9.2.5 CEPT-E1 Communication Verification

The MagnaStar ARTU is capable of interfacing to multichannel INMARSAT SATCOM equipment using a CEPT-E1 digital interface. ARTU part number 724855-802 has additional hardware which will support this interface. Calls are routed through the ARTU to the SATCOM over the CEPT-E1 interface. The CEPT-E1 interface is a 2.048 MHz time division multiplexed data bus consisting of differential serial transmit and receive lines.

Communication between the ARTU and the SATCOM equipment can be verified by viewing a MagnaStar digital handset. If a handset displays the word Satcom on the Services menu when the handset is on hook or in the bezel, then the ARTU and SATCOM equipment are in communication over the CEPT-E1 interface. Also, if the LINK option is available from the handset Main menu, then the CEPT-E1 is operational. If SATCOM is not present at the Services menu, then the SATCOM system has informed the MagnaStar system there are no channels available. If this happens during initial system installation, verify the Satcom system configuration jumpers (verify that the SATCOM system has been configured for External CTU). It is possible that conditions may exist which will keep SATCOM calls from being placed. SATCOM units do provide status information to the ARTU over the CEPT-E1 bus which can indicate that the SATCOM unit is either faulted or that SATCOM channels are not available for use. This information is reported to the user when a call is placed. SATCOM channels not being available for use may include items beyond the SATCOM unit including satellite coverage problems or ground station problems.

It is possible to determine the status of the CEPT-E1 interface between the ARTU and the SATCOM unit using the MMT. Figure 9.2.5 shows the ARTU Status screen. In the lower right hand corner is CEPT-E1 status information. The CEPT-E1 status information has three possible states; RR, RNR and DOWN. There are two columns of information. The ARTU column applies to the ARTU and the CMS column applies to the SATCOM equipment. It may be possible to isolate RNR problems to a particular piece of equipment using the column labels.

- RR -** This status information means Receiver Ready. This condition indicates that the CEPT-E1 interface and equipment is operational.
- RNR -** This status information means Receive Not Ready. This condition indicates that the CEPT-E1 interface is operational but that the equipment is not functional.
- DOWN -** This status information means that the CEPT-E1 interface is not operational. This could indicate that either piece of equipment is at fault or no CEPT-E1 connection.

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```

-----MNT Status Updates-----
Aircraft ID: E00001h      Account Number: 9002350400      Radio ID: M2A0001
(F1=Return to Prior Menu)  ARTU STATUS      (T=Toggle Status Screen)
-----
TxRx  RBS TxRx      Rx      ARTU Status
Assignment:  UNAS      SCMO 10      Admin: UNLOCK Oper: EMA
RSS (dBm):  -127.5      0.0      -81.0      Avail: NOT DG Use: IMA
Doppler (Hz):  0
Oper State:  EMA      EMA      Contrl:ONLINE
TSC/ACC State:  OFF      Handoff State: Null
Ch Tot 10x6:  0
Ch Err 10x3:  0
Ch BER : .000000      .000000      LMA Switch:      IN
RCL Tot 10x3:  0      0      Farmac Indicator: ON
RCL Err:      0      0      Oscillator:      WARN
RCL BER : .000000      .000000
Handoff RQST: NotNeed      CPU Idle:  83% (Cum)  87% (Inst)
-----
USC 1/1  USC 1/3
USC State:  T_OFF  T_OFF
Call Ref:  0      0
Bearer Cap:
Rx Ctrl:
Tx Ctrl:
    
```

| | | |
|-----------|------|------|
| | ARTU | CEPT |
| Call Ctl: | RR | RR |
| ECL: | RR | RR |

CEPT-E1 Information

Figure 9.2.5. ARTU Status Screen Showing CEPT-E1 Interface Information.

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9.3 MMTI Commanded Mode

The MMTI commanded mode allows the user more flexibility when testing the C-2000 system verses the installation mode. However, more step are required to perform an equivalent task in the commanded mode. The commanded mode also allows additional test capabilities over the installation mode.

The MMTI commanded mode menu structure is comprised of four sections: the Radio Configuration menu, the Radio Installation/Test menu, the Boot menu and the Radio Maintenance menu. A flow chart of the menu structure is shown in Figure 9.3.1

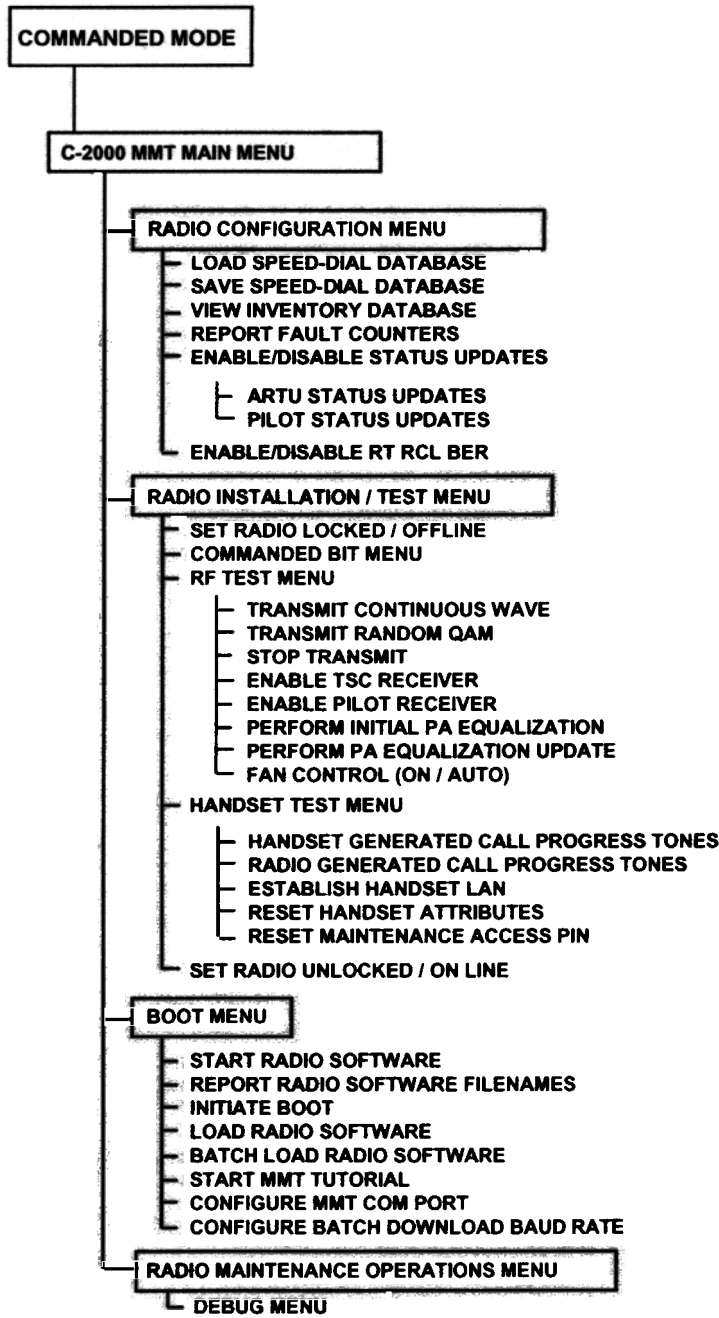


Figure 9.3. A Flow Chart Showing The Menu Structure Of The MMT Commanded Mode.

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The first screen when starting the MMTI software is the MMT Start-up menu. To begin the commanded mode operation, make the appropriate selection from the MMTI Start-up menu as shown in figure 9.3.2. If the ARTU has been powered prior to starting the MMTI software, the user will then proceed to the MMT Main menu. Figure 9.3.3 shows the MMT Main menu screen. If power is applied to the ARTU after the MMT software has started running, the user will then proceed to the MMT Boot Menu when the commanded mode of operation is selected. Power must have been removed from the ARTU for greater than ten seconds in order to proceed to the Boot menu from the Start-up menu.

A breakdown of each of the four sections with a description of each sub-menu is provided in the following sections.

```

-----V4.0A MMT Radio Responses-----
Raytheon Proprietary Software
MagnaStar MMT Version 4.0A
INSTALLER VERSION
(C) Copyright 1994 Raytheon Systems Company
MMT DOS-Extender (C) Copyright 1986-1994 Phar Lap Software, Inc. SN DE1-9503
*****
Attach Serial Cable
-----

-----MMT Menu Prompts-----
C-2000 MMT STARTUP OPTION MENU

1 - Start MMT - Command Menu
2 - Start MMT - Installation

Select MMT start-up option (1 - 2, Q to quit MMT): _
    
```

Figure 9.3.2. The MMT Start-Up Menu Screen

```

-----V4.0A MMT Radio Responses-----
Power-up Status: 80376 Microprocessor OK, SRAM OK.
ARTC code File ARTCC40B.HEX Ver 0.0 Date 04/06/00 14:25 Bank 1 CRC:4CED
DSP code File MDSFC40A.HEX Ver 0.0 Date 03/27/00 12:13 Bank 2 CRC:1298
BIT code File MBIFC40A.HEX Ver 0.0 Date 05/18/99 16:03 Bank 1 CRC:269C
Boot code File M_BFC31C.HEX Ver 0.0 Date 04/24/96 14:27 Bank 1 CRC:88E
Radio software is not executing.

-----MMT Menu Prompts-----
C-2000 MMT MAIN MENU

1 - Goto Radio Configuration Menu
2 - Goto Radio Installation/Test Menu
3 - Goto Boot Menu
4 - Goto Radio Maintenance Operations Menu

Enter Main Menu Command (1 - 4, Q to quit the MMT): _
    
```

Figure 9.3.3 The MMT Main Menu Screen.

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9.3.1 MMTI Commanded Mode - C-2000 MMT Boot Menu

The MMTI Boot menu is used to perform functions while the ARTU software is not executing. This includes reviewing software versions, loading new software files and starting software execution. The MMTI Boot menu screen is shown in figure 9.3.1.1 A brief description of each of the Boot menu selections is provided as follows:

- 1) Start Radio Software - This command will start Built-In-Test (BIT) and radio software execution. The radio software must be executing before any of the menu options, other than the boot menu options, are valid.
- 2) Report Radio Software Filenames - This command will report the software files that are loaded in the ARTU. The software files will be reported similar to those shown in the Radio Response window of Figure 9.3.1.1.
- 3) Initiate Boot - This command will stop radio software execution and place the radio in a Boot mode of operation. The ARTU must be in a Boot mode of operation for commands on this screen to be valid.
- 4) Load Radio Software - This command is to be used when new software is to be loaded in the ARTU. This command can only load a single file at a time and is only valid for ARTC and MDSP code.
- 5) Batch Load Radio Software - This command is to be used to load all four different software files required to operate the ARTU at one time. See Figure 9.3.1.2 for an example of the Batch Software Download screen
- 6) Start MMT Tutorial - This command can be used to start the installation mode of the MMTI.
- 7) Configure MMT COM Port - This command is used to change the data transfer (baud) rate when loading software between the MMTI computer and the ARTU. It should be noted that after completion of a file transfer the baud rate must be set back to 9600 in order for the MMTI software to communicate with the ARTU.
- 8) Configure Batch Download Baud Rate - This command is used to change the data transfer (baud) rate between the MMTI computer and the ARTU when batch software downloading is to be performed. The default baud rate value is 9600 (9.6 kbs) for batch software downloading. This command allows the baud rate to be changed to either 19.8 or 38.4 kbs. It should be noted that after completion of a file transfer the baud rate will automatically be set back to 9600 in order for the MMTI software to communicate with the ARTU.

```

-----V4.0A MMT Radio Responses-----
Power-up Status: 80376 Microprocessor OK, SRAM OK.
ARTC code File ARTCC40B.HEX Ver 0.0 Date 04/06/00 14:25 Bank 4 CRC:4CEB;
DSP code File MDSPC40A.HEX Ver 0.0 Date 03/27/00 12:13 Bank 2 CRC:1298;
BIT code File MBITC40A.HEX Ver 0.0 Date 05/18/99 16:03 Bank 1 CRC:209C;
Boot code File M_BTC31C.HEX Ver 0.0 Date 04/24/96 14:27 Bank 1 CRC:BBEE;
Radio software is not executing.

-----MMTI Menu Prompts-----
C-2000 MMT BOOT MENU

1 - Start Radio Software
2 - Report Radio Software Filenames
3 - Initiate Boot
4 - Load Radio Software
5 - Batch Load Radio Software
6 - Start MMT Tutorial
7 - Configure MMT COM Port
8 - Configure Batch Download Baud Rate

Enter command (1 - 5, Q to quit MMT): _

```

Figure 9.3. The MMTI Boot Menu Screen

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```

-----V4.0A MMT Radio Responses-----
-----MMT Menu Prompts-----
C-2000 MMT PERFORM BATCH DOWNLOAD MENU

Enter new Boot filename into the queue ` M_BTChckr.HEX `
Enter FILENAME.HEX file to download from C:\MTU (Esc to quit): M_BTChckr.HEX

Enter new Diagnostic BIT filename into the queue ` MBITChckr.HEX `
Enter FILENAME.HEX file to download from C:\MTU (Esc to quit): MBITChckr.HEX

Enter new Application filename into the queue ` ARTCChckr.HEX `
Enter FILENAME.HEX file to download from C:\MTU (Esc to quit): ARTCChckr.HEX

Enter new DSP filename into the queue ` MDSPChckr.HEX `
Enter FILENAME.HEX file to download from C:\MTU (Esc to quit): MDSPChckr.HEX

```

Figure 9.3.1.2. The MMTI Batch Software Download Menu Screen

9.3.2 MMTI Commanded Mode - C-2000 MMT Radio Configuration Menu

The Radio Configuration menu is used to access ARTU databases and the Status screens. The MMT Radio Configuration menu screen is shown in Figure 9.3.2.1. The ARTU must be in a "Locked Offline State" when using these commands. See the Radio/Installation menu for the information on state changes. A brief description of each of the Radio Configuration menu selections is provided as follows:

```

-----V4.0A MMT Radio Responses-----
-----MMT Menu Prompts-----
C-2000 MMT RADIO CONFIGURATION MENU

1 - Load Speed-Dial Database
2 - Save Speed-Dial Database
3 - View Inventory Database
4 - Report Fault Counters
5 - Enable/Disable Status Updates
6 - Enable/Disable RT RCL BKR

Enter Radio Configuration selection (1 - 6, Esc to exit menu): _

```

Figure 9.3.2. The MMT Radio Configuration Menu Screen.

- 1) Load Speed-Dial Database - This command will load speed-dial database information from a file stored on the computer into the ARTU memory. The numerical portion of the filename root must match the numerical version number of the ARTC C-2000 software when loading the speed dial database. See Save Speed-Dial Database. If the numerical portion of the filename root does not match the numerical version number of the ARTC software, then a DOS command which modifies the filename will need to be performed.
- 2) Save Speed-Dial Database - This command will save the speed-dial database information stored in the ARTU to a file on the computer. The user must provide a root for the filename in which the information is to be store in the computer memory. The numerical portion filename root will automatically be tagged with the version number of the ARTC C-2000 software when using this command.
- 3) View Inventory Database - This command will display ARTU database the following information: the ARTU electronic serial number, operational minutes and software subroutine version numbers.

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- 4) Report Fault Counters - This command will display the fault counter information stored in the ARTU non-volatile memory. The ARTU will increment and store faults information if faults are detected during power-up or background BIT. The fault counter information will be displayed in the Radio Responses window as shown in Figure 9.3.2.2.
- 5) Enable/Disable Status Updates - This command will enable the status screens. The status screens are used to monitor radio operation. There are two different status screens; the ARTU status screen as shown in Figure 9.3.2.3 and Pilot status screen as shown in Figure 9.3.2.4. After the screens are enable, they can be viewed by pressing the "F1" key. It is possible to toggle between the ARTU and Pilot screens by pressing "T". To return to the C-2000 MMT menus, press the "F2" key. The status screen are updated once a second corresponding with the blinking word "update" at the top status screen.
- 6) Enable/Disable RT RCL BER - This command will enable the Radio Control Link (RCL) Bit Error Rate (BER) counting. This command must be initiated prior to each ARTU transmission that BER is to be viewed. The loop around test set-up must have a stable and accurate frequency reference in order for this function to work.

```

-----V4.0A MMT Radio Responses-----
C-2000 FAULT COUNTERS:
MICROPROCESSOR: 00000          FEPRAM: 00000          SRAM: 00000
          DPRAM: 00000          NVRAM: 00000          POWER SUPPLY: 00000
          OVERTEMP: 00000        TUNE BUS: 00000        MAP I/F: 00000
          EI: 00000             BBSF DSP: 00000        RF DN CONV: 00000
          XMIT IF: 00000         PA: 00000             RCV IF: 00000
          RF LOOPBACK: 00000     TDM LOOPBACK: 00000   MUX DSP: 00000
-----MMT Menu Prompts-----
C-2000 MMT RADIO CONFIGURATION MENU

1 - Load Speed-Dial Database
2 - Save Speed-Dial Database
3 - View Inventory Database
4 - Report Fault Counters
5 - Enable/Disable Status Updates
6 - Enable/Disable RT RCL BER

Enter Radio Configuration selection (1 - 6, Esc to exit menu): _

```

Figure 9.3.2.2. Fault Counter Information As Display In The Radio Responses Window.

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| ---MFT Status Updates--- | | | |
|----------------------------|----------------------------|--------------------------|-------------------------|
| Aircraft ID: E00001h | Account Number: 9002350400 | Radio ID: MSA0001 | |
| (F1-Return to Prior Menu) | ARTU STATUS | (T-Toggle Status Screen) | |
| Assignment: UNAS | RBS TxRx: 0.0 | Rx: SCMO 10 | ARTU Status |
| RSS (dbm): -127.5 | | -81.0 | Admin: UNLOCK Oper: EHA |
| Doppler (Hz): 0 | | -22 | Avail: NOT DG Use: IHA |
| Oper State: EHA | | EHA | Contrl: ONLINE |
| TSC/ACC State: OFF | | | Handoff State: Null |
| Ch Tot 10x6: 0 | | 0 | |
| Ch Err 10x3: 0 | | 0 | |
| Ch BER: .000000 | | .000000 | LMA Switch: IN |
| RCL Tot 10x3: 0 | | 0 | Tarmac Indicator: ON |
| RCL Err: 0 | | 0 | Oscillator: WARN |
| RCL BER: .000000 | | .000000 | |
| Handoff RQST: NotNeed | CPU Idle: 83% (Cum) | 87% (Inst) | |
| USC State: USC 1/1 USC 1/3 | | | ARTU CHS |
| Call Ref: T_OFF T_OFF | | | Call Ctl: DOWN DOWN |
| Bearer Cap: 0 0 | | | ECL: DOWN DOWN |
| Rx Ctrl: | | | |
| Tx Ctrl: | | | |

Figure 9.3.2.3. The ARTU Status Screen.

| ---MFT Status Updates--- | | | | | | | | | | | |
|---------------------------|---|--------|--------|--------|--------|-------|--------|-----------|--------|-------|----------|
| (F1-Return to Prior Menu) | ARTU PILOT STATUS UPDATE (T-Toggle Status Screen) | | | | | | | | | | |
| Subband | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | |
| Rank | 0 | 0 | 0 | 0 | 0 | 118 | 0 | 0 | 0 | 117 | |
| Assignment | MON | | | | | | | | | | E1 |
| RSS (dbm) | -127.5 | -127.5 | -127.5 | -127.5 | -127.5 | -82.0 | -127.5 | -127.5 | -127.5 | -80.0 | |
| Doppler (Hz) | 0 | 0 | 0 | 0 | 0 | -25 | 0 | 0 | 0 | -22 | |
| Sync | OUT | OUT | OUT | OUT | OUT | IN | OUT | OUT | OUT | IN | |
| Free TSCs | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 6 | |
| Rx Path Loss | 0 | 0 | 0 | 0 | 0 | 88 | 0 | 0 | 0 | 86 | |
| Cell Status | 0 | 0 | 0 | 0 | 0 | MC 1 | 0 | 0 | 0 | MC 1 | |
| Cell Type | 0 | 0 | 0 | 0 | 0 | IR 1 | 0 | 0 | 0 | IR 1 | |
| TSC Avail Wt. | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | |
| Doppler Wt. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Tx Power Wt. | 0 | 0 | 0 | 0 | 0 | 22 | 0 | 0 | 0 | 22 | |
| TBI | 30 | 25 | 20 | 15 | 10 | 5 | 1 | Pilot Rcv | | | |
| SB 6: | N | N | N | N | N | N | N | N | N | N | Status |
| SB : | | | | | | | | | | | |
| SB : | | | | | | | | | | | 3:SCMO 6 |

Figure 9.3.2.4. The PILOT Status Screen.

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9.3.3 MMTI Commanded Mode - C-2000 MMT Radio Installation/Test Menu

The Installation/Test menu is used to command the radio to perform may of the task necessary to check out a C-2000 installation. The MMT Radio Installation/Test menu screen is shown in Figure 9.3.3.1. The Radio Installation/Test menu has three sub-menus in addition to the radio operational state change commands. The sub-menus are the Commanded BIT, RF Test and the Handset Test menus. A brief description of each of the Radio/Installation menu selections is provided as follows:

```

-----V4.0A MMT Radio Responses-----
|
|
|-----MMT Menu Prompts-----
|
|      C-2000 MMT RADIO INSTALLATION/TEST MENU
|
|  1 - Set Radio Locked/Offline
|  2 - Goto Commanded BIT Menu
|  3 - Goto RF Test Menu
|  4 - Goto Handset Test Menu
|  5 - Set Radio Unlocked/Online
|-----
|
| Enter Radio Test selection (1 - 5, Esc to exit menu): _
|
|
|-----

```

Figure 9.3.3. The MMT Radio Installation/Test Menu Screen.

- 1) Set Radio Locked/Offline - The locked/offline command will change the operational state of the ARTU. The locked/offline state will allow the ARTU to perform individual tests associated with normal operational functions. When the C-2000 is placed in the locked /offline mode, the Handset will no longer respond to keypad inputs and the screen may go blank.
- 2) Goto Commanded BIT Menu - The Commanded BIT menu is to be used for commanding the ARTU to perform BIT tests and to view BIT test results. See paragraph 9.3.3.1 for a brief description of the Commanded BIT menu selections.
- 3) Goto RF Test Menu - The RF test menu is to be used to perform tests related to the Radio Frequency (RF) portion of the ARTU. See paragraph 9.3.3.2 for a brief description of the RF Test menu selections.
- 4) Goto Handset Test Menu - The Handset test menu is to be used to perform tests related to Handset operation or high speed data bus portion of the ARTU. See paragraph 9.3.3.3 for a brief description of the Handset Test menu selections.
- 5) Set Radio Unlocked/Online - The Unlocked/Online command will change the operational state of the ARTU. The C-2000 will operate normally when the ARTU is in the Unlocked/Online state.

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9.3.3.1 C-2000 MMT Commanded BIT Menu

The MMT Commanded BIT menu screen is shown in Figure 9.3.3. A brief description of the Commanded BIT selections are as follows:

- 0) View Results - By pressing zero, it is possible to view the BIT test results after BIT testing has completed.
- 1) Full BIT - This command will cause the ARTU to run the Full Built-In-Test that is normally run upon power-up.
- 2) External TDM Loopback - This command will perform a test to check the transmit driver and the line receiver of the high speed data bus interface. The transmit outputs (+ and -) must be physically looped back on the receive inputs in order for this test to pass.

```

-----V4.0A MMT Radio Responses-----
|
|
|-----MMT Menu Prompts-----
|
|          C-2000 MMT COMMANDED BIT MENU
|
|  1 - Full BIT
|  2 - External TDM Loopback
|-----
|Enter BIT selection (1 - 2, 0 to view results, Esc to exit menu): _
|
|
|

```

Figure 9.3.3.1 The MMT Commanded BIT Menu Screen

9.3.3.2 C-2000 MMT RF Test Menu

The MMT RF Test menu screen is shown in Figure 9.3.3.2. A brief description of the Commanded BIT selections are as follows:

- 1) Transmit Continuous Wave - This command will make the ARTU transmit a continuous wave signal. This command should be used when checking the ARTUs frequency accuracy. The transmitter output power level of the ARTU will be 10 watts (+40 dBm) minimum with zero dB of programmed attenuation. The user will be asked to enter the value of attenuation (0-40 dB). Also, the user will be asked what frequency to transmit on (subband (1-10) and channel (1-29) or enter "0" for manual entry with a resolution to 2 kHz).
- 2) Transmit Random QAM - This command will make the ARTU transmit a modulated 16 QAM signal. The transmitter output power level of the ARTU will be 10 watts (+40 dBm) average power with zero dB of programmed attenuation. This QAM signal may have peak output power as high as 60 watts. The user will be asked to enter the value of attenuation (0-40 dB). Also, the user will be asked what frequency to transmit on (subband (1-10) and channel (1-29) or enter "0" for manual entry with a resolution to 2 kHz).
- 3) Stop Transmit - This command will cause the ARTU to stop transmitting. It will also disable a receiver if the receiver has been enabled.
- 4) Enable TSC Receiver - This command will enable the TSC (voice channel) receiver. The user will be asked what frequency to tune the receiver (subband (1-10) and channel (1-29) or enter "0" for manual entry with a resolution to 2 kHz).
- 5) Enable Pilot Receiver - This command will enable the Pilot (pilot scanning) receiver. The user will be asked what frequency to tune the receiver (subband (1-10) and channel (1-6) or enter "0" for manual entry with a resolution to 2 kHz).

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- 6) Perform Initial PA Equalization - This command performs an equalization of the transmitter path. This command is required prior to every transmit and is automatically performed when the transmit CW or QAM commands are used.
- 7) Perform PA Equalization Update - This command performs an equalization of the transmitter path while the ARTU is transmitting. This command is equivalent to a digital ALC loop for the transmitter. This command is automatically performed when the transmit CW or QAM commands are used.
- 8) FAN Control (On/Auto) - This command can be used to turn the fan located on the ARTU Mounting Tray Fan to the "ON" condition. It can also be used to place the control of the fan in an automatic mode of operation in which the ARTU determines when the fan should operate. The ARTU has an internal temperature sensor which it uses to determine when to operate the fan. The fan should normally operate when the temperature outside the ARTU is slightly below room temperature. The ARTU will also operate anytime the ARTU is in a Boot mode of operation.

```

-----V4.0A MMT Radio Responses-----
-----MMT Menu Prompts-----
C-2000 MMT RF TEST MENU

1 - Transmit Continuous Wave
2 - Transmit Random QAM
3 - Stop Transmit
4 - Enable TSC Receiver
5 - Enable Pilot Receiver
6 - Perform Initial PA Equalization
7 - Perform PA Equalization Update
8 - FAN Control (On/Auto)

Enter Test selection (1 - 8, Esc to exit menu): _

```

Figure 9.3.3.2. The MMT RF Test Menu.

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9.3.3.3 C-2000 MMT Handset Test Menu

The MMT Handset Test menu screen is shown in Figure 9.3.3.3. A brief description of the Handset Test Menu selections are as follows:

```

-----V4.0A MMT Radio Responses-----
-----MMT Menu Prompts-----
C-2000 MMT HANDSET TEST MENU

1 - Handset Generated Call Progress Tones
2 - Radio Generated Call Progress Tones
3 - Establish Handset LAN
4 - Reset Handset Attributes
5 - Reset Maintenance Access PIN

Enter Test selection (1 - 5, Esc to exit menu): _
    
```

Figure 9.3.3.3. The MMT Handset Test Menu Screen.

- 1) Handset Generated Call Progress Tones - This command will cause a Handset to generate one of several call progress tone available as a feature of the Handset. These tones included: No Tone, Fast Busy, Bong, Out-Of-Range, and Audible Call Alert. It should be noted that the Handset number refers to Handset LAN address and not to the interphone number.
- 2 - Radio Generated Call Progress Tones - This command will cause the ARTU to generate one of several call progress tone available. These tones included: No Tone, Dial Tone, Busy Tone, Ringback Tone, and Call Waiting Tone. It should be noted that the Handset number refers to Handset LAN address and not to the interphone number.
- 3 - Establish Handset LAN - This command is used to determine that the high speed data distribution bus (or LAN) is in sync with devices connected to the ARTU. It will also report the number of Handsets and repeater devices connected to the LAN. It should be noted that this test treats all repeater devices the same, i.e. CDBRs and AIUs. Also, a CAS will not be reported with this test. This test takes fifteen second to complete and display information in the Radio Responses window. Figure 4.3.3.2 shows the MMT Radio Response window after performing the Handset LAN test.
- 4 - Reset Handset Attributes - This command will reset programmable attributes of the Handset to factory default values. It should be noted that this command will change values of Speaker Gain, Call Alerter Gain, Sidetone Gain, and DTMF Gain.
- 5 - Reset Maintenance Access Passcode - The Maintenance Access Passcode is required to establish a Maintenance Session which will allow access to the Handset programmable features of the C-2000 system. Resetting the Maintenance Access Passcode will set the Passcode to the factory default value of 0000.

```

-----MMT Radio Responses-----

MMT Test ESTABLISH HANDSET LAN Results: PASS
TDM In Sync
3 Handsets Assigned
2 CDBRs Present
C-2000 reports engineering test ESTABLISH HANDSET LAN performed.
    
```

Figure 9.3.3.3.2. The MMT Radio Responses Window For The Handset LAN Test.

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9.3.3.4 C-2000 MMT Radio Maintenance Operations Menu

The MMT Maintenance Operations Menu screen is shown in Figure 9.3.3.4. A brief description of the Radio Maintenance Operations Menu selections are as follows:

```

-----V4.0A MMT Radio Responses-----
|
|
|
|-----MMT Menu Prompts-----
|
|          C-2000 MMT TEST MENU
|
| 1 - Goto Debug Menu
|-----
| Enter command (1, Q to quit MMT, 'Esc' to return to Main Menu): _
|

```

Figure 9.3.3.4. The MMT Radio Maintenance Operations Menu.

1) GoTo Debug Menu - The selection will allow the user to enable or disable the debug messaging capabilities of the MMT. In general, the debug messages report the completion of software tasks while the ARTU is operating.

9.3.3.4.1 C-2000 MMT Debug Menu.

The MMT Debug Menu screen is shown in figure 9.3.3.4.1. A brief description of the MMT Debug Menu selections are as follows:

```

-----V4.0A MMT Radio Responses-----
|
|
|
|-----MMT Menu Prompts-----
|
|          C-2000 MMT DEBUG MENU
|
| 1 - Enable/Disable All Debug Msgs
| 2 - Clear Task Debug Windows
| 3 - Review Last 100 Debug Messages
|-----
| Enter Debug selection (1 - 3, Esc to exit menu): _
|

```

Figure 9.3.3.4. The MMT Debug Menu Screens.

- 1) Enable/Disable All Debug Msgs - This command will enable or disable the Debug message screens. When enabling the Debug message screens the user will be asked if Debug log files are to be created as shown in Figure 9.3.3.4.2. It is also possible to store the ARTU and Pilot Status screens in a log format and to play back these screens. These log files will store the information in files on the computer hard drive. To close the log files the Debug messages must be disabled. It should be noted that enabling the log files will use up space on the hard drive with the ARTU Status and Pilot screen generating most of the stored information
- 2) Clear Task Debug Windows - This command will clear all task Debug message screens.
- 3) Review Last 100 Debug Messages - This command will allow the user to scroll the last 100 Debug messages that were stored in a log file.

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```
-----V4.0A MMT Radio Responses-----
Global debug messages are DISABLED.
-----MMT Menu Prompts-----
0 - Disable All Debug Msgs  1 - Enable All Debug Msgs
-----
Disable/Enable All Debug Msgs (0 - 1, Esc to exit menu): 1
Do you wish to Log debug msgs to hard disk? (Y or N): y
Enter filename of debug log file: Testflight.log
Do you wish to Store TSC status (.TSC) updates? (Y or N): N
Do you wish to Store Pilot status (.PIL) updates? (Y or N): N
```

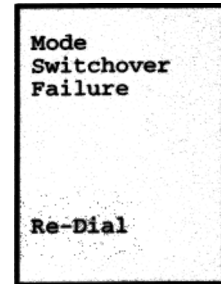
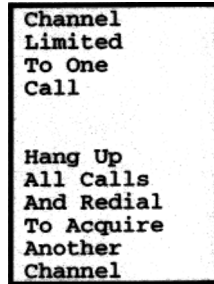
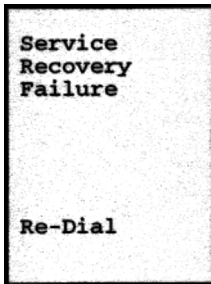
Figure 9.3.3.4.2. Debug Message Log File Enable Screen.

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9.4 Handset Text Messages

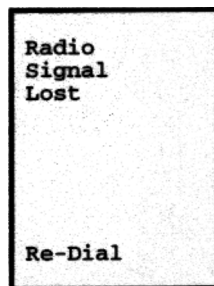
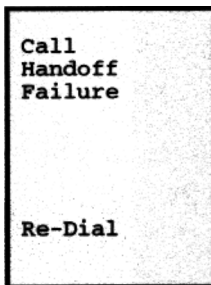
The MagnaStar system provides information screens that display text messages on the digital handset LCD display if the radio detects certain types of operational problems. These text messages are intended to help the user determine why a call may not be placed or why a call may have been interrupted and what possible action to take to correct the problem.

There are several handset text message that may be displayed indicating that the ARTU has detected an abnormal condition and has taken some type of corrective action. Typically the corrective action taken is that the ARTU will reload software. These types of handset text messages normally indicate that the ARTU is not broken and does not need to be replaced. If the problem reoccurs and cannot be cleared, then reboot the ARTU. This can be accomplished by pulling the circuit breaker and removing power for greater than 15 seconds. This information applies to the following three handset text message screens:



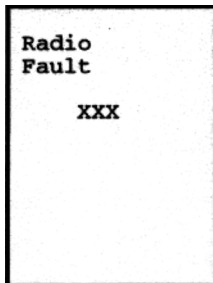
Two handset text messages are shown below that may be displayed if a telephone connection is abnormally terminated. These messages do not normally indicated an aircraft system fault unless repeated occurrence of this type of condition exists.

There are several reasons hand-off failures or abnormal call terminations can occur. They may be caused by poor radio link conditions, antenna blockage, radio frequency interference, base station coverage problems because operation is below 18,000 feet, or ground network problems. If an aircraft is experiencing excessive call hand-off failures, then it is suggested to first check the RF cabling and antenna installation on the aircraft. Check for damaged coaxial cables shields or loose coaxial cable connectors, especially the SMA connectors on the duplexer.



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The radio fault handset text message shown below will display a three digit code if the ARTU detects a built in test fault. The red fault indicator on the front of the unit will also be illuminated if this message appears. The fault codes may be an even or an odd number. Even numbered fault codes indicate that the ARTU has experienced a recoverable fault. The fault may clear itself within a few minutes. If the problem does not clear itself, then reboot the ARTU. This can be accomplished by pulling the circuit breaker and removing power for greater than 15 seconds. If the problem reoccurs, then the ARTU should be replaced. Odd numbered faults indicate a non-recoverable fault and usually indicate an intermittent or broken ARTU. Intermittent problems may be cleared by cycling power for greater than 15 seconds. If an ARTU is replaced, please include the reported fault code and any other relevant information with the unit to explain the reason for unit replacement.

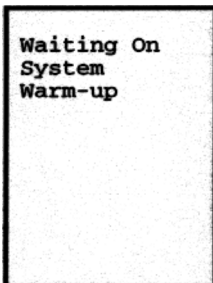


Radio
Fault

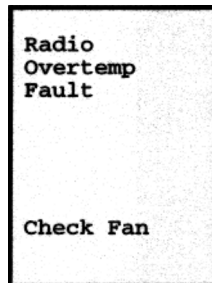
XXX

The waiting on system warm-up handset text message shown below will be displayed when the system is first powered up and has just completed built in test. The system warm-up is to allow the ARTU reference oscillator to warm-up and meet the frequency accuracy required for the system. This warm-up time lasts for four minutes after the system completes power-up built in test.

The radio overtemp fault handset text message shown below will be displayed if the radio detects an abnormal over temperature problem. The ARTU has over temperature protection and will shut down if this occurs. The ARTU will automatically recover once the unit has cooled down. This message will only be displayed for a short time prior to the ARTU shutting down.



Waiting On
System
Warm-up

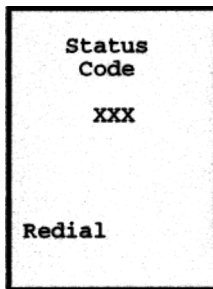


Radio
Overtemp
Fault

Check Fan

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The status code handset text message shown below will be displayed for abnormal call releases due to software coding problems or unanticipated race conditions. This screen would not indicate a hardware problem.

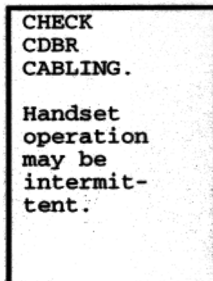


Status
Code

XXX

Redial

The check CDBR cabling handset text message as shown below will be displayed when the ARTU detects a synchronization problem on the LAN bus between the ARTU and the LAN repeaters. Typically this fault condition occurs because of cabling problems. The most common cause of this problem are wrong wiring or pinched wiring in the backshell. The ARTU and LAN repeaters can also be damaged if a LAN repeater is inadvertently connected up backwards, resulting in the same type of fault. LAN repeaters can be damaged if no cable strain relief is provided in the installation and may cause intermittent operation or latent faults. See paragraph 9.1.8 and 9.2.1 for MMT troubleshooting test for intermittent fault testing.



CHECK
CDBR
CABLING.

Handset
operation
may be
intermit-
tent.

MAGNASTAR C-2000 DIGITAL AIRBORNE TELEPHONE SYSTEM

The temporary service disruption handset text message is generated by the handset itself and does not originate from the ARTU as do all other handset messages. This message is generated by the handset if power and ground are present but the handset is missing the clock, sync or data. The message may also appear if the data to the handset is corrupted. If this message appears, check to verify that the ARTU has not detected a fault condition or is running power-up BIT. This can be done by viewing the fault (red) light on the front of the ARTU. If the ARTU fault light is illuminated then a fault has been detected or is running power-up BIT. Power-up BIT should not take longer than five minutes to complete. If after enough time has passed to allow power-up BIT to complete, then the handset text message would be displayed because of a fault with the ARTU. If the temporary service disruption handset text message is present and the ARTU fault light is not present, then check the handset and CDBR cabling in the aircraft..

