

*NOTE: The TESTS menu is visible only after entering the Service password.

Figure 13
Menu Operation Tree

ACTIVITY

This menu provides a means of monitoring transmit/receive parameters of the DIU3000 and control devices connected to it.

- For the **CONSOLE** (TRC type analog console), the **CHaNneL** and **MODE** parameters of the current transmission can be traced. If not currently transmitting, the last active parameters are displayed.
- For the **USER** (local user, handset), the **Function REQ** no., **CHaNneL** and **MODE** parameters of the current transmission can be traced. If not currently transmitting, the last active parameters are displayed.
- For the **INBOUND** activity, the **MODE** parameter can be traced. If there is currently no inbound activity, the **MODE** of the last inbound reception is displayed.

Table 6

| Action | LCD Display | Comments |
|--|--|--|
| 1. While in the ready mode, press MENU/ESC to enter the menu mode. | | The last accessed menu entry is shown. |
| 2. Scroll until ACTIVITY is shown. | ACTIVITY | |
| 3. Press ENTR to enter the device selection menu. | CONSOLE or USER or INBOUND | |
| 4. Scroll to display the required device option. | | |
| 5. Press ENTR to display activity parameters that can be traced for the selected device. | FREQ nnn or CHNL nnn or ANALOG/ CLEAR/ ENCR nnn | <ul style="list-style-type: none"> • The data displayed is updated once a second, or if ENTR is pressed. • If there was no inbound process since power-up and ENTR is pressed while in INBOUND ACTIVITY display state, the message NO INFO is displayed. |
| NOTE | | |
| <ul style="list-style-type: none"> • For the CONSOLE activity, only the CHaNneL and MODE parameters can be traced. • For the INBOUND activity, only the MODE parameter can be traced. | | |
| 6. Use the arrow keys to scroll between the available parameters. | CONSOLE or USER or INBOUND | |
| 7. Press MENU/ESC to return to the device selection menu. | | |
| 8. Repeat steps 4 to 7 to trace another device, or press MENU/ESC twice to return to the ready state. | | |

BASE STATION

This function allows changing/viewing the signal level of the communication interface to the base station. The line signal level can be set within the range of -20 to 0 dBm.



Notes

Changing the signal level requires entering the Service password (see "SERVICE" section on page 55).

MRTI (analog and digital inbound), Console (analog and digital inbound) and Base Station (analog outbound) audio levels may be set in RSS or from the front panel display (after entering service mode, password: 039302164). Each interface may be changed by 20 dB in 1 dB increments. Because the DIU passes and generates voice and tones at various levels, there is no absolute output level as suggested by the term 'dBm' on the front panel display. The term 'dBm' that accompanies gain settings in RSS and the front panel display should be interpreted as a rough estimate of signal output. In other words, the output level display should be thought of as a volume gain control, not as an absolute level indicator. The exact output, in dBm, is a function of 1) the source level, 2) the output level setting and 3) the averaging method used to measure the signal.

Changing the Base DBM Value

Table 7

| Action | LCD Display | Comments |
|--|--------------------|---|
| 1. While in the ready mode, press MENU/ESC to enter the menu mode. | | The last accessed menu entry is shown. |
| 2. Scroll until BASE is shown. | BASE | |
| 3. Press ENTR. | DBM nn | |
| 4. Press ENTR. | DBM nn | "nn" blinks. |
| 5. Scroll to select the required value. | DBM mm | "mm" indicates the new selected signal level. |
| 6. Press ENTR to confirm the selection. | DBM mm | |
| 7. Press MENU/ESC twice to return to the ready state. | 8 : 46 : 16 | |

Changing the Base AGC

This menu controls the setting of the base analog port AGC silent level. The allowable range of values for the silent level is 0–255. The following silent level values should be considered default values:

- 5—when version B or earlier wireline board is used.
- 50—when version C or later wireline board is used.

Version numbers can be obtained via RSS in the Main/Service/DIU-Config/HW-Version screen.

Once the correct default value is chosen, perform the following verification procedure for NON-ZERO silent levels.

Silent Level Verification Test:

This procedure should be used to verify that NON-ZERO silent levels are set properly.

1. Enter the DIU's Maintenance Password (039302164) at the DIU's front panel.
2. Go to the DIU's front panel menu labeled Base -> AGC -> AUTO.
3. Press **[Enter]** on the DIU's front panel. The screen should now flash "AUTO RDY".
4. Start an inbound analog call. If using a subscriber, use strong signal conditions.
5. While background noise is being transmitted (i.e. no audio), press **[Enter]** on the DIU's front panel.
6. Take note of this number returned on the DIU's display.
7. While the inbound call is still active, place a -10 dBm tone on the base -> DIU wireline.
8. Press **[Enter]** on the DIU's front panel. The screen should now flash "AUTO RDY".
9. While the tone is connected press **[Enter]** on the DIU's front panel.
10. Take note of the number returned on the DIU's display.
11. Verify or change the silent level using the "Results" section below and program the DIU with this value.

Results:

- If the default silent level is equal to or greater than the number returned in step 6, use the default silent level. This number should be less than the number returned in step 10.
- If the default silent level is less than the number returned in step 6 and the DIU has version B or earlier Wireline board, use the number returned in step 6 as the silent level.
- If the default silent level is less than the number returned in step 6 and the DIU has version C or later Wireline board, use the number returned in step 6 and add 20 to it.



Note

The silent level chosen should be in between the two numbers returned in steps 6 and 10. If the DIU input is noisy then the two numbers may be very close. This situation will lead to poor operation. The DIU will not be able to accurately differentiate between audio and noise. In this case it is best to select the value returned in step 6 to ensure audio will trip the silent level.

CLOCK SETting

This menu is used for setting the LCD clock time. The time is set by changing the hours and minutes, according to the time format set via the LCD menu.

Table 8

| Action | LCD Display | Comments |
|--|--------------------|--|
| 1. While in the ready mode, press MENU/ESC to enter the menu mode. | | The last accessed menu entry is shown. |
| 2. Scroll until CLOCKSET is shown. | CLOCKSET | |
| 3. Press ENTR to enter the hour setting state. | HH:MM:SS | |
| 4. Scroll to select the required value. | HH:MM:SS | |
| 5. Press ENTR to enter the minute setting state. | HH:MM:SS | |
| 6. Scroll to select the required value. | HH:MM:SS | |
| 7. Press ENTR to confirm the new time setting. | HH:MM:00 | The seconds are reset and the new time is displayed. |
| 8. Press MENU/ESC key to return to the ready state. | 8 : 45 : 16 | |

CONSOLE

This menu controls the parameters of the communication interface to the analog console. In the current version of the DIU3000, only the TRC type analog console is supported. The following parameter can be changed:

- Line signal level. The line signal level can be set within the range of –20 to 0 dBm.



Notes

Changing the line signal level requires entering the Service password (see "SERVICE" section on page 55).

MRTI (analog and digital inbound), Console (analog and digital inbound) and Base Station (analog outbound) audio levels may be set in RSS or from the front panel display (after entering service mode, password: 039302164). Each interface may be changed by 20 dB in 1 dB increments. Because the DIU passes and generates voice and tones at various levels, there is no absolute output level as suggested by the term 'dBm' on the front panel display. The term 'dBm' that accompanies gain settings in RSS and the front panel display should be interpreted as a rough estimate of signal output. In other words, the output level display should be thought of as a volume gain control, not as an absolute level indicator. The exact output, in dBm, is a function of 1) the source level, 2) the output level setting and 3) the averaging method used to measure the signal.

The following parameter can be viewed:

- ID. Enables viewing the console ID, shown in hexadecimal format.

Table 9

| Action | LCD Display | Comments |
|---|--------------------------------------|--|
| 1. While in the ready mode, press MENU/ESC to enter the menu mode. | | The last accessed menu entry is shown. |
| 2. Scroll until CONSOLE is shown. | CONSOLE | |
| 3. Press ENTR to display the options. | DBM nn or ID HHH | |
| 4. Scroll to select the required option. | | ID HHH shows the console ID in hexadecimal format. |
| If changing/viewing of line signal level is not required, skip to step 9. | | |
| 5. Scroll to select the DBM option. | DBM nn | "nn" indicates the currently selected signal level in dBm units. |
| 6. Press ENTR. | DBM nn | "nn" blinks. |
| 7. Scroll to select the required value. | DBM mm | "mm" indicates the new selected signal level. |
| 8. Press ENTR to confirm the selection. | DBM mm | |
| 9. Press MENU/ESC twice to return to the ready state. | 8 : 46 : 16 | |

Console AGC

This menu controls the setting of the console analog port AGC silent level. The allowable range of values for the silent level is 0-255. The following silent level values should be considered default values.

- 0—only TRC consoles with version B or earlier wireline board.
- 5—only digital keying consoles (DKC) with version B or earlier wireline board.
- 0—both TRC and DKC consoles with version B or earlier wireline board.
- 50—if TRC, DKC, or both (TRC and DKC) consoles with version C or later wireline board.

Wireline version numbers can be obtained via RSS in the Main/Service/DIU-Config/HW-Version screen.

Once the correct default value is chosen, perform the following verification procedure for NON-ZERO silent levels.

Silent Level Verification Test:

This procedure should be used to verify that NON-ZERO silent levels are set properly.

1. Enter the DIU's Maintenance Password (039302164) at the DIU's front panel.
2. Go to the DIU's front panel menu labeled CONSOLE -> AGC -> AUTO.
3. Press on the DIU's front panel. The screen should now flash "AUTO RDY".
4. Start an outbound call from the console.
5. While background noise is being transmitted (i.e. no audio), press on the DIU's front panel.
6. Take note of the number returned on the DIU's display.
7. While the console is still keyed, place a -10 dBm tone on the console ->DIU wireline.
8. Press on the DIU's front panel. The screen should now flash "AUTO RDY".
9. While the tone is being transmitted press on the DIU's front panel.
10. Take note of the number returned on the DIU's display.
11. Verify or change the silent level using the "Results" section below and program the DIU with this value.

Results:

- If the default silent level is equal to or greater than the number returned in step 6, use the default silent level. This number should be less than the number returned in step 10.
- If the default silent level is less than the number returned in Step 6 and the DIU has version B or earlier Wireline Board, use the number returned in step 6 as the silent level.

- If the default silent level is less than the number returned in step 6 and the DIU has version C or later Wireline Board, use the number returned in step 6 and add 20 to it.



Note

The silent level chosen should be in between the two numbers returned in steps 6 and 10. If the DIU input is noisy then the two numbers may be very close. This situation will lead to poor operation. The DIU will not be able to accurately differentiate between audio and noise. In this case it is best to select the value returned in step 6 to ensure audio will trip the silent level.

EDIT PASSWORD

The EDITPSWD function is used to change the password. All three types of passwords can be changed via this function, one password at a time.

Table 10

| Action | LCD Display | Comments |
|--|--|--|
| 1. While in the ready mode, press MENU/ESC to enter the menu mode. | | The last accessed menu entry is shown. |
| 2. Scroll until EDITPSWD is shown. | EDITPSWD | |
| 3. Press ENTR to display the password types. | USER or CRYPTO or MAINT | |
| 4. Scroll to select the required option. | | |
| 5. Press ENTR . | USER PSWD or CRY PSWD or MAI PSWD | The display blinks. |
| 6. Key in the password. | ----- | A short bar is displayed for each key depression. |
| 7. Press ENTR. | NEW PSWD | |
| 8. Key in the new password. | ----- | |
| NOTE | | |
| The password may contain from 6 to 10 digits. For passwords that exceed eight digits, only the last eight are shown. | | |
| 9. Press ENTR. | AGAIN | The operator is required to confirm the new password by reentering it again. |
| 10. Key in the new password again. | ----- | The message "PSWD OK" is displayed for a few seconds and the DIU3000 returns to the EDITPSWD function entry state. |
| 11. Press ENTR. | PSWD OK | |
| 12. Press MENU/ESC to return to the ready state. | 8 : 45 : 16 | |

ERRor LIST

The DIU3000 performs a series of tests (BIT) upon power-on. If a test fails, a general error message is displayed on the LCD and the failed test number is stored in the DIU3000 memory. Failures can also be detected during normal operation, in which case they are also recorded. The ERR LIST function is used to retrieve the recorded numbers of the failed tests.

Table 11

| Action | LCD Display | Comments |
|--|---------------------------------|--|
| 1. While in the ready mode, press MENU/ESC to enter the menu mode. | | The last accessed menu entry is shown. |
| 2. Scroll until ERR LIST is shown. | ERR LIST | |
| 3. Press ENTR. | NO ERR or TOT nn | "NO ERR" indicates that no failures have been detected. "TOT nn" indicates the total number of detected failures. |
| 4. If TOT nn is displayed, scroll to view the stored failures. | ERR n | "n" indicates the number of the recorded failed test. Refer to TROUBLESHOOTING section for error definitions |
| 5. Press MENU/ESC twice to return to the ready state. | 8 : 46 : 16 | |

HANDSET

This menu is used for controlling the local handset microphone sensitivity and for viewing the handset ID. The microphone sensitivity allowed range is 0 - 9. The handset ID can be viewed but not changed. It can be set only by the RSS. The handset ID is shown in hexadecimal format.



Note

Changing the microphone sensitivity level requires entering the Service password (see "SERVICE" section on page 55).

Table 12

| Action | LCD Display | Comments |
|---|--|--|
| 1. While in the ready mode, press MENU/ESC to enter the menu mode. | | The last accessed menu entry is shown. |
| 2. Scroll until HANDSET is shown. | HANDSET | |
| 3. Press ENTR. | ID HHH or MICSNS n | "ID HHH" indicates the current ID in hexadecimal format; "MICSNS n" indicates the current microphone sensitivity. |
| 4. Scroll to select the required option. | ID HHH or MICSNS n | |
| 5. Press ENTR. | MICSNS n | "n" blinks. |
| 6. Scroll between the available options or key in the required value (0 - 9). | MICSNS m | "m" blinks. |
| 7. Press ENTR to confirm the selection. | MICSNS m | |
| 8. Press MENU/ESC twice to return to the ready state. | 8 : 46 : 16 | |

LCD

This menu controls the current setting of the LCD. The following display properties may be changed:

- Brightness. Three brightness levels are available: LIGHT 0 through LIGHT 2.
- Contrast. Ten levels are available: CONTRS 0 through CONTRS 9.
- Time format. The user can select either a 12 and 24 hour format.

Table 13

| Action | LCD Display | Comments |
|--|---|---|
| 1. While in the ready mode, press MENU/ESC to enter the menu mode. | | The last accessed menu entry is shown. |
| 2. Scroll until LCD is shown. | LCD | |
| 3. Press ENTR to display the options. | CONTRS n or LIGHT n or TIME FMT | "n" indicates the currently selected level. |
| 4. Scroll to select the required option. | CONTRS n or LIGHT n or TIME FMT | |

For the following instructions refer to

- "Changing the LCD Contrast Level" section on page 51 for changing the contrast; or
- "Changing the LCD Brightness (Light) Level" section on page 52 for changing the brightness; or
- "Changing the Time Format" section on page 52 for changing the time format.

Changing the LCD Contrast Level

Table 14

| Action | LCD Display | Comments |
|--|-------------|---|
| 1. Perform the instructions given in "LCD" section on page 51. | CONTRS n | "n" indicates the currently selected level. |
| 2. Press ENTR | CONTRS n | "n" blinks. |
| 3. Scroll to select (or key in) the required value. | CONTRS m | The display contrast is updated immediately upon each change. The number indicating the contrast level continues blinking to indicate that the DIU3000 is still in the contrast changing mode |
| 4. Press ENTR or MENU/ESC to exit the contrast changing state. | CONTRS m | The MENU/ESC key can also be used in this step to exit the property changing state, since the display contrast is updated immediately and no selection confirmation is required. |
| 5. Press MENU/ESC twice to return to the ready state. | 8 : 46 : 16 | |

Changing the LCD Brightness (Light) Level

Table 15

| Action | LCD Display | Comments |
|--|-------------|--|
| 1. Perform the instructions given in "LCD" section on page 51. | LIGHT n | "n" indicates the currently selected level. |
| 2. Press ENTR. | LIGHT n | "n" blinks. |
| 3. Scroll to select (or key in) the required value. | LIGHT m | The display brightness is updated immediately upon each change. The number indicating the brightness level continues blinking to indicate that the DIU3000 is still in the brightness changing mode. |
| 4. Press ENTR to exit the brightness changing state. | LIGHT m | The MENU/ESC key can also be used in this step to exit the property changing state, since the display brightness is updated immediately and no selection confirmation is required. |
| 5. Press MENU/ESC twice to return to the ready state. | 8 : 46 : 16 | |

Changing the Time Format

Table 16

| Action | LCD Display | Comments |
|--|--|--|
| 1. Perform the instructions given in "LCD" section on page 51. | TIME FMT | |
| 2. Press ENTR. | 12 HR or 24 HR | "12" or "24" blinks. |
| 3. Scroll to select the required option. | 12 HR or 24 HR | "12" or "24" blinks. |
| 4. Press ENTR to confirm the selection. | HH : MM : SS or A HH : MM : SS or P HH : MM : SS | The time is displayed in the selected format for a short period. |

LOGIN

If FIPS is enabled (by RSS), login command allows opening an encrypted session by entering a password. The DIU3000 differentiates between three operator roles, each of which requiring a separate password. For initial installation, role and password assignments are made with the DIU3000 RSS and may subsequently be changed either from the RSS or from the DIU3000 (see "EDIT PASSWORD" section on page 48).



IMPORTANT

Login in MAINTenance role results in zeroization of all key variables.

Table 17

| Action | LCD Display | Comments |
|---|--|---|
| 1. While in the ready mode, press MENU/ESC to enter the menu mode. | | The last accessed menu entry is shown. |
| 2. Scroll until LOGIN is shown. | LOGIN | |
| 3. Press ENTR to display session types. | USER or CRYPTO or MAINT | |
| 4. Scroll to display the required option. | | |
| 5. Press ENTR to initiate password entry. | USR PSWD or CRY PSWD or MAI PSWD | The display blinks. |
| 6. Key in the password. | ----- | A short bar is displayed for each key depression. |
| 7. Press ENTR. | PSWD OK | The message "PSWD OK" is displayed for a few seconds and the DIU3000 returns to the login mode entry state. |
| NOTE | | |
| If an invalid password is entered more than 10 times consecutively, the encryption processor in the DIU3000 assumes a "tamper" operation and locks the access to the encryption functions. Unlocking the encryption requires servicing. | | |
| 8. Press MENU/ESC to return to the ready state. | 8 : 45 : 16 | |

LOGOUT

This command is used to terminate an encrypted session. The operator is required to indicate the type of session that should be terminated.

Table 18

| Action | LCD Display | Comments |
|--|--|--|
| 1. While in the ready mode, press MENU/ESC to enter the menu mode. | | The last accessed menu entry is shown. |
| 2. Scroll until LOGOUT is shown. | LOGOUT | |
| 3. Press ENTR to display session types. | USER or CRYPTO or MAINT | |
| 4. Scroll to display the required option. | | |
| 5. Press ENTR to logout. | LOG OUT ... and then LOGOUT | The LOG OUT message (with a space between LOG and OUT) is displayed for a few seconds to indicate termination of an encrypted session and then returns to the logout mode entry state. |
| 6. Press MENU/ESC to return to the ready state. | 8 : 45 : 16 | |

SERVICE

The **SERVICE** menu is used to log into and out of the service session. Logging into the service session is a prerequisite for changing the following DIU3000 parameters:

- The signal level of the communication interface to the base station (see "BASE STATION" section on page 41).
- The signal level of the communication interface to the console (see "CONSOLE" section on page 44).
- The local handset microphone sensitivity level (see "HANDSET" section on page 50).

The service password is constant and preset to "039302164".

The Service session can be active concurrently with any of the encrypted sessions.

Initiating a Service Session

Table 19

| Action | LCD Display | Comments |
|--|-------------------------------------|--|
| 1. While in the ready mode, press MENU/ESC to enter the menu mode. | | The last accessed menu entry is shown. |
| 2. Scroll until SERVICE is shown. | SERVICE | |
| 3. Press ENTR to display options. | LOGIN or LOGOUT | |
| 4. Scroll to display LOGIN. | LOGIN | |
| 5. Press ENTR to initiate password entry. | SRV PSWD | The display blinks. |
| 6. Key in the password - "039302164". | ----- | A short bar is displayed for each key depression. |
| 7. Press ENTR. | PSWD OK | The message "PSWD OK" is displayed for a few seconds and the DIU3000 returns to the SERVICE display. |
| 8. Press MENU/ESC to return to the ready state. | 8 : 45 : 16 | |

Terminating a Service Session

Table 20

| Action | LCD Display | Comments |
|--|---|---|
| 1. While in the ready mode, press MENU/ESC to enter the menu mode. | | The last accessed menu entry is shown. |
| 2. Scroll until SERVICE is shown. | SERVICE | |
| 3. Press ENTR to display options. | LOGIN or LOGOUT | |
| 4. Scroll until LOGOUT is shown. | LOGOUT | |
| 5. Press ENTR to logout. | LOG OUT ... and then SERVICE | The LOG OUT message (with a space between LOG and OUT) is displayed for a few seconds to indicate termination of an encrypted session and then returns to the service mode entry state. |
| 6. Press MENU/ESC to return to the ready state. | 8 : 45 : 16 | |

TESTS

This menu currently includes the Audio Loop test. In the future DIU3000 versions, the menu will provide access to additional tests.



Performing the Audio Loop test requires entering the Service password.

Note

Audio Loop Test

This test is used for stand alone testing of the DIU3000 during system troubleshooting. For details, refer to Figure 14 on page 77.

TX PARAMS

The TX PARMS (Transmission Parameters) menu is used only for changing the access code for local transmission. This access code is attached to the outgoing messages sent from the DIU3000 using the PTT or local handset.

The access code allowable range is 0 to 255 and "none". When "none" is selected ("- - -" is displayed), no access code is included in the transmission. The value "none" is selected by scrolling to "- - -" or keying in a value larger than 255.

Table 21

| Action | LCD Display | Comments |
|--|--------------------|---|
| 1. While in the ready mode, press MENU/ESC to enter the menu mode. | | The last accessed menu entry is shown. |
| 2. Scroll until TX PARMS is shown. | TX PARMS | |
| 3. Press ENTR to display the parameter options (currently only the Access Code). | ACCS nnn | "nnn" indicates the current access code value. |
| 4. Press ENTR to enter the access code editing state. | ACCS nnn | "nnn" blinks. |
| NOTE | | |
| Pressing MENU/ESC at this stage will return to the access code display state retaining the previous value. | | |
| 5. Scroll between the available values or key in the required value. | ACCS mmm | "mmm" blinks. Selecting the "- - -" value by scrolling or keying in a value larger than 255 sets the access code to "none". |
| 6. Press ENTR to confirm the selection. | ACCS mmm | The DIU3000 returns to the access code display state. |
| 7. Press MENU/ESC key twice to return to the ready state. | 8 : 45 : 16 | |

OTAR

This menu controls the initiation of an OTAR rekey request.

Table 22

| Action | LCD Display | Comments |
|--|-------------|--|
| 1. Press ESC to enter menu mode. | | |
| 2. Scroll until OTAR is shown. | OTAR | |
| 3. Press ENTR to display Rekey . | Rekey RQ | |
| 4. Press ENTR to initiate a rekey request. | OTR WAIT | Other OTAR statuses will be displayed as the request is processed. |

Local Console-Like Functions

General

In addition to interfacing other control equipment to the base station, the DIU3000 flexible design also provides the user with console-like capabilities. The built-in PTT allows sending of the ASTRO signalling data and base station control commands to the base station. Adding an optional handset allows operating the DIU3000 in a console-like manner, such as transmitting and receiving audio messages.

The following sections describe how to control the DIU3000 "local console" parameters related to PTT and handset operation, and how to use the DIU3000 "console" functions. The following procedures are covered:

- Function REQuest (FREQ) Selection
- CHaNeL Selection
- MODE Selection
- Key Index Selection
- Volume Control
- Transmission
- Encryption Key Erasure
- Monitor



Note

The memory that stores the DIU3000 "local console" parameters is backed up by a battery. Therefore, these parameters are not erased when the DIU3000 is turned off and restored when the DIU3000 is turned on again.

Error Messages

Refer to the "Troubleshooting Using the Error List Function" section on page 69 for description of error messages that are displayed in case of incorrect operation.

FREQ**Function Request Selection**

The DIU3000 converts the TRC command into a combination of ASTRO commands, referred to as Function REQuests (FREQs). Each TRC function tone (single- or dual-tone) is converted into a different FREQ. A FREQ may include up to seven ASTRO Signalling, Base Station control and DIU3000 control commands. The DIU3000 RSS maintains the TRC FUNCTIONALITY TABLE that defines the FREQ functions and associates FREQ numbers to function tones.

The **FREQ** key is used to select the FREQ No. associated with transmission from the local PTT/handset.

Table 23

| Action | LCD Display | Comments |
|--|-------------|---|
| 1. Press FREQ. | FREQ nnn | "nnn" indicates the currently selected FREQ number. |
| NOTE | | |
| An asterisk is displayed in front of the FREQ number (e.g., "FREQ * 123"), when some of the transmit parameters controlled by this FREQ have been manually set via the direct access keys. The asterisk is removed when another FREQ is selected or the same FREQ is reselected. | | |
| 2. Press ENTR to enter the FREQ number editing state. | FREQ nnn | "nnn" blinks. |
| 3. Key in the required value or scroll through the available values using the arrows. | FREQ mmm | The selected value blinks. |
| NOTE | | |
| Pressing CHNL or MENU/ESC at this stage will return to the FREQ number display state retaining the previous frequency value. | | |
| 4. Press ENTR to confirm the selection. | FREQ mmm | The DIU3000 returns to the frequency display state. |



Channel Selection

The CHNL key is used to select the channel command associated with the local PTT.

The available values are 0 through 255. An additional value allowed for the channel selection is the "don't care". When the channel is set to this value (" - - " is displayed in the value field) the channel is determined by the base station (usually the last channel used). It is also possible to select the "don't care" value by keying in an out of range value.

Table 24

| Action | LCD Display | Comments |
|--|-------------|--|
| 1. Press CHNL to enter the channel display state. | CHNL nnn | "nnn" indicates the currently selected channel number. |
| 2. Press ENTR to enter the channel editing state. | CHNL nnn | "nnn" blinks. |
| 3. Key in the required value or scroll through the available values using the arrows. | CHNL mmm | The selected value blinks. |
| NOTE | | |
| Pressing CHNL or MENU/ESC at this stage will return to the channel display state retaining the previous channel value. | | |
| 4. Press ENTR to confirm the selection and to return to the channel display state. | CHNL 46 | |

MODE

Mode Selection

The MODE key is used to select the base station mode that will be used for the local handset communications. The available modes are Analog, ASTRO Clear and ASTRO Encrypted. For operation in the ASTRO Encrypted mode, this procedure is used for selection of the transmission encryption key, as well.

Selection of the Encrypted mode differs from other modes and therefore is described separately.

Analog and Clear Mode Selection

The following table describes the selection of the Analog and ASTRO Clear base station modes.

Table 25

| Action | LCD Display | Comments |
|--|--|---|
| 1. Press MODE to enter the mode display state. | ANALOG or CLEAR or ENCR nnn | The current mode is displayed. |
| 2. Press ENTR to enter the mode selection state. | | The displayed mode blinks. |
| NOTE | | |
| Pressing MODE or MENU/ESC at this stage will return to the mode display state retaining the previous mode. | | |
| 3. Scroll to display the required mode (ANALOG or CLEAR). | ANALOG or CLEAR | The displayed mode blinks. |
| 4. Press ENTR to confirm the selection. | | Use the MENU/ESC key instead of the ENTR key, to abort mode selection and return to the mode display state retaining the previous mode. |

ASTRO Encrypted Mode Selection

This paragraph describes the selection of the ASTRO Encrypted mode and its associated encryption key. The following rules apply to the key selection:

- The USER and the CRYPTO officer are allowed to select the 1 – 8 and the “don't care” (see below) keys.
- The MAINTenance officer is allowed to select the 996 – 999 (test) and the “don't care” (see below) keys.
- When the key is set to “**don't care**” (“- - -” is selected), the encryption key is determined by the last key used. It is also possible to select the “don't care” value by keying in an out of range value.

**Note**

When FIPS is enabled, entering the ASTRO Encrypted mode is allowed only if the operator has already entered a valid password (see "LOGIN" section on page 53).

Table 26

| Action | LCD Display | Comments |
|---|--|--|
| 1. Press MODE to enter the mode display state. | ANALOG or CLEAR or ENCR hnn | The current mode is displayed. |
| 2. Press ENTR to enter the mode selection state. | | The displayed mode blinks. |
| 3. Scroll to display the Encrypted mode selection. | ENCR nnn | "ENCR" blinks and "nnn" indicates the active encryption key. |
| 4. Press ENTR to enter encryption key selection state. | KEY nnn | The active encryption key number blinks. |
| 5. Key in the required value or scroll through the available values using the arrows. The "don't care" key is accessed by scrolling to "---" or by keying in an out of range value. | KEY mmm | The selected value blinks. The USER and the CRYPTO officer are allowed to select the 1 – 8 and the "don't care" (---) keys. The MAINTenance officer is allowed to select the 996 – 999 (test) and the "don't care" (---) keys. |
| NOTE | | |
| Pressing MODE or MENU/ESC at this stage will return to the mode display state retaining the previous key value. | | |
| 6. Press ENTR to confirm the selection. | ENCR mmm | Use the MENU/ESC key instead of the ENTR key, to abort value entry and return to the mode display state retaining the previous mode. |

INDEX

Key Index/CKR Keyset Selection

Key indexing is a feature that allows instantaneous switchover between different sets of encryption keys. This way a set of new keys can be programmed into the various system devices (DIU3000s, subscribers, etc.) at different times and remain stored in the device's memories in an inactive state. Later, all those devices can simultaneously be switched to the new key set.

Key Index

The DIU3000 supports two encryption key sets, referred to as indexes. A distinct name (also referred to as "alias") is assigned to each index and loaded by means of the KVL (KEY Variable Loader) on the front panel.

The INDX key allows switching between the two available indexes. The index alias cannot be altered from the DIU3000 front panel.

Note that if the RSS parameter "ERASE OLD INDEX KEYS" is enabled, changing the index once will erase the previously active index, and changing the index twice will erase all encryption keys in the encryption module.

Table 27

| Action | LCD Display | Comments |
|--|-----------------------------|---|
| 1. Press INDX to enter the index display state. | NAME1 or NAME2 | The alias of the currently active index is displayed. |
| 2. Press ENTR to enter the index selection state. | NAME1 or NAME2 | The active index name blinks. |
| 3. Use arrows to scroll between the available indexes. | NAME1 or NAME2 | The name of the selected index blinks. |
| NOTE | | |
| Pressing INDX or MENU/ESC at this stage will return to the index display state without changing the index. | | |
| 4. Press ENTR to confirm the selection. | NEW!INDX or SAME!INDX | Either the "NEW!INDX" or "SAME!INDX" message is displayed for a short period to indicate if the index change has occurred. Then, the name of the currently active index is displayed. |



CKR Keypad

For APCO key management configurations, the DIU3000 supports numerous keysets. The keysets provide for functionality similar to Indexing.



Table 28

| Action | LCD Display | Comments |
|--|-------------|--|
| 1. Press INDX to display the active keyset. | | |
| 2. Press ENTER to enter the keyset selection state. | | |
| 3. Use arrows to scroll between the available keysets. | | Active keysets will be blinking. Inactive keysets will be solid. |
| 4. Press ENTER to select and make the keyset active. | | |

Volume Control

The  and  arrows on the DIU3000 keypad can control the volume of the handset speaker. To do so, the DIU3000 should be in one of the following states:

- Time of day *display state*
- Function request (FREQ) *display state*
- Mode *display state*
- Channel *display state*
- Index *display state*

The  arrow increases the volume, while the  arrow decreases the volume. There are 10 available volume levels, designated 0 through 9.

When either of the arrows is pressed, the volume is adjusted and the updated volume level is displayed on the LCD (e.g., VOL x, where "x" indicates the updated volume level).



Transmission

The DIU3000 PTT is used to key in the base station. The transmission includes ASTRO signalling, determined by parameters set from the DIU3000 front panel via the direct access keys, as described in the previous sections. Note that these parameters are stored in a memory backed up by a battery, so that they are retained after the DIU3000 has been turned off and on.

When the Link Busy LED is lit, transmission is inhibited. During transmission, the Transmit LED is lit.

**Note**

The DIU3000 can be programmed by the RSS to issue an alert tone to the console, to indicate transmission in clear mode when the encrypted mode is enabled.



Encryption Key Erasure

The ERSE direct access function key enables erasing (zeroization) of all traffic encryption keys in the encryption module via the DIU3000 keypad. For CKR and OTAR configurations, all key encryption keys will also be erased. However, if the Key Loss Key feature is enabled, the key loss key will not be erased.



Note

The DIU3000 can be programmed by the RSS to issue an alert tone to the console, to indicate key zeroization.

Table 29

| Action | LCD Display | Comments |
|--|-------------|--|
| 1. Press the ERSE key to enter the key zeroization function. | KEYERSE | The prompt indicates that the key zeroization function is active and the LED on the ERSE key is lit. |
| NOTE | | |
| Pressing ERSE or MENU/ESC at this stage will exit the key zeroization function without performing the zeroization. | | |
| 2. Press ENTR to initiate the zeroization procedure. | ZEROIZED | The LED on the ERSE key goes off and the "ZEROIZED" prompt is shown for several seconds to indicate successful zeroization. The DIU3000 then returns to the ready state. |



Monitor

Pressing the monitor key on the DIU3000 front panel allows unsquelching and monitoring the receive path.

Troubleshooting

General Checks

In case of malfunctioning, and before consulting the troubleshooting procedures, verify the following:

- The ac power cable and all the other cables are firmly connected to the unit.
- The encryption cartridge is properly installed (if present).
- The DIU3000 has been appropriately programmed by the RSS.

General Indications

Table 30

| Problem / Indication | Possible Cause | Remedy |
|--|--|---|
| Power-on self-test reports "TST FAIL". | DIU3000 internal failure. | Refer to "Information and Error Messages". |
| Link Busy LED is on. | The link establishment between the DIU3000 and the Base Station is in progress. This indication is normal if it appears immediately after the power-on sequence and lasts for about 30 seconds. | If still on after 30 seconds, then check the connection to the Base Station/Comparator. Check the connectors, line, Base Station or the Comparator functionality (either Modem link or V.24 link). |
| Link Busy LED is flashing. | The link establishment between the DIU3000 and the RNC is in progress. This indication is normal if it appears immediately after the power-on sequence and lasts for about 30 seconds. | |
| Battery LED is on. | No ac power (DIU3000 operates from external backup battery). | Connect DIU3000 to ac power. |
| Battery LED is flashing. | Low voltage problem. | Refer to "Information and Error Messages". |
| The transmission fails. | <ol style="list-style-type: none"> 1. The link is busy (Link Busy LED is lit). 2. Tone1 and Tone2 frequencies of a dual tone TRC command are identical. 3. The encrypted session has not been opened. 4. Trial to transmit in encrypted mode, while the encryption cartridge is not properly installed or not installed at all. 5. Trial to transmit with an encryption key that is not loaded. | <p>Wait till the Link Busy LED goes off.</p> <p>Use RSS to correct the frequency values of the particular FREQ.</p> <p>Login into an encrypted session.</p> <p>Verify that the encryption cartridge is present and properly installed.</p> <p>Load the required encryption key using KVL or if possible, use another key.</p> |
| "BAD EPRM" message on the LCD. | Internal memory failure. | Have the unit serviced. |
| "BAD FLSH" message on the LCD. | Internal memory failure. | Have the unit serviced. |
| "BAD RAM" message on the LCD. | Internal memory failure. | Have the unit serviced. |
| "ERSE ERR" message on the LCD. | The key erase operation has failed. | Verify that the encryption cartridge is properly installed. |
| "LOG FAIL" message on the LCD. | The logout operation has failed. | Verify that the encryption cartridge is properly installed. |
| "PWR LOW" message on the LCD. | Low voltage problem. | Refer to "Information and Error Messages". |

Alert Tones

Table 31

| Alert Tone Type | Meaning | Remedy |
|---|--|--|
| Self Test: Four tones during self test (476 Hz, 600 Hz, 712 Hz and 950 Hz, 200 ms each). | This is a normal indication during testing of the speaker/earpiece. | Not required. |
| Self Test Fail: Eight tones of 26 ms with alternating frequencies of 500 and 1000 Hz. | The self test has failed. | Have the unit serviced. |
| Clear Tx / Clear Rx: 750 Hz for 85 ms. | Indicates transmission/reception in the clear mode, while the encrypted mode is enabled. | Use the encrypted mode for transmission or use the RSS to disable either the encrypted mode or the Clear Tx / Clear Rx alert tone. |
| Tx Key Fail: Two tones of 750 Hz, 350 ms long, separated by a 350 ms silent interval. | Indicates a transmission key failure. | Load the required encryption key using KVL, or, if possible, use another key or use the RSS to disable the Tx Key Fail alert tone. |
| Rx Key Fail: 750 Hz tones, 85 ms long, repeated every 360 ms, for the entire duration of reception. | Indicates a reception key failure. | Load the required encryption key using KVL, or, if possible, use another key or use the RSS to disable the Rx Key Fail alert tone. |
| Key Erase: Three tones of 750 Hz 100 ms long, separated by silent intervals of 100 ms. | Indicates an intentional zeroization of all encryption keys. | Reload keys using KVL and reset the DIU3000. |
| Multi-Key Verification: A sequence of 175 ms tones with alternating frequencies of 911 and 1823 Hz, for a period of 1.05 seconds. | Indicates KVL keyloading was successful. | Not required. |
| Duplicate LID's: A sequence of 25 ms tones with alternating frequencies of 911 and 1823 Hz, for a period of 1.05 seconds. | Indicates that more than one key number is allocated to the same LID. | This is a warning. |
| Data Busy: A sequence of 80 ms tones with alternating frequencies of 911 and 1823 Hz, for the entire duration of data transmission. | Indicates the outbound audio path is busy with data. | This is a warning tone, and there is no remedy. |

Troubleshooting Using the Error List Function

This section describes the troubleshooting procedures that should be performed if failures are detected by the DIU3000 self-test. Follow the steps below to display the error list.

1. While the time of day is displayed, press MENU/ESC to enter the menu mode.
2. Scroll until ERR LIST is shown and press ENTR.
3. Scroll to view the stored failures.

Refer to the troubleshooting table below and the full error list summary in Table 34.

Table 32

| Error No. | Possible Cause | Remedy |
|--|--|--|
| 1 - 6, 8 - 25, 31 - 44, 46 - 48, 55 | DIU3000 internal failure. | Call service. |
| 7, 49, 50 | Encryption cartridge related failure. | <ol style="list-style-type: none"> 1. Verify that the encryption cartridge is properly installed, and then restart the unit. If the error persists, replace the encryption cartridge. 2. If the Encryption cartridge is not installed and the ENCRYPTION parameter is enabled, disable this parameter via the RSS. |
| 51, 53, 54 | <ol style="list-style-type: none"> 1. Encryption cartridge related failure. | <ol style="list-style-type: none"> 1. Verify that the encryption cartridge is properly installed, and then restart the unit. If the error persists, replace the encryption cartridge. 2. If the Encryption cartridge is not installed and the ENCRYPTION parameter is enabled, disable this parameter via the RSS. |
| | <ol style="list-style-type: none"> 2. DIU3000 internal failure. | Call service. |
| 52 | <p>EMC crypto violation.</p> <p style="text-align: center;">NOTE</p> <p>In any case of crypto violation, the encryption cartridge automatically erases all encryption keys.</p> | <ol style="list-style-type: none"> 1. Verify that the encryption cartridge has not been tampered. 2. Verify that voltage supply is correct. 3. Verify that the temperature conditions are appropriate. 4. Reload keys and reset DIU3000. If the temperature was not suitable, shut the DIU3000 for about 15 minutes, and then reload keys and reset. |
| 29 | External battery voltage is low. | Charge external battery as soon as possible. |
| 30 | DIU3000 internal lithium battery voltage is low. | Replace the battery as soon as possible. |
| 45 | Encryption battery voltage is low. | Replace the battery as soon as possible. |

Run-time Messages on External Terminal

Table 33

| Messages Printed | Possible Cause for Failure |
|--|--|
| LEGEND:(F) fatal error. The DIU3000 may reset itself. (W) Warning only. (I) Information (no problem) | |
| (1) (F) Problem with system calls | Host Memory board |
| (2) (F) Could not set wireline | I/O Controller or Host Memory board |
| (5) (F) Could not set attenuator | I/O Controller or Host Memory board |
| (6) (F) Unexpected inner task message | I/O Controller or Host Memory board |
| (8) (W) Encryption key error | EMC Key not loaded |
| (9) (F) Could not set analog matrix | I/O Controller or Host Memory board |
| (10) (W) Timeout getting vself from DSP | Software problem |
| (11) (W) Wrong vself number from DSP | Software problem |
| (12) (W) Timeout getting vself from EMC | Software problem |
| (11) (W) Wrong vself number from EMC | Software problem |
| (14) (W) Esync error | Software problem |
| (15) (W) Error sending STOP (no CTS) | Bad Modem board or Communications board (V.24) connector |
| (16) (F) Cannot update infra-structure Data Base | Host Memory board |
| (17) (W) Error sending Data (no CTS) | Bad Modem board or Communications board (V.24) connector |
| (18) (W) Could not initialize modem using V.24 | Modem board is required, but does not exist or Bad |
| (19) (F) Fail to receive start message | Host Memory board |
| (20) (I) Got message from infrastructure that require ack | - |
| (21) (W) Got an unknown RECEIV mode from infrastructure | - |
| (22) (W) Bad pre-escync received | Link problem |
| (23) (F) Fail to receive stop message | Host Memory board |
| (24) (F) Could not configure DSP1 | BAD DSP board |
| (25) (F) Could not configure EMC | BAD EMC module |
| (26) (W) Timeout getting vself from infrastructure | Link problem |
| (27) (W) Wrong vself number from infrastructure | Link problem |
| (28) (W) Timeout getting esync from infrastructure | Link problem |
| (29) (W) EMC is not installed | |

Table 33 (Continued)

| Messages Printed | Possible Cause for Failure |
|---|------------------------------------|
| (30) (F) Could not get ESYNC from EMC | BAD EMC module |
| (31) (F) Could not figure DSP2 | BAD DSP board |
| (32) (W) Operator board problem | Problem with OPERATOR Board |
| (34) (W) Operator board problem | Problem with OPERATOR Board |
| (35) (W) Undefined function tone | Problem with TRC decoding |
| (36) (I) Start Link Establishment process | |
| (37) (W) Missing STOP in analog | Modem missed fast train |
| (38) (I) Sending SABM frame | Part of Link establishment process |
| (39) (I) Sending UA frame | Part of Link establishment process |
| (40) (I) Receive SABM frame | Part of Link establishment process |
| (41) (I) Receive UA frame | Part of Link establishment process |
| (42) (W) Link establishment failed | Link problem |
| (43) (W) Link establishment O.K | Part of Link establishment process |
| (44) (W) Link failure | Link problem |
| (45) (W) Analog timeout | Link problem |
| (46) (W) Link Degradation (TOD) | Link problem |
| (47) (W) Modem Self-Test Failed | Local Modem Problem |
| (48) (I) Modem Self-Test Passed | |
| (49) (W) Link failure on remote modem | Remote Modem Problem |
| (54) (W) CRC Errors Counter Critical Value | Link problem |
| (55) (W) Unknown Command from ZC | Zone controller Link Problem |
| (60) (W) EMC status timeout | Bad EMC Module |
| (62) (I) Start RNC Link establishment process | |
| (63) (I) Sending SABM frame to RNC | Part of Link establishment process |
| (64) (I) Sending UA frame from RNC | Part of Link establishment process |
| (65) (I) Sending SABM frame from RNC | Part of Link establishment process |
| (66) (I) Receive UA frame to RNC | Part of Link establishment process |
| (67) (W) Link establishment with RNC failed | RNC link problem |
| (68) (I) Link establishment with RNC O.K | |
| (69) (W) RNC Link Failure | RNC link problem |
| (74) (W) No Receive ready from Base | Link problem |
| (75) (W) HLM: DIU-Base link is down | Hybrid base link problem |

Table 33 (Continued)

| Messages Printed | Possible Cause for Failure |
|--|------------------------------------|
| (76) (I) HLM: DIU-Base link is up | |
| (77) (W) HLM: DIU-Console link is down | Hybrid console link problem |
| (78) (I) HLM: DIU-Base link is up | |
| (79) (W) ACIM link is down | ACIM link problem |
| (80) (I) ACIM link is up | |
| (82) (W) DIU Main Battery Failure | Lithium Battery problem |
| (83) (I) DIU Main Battery O.K | |
| (84) (W) DIU EMC Battery Failure | |
| (85) (I) DIU EMC Battery O.K | |
| (99) (I) Sending XID Command to Base | Part of Link establishment |
| (100) (I) Sending XID Response to Base | Part of Link establishment process |
| (101) (I) Receive XID Command from Base | Part of Link establishment process |
| (102) (I) Receive XID Response from Base | Part of Link establishment process |
| (103) (W) No Receive Ready from RNC | RNC link problem |
| (107) (I) Sending XID Command to RNC | Part of Link establishment process |
| (108) (I) Sending XID Response to RNC | Part of Link establishment process |
| (109) (I) Receive XID Command from RNC | Part of Link establishment process |
| (110) (I) Receive XID Response from RNC | Part of Link establishment process |

Table 34
ERR LIST Error Summary

| Error No. | Error Name |
|------------------|------------------------------|
| 1 | DSP1 Comm.Test |
| 2 | DSP1 RAM Test |
| 3 | DSP1 Bootstrap |
| 4 | DSP2 Comm. Test |
| 5 | DSP2 RAM Test |
| 6 | DSP2 Bootstrap |
| 7 | Host EMC Comm. Test |
| 8 | Host MODEM Comm. Test |
| 9 | Host V24 Link Comm. Test |
| 10 | Basic Board Existence |
| 11 | Base WLI Board Existence |
| 12 | Memory Board Existence |
| 13 | Base WLI Board Existence |
| 14 | Operator Board Existence |
| 15 | Console WLI Board Existence |
| 16 | GPIO Board Existence |
| 17 | Comm. Board Existence |
| 18 | EMC Server Test |
| 19 | HC11 Server Test |
| 20 | DSP Server Test |
| 24 | DSP to EMC Test |
| 25 | DSP Software Version Test |
| 29 | 14 V Power Supply Test |
| 30 | DIU3000 Lithium Battery Test |
| 32 | DTMF Generator Test |
| 38 | Base WLI Board Test |
| 39 | Console WLI Board Test |
| 40 | Modem Test |
| 43 | Host RAM Test |
| 45 | EMC Battery Test |

Table 34
ERR LIST Error Summary (Continued)

| Error No. | Error Name |
|-----------|-----------------------------|
| 46 | EMC Memory Backup Test |
| 47 | GPIO Board Test |
| 48 | DSP Tone Generation Test |
| 49 | EMC Software Integrity Test |
| 50 | EMC Crypto Security Test |
| 51 | EMC Error Condition Test |
| 52 | EMC Crypto Violation Test |
| 53 | EMC SCI Test |
| 54 | EMC Board Existence |
| 55 | EMC Adaptor Board Existence |

Information and Error Messages

| | |
|----------|---|
| BAD EPRM | Internal memory failure (see Table 30). |
| BAD FLSH | Internal memory failure (see Table 30). |
| BAD RAM | Internal memory failure (see Table 30). |
| DIFF VER | A flash programming failure has been encountered. Because of the problem, different codeplug versions may exist in flash, RAM, and RSS. If the problem persists, have the DIU serviced. |
| ERSE ERR | The key erase operation has failed (see Table 30). |
| FIPS DIS | FIPS Disabled. When disabled, using encryption functions does not require password entry. The FIPS parameter is controlled by the RSS. |
| LOG FAIL | The logout operation has failed (see Table 30). |
| NO EMC | You are trying to perform an action that involves encryption, while the encryption cartridge is either not installed or disabled by the RSS (Service: DIU Configuration : Hardware Configuration data screen in the RSS). |
| NO INFO | There was no inbound process since power-up. |
| NO LOGIN | <ol style="list-style-type: none"> 1. You are trying to perform an action that involves encryption while FIPS is enabled, but a corresponding encryption session has not been initiated. 2. The selected encryption key does not correspond to the user type. |
| NO KEY | You are trying to perform an action that involves encryption, but the encryption key requested does not exist. The DIU3000 can be programmed by the RSS to send an alert tone to the console when this error occurs. |
| NO SRVC | Not a Service Session. This error message is displayed when trying to perform an action that involves changing certain parameters that require being in a Service session. |
| PWR LOW | The external battery voltage is lower than 14 V (see Table 30). |
| PSWD ERR | Password Error. A message informing that an incorrect password was entered. |
| VAR ERR | The selected value is out of range. |

DIU3000 Functional Tests

General

The DIU3000 is a full duplex device, that allows establishing a link with itself by interconnecting the transmit and receive lines on the DIU3000 rear panel connectors. The following sections provide instructions on performing such tests for fault isolation purposes during system problems.

It is possible to disconnect the base station and create a direct connection between the DIU3000 transmit and receive terminals to/from the base station. This enables the DIU3000 functional operation to be checked in all modes of operation. Refer to section "Testing the DIU3000 with Loop-Back on Base Station" below.

An additional test requires placing the DIU3000 in a special test mode. In this mode, it is possible to completely disconnect it from the outside world (both from the base station and the console), and functionally test about 99% of the DIU3000 hardware. Refer to section "DIU Stand Alone Audio Loop Test" on page 78.

Testing the DIU3000 with Loop-Back on Base Station



The Audio Loop test requires the use of a test handset (option C109AA).

Note

This test allows testing the DIU3000 functional operation without connecting it to the base station. Perform the following setup (see Figure 14):

- For the Modem analog link (option X437AF): connect jumper wires between the T/R and R terminals of the "STATION" connector.
- For the V.24 Digital link: connect jumper wires between the following pins of the "COMM" connector: 2 (TD) and 3 (RD), 24 (TCLK) and 17 (RCLK), 4 (RTS), 5 (CTS) and 8 (CD). Connect jumper wires between the T/R and R terminals of the "STATION" connector.

Use the DIU3000 handset to speak and monitor your voice (with some delay). Only if the DIU3000 circuits function properly, will you hear your voice through the handset earpiece. You can perform the test in all the modes of operation.

Use the analog console handset in full duplex mode to speak and monitor your voice (with some delay). Only if the DIU3000 circuits function properly, will you hear your voice through the handset earpiece. You can perform the test in all modes of operation.

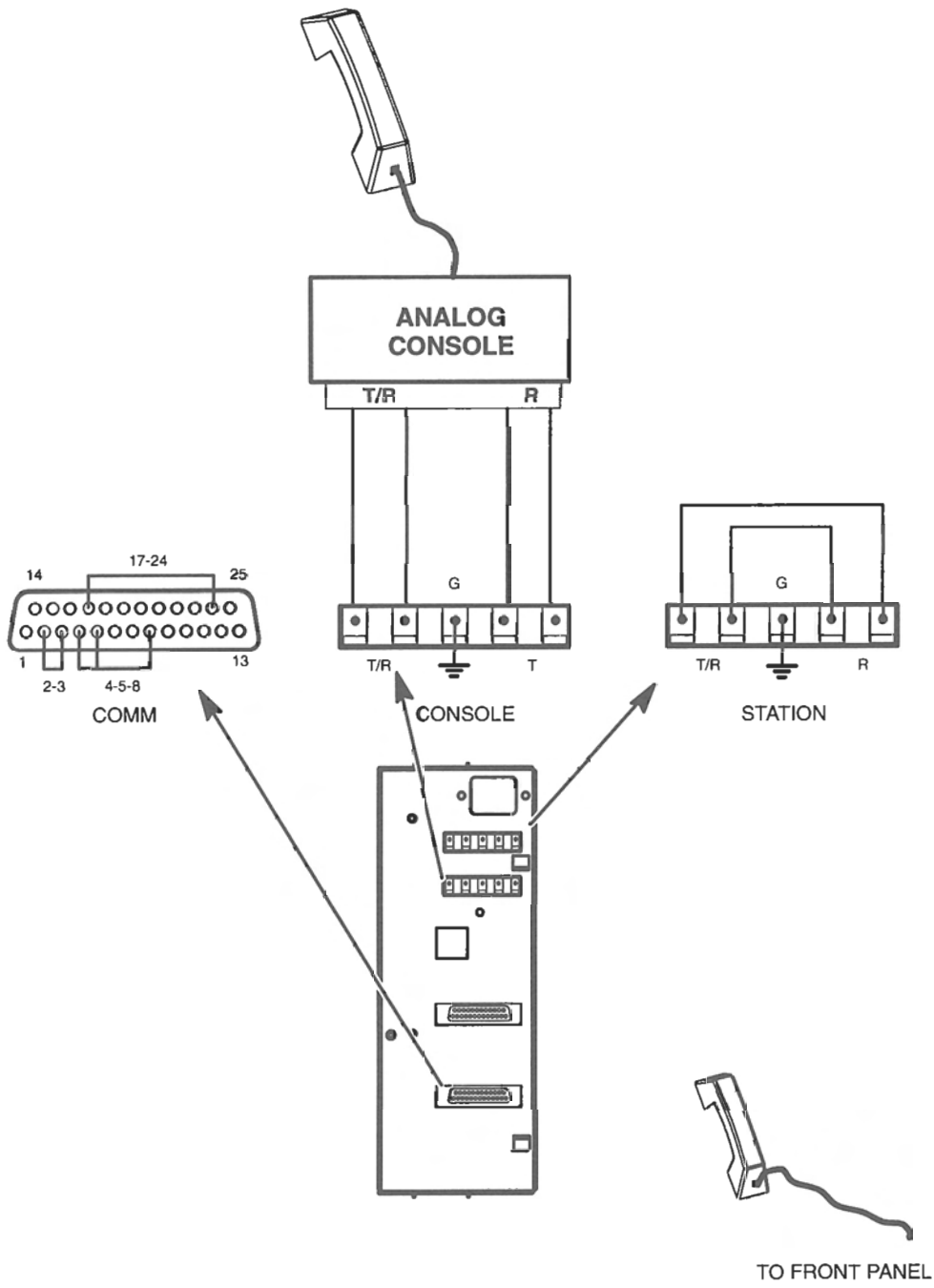


Figure 14
Testing the DIU3000 with Loop-Back on Base Station

DIU Stand Alone Audio Loop Test



The Audio Loop test requires the use of a test handset (option C109AA).

Note

In this test, the DIU3000 is disconnected from both the base station and the console and placed in an abnormal loop-back test mode. Under these conditions, proper operation of is verified to a very large extent (about 99% of the hardware is tested).

Perform the setup shown in Figure 15. Power up the DIU3000 and perform the following steps to enter the AUDio LOOP test mode.

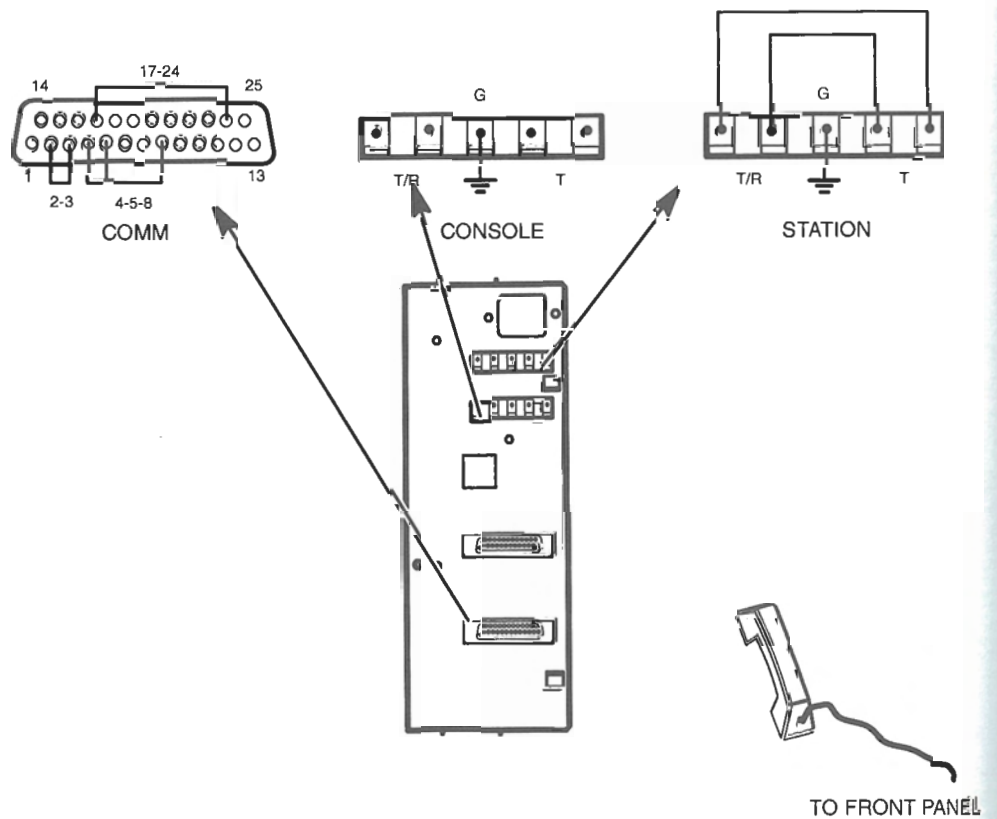


Figure 15
Stand Alone Audio Loop Test Setup

Table 35

| Action | LCD Display | Comments |
|--|-------------------------------------|--|
| 1. While in the ready mode, press MENU/ESC to enter the menu mode. | | The last accessed menu entry is shown. |
| 2. Scroll until SERVICE is shown. | SERVICE | |
| 3. Press ENTR to display options. | LOGIN or LOGOUT | |
| 4. Scroll to display LOGIN. | LOGIN | |
| 5. Press ENTR to initiate password entry. | SRV PSWD | The display blinks. |
| 6. Key in the password - "039302164". | ----- | A short bar is displayed for each key depression. |
| 7. Press ENTR. | PSWD OK | The message "PSWD OK" is displayed for a few seconds and the DIU3000 returns to the SERVICE display. |
| 8. Press MENU/ESC to return to the menu mode. | SERVICE | |
| 9. Scroll until TESTS is shown. | TESTS | |
| 10. Press ENTR to display options and scroll to display AUD LOOP. | AUD LOOP | |
| 11. Press ENTR to enter the Audio Loop test mode. | LOOP RDY | The DIU3000 is ready for the loop-back testing |

You are now in the audio loop test mode. Use the handset to speak and monitor your voice (with some delay). Only if the DIU3000 circuits function properly, will you hear your voice through the handset earpiece. Use the [↑] and [↓] arrows on the DIU3000 keypad to control the handset speaker's volume.

Use the MENU/ESC key to exit the Audio Loop test mode.

Appendix A: DIU3000 External Connectors

Table 36
DIU3000 External Connector List

| Name | Type | Description |
|----------|---------|--|
| STATION | Line | Base station line connection |
| CONSOLE | Line | Console line connection |
| PATCH | RJ45 | Reserved for phone patch |
| MIC | RJ45 | Desk microphone |
| H. SET | RJ11 | Test handset connection |
| LINE | AC jack | AC line input |
| OPT1 | DB-25 | General I/O connector |
| COMPUTER | RJ45 | Serial communication RS-232 port for connecting external computer/terminal/printer |
| COMM | DB-25 | Optional communication links |

Table 37
STATION Connector Pin Description

| Pin No. | Type | Description | I/O Type |
|---------|------|--|---------------|
| 1, 2 | T/R | Transmit audio and embedded signalling to base station | analog output |
| 3 | GND | Protective ground | |
| 4, 5 | R | Receive audio and embedded signalling from base station. | analog input |

Table 38
CONSOLE Connector Pin Description

| Pin No. | Type | Description | I/O Type |
|---------|------|------------------------------------|---------------|
| 1, 2 | T/R | Receive audio and TRC from console | analog input |
| 3 | GND | Protective ground | — |
| 4, 5 | T | Transmit signalling to console | analog output |

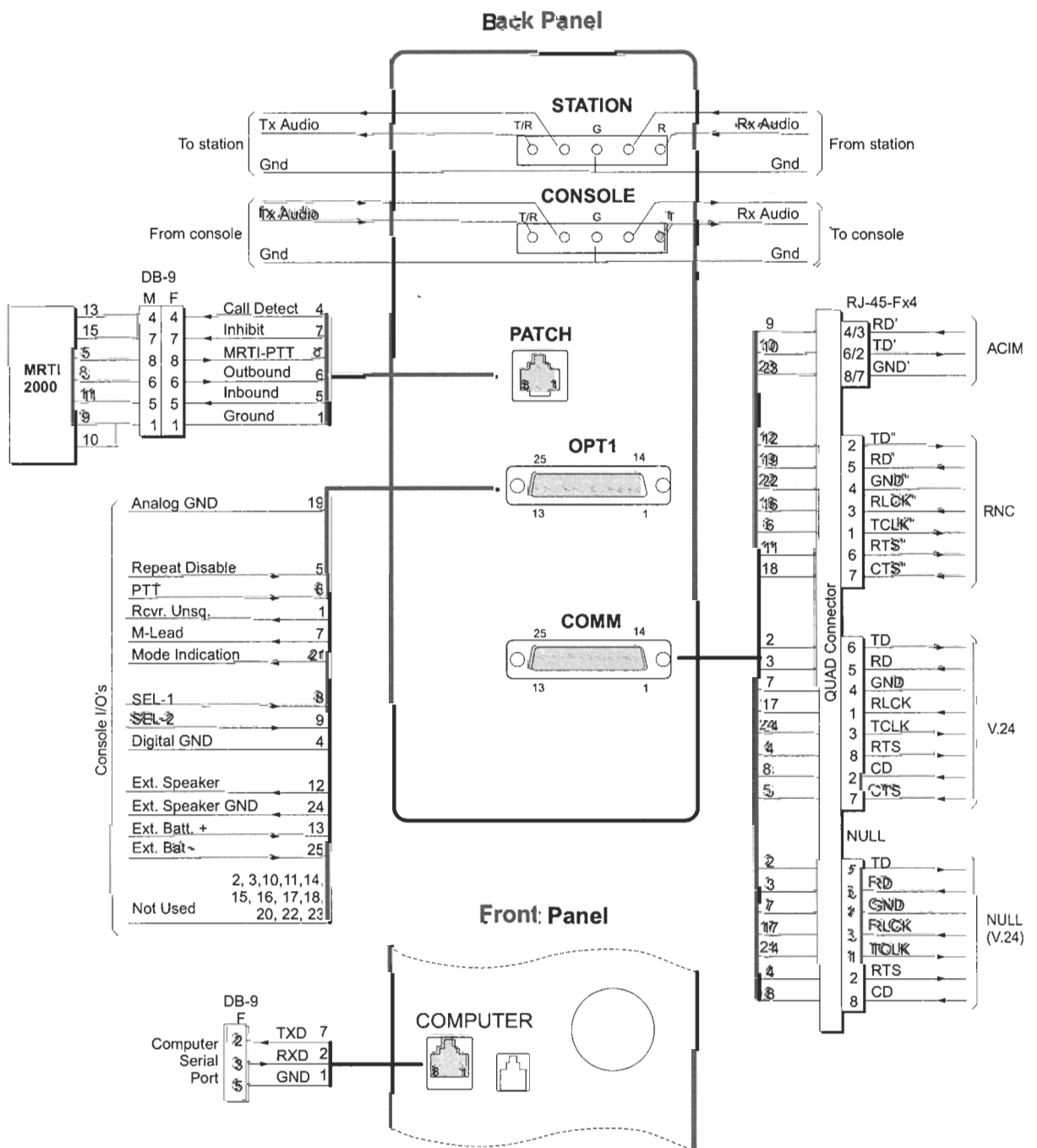


Figure 16
DIU3000 Interface Diagram

Table 39
H SET Connector Pin Description

| Pin No. | Description | I/O Type |
|---------|--------------------------------|---------------|
| 1 | Ground | - |
| 2 | PTT and On/Off hook indication | analog input |
| 3 | Earpiece | analog output |
| 4 | Microphone | analog input |

Table 40
OPT. 1 (General Purpose I/O) Connector Pin Description

| Pin No. | Description | I/O Type | Logic Low = | Junction Box Corresponding Pin No. (option C62AB) |
|---------|---|---------------------------|------------------------|---|
| 1 | Receiver unsquelch to Centracom console | logic output [†] | Unsquelch [‡] | TB4-2 |
| 2 | Not used | | | |
| 3 | Not used | | | |
| 4 | Digital ground | | | TB4-3 |
| 5 | Repeat disable | logic input | | |
| 6 | PTT | logic input | | |
| 7 | M_LEAD | logic output [†] | PTT active | TB2-1 |
| 8 | SEL-1 | | | |
| 9 | SEL-2 | | | |
| 10 | Not used | | | |
| 11 | Not used | | | |
| 12 | External speaker | analog output | | TB5-5 |
| 13 | External battery (+) | power input | | TB5-6 |
| 14 | Not used | | | |
| 15 | Not used | | | |
| 16 | Not used | | | |
| 17 | Not used | | | |
| 18 | Not used | | | |
| 19 | Analog GND | | | |
| 20 | Not used | | | |
| 21 | Mode indication | logic output [†] | Mode 1 [‡] | TB4-1 |

Table 40
OPT. 1 (General Purpose I/O) Connector Pin Description

| Pin No. | Description | I/O Type | Logic Low = | Junction Box Corresponding Pin No.* (option C62AB) |
|---------|-------------------------|--------------|-------------|--|
| 22 | Not used | | | |
| 23 | Not used | | | |
| 24 | External speaker ground | | | TB5-8 |
| 25 | External battery (-) | power return | | TB5-7 |

*. When using the Junction box connect TB4-7 and 8 to good earth ground to ensure surge protection.

†. Internally pulled up to 15 V dc by a 10 K Ω resistor.

‡. Polarity can be reversed (to active high) using RSS.

Table 41
COMPUTER Connector Pin Description

| Pin No. | Signal Name | Description | I/O Type |
|---------|-------------|---|-----------------------|
| 1 | GND | Ground | |
| 2 | RXD | Asynchronous data from computer to DIU3000 controller | RS-232 digital input |
| 3 | | Not used | |
| 4 | | Not used | |
| 5 | | Not used | |
| 6 | | Not used | |
| 7 | TXD | Asynchronous data from DIU3000 controller to computer | RS-232 digital output |
| 8 | | Not used | |

Table 42
COMM Connector Pin Description

| Pin No. | Signal Name | Description | I/O Type |
|---------|-------------|--|----------------|
| 1 | Prot. GND | Protective Ground | |
| 2 | TD | Transmit data to Base Station | digital output |
| 3 | RD | Receive data from Base Station | digital input |
| 4 | RTS | Request to Send to Base Station | digital output |
| 5 | CTS | Clear to Send from Base Station | digital input |
| 6 | TCLK" | External Tx clock for RNC | digital |
| 7 | GND | Ground from Base Station | |
| 8 | CD | Carrier Detect from Base Station | digital input |
| 9 | RD' | Receive Data from CENTRACOM or Zone Controller | digital input |
| 10 | TD' | Transmit Data to CENTRACOM or Zone Controller | digital output |
| 11 | RTS" | Request to Send to RNC | digital |
| 12 | TD" | Transmit data to RNC | digital |
| 13 | | Not used | |
| 14 | | Not used | |
| 15 | CD" | Carrier Detect from RNC | digital |
| 16 | RCLK" | Receive Clock from RNC | digital |
| 17 | RCLK | Receive Clock from Base Station | digital input |
| 18 | CTS" | Clear to Send from RNC | digital |
| 19 | RD" | Receive data from RNC | digital |
| 20 | | Not used | |
| 21 | | Not used | |
| 22 | GND" | Ground from RNC | |
| 23 | GND" | Ground from CENTRACOM or Zone Controller | |
| 24 | TCLK | Internal Tx Clock for Base Station | digital output |
| 25 | | Not used | |

Table 43
Quad Connector FLN5462A Pin Description

| Function | DIU Comm Port DB-25M PIN | V.24 (null) RJ-45 #1 | V.24 RJ-45 #2 | ACIM/SZ RJ-45 #3 | RNC RJ-45 #4 |
|-----------|---|-------------------------|------------------------|--|-----------------|
| PROT. GND | 1 | | | | |
| TD | 2 | 5 | 6 | | |
| RD | 3 | 6 | 5 | | |
| RTS | 4 | 2 | 8 | | |
| CTS | Jmpr #4 DB25-5 to DB25-4 & DB25-5 to Jmpr #6-1 | | 7 | | |
| TCLK" | 6 | | | | 1 |
| SIG GND | 7 | 4 | 4 | | |
| CD | DB25-8 to Jmpr #6-2 | RJ#1-8 to Jmpr #6-3 | RJ#2-2 to Jmpr #6-3 | | |
| RD' | 9 | | | Jmpr #2 DB25-9 to RJ#3-3 & DB25-9 to RJ#3-4 | |
| TD' | 10 | | | Jmpr #3 DB25-10 to RJ#3-2 & DB25- 10 to RJ#3-6 | |
| RTS" | 11 | | | | 6 |
| TD" | 12 | | | | 2 |
| Not used | 13 | | | | |
| Not used | 14 | | | | |
| CD" | Jmpr #5 DB25- 15 to DB25-11 | | | | |
| RCLK" | 16 | | | | 3 |
| RCLK" | 17 | 3 | 1 | | |
| CTS" | 18 | | | | 7 |
| RD" | 19 | | | | 5 |
| Not used | 20 | | | | |
| Not used | 21 | | | | |
| GND" | 22 | | | | 4 |
| GND" | 23 | | | Jmpr #1 DB25-23 to RJ#3-7 & DB25- 23 to RJ#3-8 | |
| TCLK | 24 | 1 | 3 | | |
| Not used | 25 | | | | |

Table 44
Quad Connector FLN5462A Jumpers

| Jumper # | Application | Jumper Table | Standard Jumper Installation |
|----------|-----------------|--------------|------------------------------|
| 1* | ACIM Position | 23 & 8 | Default |
| | SZ Position | 23 & 7 | |
| 2* | ACIM Position | 9 & 4 | Default |
| | SZ Position | 9 & 3 | |
| 3* | ACIM Position | 10 & 6 | Default |
| | SZ Position | 10 & 2 | |
| 4 | V.24 and Null | 4 & 5 | Default |
| | Open Connection | 5 & N/C | |
| 5 | RNC | 11 & 15 | Default |
| | Open Connection | 15 to N/C | |
| 6 | Internal CD | 8 & 5 | Default |
| | External CD | 8 & 8/2 | |

*Jumpers 1, 2, and 3 must all be in the ACIM position or SZ position.



Note

Jumper Access

The top cover of the Quad Connector is secured to the bottom via four tabs. To access the jumpers, gently pull the sides of the top cover out from the sides of the bottom cover to release the tabs. DO NOT overbend so as to cause deforming of the top cover.

The top cover is keyed by the tabs. When re-connecting the top cover, make certain the tabs snap into place and the letters are right side up. If not, the top cover may be upside down.

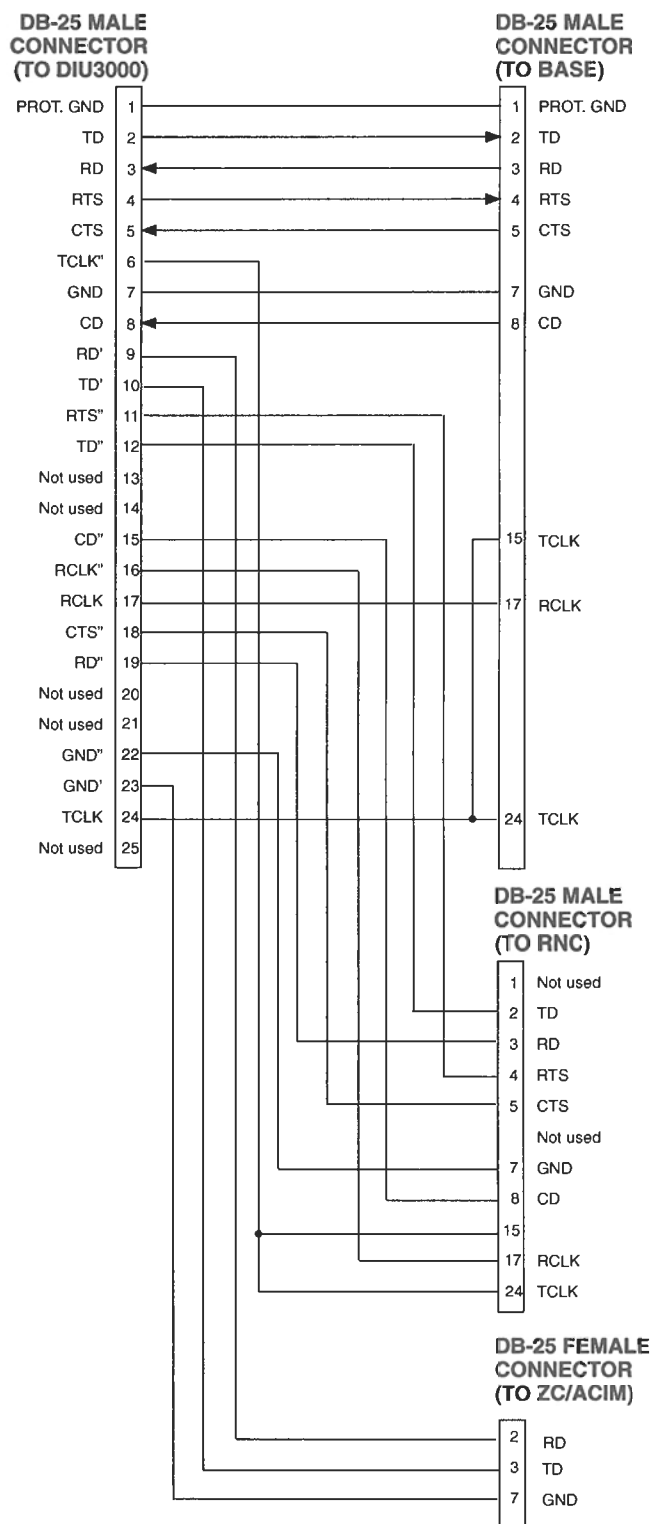


Figure 17
DIU3000 Communication Adaptor Cable FKN4632A (W cable)

Appendix B: Communcation Cables

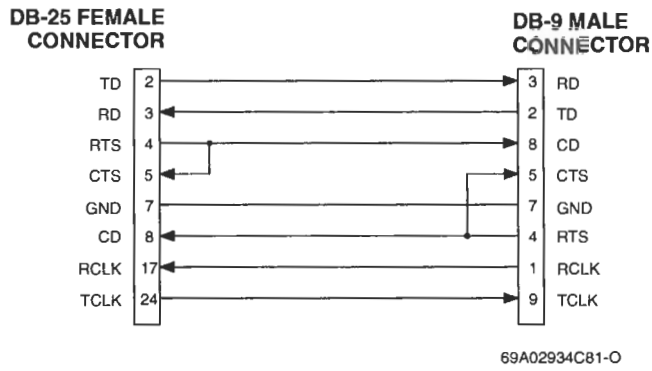


Figure 18
 DIU3000-to-Base Station Modem Eliminator Cable (options C542AC and C542AD)

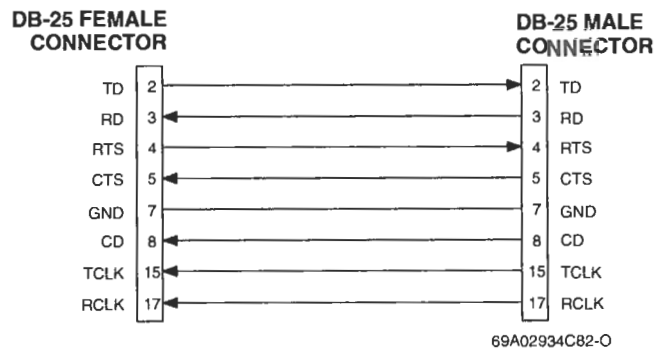


Figure 19
 DIU3000 to Channel Bank DSU Cable (options C543AC and C543AD)

Appendix C: Glossary of Terms and Phrases

| | |
|--|--|
| Access Code | A preprogrammed network access code transferred on the radio channel, that allows private communication between end users. The access code may be PL, DPL, Single Tone, DTMF, MDC1200 or ASTRO N word. |
| ASTRO™ | MOTOROLA Trademark for Land Mobile Radio Sector's FDMA digital radio system. |
| Bit | A binary digit. |
| Bit Rate | In a bit stream, the number of bits occurring per unit of time, usually expressed as bits per second or "bps". |
| Channel Rate | The data rate at which information is transmitted through the channel. |
| Embedded Signalling | Digital signalling information transmitted simultaneously with the voice. |
| Frequency Division Multiple Access (FDMA) | An access method of improving spectrum efficiency that divides the communication channel into two or more individual channels. |
| Improved Multi-Band Excitation* (IMBE) coding | One of the analog-to-digital voice conversion methods used by the DIU3000. |
| Inbound | Base station to console direction of data/voice transfer. |
| Infrastructure | A fixed radio network that allows indirect communication between field radios and centralized dispatches and control points. The infrastructure also expands the coverage area of otherwise directly communicating field radios. |
| Logical ID (LID) | A key variable used to encrypt a message. |
| Multikey | The ASTRO devices capability to be equipped with multiple encryption keys. |
| Multiple Algorithm | The ASTRO devices capability to be equipped with two hardware-based encryption algorithms. This feature supports interoperability and migration. |
| Outbound | Console to base station direction of data/voice transfer. |
| SECURENET | Motorola's 12 kbps voice encryption system. |
| SmartZone™ | A trunking system using multiple sites with a variable number of repeaters to cover large geographic areas. |
| Stat-Alert™ | A signalling scheme based on the MDC standard. |
| Zeroization (of encryption keys) | The process of erasing encryption keys. |

Appendix D: Acronyms

| | |
|-------------|--|
| ACIM | ASTRO Console Interface Module |
| AGC | Automatic Gain Control |
| BER | Bit Error Rate |
| BIT | Built In Test |
| CEB | Central Electronics Bank (CENTRACOM Series II) |
| CKR | Common Key Reference |
| DIU | Digital Interface Unit |
| DKC | Digital Keying Console |
| DRC | Digital Remote Control |
| DSP | Digital Signal Processing |
| DSU | Data Service Unit |
| EMC | Encryption Module Cartridge |
| FDMA | Frequency Division Multiple Access |
| FIPS | Federal Information Processing Standards |
| FREQ | Function Request |
| FT | Function Tone |
| HLGT | High Level Guard Tone |
| IMBE | Improved Multi-Band Excitation |
| KMC | Key Management Controller |
| KVL | Key Variable Loader |
| LID | Logical ID |
| LLGT | Low Level Guard Tone |
| OTAR | Over-the-Air-Rekeying |
| PL | Private-Line |
| RNC | Radio Network Controller |
| RSS | Radio Service Software |
| TRC | Tone Remote Control |