5   Functional Tests

Functional testing of the MDT after service or maintenance is performed by means of two on-board test routines:

- a self-test is conducted each time the MDT is powered up

- the operating system software includes a semi-automatic testing facility, referred to as Test Mode.

This section describes how to use each of the test routines to ascertain that the MDT is functioning correctly.

5.1 Preparation for Testing

5.1.1 Serial Port Loop Back Test Connector

To ensure accurate testing of the MDT's communications port, a serial port loop back test connector should be prepared and fitted to the MDT prior to testing. Figure 5.1 below identifies the correct wiring arrangement for a suitable test connector.

Note: Testing can be conducted without the loop back test connector, for example while the MDT is connected to power in its working installation. However, in this event, the communications port tests will fail even if the ports are operating normally.
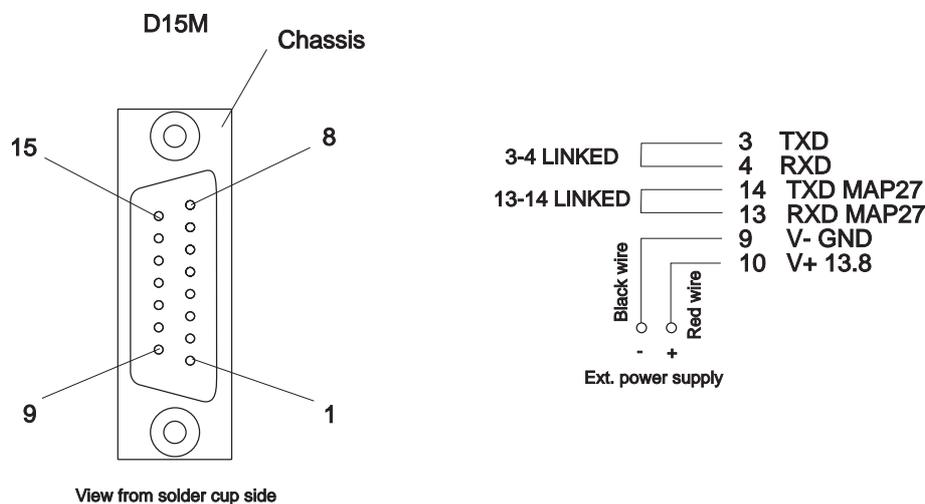

Figure 5.1   Wiring Arrangement for Serial Port Loop Back Test Connector

Fit the test connector to the MDT as follows:

1   Fit the serial port loop back test connector to the 15-pin D-range connector of the MDT.

2   Locate a suitable 12 V power supply and ensure that it is switched off.

3   Connect the negative wire from the serial port loop back test connector to the negative terminal of the 12 V power supply.

4   Connect the positive wire from the serial port loop back test connector to the positive terminal of the 12 V power supply.

5.1.2 Test Equipment

The following test equipment may be useful during functional testing of the MDT:

- Serial port loop back test connector and power supply cord; refer to section 5.1.1.

- Power supply, adjustable between 9 V DC and 16 V DC and having a capacity of at least 1 A.

- Digital multimeter (e.g. Fluke 75).

- 20 MHz dual channel oscilloscope with X10 and X1 probes (e.g. Trio CS1022).

5.2   Testing the MDT

When the MDT has been connected to a suitable power supply and the serial port loop back test connector, if applicable, testing can be conducted as described in sub-sections 5.2.1 to 5.2.3.

Note: Testing proceeds automatically and rapidly as soon as the MDT is powered up. It may be necessary to repeat the test procedure to evaluate the outcome of all tests.

5.2.1   Starting Up the MDT in Test Mode

Start up the MDT in Test Mode as follows:

1   Press and hold down the second-from-left softkey.

2   Press the On/Off key.

The MDT is powered up in Test mode and the power up self-test commences immediately.

3   When the Test Mode display appears, release the keys.

```
                    Test Mode

Port 1:     Ok        Piezo:      Done
Port 2:     Ok        Backlight:
Serial #:   Ok        Contrast:
Flash ROM: Ok         Key:

```

Figure 5.2   MDT Test Mode Display

5.2.2   Power Up Self-Test

Each time the MDT is powered up, whether in normal operating mode, Programming Mode or Test Mode, the on-board software conducts a predetermined start-up routine that comprises a series of self tests. The self-test sequence comprises the following tests:

•   LCD module. The test confirms that the module is present and operational.

•   RAM operation. The test confirms that the RAM is operational.

•   RAM integrity. The test confirms that the contents of the RAM are not corrupt.

While self-testing is in progress, the system start-up message is displayed on the LCD; Figure 5.3 refers.
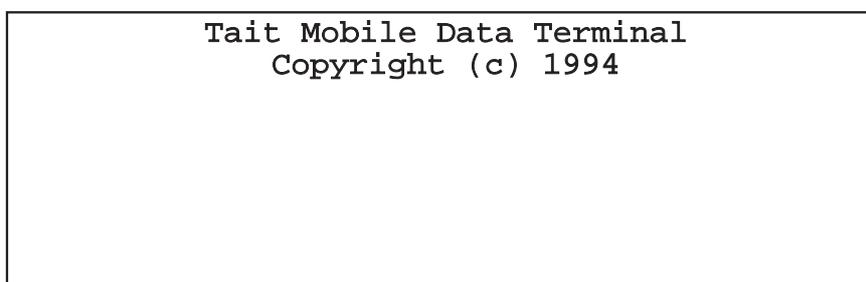
```
        Tait Mobile Data Terminal
            Copyright (c) 1994
```

Figure 5.3   MDT System Start-up Message

Under normal circumstances the self-test is completed successfully and rapidly. If the MDT has been powered up in Test Mode the Test Mode Display appears, as shown in Figure 5.2.

Note: If the MDT has been powered up in normal operating mode, the Message List display appears as soon as the self-test is complete. Alternatively, if the MDT has been started up in Programming Mode, the PROGRAMMING MODE message is displayed when self-testing is complete.

5.2.2.1   Self-Test Failure

If any test is unsuccessful, testing halts immediately. In this event a prompt is displayed on the LCD and a series of [1]long and [2]short audible tones indicate the cause of the failure. Table 5.1 summarizes the failure indication for each test.

Table 5.1   Self-Test Fail Notification

Test	Displayed Message	Audible Tone
LCD module	None - LCD remains blank.	long-long-long
RAM operation	Error 3 - RAM Operation Failure	long-short-long
RAM integrity	Error 4 - Memory Failure, Check Battery	long-long

1.   Approximately one second duration
2.   Approximately 0.25 second duration

5.2.3   Supervising Test Mode

Note: Tests are conducted automatically and rapidly as soon as the power up self-test is complete. It is necessary to observe the MDT to evaluate the results of certain tests. You may need to repeat the test procedure to evaluate the outcome of all tests.

When the Test Mode Display appears, functional testing commences immediately. The result/progress of testing is displayed on screen as each test is completed. Some of the tests require manual input and/or operator evaluation of the test outcome.

Refer to Table 5.2 for details of the tests performed, and to assess the outcome of testing.

Table 5.2   Test Routines and Outcomes

Test	Description	Evaluation Method	Outcome
Serial port	The test verifies that the communications ports are present and operational. Note that Port 2: must be operational even though it is not used in most installations.	Automatic	If test is completed successfully, OK is displayed beside Port 1: and Port 2:. Otherwise Fail is displayed; in this event check that a loop back test connector is fitted (if applicable) and/or refer to section 6.3.1.
Serial #	The test verifies that a serial number is present, and that it can be read.	Automatic	If test is completed successfully, OK is displayed beside Serial #:. Otherwise Fail is displayed; in this event refer to section 6.3.2.
Flash ROM	The test verifies the type of memory that is fitted in the MDT.	Automatic	If Flash ROM is present and operational OK is displayed beside Flash ROM:. Otherwise Fail is displayed; this usually indicates that the MDT is fitted with OTP memory. In the unlikely event that Flash ROM is present in the MDT and the test fails, refer to section 6.3.3.
Piezo	The test verifies that the piezo is operational by generating a high and low audible tone. Each tone is sounded for approximately one second duration.	By audible observation	If two audible tones of different volumes are observed the piezo is operating normally. Otherwise refer to section 6.3.4. Done is displayed beside Piezo: when the test is complete.
Backlight	The test verifies that backlighting is operational by switching off the backlight and then adjusting the backlight through seven different levels. Each light level is maintained for approximately one second duration.	By visual observation	If the backlight is seen to switch off, on, and then become increasing lighter through six levels, the backlight is operating normally. Otherwise refer to section 6.3.6. Done is displayed beside Backlight: when the test is complete.

Table 5.2 Test Routines and Outcomes

Test	Description	Evaluation Method	Outcome
Contrast	The test verifies that the contrast function is operational by adjusting the screen contrast through dark and light settings to the normal setting. Each contrast setting is maintained for approximately one second duration	By visual observation	If the screen contrast becomes dark, then light and then reverts to the normal setting, the screen contrast is operating normally. Otherwise refer to section 6.3.5. Done is displayed beside Contrast: when the test is complete.
Key	The test verifies that each of the softkeys is operational. It is necessary to press each softkey to view the outcome of the test.	Manual	Press each softkey in turn. If the softkey line above the respective key is filled when a key is pressed, that key is operating normally. If the Piezo is operational, an audible tone is emitted each time a key is pressed. When all keys have been pressed and are operating normally, OK is shown beside Key:. Otherwise refer to section 6.3.6.

4   When testing is complete, switch the MDT off.

```
         Test Mode

Port 1:     Ok      Piezo:       Done
Port 2:     Ok      Backlight:   Done
Serial #:   Ok      Contrast:    Done
Flash ROM: Ok       Key:         OK
```

Figure 5.4 MDT Test Mode Display - Tests Complete

5   Disconnect the serial port loop back connector (if fitted) from the MDT.

END OF CHAPTER 5