1 Introduction

1.1 General

The Hawk Rural Radio Telephone Link enables Public Switched Telephone Network (PSTN) connections to be made using a radio link in place of the normal copper wire pairs.

1.2 System Overview

The Hawk Rural Radio Telephone Link is available in single and dual channel versions; the single channel version replaces one PSTN connection and the dual channel can replace two PSTN connections. An overview of the dual channel version is shown in Figure 1.1.

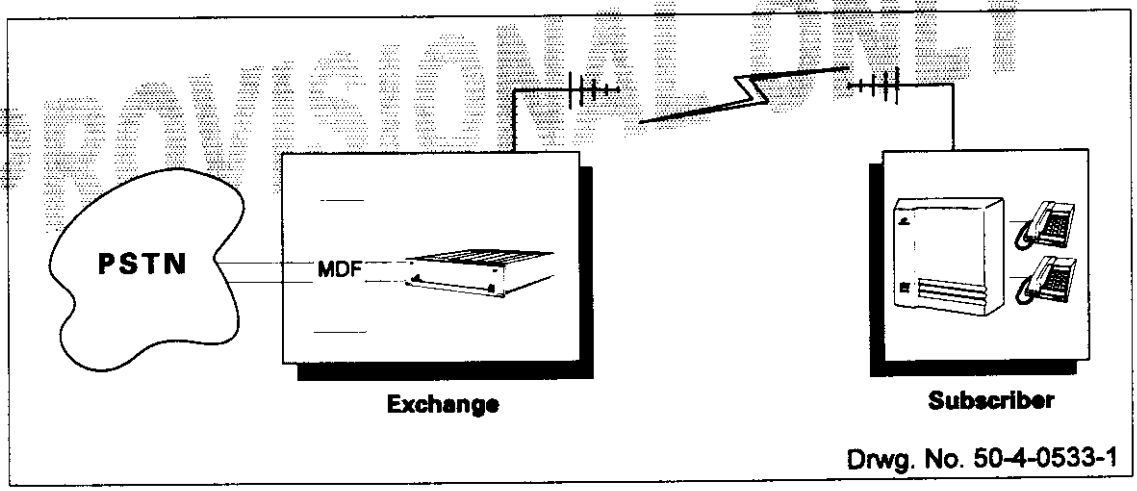

Figure 1.1: System Overview

The Hawk has two main operating modes, telephone and non-telephone. In the telephone mode, the Hawk is used to connect subscribers to an exchange. In the non-telephone mode the Hawk can be used to connect two exchanges (trunking), or as a point-to-point telemetry link (basic). As far as the user is concerned, there is no difference between connections made via the Hawk and those made using wires. For further details of the Hawk operation, refer to Section 2.

1.3 Physical Overview

The Hawk Rural Radio Telephone Link is delivered as a pair of terminals. The configuration of a terminal is set-up in both hardware and software. Usually, the terminals are configured to the customer's requirements before leaving the factory, but certain parameters can be changed in the field. Refer to Section 4 for further details.

The terminals are available in either a rack mount or a wall mount version. A link can use any combination of wall and rack mount terminals, but the wall mount is usually more suitable for a customer's premises.

Each terminal has a label detailing the transmit and receive frequencies, RF power output, and the configuration (subscriber or exchange terminal) set before it left the factory. The label is located on the underside of a wall mount terminal, and on the side panel of a rack mount terminal.

Note: If you change any of the factory set parameters, be sure and amend the label to reflect the new parameters.

Each terminal has a set of completely self contained modules, which may be easily removed for adjustment or replacement. The following are the standard modules for all Hawk links:

- Type 2832 Controller and Line Interface,
- Type 2825 Line Interface (not used in single channel versions),
- Type 2950 UHF Transmitter, or Type 2951 VHF Transmitter,
- Type 2940 UHF Receiver, or Type 2949 VHF Receiver,
- Type 2824 Duplexer.

Figures 1.2 and 1.3 show the standard Hawk rack mount and wall mount terminals. The figures are followed by a key detailing the functions and descriptions of designated items on the figures. The figures and key should be freely referred to when reading other sections of this manual, to assist in your understanding of the Hawk.

Note: In addition to the standard modules, there are various optional modules which can be used with the Hawk. These are described in the relevant sections.

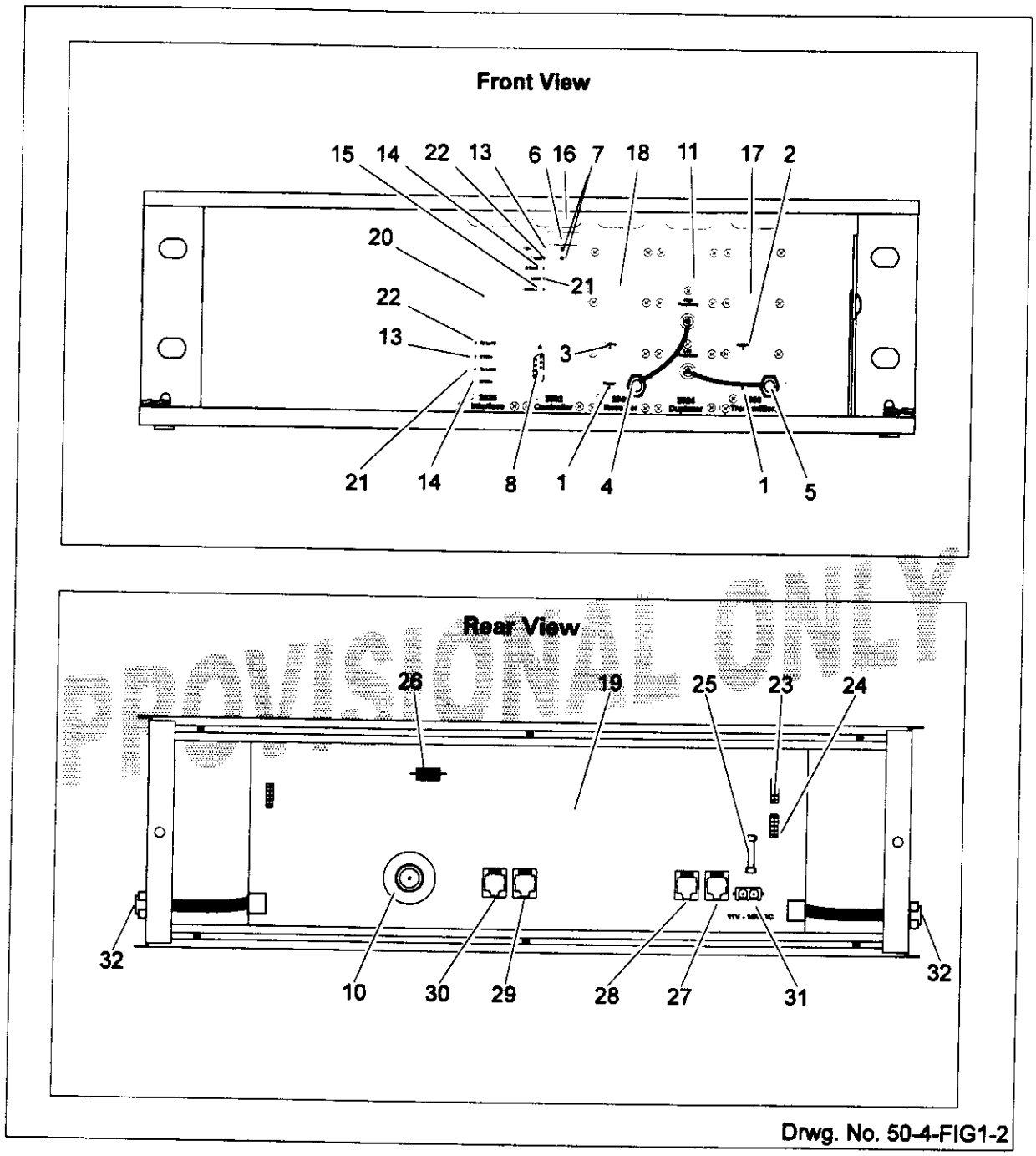

Figure 1.2: Hawk Rack Mount Terminal

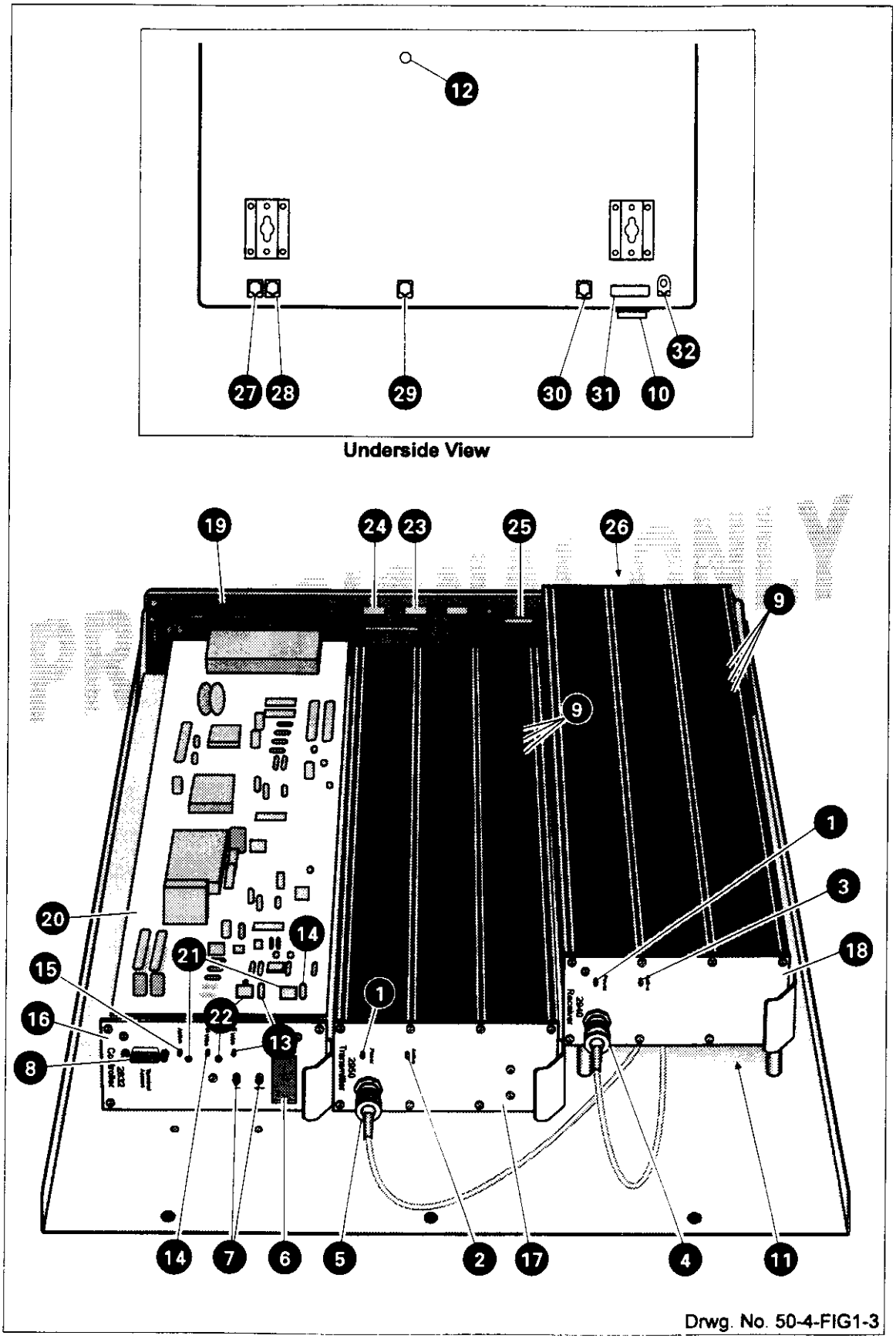

Figure 1.3: Hawk Wall Mount Terminal

Key	Description	Function
1	Power LED	Lit when power is supplied to the module. Should be lit whenever external power is present.
2	Transmitter active LED	Lit when the transmitter is sending a signal over the link.
3	Receiver signal valid LED	Lit when the receiver has detected a valid signal on the link.
4	Receiver input connector	Provides the RF input connection to the receiver. It is connected to the terminal antenna connector (10) via the duplexer (11).
5	Transmitter output connector	Provides the RF output connection for the transmitter. It is connected to the terminal antenna connector (10) via the duplexer (11).
6	Liquid Crystal Display (LCD)	Displays controller functions and meter readings selected by the front panel buttons (7). Refer to Section 2 for details.
7	Front panel buttons	Used in combination with the LCD (6) to select controller functions and meter readings. Refer to Section 2 for details.
8	RS232C connector	Used to connect the controller to a standard ASCII terminal or a modem. Refer to Section 2 for details.
9	Frequency selection switches	Used to select the transmitter and receiver frequencies. Refer to Section 4 for details.
10	Antenna connector	Connector for the co-axial cable to the antenna system.
11	Duplexer module	Allows the transmitter and receiver to simultaneously use the same antenna system.
12	Transmitter output	Allows access to the potentiometer that controls the transmitter RF output power while the Transmitter module is in the wall mount terminal.
13	E-wire LED	Lit when the E-wire from the terminal is active. Refer to Section 2 for details.

Continued overleaf

Key	Function	Description
14	M-wire LED	Lit when the M-wire to the terminal is active. Refer to Section 2 for details.
15	Active LED	Lit when the DSP and audio circuitry are active. The LED is off when the Hawk is in the idle state. Refer to Section 2 for details.
16	Controller module	Controls the operation of the other modules in the terminal, and communication with the terminal at the other end of the link. It also contains line interface and audio circuits used by Channel A.
17	Transmitter module	Transmits the digital and audio information to the terminal at the other end of the link.
18	Receiver module	Receives the digital and audio information from the terminal at the other end of the link.
19	Motherboard	Provides the connections between the modules and the external connectors on the Hawk.
20	Line interface module	Provides the line interface and audio circuits for the Channel B 2-wire and 4-wire plus E and M sockets on the Hawk.
21	Send audio level	Controls the audio line level to the DSP from the equipment connected to the Hawk.
22	Receive audio level	Controls audio line level from the DSP to the equipment connected to the Hawk.
23	Channel A payphone plug	Provides the connection for a payphone option PWB used on Channel A.
24	Channel B payphone plug	Provides the connection for a payphone option PWB used on Channel B.
25	Fuse	Protects the Hawk from DC power supply overload.
26	Diode	Provides the Hawk from reverse transients.
27	Channel B 2-wire socket	Connector for 2-wire line to Channel B.
28	Channel B 4-wire + E and M socket	Connector for 4-wire + E and M line to Channel B.
29	Channel A 4-wire + E and M socket	Connector for 4-wire + E and M line to Channel A.

Continued overleaf

Key	Function	Description
30	Channel A 2-wire socket	Connector for 2-wire line to Channel A.
31	DC Power Supply socket	Connector for the 13.8 VDC power supply to the Hawk.
32	Earth Tab	Earth connection for the Hawk terminal.

2
Operation

2.1 Introduction

This section describes how the Hawk Rural Radio Telephone Link operates as a telephone link or as a point-to-point link, and how to access the Hawk software.

2.2 Telephone Link Operation

2.2.1 General

The Hawk link is designed primarily to carry telephone traffic. This includes any service which uses the Public Switched Telephone Network (PSTN) such as telephones, facsimile machines and dial-up modems.

2.2.2 Link Set-up and Control

A Hawk link is set-up and controlled by the Type 2832 Controller and Line Interface modules in each terminal. These modules also control the operation of the other modules in their terminal. Each controller module has an internal modem which it uses to communicate with the controller module at the other end of the link. After a link has been set-up, communication between the controller modules is carried out over the audio channel using "out-of-band" signalling tones. These tones have frequencies outside the usual audio range (300-3400 Hz) and do not interfere with any signals being carried by the channel.

2.2.3 Idle State

When the Hawk link is in the idle state, the transmitter modules are unpowered, the exchange receiver module is fully powered up, the subscriber receiver module is normally cycling[1] to save power and most of the circuits in the controller modules are turned off. Apart from the receiver modules, the major circuit block drawing power is the subscriber's line supply. The Hawk link remains in this state until one of the following occurs:

> The exchange terminal detects ringing from the exchange,
> The subscriber terminal detects that the equipment it is connected to has gone off-hook.

[1] The receiver is switched on and off periodically, usually with the on time being much less than the off time. Hawk receiver cycling is software programmable. Refer to Section 4 for further details on how to enable receiver cycling.

2.2.4 Single Channel Operation

The operation of a single channel Hawk link in the telephone mode depends on whether the call is initiated from a subscriber terminal or an exchange terminal.

Call initiated from subscriber terminal

1. The Hawk link is in the idle state, as described in Section 2.2.3,
2. The subscriber goes off-hook, i.e. the subscriber lifts the handset off their phone or presses the "Send" button on their Fax or modem,
3. The subscriber terminal detects the off-hook condition, fully powers-up all its modules, and transmits the link ident code to the exchange terminal,
4. The exchange terminal detects the link ident code, fully powers up all its modules and transmits the link ident code back to the subscriber terminal,
5. The subscriber terminal detects the exchange terminal is sending the link ident code, stops itself sending the code, and sends an acknowledge signal back to the exchange terminal,
6. The exchange terminal detects the acknowledge signal, stops sending the link ident code, and opens up its end of the audio channel,
7. The subscriber terminal detects that the exchange is no longer sending the link ident code, opens up its end of the audio channel, and sends an "out-of-band" signalling tone to the exchange terminal,
8. The exchange terminal detects the signalling tone, and connects the exchange to the subscriber terminal via the audio channel,
9. The exchange sends the dialling tone to the subscriber terminal,
10. The subscriber hears the dialling tone in their handset, and dials the number they require. If their telephone is of the Decadic type, the subscriber terminal converts the loop breaks into BCD digits and sends these via the audio channel to the exchange terminal. Tones from a DTMF telephone are sent via the audio channel with no processing.
11. If the exchange terminal receives BCD digits over the audio channel it converts them to loop breaks and sends these to the exchange. DTMF tones are sent directly to the exchange without any processing,
12. In response to the signals from the exchange terminal, the exchange makes the connections to the required number. Any PSTN tones that would be received by a wired subscriber are sent to the subscriber via the audio channel,
13. At the conclusion of the call, the subscriber replaces the handset. The subscriber terminal detects the "on-hook" condition and stops sending "out-of-band" signalling tones across the audio channel,
14. The exchange terminal detects that no "out-of-band" signalling tones are being sent, closes the connection to the exchange and powers down its transmitter,
15. The subscriber terminal detects that there is no RF signal being sent from the exchange, powers down its transmitter, and puts its receiver into cycling (if programmed to do so),
16. The Hawk link is now back in the idle state, as described in Section 2.2.3.

Call initiated from exchange terminal

1. The Hawk link is in the idle state, as described in Section 2.2.3,
2. The exchange terminal receives ringing from the exchange, fully powers up all its modules, and transmits the link ident code to the subscriber terminal,
3. The subscriber terminal detects the link ident code, fully powers up all its modules and transmits the link ident code back to the exchange terminal,
4. The exchange terminal detects the link ident code is being sent from the subscriber terminal, stops itself sending the ident code, and sends an acknowledge signal back to the subscriber terminal,
5. The subscriber terminal detects the acknowledge signal, stops sending the ident code, and opens up its end of the audio channel,
6. The exchange terminal detects that the link ident code is no longer being sent from the subscriber terminal, opens up its end of the audio channel, and uses an "out-of-band" signalling tone to send the ringing signal to the subscriber terminal,
7. The subscriber terminal detects the signalling tone, and sends the ringing to the subscriber telephone,
8. The subscriber picks up the handset, and is connected to the call via the audio channel. While the subscriber terminal detects the off-hook condition, it sends "out-of-band" signalling tones to the exchange terminal,
9. At the conclusion of the call, the subscriber replaces the handset. The subscriber terminal detects the "on-hook" condition and stops sending "out-of-band" signalling tones across the audio channel,
10. The exchange terminal detects that no signalling tones are being sent from the subscriber terminal, closes the connection to the exchange and powers down its transmitter,
11. The subscriber terminal detects that there is no RF signal being sent from the exchange terminal, powers down its transmitter, and puts its receiver into cycling (if programmed to do so),
12. The Hawk link is now back in the idle state, as described in Section 2.2.3.

2.2.5 Dual Channel Operation

A dual channel Hawk link can carry two audio channels on a single RF link. When the link is in the idle state, a call made using either channel will be set-up and controlled as described in Section 2.2.4. A second call made when the link is already set-up is connected without any set-up procedures. The link will not shut-down while a call is being carried via either channel.

2.2.6 Payphone Operation

When provided with suitable interface modules, single or dual channel Hawk links can be set-up to operate with 12 or 16 kHz meter pulse payphones, or line reversal payphones. Dual channel links can have either or both channels set-up to operate with payphones. The only difference between payphone and normal telephone operation is that the exchange terminal uses "out-of-band" signalling tones to send costing information to the subscriber terminal. This information is used by the payphone at the subscriber terminal to determine how much to charge the subscriber for time elapsed during the call.

2.2.7 Caller Line Identity (CLI) Operation

If the subscriber has a telephone that can receive CLI information, the Hawk link can be set to supply this information in either the DTMF or FSK format. The CLI information is sent in the first silent period (the period between the first and second ringing tones). To ensure the information is received, the speech loops in both the exchange and subscriber terminals must be open at the same time, which in turn means that the first silent period at the subscriber terminal must occur at the same time as the first silent period at the exchange terminal. However, due to the link set-up time, the ringing tones and silent periods at the subscriber terminal are delayed with respect to those at the exchange terminal by a time equal to the link set-up time. Therefore, when the CLI function is enabled, the duration of the first ringing tone at the subscriber terminal is reduced by a period equal to the link set-up time, which in turn synchronises the following ringing tones and silent periods at the subscriber terminal with those at the exchange.

2.2.8 Alarms

As well as carrying the usual PSTN tones, the Hawk link has the facility for generating its own alarm tones to indicate various types of fault. The tones are heard over the link. The alarms and associated corrective actions are as listed below:

> **Low Power Supply Volts alarm.** One beep every five seconds indicates that the power supply voltage to one of the terminals is below specified levels. Check the external supplies to the terminals, any power supply unit or converter used with the terminals, and all power supply connections.

> **Voltage Standing Wave Ratio (VSWR) alarm.** Two beeps every five seconds indicates a problem with the antennas or the cabling between the terminals and the antennas. Check the cabling, including all connections, and the antenna directions.

> **Low Received Signal Strength Indicator (RSSI) alarm.** Three beeps every five seconds indicates a problem with the antennas or the cabling between the terminals and the antennas. Check the cabling, including all connections, and the antenna directions.

If more than one fault is present at one time, the tones for each fault are heard in turn, separated by a five second gap. The alarm facility is enabled or disabled by setting the appropriate bit in the Hardware Configuration Byte. For further details, refer to Section 4.

2.3 Point-to-point Link Operation

2.3.1 General

In the point-to-point mode of operation, the Hawk link can be used to replace trunk lines between telephone exchanges, direct data links or telemetry links. A dual channel Hawk link can have one channel in point-to-point mode and the other in telephone mode (see Section 2.3.6). The wired connections for channels set-up in point-to-point mode are of the 4-wire plus E and M type, as the system relies on M-wire operation to control the link.

2.3.2 Link Set-up and Control

As in telephone mode (see Section 2.2.2), the Type 2832 Controller and Line Interface modules set-up and control the Hawk point-to-point link. In point-to-point mode, the time taken to set-up a link must be kept to a minimum. To achieve this, the audio channel is opened as soon the link is brought up, i.e. there is no exchange of ident codes or acknowledgement signals between terminals. The link is controlled by the states of the M-wires connected to the terminals at either end of the link. Each terminal monitors the state of its own M-wire and uses "out-of-band" signalling tones to communicate this information to the other terminal via the RF link.

2.3.3 Idle State

When the Hawk point-to-point link is idle, the modules in each terminal are powered up, but the terminals are not actually sending or receiving information. The link remains in this state until one of the following occurs:

> The M-wires at either terminal become active,
> An RF signal is detected by the receiver at either terminal.

2.3.4 Single Channel Operation

A Hawk point-to-point link has two possible modes of operation, trunking and basic.

Trunking

When operating in trunking mode, a Hawk link is used to connect two telephone exchanges.

1. The Hawk link is in the idle state, as described in Section 2.3.3,
2. One of the terminals receives a valid M-wire input from its exchange,
3. The M-wire keys the transmitter module to transmit the signal on its line connection, and the M-wire status, to the terminal at the other end of the link. The line signal is sent on the link audio channel, and M-wire status is sent using "out-of-band" signalling tones,
4. The receiver module in the terminal at the other end of the link detects the RF signal. It sends the information on the audio channel to the exchange via its line connection. It also produces an E-wire valid output from the M-wire status information in the out-of-band signalling tones,
5. The controller module detects the valid E-wire from the receiver module, and uses it to derive an M-wire signal to the transmitter module,

6. The M-wire signal keys the transmitter module to transmit the signal on its line connection, and the local M-wire status, to the terminal at the other end of the link. The link is now set-up,
7. The link remains set-up as long as there is a valid external M-wire input at either terminal. If there has been no such input within the set time-out period[1], the link closes down.

Basic

When operating in basic point-to-point mode, a Hawk link is used for data transmission or telemetry. There is usually one master station communicating with several slave stations. Usually one end is transmitting at one time, although both can be active at once. The link is activated by the M-wire at one terminal which is carried to the other end and reproduced as an active E-wire. The operation of the basic point-to-point link differs from trunking point-to-point link in that the controller modules in the terminals do not derive an M-wire signal from the receiver E-wire. This means that the return path is not automatically activated, but requires an active M-wire to be externally input to the terminal.

2.3.5 Dual Channel Operation

A dual channel Hawk link can carry two point-to-point links on a single RF link. When the link is in the idle state, a point-to-point link made using either channel will be set-up and controlled as described in Section 2.3.4. When the RF link has already set-up by one channel, the second channel is connected without any set-up procedures. The link will not shut-down while either channel is carrying information.

2.3.6 Mixed Mode

A dual channel Hawk link can have one audio channel in point-to-point mode and the other in telephone mode. This is known as mixed mode. In this mode, Channel A must be configured in the point-to-point mode and Channel B in the telephone mode. When the link is in the idle state, input on either channel will cause the RF link to be set-up and controlled as described in Section 2.3.4. When the RF link has already set-up by one channel, the second channel is connected without any set-up procedures. The link will not shut-down while either channel is carrying information.

[1] The time-out period is software programmable. Refer to Section 4 for further details.

2.3.7 Alarms

The alarm tones described in Section 2.2.8 are available during point-to-point operation, with the following additional facilities:

> **High/Low Tones.** The pitch of the tones generated at either terminal can be set to distinguish them from those generated at the other terminal. This enables the listener to identify which terminal the fault is at. The tone pitch facility is enabled or disabled during point-to-point configuration, as described in Section 4.3.

> **External Alarms.** The VSWR and the Low RSSI alarms can be set to trigger external devices (bells, lights, etc.) rather than being heard as tones over the link. The alarms appear on the connectors used for the Payphone Interface cards, the VSWR alarm goes to the Channel A connector, and the Low RSSI alarm goes to the Channel B connector. The External Alarms are set during point-to-point configuration, as described in Section 4.3.

Notes:

1. If the External Alarms facility is enabled, no alarm tones are sent over the link.
2. The Low RSSI alarm is not available if Channel B of a mixed mode point-to-point link is being used to support a payphone (the Channel B Payphone Interface connector is in use).
3. The Low Power Supply Volts alarm normally cannot be provided as an external alarm, because in a standard terminal there is no connector available for it. However, if requested, Exicom can modify a terminal to provide such a connector. Contact Exicom International, or your local dealer, for details.

2.4 Hawk Software User Interface using Controller Front Panel

2.4.1 General

The operation of the Hawk link is controlled by the software contained in the Type 2832 Controller and Line Interface module. This software also enables the operator to monitor the performance of the link and to alter some of the parameters that control the link configuration. The operator can access the software using the buttons and LCD on the controller front panel.

CAUTION

Any changes to software parameters should only be carried out by authorised personnel. Unauthorised changes to the set software parameters can cause the Hawk link to fail.

The Hawk software is displayed on the LCD as a set of scroll-through menu items. The operator can use the two buttons on the controller front panel to scroll through the menu items, or to alter selected parameters of the items displayed on the LCD.

Note: The menu items that can be accessed at any given time will depend upon the current status of the Hawk link.

2.4.2 Using the LCD and buttons to access menu items

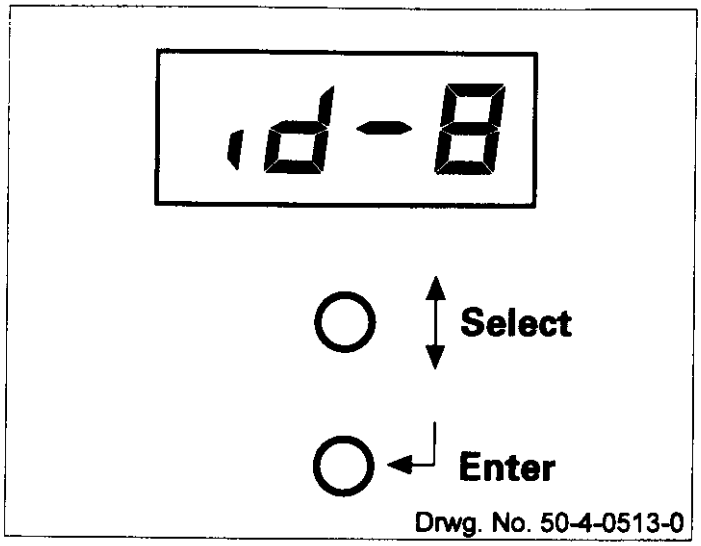

Figure 2.1: Controller front panel

You can use the buttons to scroll through the menu items as follows:

> Press the top button to wake up or activate the terminal if the LCD is blank,

> Press the top button when the terminal is awake to scroll forward through the menu items,

> Hold the top button down while pressing and releasing the bottom button allows you to scroll backwards through the menu items,

> Press the bottom button to activate the menu item currently displayed on the LCD. Press the button a second time to deactivate the item,

> To deactivate the Hawk, scroll through the menu until "OFF" is displayed on the LCD, then press the bottom button. The LCD will go blank.

2.4.3 LCD menu items

The software menu items that are displayed on the LCD are of two types:

> Items that display readings,

> Items that cause certain operations to be carried out.

The following graphs are of use with certain of the items that display readings:

Note: Due to the variations between individual Hawk systems, values derived from the graphs are only approximate.

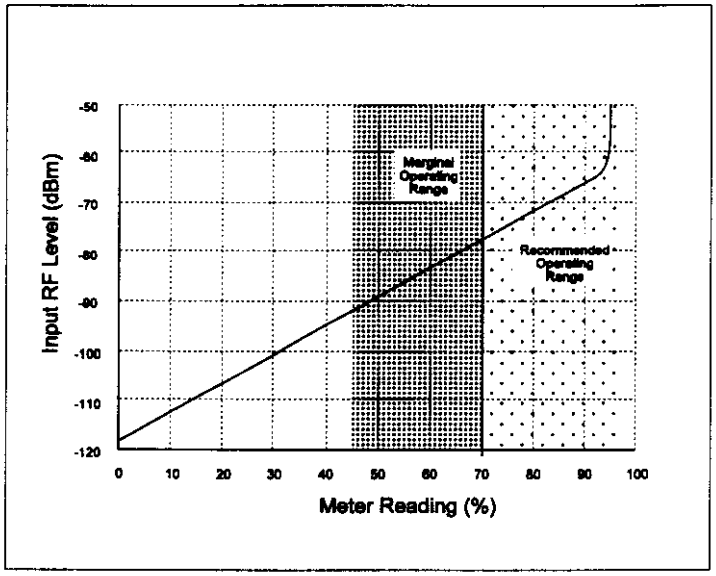

Figure 2.2: RSSI Conversion Graph

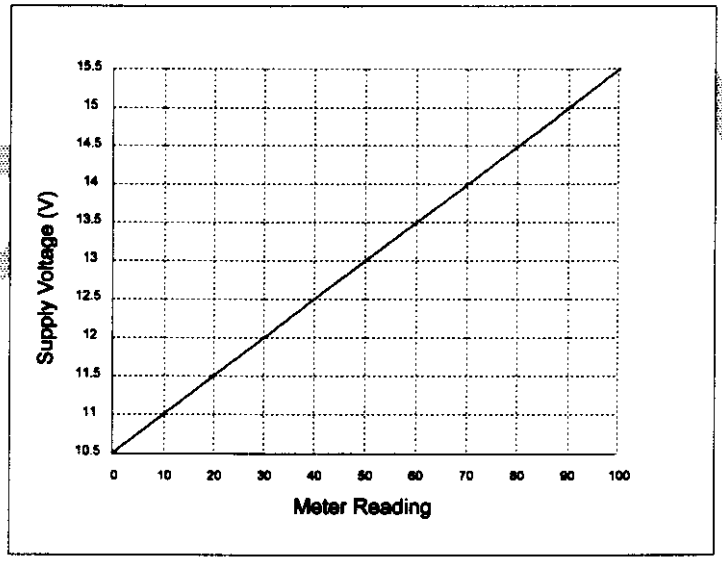

Figure 2.3: +12V DC Conversion Graph

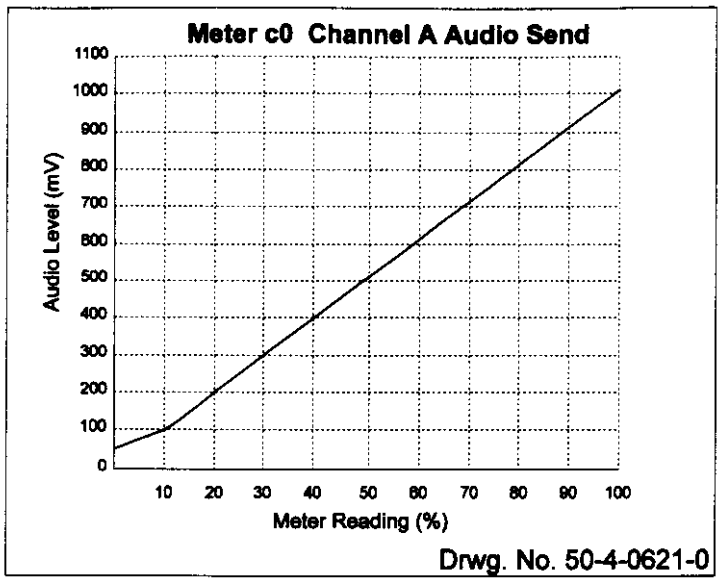

Figure 2.4: Channel A and B Audio Send Line Levels

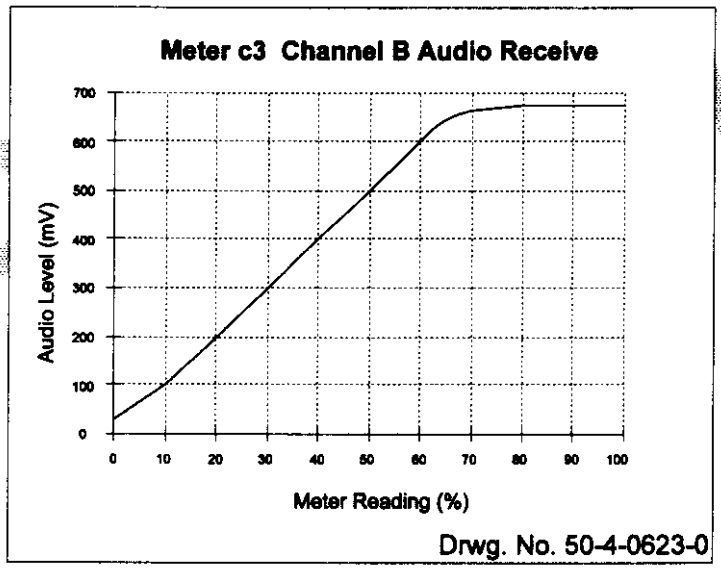

Figure 2.5: Channel A and B Audio Receive Line Levels

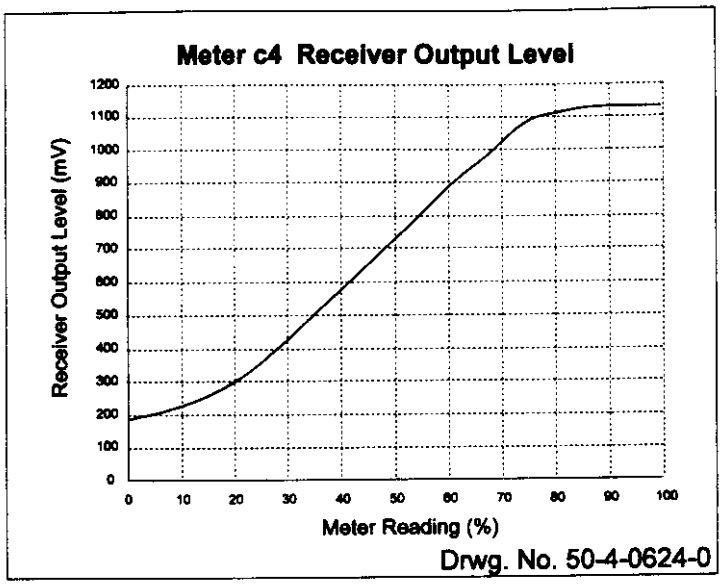

Figure 2.6: Receiver Output Level

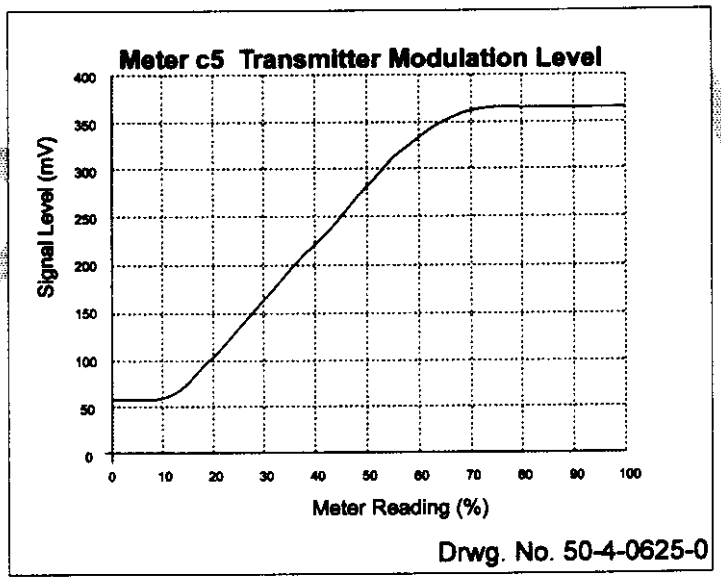

Figure 2.7: Transmitter Modulation Level

The LCD displays the software menu items in the following order.

Notes:

1. The menu items that can be accessed at any given time will depend upon the current status of the link.
2. The term "local" in the following text refers to the terminal and modules at the site of the person using the controller module to access the menu items.
3. The term "remote" in the following text refers to the terminal and modules at the site at the opposite end of the link from the person using the controller module to access the menu items.

0-

This menu item indicates the RSSI at the local terminal. When it is activated, a two digit number is displayed after the 0-. For satisfactory operation of the link, this number should be greater than 70. Figure 2.3 can be used to convert the reading into the approximate value in millivolts.

1-

Note: This menu item is only available after a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item indicates the RSSI at the remote terminal. When it is activated, a two digit number is displayed after the 1-. For satisfactory operation of the link, this number should be greater than 70. Figure 2.3 can be used to convert the reading into the approximate value in millivolts.

2-

This menu item indicates the VSWR at the local terminal. When it is activated, a two digit number is displayed after the 2-. For satisfactory operation of the link, this number should be less than 50.

3-

Note: This menu item is only available after a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item indicates the VSWR at the remote terminal. When it is activated, a two digit number is displayed after the 3-. For satisfactory operation of the link, this number should be less than 50.

4-

This menu item indicates the RF output power of the transmitter at the local terminal. When it is activated, a two digit number is displayed after the 4-. For satisfactory operation of the link, this number should be 99.

5-

Note: This menu item is only available when a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item indicates the RF output power of the transmitter at the remote terminal. When it is activated, a two digit number is displayed after the 5-. For satisfactory operation of the link, this number should be 99.

6-

This menu item is not used, and will always read "6-00" when activated.

7-

This menu item is not used, and will always read "7-00" when activated.

8-

Note: This menu item is only available when there is no link between the two terminals.

This menu item indicates the Channel A send line levels at the local terminal. When it is activated, a two digit number is displayed after the 8-. For satisfactory operation of the link, this number should be 50. Figure 2.5 can be used to convert the reading into the approximate value in millivolts. For details on how to use this item to set-up the line levels, refer to Section 4.

9-

Note: This menu item is only available in dual channel systems, when there is no link between the two terminals.

This menu item indicates the Channel B send line levels at the local terminal. When it is activated, a two digit number is displayed after the 9-. For satisfactory operation of the link, this number should be 50. For details on how to use this item to set-up the line levels, refer to Section 4.

F0

Note: This menu item is only available when there is no link between the two terminals.

This menu item is used to set-up a test link when the ident code of the remote terminal is unknown. If the link is successfully set-up, the two digit number after the "F0" is the remote terminal ident code.

F1

Note: This menu item is only available when there is no link between the two terminals.

This menu item is used to set-up a test link when the ident code of the remote terminal is known. If the link is successfully set-up, the two digit number after the "F1" is the remote terminal ident code.

F2

Note: This menu item is only available after a test link has been set-up between the two terminals.

This menu item is used to close down a test link between two Hawk terminals. When the link closes down, the LCD shows "F0".

F3

Note: This menu item is only available after a test link has been set-up between the two terminals.

This menu item is used to monitor the effect of adjusting the antenna alignment on the local terminal RSSI. It is used while aligning the antennas of the two Hawk terminals to give the maximum received signal. When activated, the transmitter in the local terminal is switched off, the transmitter at the remote terminal is switched on, and the two digits after "F3" indicate the RSSI at the local terminal. The effects of any antenna adjustments can be monitored by observing the change in the LCD reading. Figure 2.3 can be used to convert the reading into the approximate value in millivolts.

For full details on how to align the antennas, refer to Section 3.

F8

Note: This menu item is only available when either a test link has been set-up between the two terminals, or when there is no link at all.

This menu item is used to set value of transmitter RF output power stored in the controller module memory. When activated, it reads the current value of transmitter RF output and stores it for comparison with future values.

For full details on how and when this function should be used, refer to Section 4.

F9

Note: This menu item is only available when there is no link set-up between the two terminals.

This menu item is used to enable diagnostics to be carried out on the terminal without having to set-up a call. When activated, the local terminal behaves exactly as if during normal link operation, but without actually setting up a call. Test equipment can then be attached to the terminal to monitor various aspects of the terminal performance.

id

Note: This menu item is only available when the Hawk is set-up as a telephone system, and there is no link set-up between the two terminals.

This menu item is used to display and/or set the local terminal ident code. When activated the code is shown as two digits after "id". For full details on how and when this function should be used, refer to Section 4.

PP1

Note: This menu item is only available when the Hawk is set-up as a point-to-point system, and there is no link set-up between the two terminals.

This menu item is used to set-up Channel A of the local terminal for point-to-point operation. For further details, refer to Section 4.

PP2

Note: This menu item is only available when the Hawk is set-up as a dual channel point-to-point system, and there is no link set-up between the two terminals.

This menu item is used to set-up Channel B of the local terminal for point-to-point operation. For further details, refer to Section 4.

c0.

This menu item indicates the Channel A send line levels at the local terminal. When it is activated, a two digit number is displayed after the "c0.". For satisfactory operation of the link, this number should be 50. Figure 2.5 can be used to convert the reading into the approximate value in millivolts. For details on how to use this item to set-up the line levels, refer to Section 4.

c1.

This menu item indicates the supply voltage at the local terminal. When it is activated, a two digit number is displayed after the "c1.". Figure 2.4 can be used to convert the reading into the approximate value in volts.

CAUTION

The Hawk will not operate below 10.5 V and internal damage may occur if an input voltage greater than 15.5 V is applied.

c2.

This menu item indicates the Channel B send line levels at the local terminal. When it is activated, a two digit number is displayed after the "c2.". For satisfactory operation of the link, this number should be 50. Figure 2.5 can be used to convert the reading into the approximate value in millivolts. For details on how to use this item to set-up the line levels, refer to Section 4.

c3.

This menu item indicates the Channel B audio level received at the local terminal. The reading is taken before the compander. When it is activated, a two digit number is displayed after the "c3.". Figure 2.5 can be used to convert the reading into the approximate value in millivolts. For details on how to use this item to set-up the line levels, refer to Section 4.

c4.

This menu item indicates the baseband signal level from the local receiver module to the local controller module DSP circuitry. The signal includes audio plus signalling tones. When it is activated, a two digit number is displayed after the "c4.". Figure 2.6 can be used to convert the reading into the approximate value in millivolts. For details on how to use this item to set-up the line levels, refer to Section 4.

c5.

This menu item indicates the baseband signal level from the local controller module DSP circuitry to the local transmitter module. The signal includes audio plus signalling tones. When it is activated, a two digit number is displayed after the "c5.". Figure 2.8 can be used to convert the reading into the approximate value in millivolts. For details on how to use this item to set-up the line levels, refer to Section 4.

c6.

This menu item indicates the Channel A audio level received at the local terminal. The reading is taken before the compander. When it is activated, a two digit number is displayed after the "c6.". Figure 2.5 can be used to convert the reading into the approximate value in millivolts. For details on how to use this item to set-up the line levels, refer to Section 4.

c7.

This menu item is not used and will always display "c7.00" when activated.

r0.

This menu item indicates the RSSI at the local terminal. When it is activated, a two digit number is displayed after the "r0.". For satisfactory operation of the link, the number should be greater than 70. Figure 2.3 can be used to convert the reading into the approximate value in millivolts.

r1.

This menu item is not used and will always read "r1.00" when activated.

r2.

This menu item indicates whether or not the synthesiser in the local receiver module has locked to the specified frequency. When it is activated, either "00" or "99" is displayed after the "r2.". "00" indicates the synthesiser is locked. "99" indicates the synthesiser is out of lock, and the receiver will not operate.

r3.

This menu item indicates the tuning voltage applied to the synthesiser in the local receiver module. When it is activated, a two digit number is displayed after the "r3.". For normal operation, the number should be between 40 and 60.

r4.

This menu item is not used and will always read "r4.00" when activated.

r5.

This menu item is not used and will always read "r5.00" when activated.

r6.

This menu item indicates the AFC error voltage at the local receiver module. When it is activated, a two digit number is displayed after the "r6.". This number indicates the difference in the frequency settings between the local receiver module and the remote transmitter module. A reading of 50 shows the modules are set to the same frequency. A reading less than 50 indicates that the remote transmitter module is lower in frequency than the local receiver module, and a reading higher then 50 indicates the remote transmitter is higher in frequency.

r7.

This menu item indicates if the local receiver module is sensing input overload from the local transmitter module. When it is activated, a two digit number is displayed after the "r7.". If the number is less than 99, then the local duplexer module requires alignment.

t0.

This menu item indicates if there has been any change in the RF output level of the local transmitter. When activated, it compares the present level to the level stored the last time a transmitter calibration was carried out, and displays a two digit number after the "t0.". If the number is below 99 there has been a drop in output power since the last calibration. If there has been no adjustment of the transmitter power potentiometer (see Section 4) since the last calibration, the drop in output indicates problems with the transmitter.

t1.

This menu item indicates the VSWR at the local transmitter RF output. When it is activated, a two digit number is displayed after the "t1.". This number should be less than 50 for satisfactory operation (the lower the number, the less power is being reflected back into the transmitter).

t2.

This menu item indicates whether or not the synthesiser in the local transmitter module has locked to the specified transmitter frequency. When it is activated, either "00" or "99" is displayed after the "t2.". "00" indicates the synthesiser is locked. "99" indicates the synthesiser is out of lock, and the transmitter will not operate.

t3.

This menu item indicates the tuning voltage applied to the synthesiser in the local transmitter module. When it is activated, a two digit number is displayed after the "t3.". A low reading (e.g. 20) indicates the transmitter is tuned to the low end of the frequency band while a high reading (e.g. 70) indicates it is tuned to the high end of the band.

t4.

This menu item is only used during manufacture to indicate any correction voltage applied to the transmitter synthesiser.

t5.

This menu item is only used during manufacture. It indicates the driver output voltage.

t6.

This menu item displays the temperature of the local power block heatsink. When it is activated, the temperature in degrees Centigrade is displayed as a two digit number after the "t6.".

Note: If the heatsink temperature exceeds 95 ºC, the local transmitter output power is automatically reduced to prevent overload.

t7.

This menu item indicates the output value from the internal 10 V regulator in the local transmitter module. When it is activated, a two digit number is displayed after the "t7.". The number should be 99 for normal operation.

c.0.

Note: This menu item is only available when a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item indicates the Channel A send line levels at the remote terminal. When it is activated, a two digit number is displayed after the "c.0.". For satisfactory operation of the link, this number should be 50. Figure 2.5 can be used to convert the reading into the approximate value in millivolts. For details on how to use this item to set-up the line levels, refer to Section 4.

c.1.

Note: This menu item is only available when a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item indicates the supply voltage at the remote terminal. When it is activated, a two digit number is displayed after the "c.1.". Figure 2.4 can be used to convert the reading into the approximate value in volts.

CAUTION

The Hawk will not operate below 10.5 V and internal damage may occur if an input voltage greater than 15.5 V is applied.

c.2.

Note: This menu item is only available when a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item indicates the Channel B send line levels at the remote terminal. When it is activated, a two digit number is displayed after the "c.2.". For satisfactory operation of the link, this number should be 50. Figure 2.5 can be used to convert the reading into the approximate value in millivolts. For details on how to use this item to set-up the line levels, refer to Section 4.

c.3.

Note: This menu item is only available when a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item indicates the Channel B audio level received at the remote terminal. The reading is taken before the compander. When it is activated, a two digit number is displayed after the "c.3.". Figure 2.5 can be used to convert the reading into the approximate value in millivolts. For details on how to use this item to set-up the line levels, refer to Section 4.

c.4.

Note: This menu item is only available when a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item indicates the baseband signal level from the remote receiver module to the remote controller module DSP circuitry. The signal includes audio plus signalling tones. When it is activated, a two digit number is displayed after the "c.4.". Figure 2.7 can be used to convert the reading into the approximate value in millivolts. For details on how to use this item to set-up the line levels, refer to Section 4.

c.5.

Note: This menu item is only available when a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item indicates the baseband signal level from the remote controller module DSP circuitry to the remote transmitter module. The signal includes audio plus signalling tones. When it is activated, a two digit number is displayed after the "c.5.". Figure 2.8 can be used to convert the reading into the approximate value in millivolts. For details on how to use this item to set-up the line levels, refer to Section 4.

c.6.

Note: This menu item is only available when a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item indicates the Channel A audio level received at the remote terminal. The reading is taken before the compander. When it is activated, a two digit number is displayed after the "c.6.". Figure 2.5 can be used to convert the reading into the approximate value in millivolts. For details on how to use this item to set-up the line levels, refer to Section 4.

c.7.

This menu item is not used and will always display "c.7.00" when activated.

r.0.

Note: This menu item is only available when a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item indicates the RSSI at the remote terminal. When it is activated, a two digit number is displayed after the "r.0.". For satisfactory operation of the link, the number should be greater than 70. Figure 2.3 can be used to convert the reading into the approximate value in millivolts.

r.1.

This menu item is not used and will always read "r.1.00" when activated.

r.2.

Note: This menu item is only available when a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item indicates whether or not the synthesiser in the remote receiver module has locked to the specified frequency. When it is activated, either "00" or "99" is displayed after the "r.2.". "00" indicates the synthesiser is locked. "99" indicates the synthesiser is out of lock, and the receiver will not operate.

r.3.

Note: This menu item is only available when a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item indicates the tuning voltage applied to the synthesiser in the remote receiver module. When it is activated, a two digit number is displayed after the "r.3.". For normal operation, the number should be between 40 and 60.

r.4.

This menu item is not used and will always read "r.4.00" when activated.

r.5.

This menu item is not used and will always read "r.5.00" when activated.

r.6.

Note: This menu item is only available when a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item indicates the AFC error voltage at the remote receiver module. When it is activated, a two digit number is displayed after the "r.6.". This number indicates the difference in the frequency settings between the remote receiver module and the local transmitter module. A reading of 50 shows the modules are set to the same frequency. A reading less than 50 indicates that the local transmitter module is higher in frequency than the remote receiver module, and a reading higher then 50 indicates the local transmitter is lower in frequency.

r.7.

Note: This menu item is only available when a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item indicates if the remote receiver module is sensing input overload from the remote transmitter module. When it is activated, a two digit number is displayed after the "r.7.". If the number is less than 99, then the remote duplexer module requires alignment.

t.0.

Note: This menu item is only available when a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item indicates if there has been any change in the RF output level of the remote transmitter. When activated, it compares the current level to the level stored the last time a transmitter calibration was carried out, and displays a two digit number after the "t.0.". If the number is below 99 there has been a drop in output power since the last calibration. If there has been no adjustment of the transmitter power potentiometer (see Section 4) since the last calibration, the drop in output indicates problems with the transmitter.

t.1.

Note: This menu item is only available when a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item indicates the VSWR at the remote transmitter RF output. When it is activated, a two digit number is displayed after the "t.1.". This number should be less than 50 for satisfactory operation (the lower the number, the less power is being reflected back into the transmitter).

t.2.

Note: This menu item is only available when a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item indicates whether or not the synthesiser in the remote transmitter module has locked to the specified transmitter frequency. When it is activated, either 00 or 99 is displayed after the "t.2.". 00 indicates the synthesiser is locked. 99 indicates the synthesiser is out of lock, and the transmitter will not operate.

t.3.

Note: This menu item is only available when a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item indicates the tuning voltage applied to the synthesiser in the remote transmitter module. When it is activated, a two digit number is displayed after the "t.3.". A low reading (e.g. 20) indicates the transmitter is tuned to the low end of the frequency band while a high reading (e.g. 70) indicates it is tuned to the high end of the band.

t.4.

This menu item is only used during manufacture to indicate any correction voltage applied to the transmitter synthesiser.

t.5.

This menu item is only used during manufacture to indicate the driver output voltage.

t.6.

Note: This menu item is only available when a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item displays the temperature of the remote power block heatsink. When it is activated, the temperature in degrees Centigrade is displayed as a two digit number after the "t6.".

Note: If the heatsink temperature exceeds 95ºC, the transmitter output power is automatically reduced to prevent overload.

t.7.

Note: This menu item is only available when a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item indicates the output value from the internal 10 V regulator in the remote transmitter module. When it is activated, a two digit number is displayed after the "t7.". The number should be 99 for normal operation.

OFF

Note: This menu item is only available when no link has been set-up between the two terminals.

When activated, this menu item returns the Hawk to the idle state.

2.5 Hawk Software User Interface using VDT

2.5.1 General

The operation of the Hawk link is controlled by the software contained in the Type 2832 Controller and Line Interface module. This software also enables the operator to monitor the performance of the link and to alter the parameters that control the link configuration.

CAUTION

Any changes to software parameters should only be carried out by authorised personnel. Unauthorised changes to the set software parameters can cause the Hawk link to fail.

The software parameters of the Hawk are displayed as a set of scroll-through menu items. The items can be viewed or altered using a standard ASCII Video Display Terminal (VDT). The menu items that can be accessed at any given time will depend upon the current status of the Hawk link.

2.5.2 Video Display Terminal Access

An ASCII Video Display Terminal (VDT) can be used to access the software menu. It can be plugged directly into the RS232C connector on the front panel of the Controller, or be connected to the connector via a modem. Refer to Appendix B for information on setting up the VDT.

Direct Connection

As for the Controller LCD, the software items are displayed as a prefix, which identifies the item, followed by a number. The prefixes used on the VDT are textual abbreviations describing the software item. The number following the prefix can be either one or two digits long, and is either a code, or the numerical value of the parameter the software item refers to (normally expressed as a percentage). If the prefix starts with "R.", the parameter being displayed is that of the terminal at the other end of the link). If the prefix starts with "L.", the parameter displayed is that of the local terminal. If the VDT display is blank, then the terminal is in the idle state. If the prefix is followed by a bar, "–", the parameter is not currently available while the link is in its current status.

Pressing any key on the VDT wakes up the Hawk terminal if it is asleep. After a short delay the headings "Prev", "Next" and "Enter" are displayed on the VDT screen. The currently selected item of the scroll-through software menu is shown under the "Enter" heading. The item immediately before the current item is shown under the "Prev" heading, and the item immediately following the current item is shown under the "Next" heading.

You can scroll through the menu items by pressing the following VDT keys:

> "P" selects the previous menu item,

> "N" selects the next menu item,

> "Enter" activates the currently selected menu item; pressing "Enter" again returns to the scroll-through menu.

Modem Connection

Operation of a VDT via a modem connection is identical to that of a direct connection, except that the modem connection has a different terminal wake-up sequence. This is required to prevent normal modem shut-down reactivating the Hawk. When the Hawk is in the idle state, pressing any key on the VDT displays the instruction for the modem wake-up sequence on the VDT screen. The default instruction is "Press the "A" key three times".

Note: It is possible to change the modem wake-up sequence. Refer to Section 4.2.3.

2.5.3 VDT menu items

The VDT displays the software menu items in the following order.

Note: The menu items that can be accessed at any given time will depend upon the current status of the Hawk link.

L.RSSI:

This menu item indicates the RSSI at the local terminal. When it is activated, a two digit number is displayed after the "L.RSSI:". For satisfactory operation of the link, this number should be greater than 70. Figure 2.2 can be used to convert the reading into the approximate value in millivolts.

R.RSSI:

Note: This menu item is only available when a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item indicates the RSSI at the remote terminal. When it is activated, a two digit number is displayed after the "R.RSSI:". For satisfactory operation of the link, this number should be greater than 70. Figure 2.2 can be used to convert the reading into the approximate value in millivolts.

L.VSWR:

This menu item indicates the VSWR at the local terminal. When it is activated, a two digit number is displayed after the "L.VSWR:". For satisfactory operation of the link, this number should be less than 50.

R.VSWR:

Note: This menu item is only available when a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item indicates the VSWR at the remote terminal. When it is activated, a two digit number is displayed after the "L.VSWR:". For satisfactory operation of the link, this number should be less than 50.

L.TxPwr:

This menu item indicates the RF output power of the transmitter at the local terminal. When it is activated, a two digit number is displayed after the "L.TxPwr:". For satisfactory operation of the link, this number should be 99.

R.TxPwr:

Note: This menu item is only available when a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item indicates the RF output power of the transmitter at the remote terminal. When it is activated, a two digit number is displayed after the "L.TxPwr:". For satisfactory operation of the link, this number should be 99.

Ch.A.CAL

Note: This menu item is only available when there is no link between the two terminals.

This menu item indicates the Channel A send line levels at the local terminal. When it is activated, a two digit number is displayed after the "Ch.A.CAL:". For satisfactory operation of the link, this number should be 50. Figure 2.4 can be used to convert the reading into the approximate value in millivolts. For details on how to use this item to set-up the line levels, refer to Section 4.

Ch.B.CAL

Note: This menu item is only available when there is no link between the two terminals.

This menu item indicates the Channel B send line levels at the local terminal. When it is activated, a two digit number is displayed after the "Ch.B.CAL:". For satisfactory operation of the link, this number should be 50. Figure 2.4 can be used to convert the reading into the approximate value in millivolts. For details on how to use this item to set-up the line levels, refer to Section 4.

Force a link:

Note: This menu item is only available when there is no link between the two terminals.

This menu item is used to set-up a test link when the ident code of the remote terminal is unknown. If the link is successfully set-up, the two digit number after the "Force a link:" is the remote terminal ident code.

Establish link:

Note: This menu item is only available when there is no link between the two terminals.

This menu item is used to set-up a test link when the ident code of the remote terminal is known. If the link is successfully set-up, the two digit number after the "Establish link:" is the remote terminal ident code.

Cleardown link:

Note: This menu item is only available after a test link has been set-up between the two terminals.

This menu item is used to close down a test link between two Hawk terminals. When the link closes down, the currently selected item on the VDT becomes "Force a link:".

Anten align:

Note: This menu item is only available after a test link has been set-up between the two terminals.

This menu item is used to monitor the effect of adjusting the antenna alignment on the local terminal RSSI. It is used while aligning the antennas of the two Hawk terminals to give the maximum received signal. When activated, the transmitter in the local terminal is switched off, the transmitter at the remote terminal is switched on, and the two digits after "Anten align:" indicate the RSSI at the local terminal. The effects of any antenna adjustments can be monitored by observing the change in the reading. Figure 2.2 can be used to convert the reading into the approximate value in millivolts.

For full details on how to align the antennas, refer to Section 3.

Tx Meter Cal.

Note: This menu item is only available when either a test link has been set-up between the two terminals, or when there is no link at all.

This menu item is used to set the stored value of transmitter RF output power. When activated, it reads the present value of transmitter RF output and stores it for comparison with future values.

For full details on how and when this function should be used, refer to Section 4.

Terminal Test

Note: This menu item is only available when there is no link set-up between the two terminals.

This menu item is used to enable diagnostics to be carried out on the terminal without having to set-up a call. When activated, the local terminal behaves exactly as if during normal link operation, but without actually setting up a call. Test equipment can then be attached to the terminal to monitor various aspects of the terminal performance.

ID code:

Note: This menu item is only available when the Hawk is set-up as a telephone system, and there is no link set-up between the two terminals.

This menu item is used to display and/or set the local terminal ident code. When activated the code is shown as two digits after "id". For full details on how and when this function should be used, refer to Section 4.

PP1 code:

Note: This menu item is only available when the Hawk is set-up as a point-to-point system, and there is no link set-up between the two terminals.

This menu item is used to set-up Channel A of the local terminal for point-to-point operation. For further details, refer to Section 4.

PP2 code:

Note: This menu item is only available when the Hawk is set-up as a dual channel point-to-point system, and there is no link set-up between the two terminals.

This menu item is used to set-up Channel B of the local terminal for point-to-point operation. For further details, refer to Section 4.

L.Con0:

This menu item indicates the Channel A send line levels at the local terminal. When it is activated, a two digit number is displayed after the "L.Con0:". For satisfactory operation of the link, this number should be 50. Figure 2.4 can be used to convert the reading into the approximate value in millivolts. For details on how to use this item to set-up the line levels, refer to Section 4.

L.Con1:

This menu item indicates the supply voltage at the local terminal. When it is activated, a two digit number is displayed after the "L.Con1:". Figure 2.3 can be used to convert the reading into the approximate value in volts.

CAUTION

The Hawk will not operate below 10.5 V and internal damage may occur if an input voltage greater than 15.5 V is applied.

L.Con2:

This menu item indicates the Channel B send line levels at the local terminal. When it is activated, a two digit number is displayed after the "L.Con2:". For satisfactory operation of the link, this number should be 50. Figure 2.4 can be used to convert the reading into the approximate value in millivolts. For details on how to use this item to set-up the line levels, refer to Section 4.

L.Con3:

This menu item indicates the Channel B audio level received at the local terminal. The reading is taken before the compander. When it is activated, a two digit number is displayed after the "L.Con3:". Figure 2.5 can be used to convert the reading into the approximate value in millivolts. For details on how to use this item to set-up the line levels, refer to Section 4.

L.Con4:

This menu item indicates the baseband signal level from the local receiver module to the local controller module DSP circuitry. The signal includes audio plus signalling tones. When it is activated, a two digit number is displayed after the "L.Con4:". Figure 2.6 can be used to convert the reading into the approximate value in millivolts. For details on how to use this item to set-up the line levels, refer to Section 4.

L.Con5:

This menu item indicates the baseband signal level from the local controller module DSP circuitry to the local transmitter module. The signal includes audio plus signalling tones. When it is activated, a two digit number is displayed after the "L.Con5:". Figure 2.7 can be used to convert the reading into the approximate value in millivolts. For details on how to use this item to set-up the line levels, refer to Section 4.

L.Con6:

This menu item indicates the Channel A audio level received at the local terminal. The reading is taken before the compander. When it is activated, a two digit number is displayed after the "c6.". Figure 2.5 can be used to convert the reading into the approximate value in millivolts. For details on how to use this item to set-up the line levels, refer to Section 4.

L.Con7:

This position is not used and will always read "L.Con7:00".

L.Rx0:

This menu item indicates the RSSI at the local terminal. When it is activated, the RSSI is displayed as a percentage after the "L.Rx0:". For satisfactory operation of the link, this should be greater than 70%. Figure 2.2 can be used to convert the reading into the approximate value in millivolts.

L.Rx1:

This menu item is not used and will always read "L.Rx1:00" when activated.

L.Rx2:

This menu item indicates whether or not the synthesiser in the local receiver module has locked to the specified frequency. When it is activated, either 0% or 99% is displayed after the "L.Rx2:". 0% indicates the synthesiser is locked. 99% indicates the synthesiser is out of lock, and the receiver will not operate.

L.Rx3:

This menu item indicates the tuning voltage applied to the synthesiser in the local receiver module. When it is activated, a percentage is displayed after the "L.Rx3:". For normal operation, this should be between 40% and 60%.

L.Rx4:

This position is not used and will always read "L.Rx4:00" when activated.

L.Rx5:

This position is not used and will always read "L.Rx5:00" when activated.

L.Rx6:

This menu item indicates the AFC error voltage at the local receiver module. When it is activated, a percentage is displayed after the "L.Rx6:". This indicates the difference in the frequency settings between the local receiver module and the remote transmitter module. A reading of 50% shows the modules are set to the same frequency. A reading less than 50% indicates that the remote transmitter module is higher in frequency than the local receiver module, and a reading higher then 50% indicates the remote transmitter is lower in frequency.

L.Rx7:

This menu item indicates if the local receiver module is sensing input overload from the local transmitter module. When it is activated, a percentage is displayed after the "L.Rx7:". If this is less than 99%, then the local duplexer module requires alignment.

L.Tx0:

This menu item indicates if there has been any change in the RF output level of the local transmitter. When activated, it compares the current level to the level stored the last time a transmitter calibration was carried out, and displays a percentage after the "L.Tx0:". If the number is below 99% there has been a drop in output power since the last calibration. If there has been no adjustment of the transmitter power potentiometer (see Section 4) since the last calibration, the drop in output indicates problems with the transmitter.

L.Tx1:

This menu item indicates the VSWR at the local transmitter RF output. When it is activated, a percentage is displayed after the "L.Tx1:". This number should be less than 50% for satisfactory operation (the lower the number, the less power is being reflected back into the transmitter).

L.Tx2:

This menu item indicates whether or not the synthesiser in the local transmitter module has locked to the specified transmitter frequency. When it is activated, either 0% or 99% is displayed after the "L.Tx2:". 0% indicates the synthesiser is locked. 99% indicates the synthesiser is out of lock, and the transmitter will not operate.

L.Tx3:

This menu item indicates the tuning voltage applied to the synthesiser in the local transmitter module. When it is activated, a percentage is displayed after the "L.Tx3:". A low reading (e.g. 20%) indicates the transmitter is tuned to the low end of the frequency band while a high reading (e.g. 70%) indicates it is tuned to the high end of the band.

L.Tx4:

This menu item is only used during manufacture to indicate any correction voltage applied to the transmitter synthesiser.

L.Tx5:

This menu item is only used during manufacture to indicate the driver output voltage.

L.Tx6:

This menu item displays the temperature of the local power block heatsink. When it is activated, the temperature in degrees Centigrade is displayed after the "L.Tx6:".

Note: If the heatsink temperature exceeds 95ºC, the local transmitter output power is automatically reduced to prevent overload.

L.Tx7:

This menu item indicates the output value from the internal 10 V regulator in the local transmitter module. When it is activated, a percentage is displayed after the "L.Tx7:". The number should be 99% for normal operation.

R.Con0:

Note: This menu item is only available when a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item indicates the Channel A send line levels at the remote terminal. When it is activated, a percentage is displayed after the "R.Con0:". For satisfactory operation of the link, this number should be 50%. Figure 2.4 can be used to convert this into the approximate value in millivolts. For details on how to use this item to set-up the line levels, refer to Section 4.

R.Con1:

Note: This menu item is only available when a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item indicates the supply voltage at the remote terminal. When it is activated, a percentage is displayed after the "R.Con1:". Figure 2.3 can be used to convert this into the approximate value in volts.

CAUTION

The Hawk will not operate below 10.5 V and internal damage may occur if an input voltage greater than 15.5 V is applied.

R.Con2:

Note: This menu item is only available when a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item indicates the Channel B send line levels at the remote terminal. When it is activated, a percentage is displayed after the "R.Con2:". For satisfactory operation of the link, this should be 50%. Figure 2.4 can be used to convert this into the approximate value in millivolts. For details on how to use this item to set-up the line levels, refer to Section 4.

R.Con3:

Note: This menu item is only available when a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item indicates the Channel B audio level received at the remote terminal. The reading is taken before the compander. When it is activated, a percentage is displayed after the "R.Con3:". Figure 2.5 can be used to convert this into the approximate value in millivolts. For details on how to use this item to set-up the line levels, refer to Section 4.

R.Con4:

Note: This menu item is only available when a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item indicates the baseband signal level from the remote receiver module to the remote controller module DSP circuitry. The signal includes audio plus signalling tones. When it is activated, a percentage is displayed after the "R.Con4:". Figure 2.6 can be used to convert this into the approximate value in millivolts. For details on how to use this item to set-up the line levels, refer to Section 4.

R.Con5:

Note: This menu item is only available when a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item indicates the baseband signal level from the remote controller module DSP circuitry to the remote transmitter module. The signal includes audio plus signalling tones. When it is activated, a percentage is displayed after the "R.Con5:". Figure 2.7 can be used to convert the reading into the approximate value in millivolts. For details on how to use this item to set-up the line levels, refer to Section 4.

R.Con6:

Note: This menu item is only available when a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item indicates the Channel A audio level received at the remote terminal. The reading is taken before the compander. When it is activated, a two digit number is displayed after the "R.Con6:". Figure 2.5 can be used to convert the reading into the approximate value in millivolts. For details on how to use this item to set-up the line levels, refer to Section 4.

R.Con7:

This position is not used and will always read "R.Con7:00%" when activated.

R.Rx0:

Note: This menu item is only available when a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item indicates the RSSI at the remote terminal. When it is activated, the RSSI is displayed as a percentage after the "R.Rx0:". For satisfactory operation of the link, this should be greater than 70%. Figure 2.2 can be used to convert the reading into the approximate value in millivolts.

R.Rx1:

This menu item is not used and will always read "R.Rx1:00" when activated.

R.Rx2:

Note: This menu item is only available when a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item indicates whether or not the synthesiser in the remote receiver module has locked to the specified frequency. When it is activated, either 0% or 99% is displayed after the "R.Rx2:". 0% indicates the synthesiser is locked. 99% indicates the synthesiser is out of lock, and the receiver will not operate.

R.Rx3:

Note: This menu item is only available when a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item indicates the tuning voltage applied to the synthesiser in the remote receiver module. When it is activated, a percentage is displayed after the "R.Rx3:". For normal operation, this should be between 40% and 60%.

R.Rx4:

This position is not used and will always read "R.Rx4:00%".

R.Rx5:

This position is not used and will always read "R.Rx5:00%".

R.Rx6:

Note: This menu item is only available when a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item indicates the AFC error voltage at the remote receiver module. When it is activated, a percentage is displayed after the "R.Rx6:". This indicates the difference in the frequency settings between the remote receiver module and the local transmitter module. A reading of 50% shows the modules are set to the same frequency. A reading less than 50% indicates that the local transmitter module is higher in frequency than the remote receiver module, and a reading higher then 50% indicates the local transmitter is lower in frequency.

R.Rx7:

Note: This menu item is only available when a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item indicates if the remote receiver module is sensing input overload from the remote transmitter module. When it is activated, a percentage is displayed after the "R.Rx7:". If this is less than 99%, then the remote duplexer module requires alignment.

R.Tx0:

Note: This menu item is only available when a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item indicates if there has been any change in the RF output level of the remote transmitter. When activated, it compares the current level to the level stored the last time a transmitter calibration was carried out, and displays a percentage after the "R.Tx0:". If the number is below 99% there has been a drop in output power since the last calibration. If there has been no adjustment of the transmitter power potentiometer (see Section 4) since the last calibration, the drop in output indicates problems with the transmitter.

R.Tx1:

Note: This menu item is only available when a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item indicates the VSWR at the remote transmitter RF output. When it is activated, a percentage is displayed after the "R.Tx1:". This number should be less than 50% for satisfactory operation (the lower the number, the less power is being reflected back into the transmitter).

R.Tx2:

Note: This menu item is only available when a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item indicates whether or not the synthesiser in the remote transmitter module has locked to the specified transmitter frequency. When it is activated, either 0% or 99% is displayed after the "R.Tx2:". 0% indicates the synthesiser is locked. 99% indicates the synthesiser is out of lock, and the transmitter will not operate.

R.Tx3:

Note: This menu item is only available when a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item indicates the tuning voltage applied to the synthesiser in the remote transmitter module. When it is activated, a percentage is displayed after the "R.Tx3:". A low reading (e.g. 20%) indicates the transmitter is tuned to the low end of the frequency band while a high reading (e.g. 70%) indicates it is tuned to the high end of the band.

R.Tx4:

This menu item is only used during manufacture to indicate any correction voltage applied to the transmitter synthesiser.

R.Tx5:

This menu item is only used during manufacture to indicate the driver output voltage.

R.Tx6:

Note: This menu item is only available when a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item displays the temperature of the remote power block heatsink. When it is activated, the temperature in degrees Centigrade is displayed after the "R.Tx6:".

Note: If the heatsink temperature exceeds 95ºC, the remote transmitter output power is automatically reduced to prevent overload.

R.Tx7:

Note: This menu item is only available when a test link has been set-up between the two terminals. Refer to menu items F0 and F1.

This menu item indicates the output value from the internal 10 V regulator in the remote transmitter module. When it is activated, a percentage is displayed after the "R.Tx7:". The number should be 99% for normal operation.

Go to sleep

Note: This menu item is only available when no link has been set-up between the two terminals.

When activated, this menu item returns the Hawk to the idle state.

L.Ser#

Note: This menu item is not available when a normal link has been set-up between the two terminals.

This menu item is used to display the serial number of the local terminal. When activated, the serial number is displayed after "L.Ser#".

Alt L.Sys-Param

Note: This menu item is not available when a normal link has been set-up between the two terminals.

This menu item is used to display the software controlled system parameters of the local terminal. When activated, the operator is prompted for the EEPROM address of the parameter they are interested in. After the address is entered, the current value is displayed, and can be changed if required.

Table 2.1 lists the software controlled parameters and their EEPROM addresses.

Note: Certain of the parameters in Table 2.1 are not usually altered using the Alt L.Sys-Param menu. The table refers to the section of this manual where the normal procedure is listed.

Address	Function	Description
0-7	Serial number	Not adjustable.
8	Hardware configuration	Refer to "Hardware Configuration" in Section 4 for further details.
9	Ident code	Refer to "Changing the Ident Code" in Section 4.
10	Point-to-point configuration	Refer to "Changing Point-to-Point Configuration" in Section 4.
11-18	Password	Factory default password is EXICOM.
19-20	Micro-controller idle time	The rate the micro-controller inputs are scanned when the Hawk is asleep, normally 2.6ms.
21	Receiver on time	The period of time the receiver is powered when a Hawk terminal is in cycling mode. Multiply the figure by the micro-controller idle time to obtain the receiver on time in ms.
22	Receive total cycle time	The sum of the receiver on and off times. Multiply the figure by the micro-controller idle time to obtain the receiver total cycle time in ms.
23	Identify timeout time	The period of time the Hawk will attempt to identify the input which woke it up. This figure is the true time in ms.
24	Maximum link establishment time	Sets the maximum time to establish a link, after which the Hawk will go to sleep. Divide the figure at this address by 10 to obtain the true time in seconds.
25	Maximum allowable signal dropout time	A signal dropout of longer than this time will result in a dropped call (refer to RSSI cut-off). Divide the figure by 20 to obtain the true figure in seconds.
26	RSSI cut-off	This is the level where signal dropout occurs. At this point the receiver is muted and the signal dropout time started. This figure is directly related to the figure on the LCD in the RSSI meter position.
27	DSP power on time	The period of time the system waits for the DSP to power on after commencing operation.

Table 2.1: Software Controlled System Parameters

Address	Function	Description
28	Tx calibration factor	The Tx calibration function F8 stores a scaling factor in this location.
29	Rx mute time	The time the receiver mute remains open after the loss of M or E-wire. Multiply this number by 3 ms. Values between 95 (285 ms) and 254 (762 ms) are acceptable. If the number is 255, the default time of 750 ms is used. If the number is 0, the receiver will never mute, ie. infinite hold-up time.
30	Tx hold time	The time the transmitter remains active after the loss of M or E wire. Multiply this number by 3 ms. Values between 55 (165 ms) and 254 (762 ms) are acceptable. If the number is 255, the default time of 630 ms is used. If the number is 0, the transmitter will never turn off. This number must be 40 (120 ms) less than the number at address 29 to maintain the link close down timing.
31-32	Modem access	Refer to "Wake Up Sequence" in Section 4.
33	Diagnostic Hold Up Time	The time the Hawk remains active for diagnostics after the last keypress. Multiply this number by 10 s. Values between 3 and 254 are acceptable. If the number is 255 the default of 5 minutes (300 s) is used.
35	Calling Line Identity	When enabled, this allows transmission of Calling Line Identity (CLI) information from the exchange to the subscriber. Storing the number 255 in this address disables the function, any other value will enable it. Refer to "Calling Line Identity".
36-39	Not used	
40	Subscriber Terminal Minimum Dial Break Length	Minimum dial break length the subscriber terminal will accept when operating with a decadic phone (a shorter break would cause the terminal to accept switch bounces as dial breaks). Multiply this value by 5 to obtain the minimum dial break time in ms.

Table 2.1: Software Controlled System Parameters

Address	Function	Description
41	Subscriber Terminal Maximum Dial Break Length	Maximum dial break length the subscriber terminal will accept when operating with a decadic phone (a longer break would cause the terminal to accept hook-flashes as dial breaks). Multiply this value by 5 to obtain the maximum dial break time in ms.
42	Subscriber Terminal Minimum Interdigit Pause	Minimum time the subscriber terminal will accept between the individual digits when operating with a decadic phone (a shorter pause would cause the terminal to accept the pauses between the dial breaks that make up each digit as interdigit pauses). Multiply this value by 5 to obtain the minimum interdigit pause time in ms.
43	Subscriber Terminal Maximum Hook-flash	Maximum time the subscriber terminal will accept as a hook-flash (a longer break is a hang-up). Multiply this value by 5 to obtain the minimum interdigit pause time in ms.
44	Payphone Hold-up Time	Maximum time a subscriber terminal will listen for payphone pulses over the link, after a call is terminated. Multiply this value by 5 to obtain the minimum interdigit pause time in ms.
45-49	Not used	
50	Exchange Terminal Maximum Hook-flash	Maximum time the exchange terminal will accept as a hook-flash (a longer break is a hang-up). Multiply this value by 5 to obtain the minimum interdigit pause time in ms.
51	Exchange Terminal Maximum Dial Break Length	Maximum dial break length the subscriber terminal will accept when operating with a decadic phone (a longer break would cause the terminal to accept hook-flashes as dial breaks). Multiply this value by 5 to obtain the maximum dial break time in ms.
52	Exchange Terminal Minimum Dial Break Length	Minimum dial break length the subscriber terminal will accept when operating with a decadic phone (a shorter break would cause the terminal to accept switch bounces as dial breaks). Multiply this value by 5 to obtain the minimum dial break time in ms.

Table 2.1: Software Controlled System Parameters

Address	Function	Description
53	Exchange Terminal Minimum Interdigit Pause	Minimum time the exchange terminal will accept between the individual digits when operating with a decadic phone (a shorter pause would cause the terminal to accept the pauses between the dial breaks that make up each digit as interdigit pauses). Multiply this value by 5 to obtain the minimum interdigit pause time in ms.
54	Exchange Terminal Maximum Ringing Pause	Maximum time between rings after which the link will go to sleep, unless the subscriber is off-hook.

Table 2.1: Software Controlled System Parameters

Change password

Note: This menu item is only available when a test link has been set-up between the two terminals.

This menu item is used to changes the password for the controller. When activated, the Hawk will prompt you for the new password.

R.Ser#

Note: This menu item is only available when a test link has been set-up between the two terminals.

This menu item is used to display the serial number of the remote terminal. When activated, the serial number is displayed after "R.Ser#".

R.Ver#

Note: This menu item is only available when a test link has been set-up between the two terminals.

This menu item is used to display the version number of the software used in the remote terminal. When activated, the version number is displayed after "R.Ver#".

Clone Ph. timing

Note: This menu item is only available when a test link has been set-up between the two terminals.

This menu item is used to copy the telephone timing characteristics of the local terminal to the remote terminal. After the transfer is completed "OK" will be displayed after "Clone Ph. timing".

Alter R.Sys Param

Note: This menu item is only available when a test link has been set-up between the two terminals.

This menu item is used to display the software controlled system parameters of the remote terminal. The operation is identical to that of the Alt L.Sys Param menu.

2.5.4 Accessing the Software Menu with the Exicom Hand-held Terminal

Exicom can supply a Hand-held Terminal (HHT) set up for use with the Hawk link. Software item display on the HHT is identical to that of a VDT, but the HHT has the advantage of being more portable.

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3
Installation

3.1 General

It is the responsibility of the installer to carry out site planning for both ends of the Hawk Rural Radio Telephone link. This planning should be complete before installing the link is attempted. In particular antenna direction, heights, polarisation, and methods of securing should all be decided prior to work commencing. If you have any queries, please consult Exicom International or your local supplier.

3.2 Installing a Rack Mount Terminal

3.2.1 General

Hawk rack mount terminals are always installed inside a building, usually a telephone exchange or similar. The terminal is compatible with the industry standard 19 inch rack system and occupies 3 U of vertical space (one U = 44.5 mm or $1^3/_4$ inch). When deciding on the position of the terminal, you should take into account the following:

- The length of coaxial cable between the terminal and the antenna should be as short as possible, and should not exceed 10 metres,
- The terminal requires good ventilation, and there should be a gap of at least 2 U between the top and bottom of the terminal and any other equipment in the rack to allow generated heat to escape (see Figure 3.1),
- The terminal requires access to a good earth (separate to mains earth),
- The wires to the terminal from its power source, and any other equipment it is attached to, should be kept as short as possible,
- There should be enough room around the terminal to enable installation and any subsequent servicing to be easily carried out.

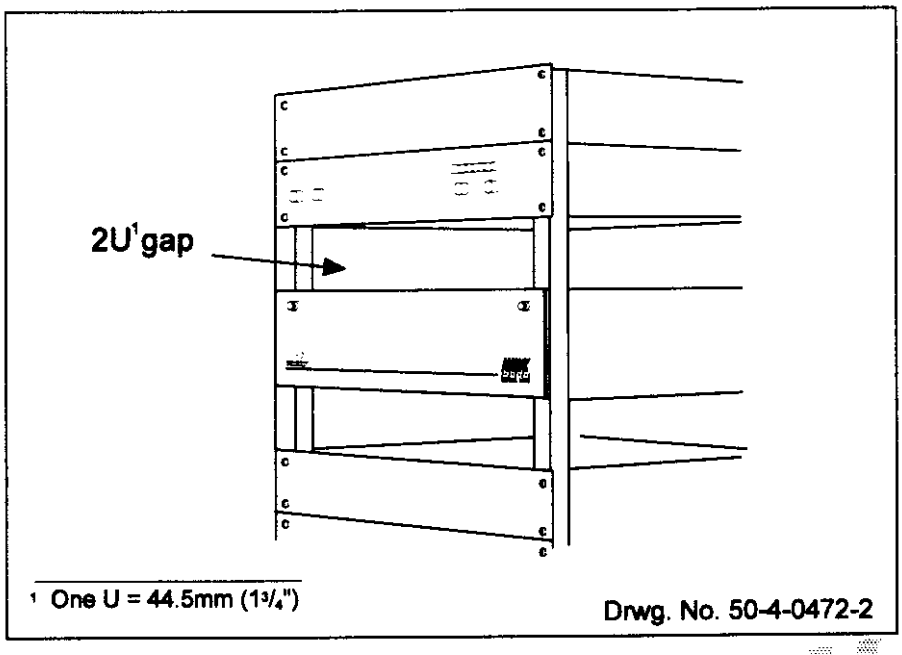


Figure 3.1: Rack Mount Positioning

3.2.2 Tools Required

> Screwdriver for rack screws,

> Screwdriver for rear plate screws,

> Utility knife,

> Screwdriver for earth tab.

3.2.3 Securing the Terminal in the Rack

After selecting the position of the terminal as detailed in Section 3.2.1, secure the terminal to the rack as follows:

Note: It is advisable to have two people for securing the terminal to the rack.

1 Slide the terminal, rear end first, into position in the rack, until the lugs on the front of the terminal are against the vertical bars of the rack (see Figure 3.2),

2 While holding the terminal in position, open the terminal front panel, and align the four holes in the lugs over the screw holes in the rack,

3 Insert and tighten a suitable screw into each of the four holes in the rack, supporting the terminal in position until all four screws are tight.

Note: Ensure that the protruding screw heads do not prevent the front panel of the terminal closing properly.

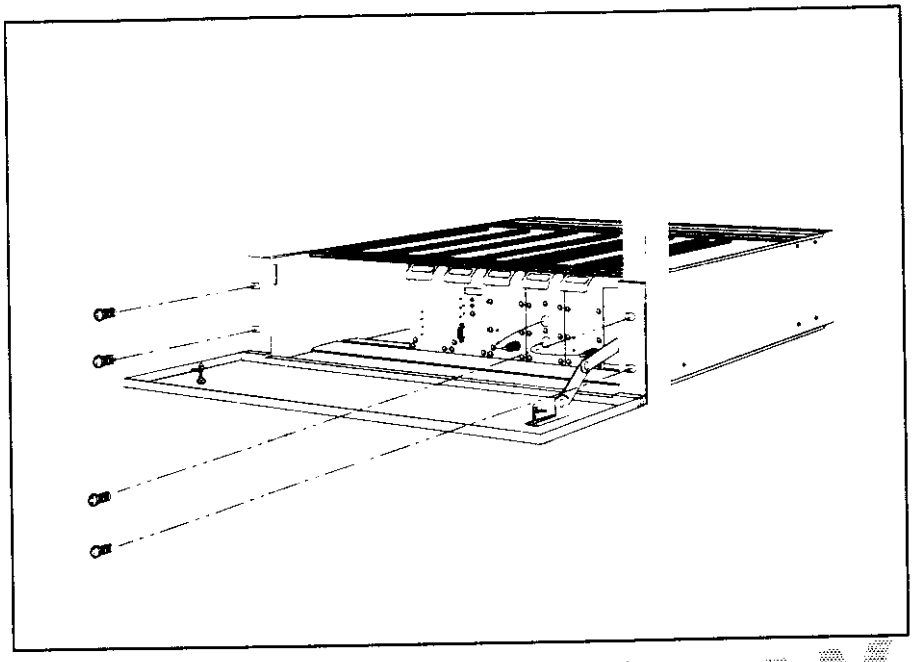


Figure 3.2: Rack Mount Installation

3.2.4 Attaching the cables to the terminal

The terminal needs to be connected to the antenna, the power source, the line interface (2-wire or 4-wire + E and M), and an earth. Except for the earth tabs, all the connectors on the rack mount terminal are on the rear of the motherboard PCB. There is an earth tab at the bottom rear corner of each of the rack side plates.

Note: Only one earth tab needs to be connected to earth the terminal.

To gain access to the connectors, remove the rear plate on the back of the terminal by undoing the two screws holding it in place. Retain the screws for refitting the rear plate when you have connected all the required cables.

Figure 3.3 shows the Hawk rack mount with the rear panel removed.

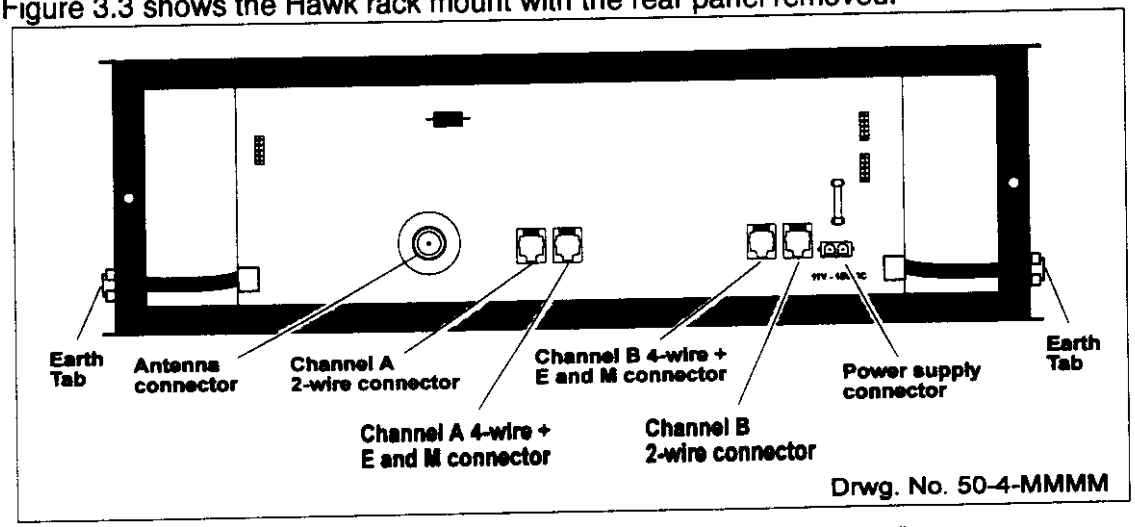


Figure 3.3: Rack Mount Connectors (Rear Panel Removed)

2-wire connections

The 2-wire sockets are designed to take an RJ-11 connector. Exicom supplies two cables with every terminal, each with an RJ-11 connector on one end and unterminated at the other. The operator can use these to make the 2-wire connections to the terminal, or provide their own RJ-11 connection. An RJ-11 connector is shown in Figure 3.4 and the connector pin-outs are identified in Table 3.1.

CAUTION

If the operator is making their own 2-wire connection, they must ensure the connector pin-outs are as given in Table 3.1.

Note: The wiring colours in Figure 3.4 are for the connector on the Exicom supplied cable.

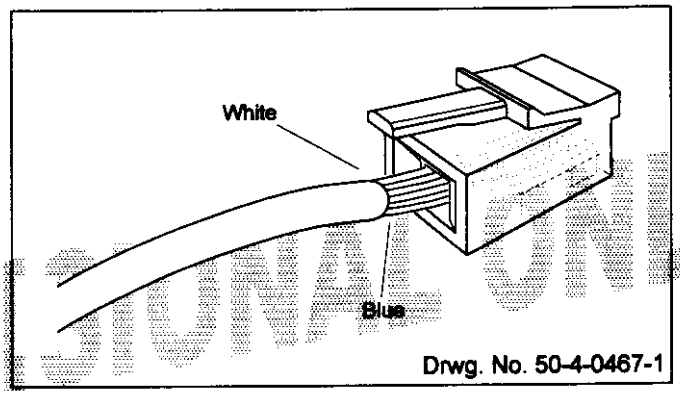


Figure 3.4: Connector for 2-wire Socket

Pin	Signal
1	Not connected
2	Not connected
3	+ve Leg
4	-ve Leg
5	Not connected
6	Not connected

Table 3.1: RJ-11 Pin-outs

To use an Exicom supplied cable for a 2-wire connection to a single channel link terminal, or Channel A of a dual channel link terminal, proceed as follows:

1 Strip the unterminated end of the cable to expose the six coloured wires,

2 Trim back the blue and white wires, and bare the ends of the red, black, green and yellow wires,

3 Twist the bared ends of the red and black wires together to make one leg of a 2-wire pair. Do the same with the green and yellow wires to make the other leg,

4 If the terminal is located at an exchange, insert the twisted wire pairs into the appropriate points on the Main Distribution Frame (MDF),

5 If the terminal is located at a subscriber's premises, the advised method of connection is to insert the twisted wire pairs into a junction box, so that they make a 2-wire connection to any device (telephone, fax or modem) plugged into the box,

6 Plug the connector on the other end of the cable into the Channel A 2-wire socket on the terminal.

To use the Exicom supplied cabling for a 2-wire connection to Channel B of a dual channel link terminal, carry out steps 1 to 5 as detailed above, then plug the connector on the cable into the Channel B 2-wire socket on the terminal.

4-wire + E and M connections

The 4-wire + E and M sockets are designed to take an RJ-11 connector. Exicom supplies two cables with every terminal, each with an RJ-11 connector on one end and unterminated at the other. The operator can use these to make the 4-wire + E and M connections to the terminal, or provide their own RJ-11 connection.

CAUTION If the operator is making their own 4-wire connection, they must ensure the connector pin-outs are as given in Table 3.2.

Note: The wiring colours in Figure 3.5 are for the connector on the Exicom supplied cable.

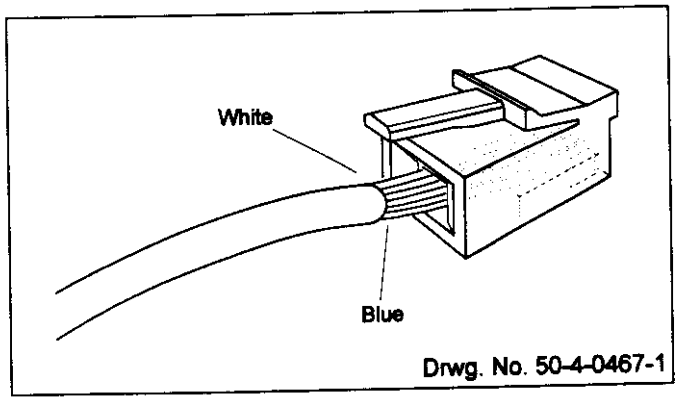


Figure 3.5: Connector for 4-wire + E and M Socket

Pin	Signal
1	E-wire
2	Rx audio
3	Rx audio
4	Tx audio
5	Tx audio
6	M-wire

Table 3.2: RJ-11 Pin-outs

To use the Exicom supplied cable for a 4-wire + E and M connection to a single channel link terminal, or Channel A of a dual channel link terminal, proceed as follows:

1 Strip the unterminated end of the cable to expose the six coloured wires,

2 Bare the ends of all the wires, and connect each wire to the equipment using the terminal as detailed in Table 3.3,

Wire Colour	Function (at Hawk terminal)
White	E-wire
Yellow	Rx audio
Green	Rx audio
Red	Tx audio
Black	Tx audio
Blue	M-wire

Table 3.3: Wiring to User Equipment

3 Plug the connector on the other end of the cable into the Channel A 4-wire + E and M socket on the terminal.

To use the Exicom supplied cable for a 4-wire + E and M connection to Channel B of a dual channel link terminal, carry out steps 1 and 2 as detailed above, then plug the connector on the cable into the Channel B 4-wire plus E and M socket in the terminal.

Antenna connection

The co-axial cable from the antenna is connected to the N-Type connector on the bottom of the terminal. Exicom advises the use of Type RG213 RF cabling, or similar, with a male N-Type connector at each end. Exicom can supply suitable connectors and cabling if requested. If a lightning arrestor is fitted to the antenna, the terminal should be connected to the antenna through the arrestor. An exploded view of a suitable connector is shown in Figure 3.6.

Note: The total length of co-axial cable between the antenna and the terminal, including the cabling to any lightning arrestor, should be less than 10 metres.

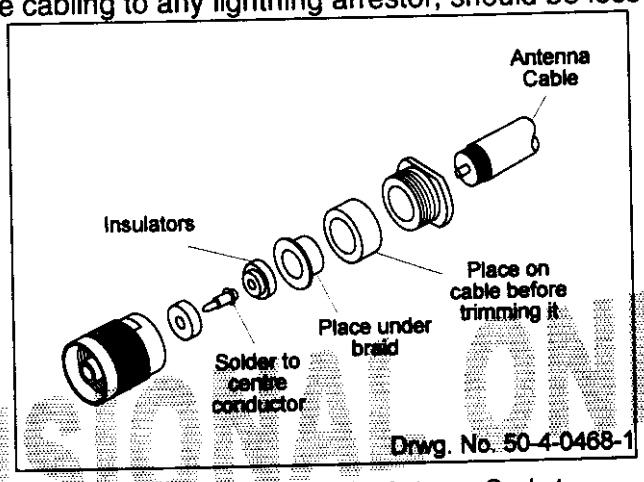


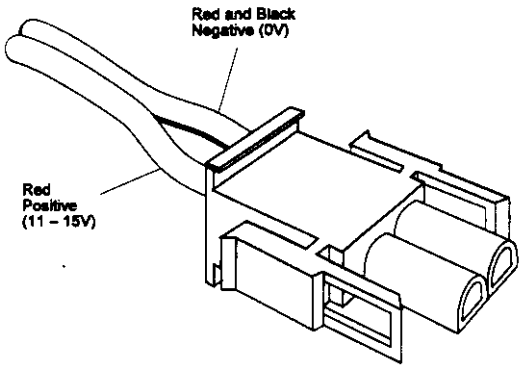
Figure 3.6: Connector for Antenna Socket

Power Supply connection

If you have requested one of the two power supplies available from Exicom, the rack will come with the supply already in the rack. The two cables from the supply are fed out the rear of the terminal, one going to the external supply, and the other to the power supply socket on the rear of the motherboard PCB.

The connection of a non-Exicom power supply to the terminal is the responsibility of the installer. The supply must conform to the specifications given in Section 1.4.3. The connector to the power supply socket on the terminal must be as shown in Figure 3.7, as must be the polarity of the supply.

Note: The colour coding of the wires shown in Figure 3.7 is for an Exicom supply.



Drwg. No. 50-4-0458-0

Figure 3.7: Connector for Power Supply Socket

Earth connection

The provision of a suitable earth for the terminal is the responsibility of the installer. The terminal earth connection is made via either of the two earth tabs at the rear of the terminal. The recommended earth connection to an earth tab is a copper cable with a diameter greater than 4 mm. This should be directly connected to an earthing stake driven into the ground.

Note: Only one earth tab needs to be connected to earth the terminal.

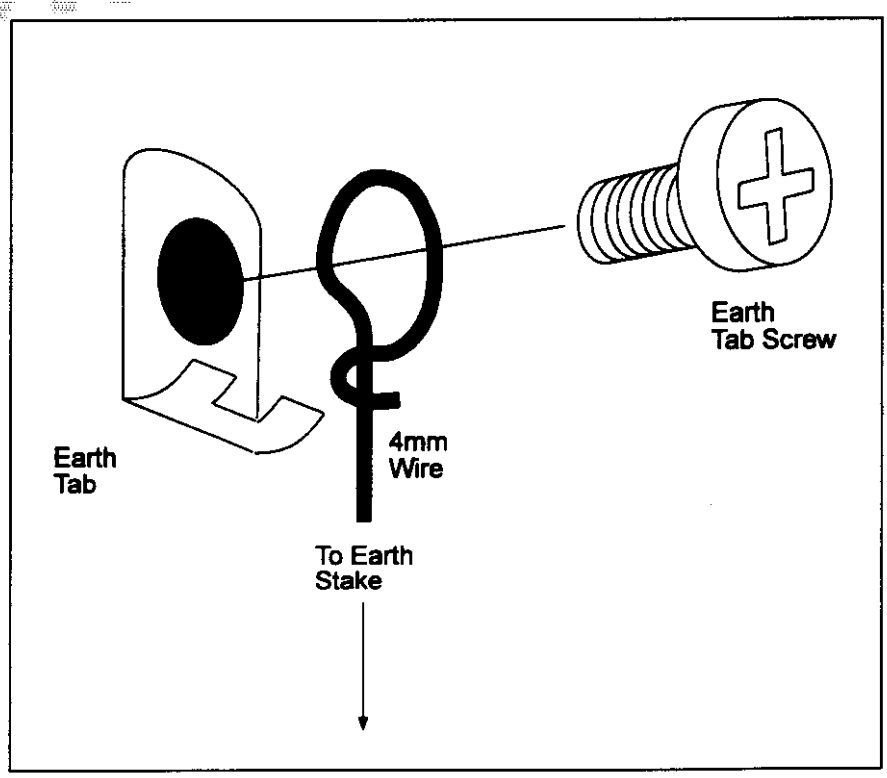


Figure 3.8: Connection to Earth Tab

Checking the connections

When you have ensured that all the connections to the terminal have been properly made, and that the power source is functioning, you can check the connections to the terminal by applying power to the terminal and observing the activity of the LEDs on the front of the modules. While power is supplied to the terminal, this should be as follows:

> Controller "Active" LED - lights for a few seconds when power is applied to the terminal. Lights again when a signal is received,

> Transmitter "Power" LED - remains lit while power is supplied to the terminal,

> Receiver "Power" - either remains lit, or regularly flashes on and off (cycling) while power is supplied to the terminal.

If the LED do not perform as detailed, proceed as follows:

1 Check that the power supply plug is inserted correctly into its socket on the terminal.

2 Check that the modules are inserted correctly into the terminal.

3 Check that the fuse on the terminal motherboard PCB has not blown.

4 Check that the diode on the terminal motherboard PCB is not short-circuited.

5 Check that the wiring for the power supply cabling is correct.

If you have completed the above checks without identifying any faults, and the LED are still not performing as detailed, consult Exicom International or your local supplier.

If the LED are performing as detailed, secure the rear panel back on the terminal using the two screws kept on its removal.

3.3 Installing a Wall Mount Terminal

3.3.1 General

Hawk wall mount terminals are designed to be fitted onto a wall inside a building. When deciding on the position of the terminal, you should take into account the following:

> The length of coaxial cable between the terminal and the antenna should be as short as possible, and should not exceed 10 metres,

> The terminal requires good ventilation to allow generated heat to escape, and should not be mounted inside a cupboard or a very small closed room,

> The terminal requires access to a good earth (separate to mains earth),

> The wires to the terminal from its power source, and any other equipment it is attached to, should be kept as short as possible,

> There should be enough room around the terminal to enable installation and any subsequent servicing to be easily carried out. Refer to Figure 3.9.

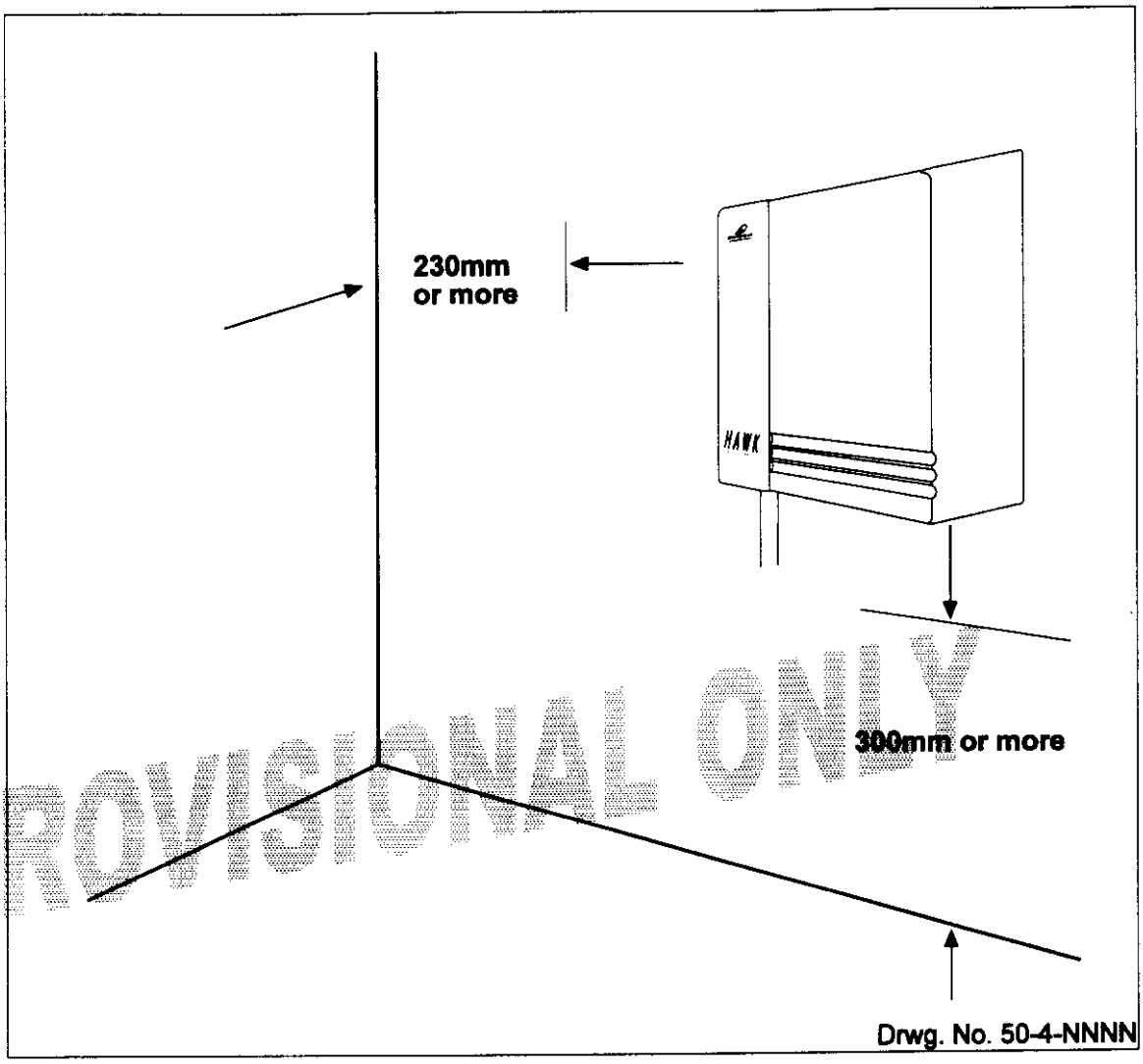


Figure 3.9: Wall Mount Positioning

3.3.2 Tools Required

> Utility knife,

> Marker pen,

> Drill with 3.5mm bit,

> Ruler,

> Screwdriver for wall screws,

> Screwdriver for cover bottom,

> Screwdriver for cover top,

> Screwdriver for earth tab,

> JIS No. 2 Screwdriver or No.2 Phillips,

> Screwdriver for chassis underside.

3.3.3 Fixing the Terminal to the Wall

After selecting the position of the terminal as detailed in Section 3.3.1, attach the terminal to the wall as follows:

1 Lay the drilling template in Appendix A of this manual flat against the wall, in the position you intend to attach the terminal. Mark the positions of the centres of each of the four circles on the template on the wall.

2 Using a drill with a 3.5 mm diameter bit, drill a 20 mm deep hole at each of the positions marked in (1).

3 Insert one of the four screws supplied with the terminal into each hole. Drive each screw into the wall, until the space between the wall and the head of the screw is 5 mm.

4 Mount the terminal on the wall by slotting the screw heads into the four holders for them on the terminal underside (see Figure 3.10). Check that it fits correctly.

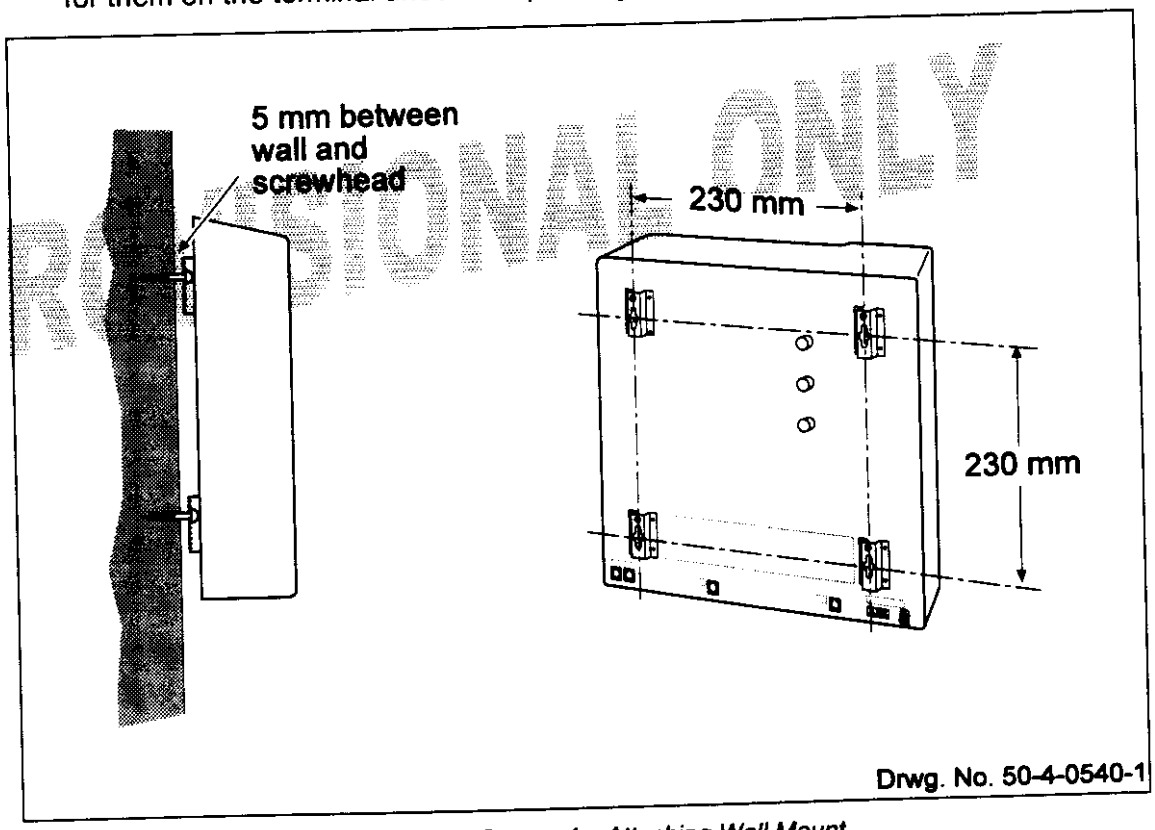


Figure 3.10: Screws for Attaching Wall Mount

Installation of the Type 2828 Mains Power Supply

For a wall mount Hawk, the Type 2828 Mains Power Supply is secured on the wall, near to the Hawk, by inserting four screws into the wall through the holes provided in the power supply plate (see Figure 3.11).

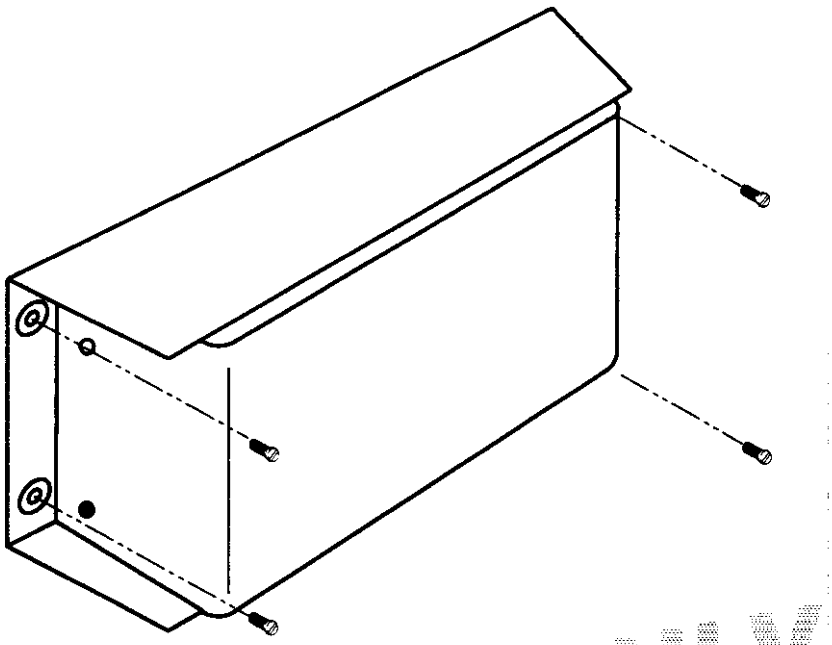


Figure 3.11: Type 2828 Mains Power Supply Mounting

Installation of the Type 2461 DC-DC Converter

For a wall mount Hawk, the Type 2461 DC-DC Converter is supplied attached to a bracket. The converter is secured on the wall, near to the Hawk, by inserting two screws into the wall, then fitting the slots in the bracket over the heads of the screws. When inserting the screws, ensure that their positions correspond to the slots in the bracket, and that their heads are left protruding from the wall by about 5 mm.

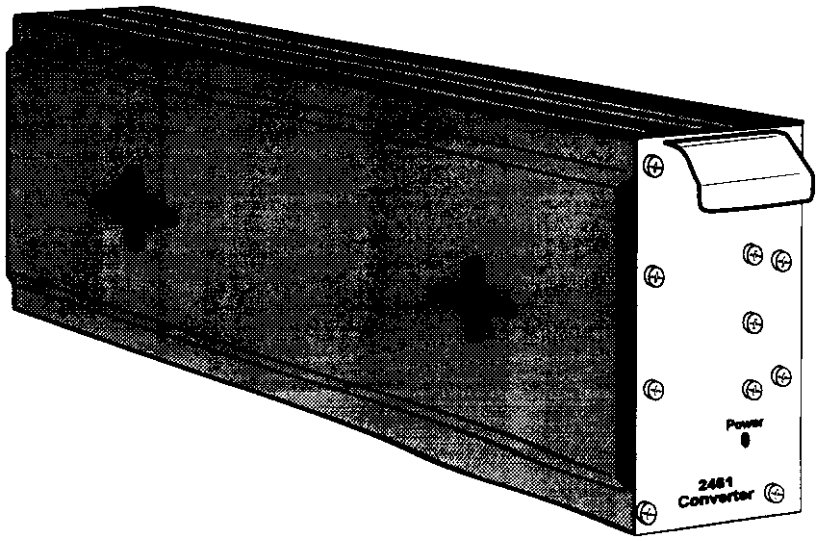


Figure 3.12: Type 2461 DC-DC Converter with Bracket

3.3.4 Attaching the cables to the terminal

All the connectors on the wall mount terminal are on the underside of the terminal, i.e. the side facing the wall when the terminal is in position. When attaching or removing cables, take the terminal off the wall first. If you intend to perform the checks detailed in Section 3.2.4, you will need to remove the cover as follows:

1 Lay the terminal on a flat surface, with the terminal chassis uppermost.

2 Identify the three taptights inserted into the cover through the terminal chassis. They are located near the connectors on the terminal (see Figure 3.13). Remove the taptights and their associated washers, and store them in a safe place.

3 Remove the three screws located at the top of the chassis and store them in a safe place, separately from the screws removed in (2).

4 Turn the terminal over so that the cover is now uppermost and lift the cover off the terminal.

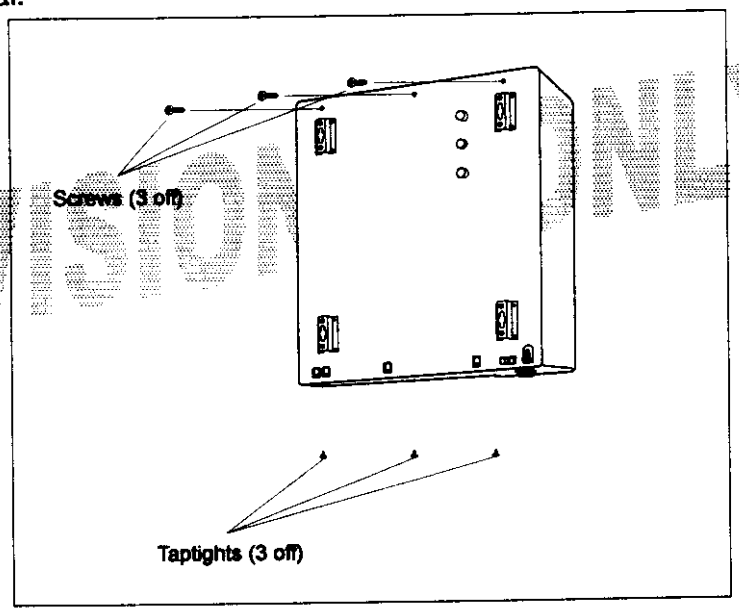


Figure 3.13: Wall Mount Cover Removal

The procedure for attaching the cabling to the connectors is as detailed in Section 3.2.4, except that there is only one earth tab, located next to the power supply connector.

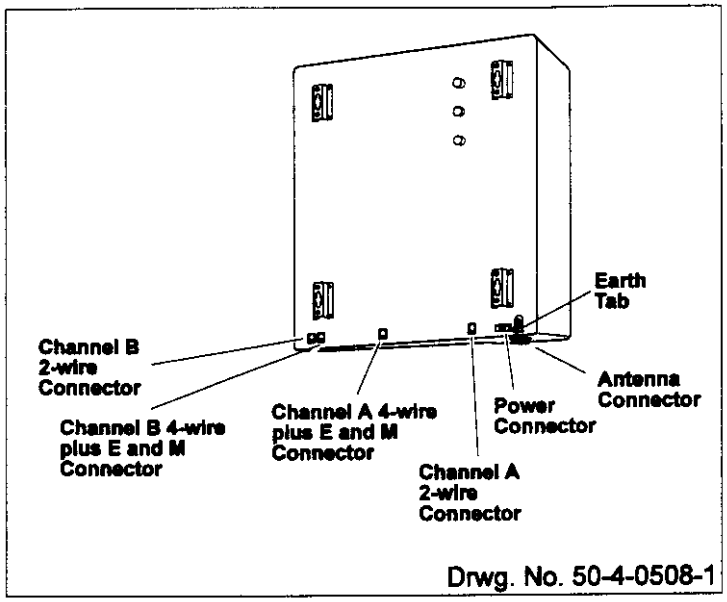


Figure 3.14: Wall Mount Terminal Connectors

When you have completed checking the terminal operation, proceed as follows:

Note: Both the Final Antenna Alignment (Section 3.7) and the Hawk Link Testing (Section 3.6) should be carried out on a wall mount terminal with the cover off. If possible, you should only carry out the following when the testing of the link is complete.

1 Switch off the power supply to the terminal, and remove the co-axial cable from the N-Type antenna connector.

2 Fit the cover over the chassis then lay the terminal on a flat surface with the chassis uppermost.

3 Insert each of the three screws removed in step (3) of the cover removal procedure back into their positions, and tighten them into the terminal chassis through the holes in the cover.

4 Insert and tighten each of the three taptights removed in step (2) of the cover removal procedure back into their positions. Ensure that each taptight has its associated washers.

5 Connect the co-axial cable to the antenna connector, and fit the terminal into position on the wall.

6 Apply power to the terminal.

3.4 Installing a Wall Mount Terminal in the Optional Rack Shelf

3.4.1 General

Exicom supplies an optional Rack Shelf for use with the Hawk wall mount terminal. The rack shelf is used when it is required to fit a Hawk wall mount terminal in a rack. The rack shelf is compatible with the industry standard 19 inch rack system. When the Hawk wall mount terminal is fitted, the rack shelf occupies 3 U of vertical space (one U = 44.5 mm or $1^3/_4$ inch). When deciding on the position of the terminal, you should use the criteria defined in Section 3.2.1.

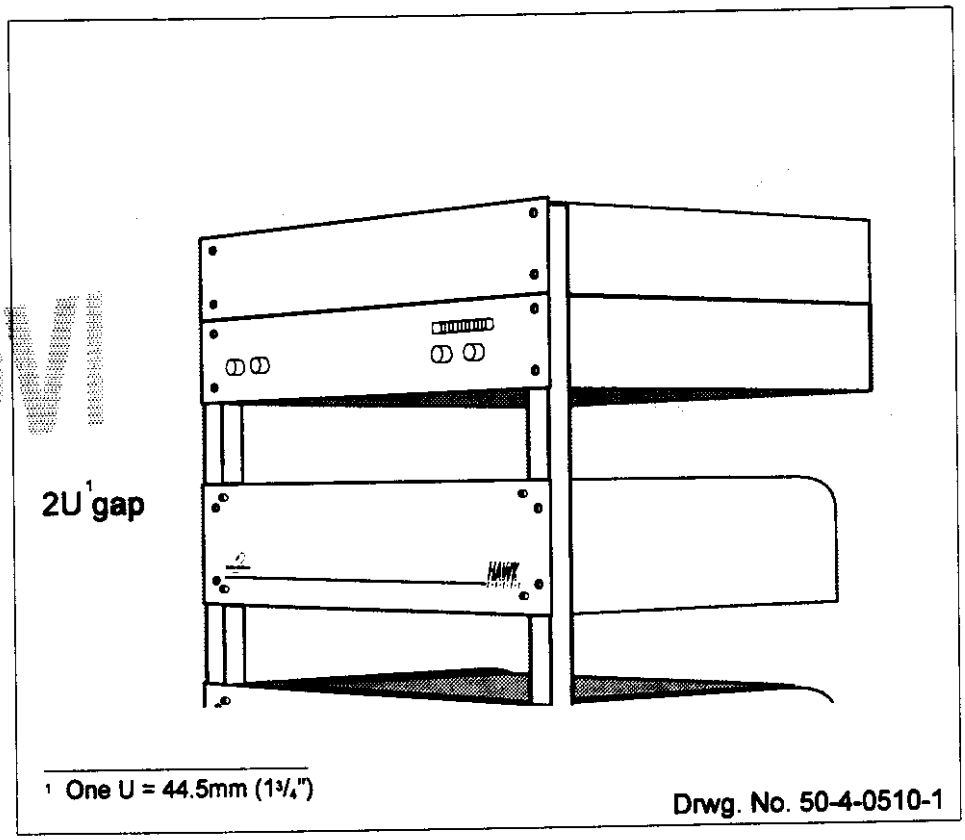


Figure 3.15: Optional Rack Mount Shelf Positioning

3.4.2 Fixing the Terminal to the Optional Rack Mount Shelf

After selecting the position of the terminal as detailed in Section 3.2.1, align the terminal in the rack shelf as shown in Figure 3.16, and then tighten each of the four screws provided with the rack shelf through the shelf underside, into one of the holders that would secure the terminal to the wall.

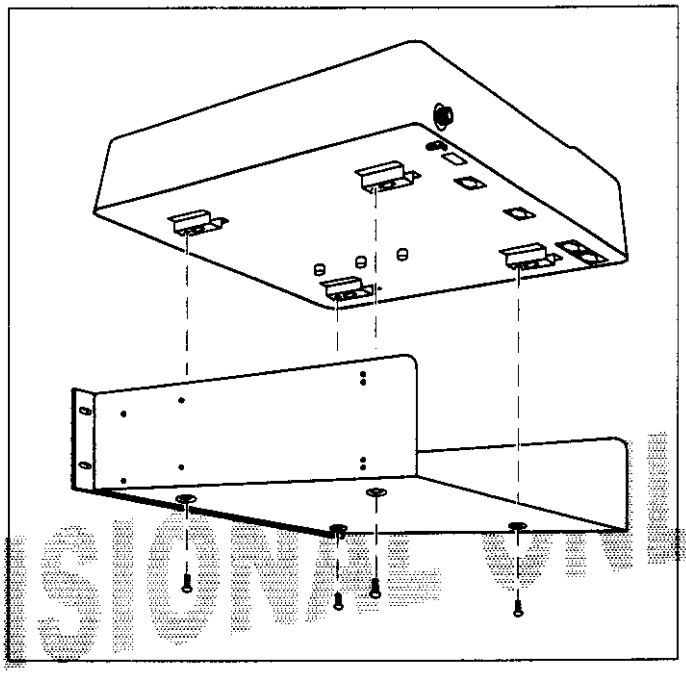


Figure 3.16: Wall Mount Positioning in Rack Mount Shelf

Installation of the Type 2828 Mains Power Supply

When the wall mount Hawk is mounted on the optional rack mount shelf, the power supply is attached on the right hand side of the rack mount shelf, in the holes provided.

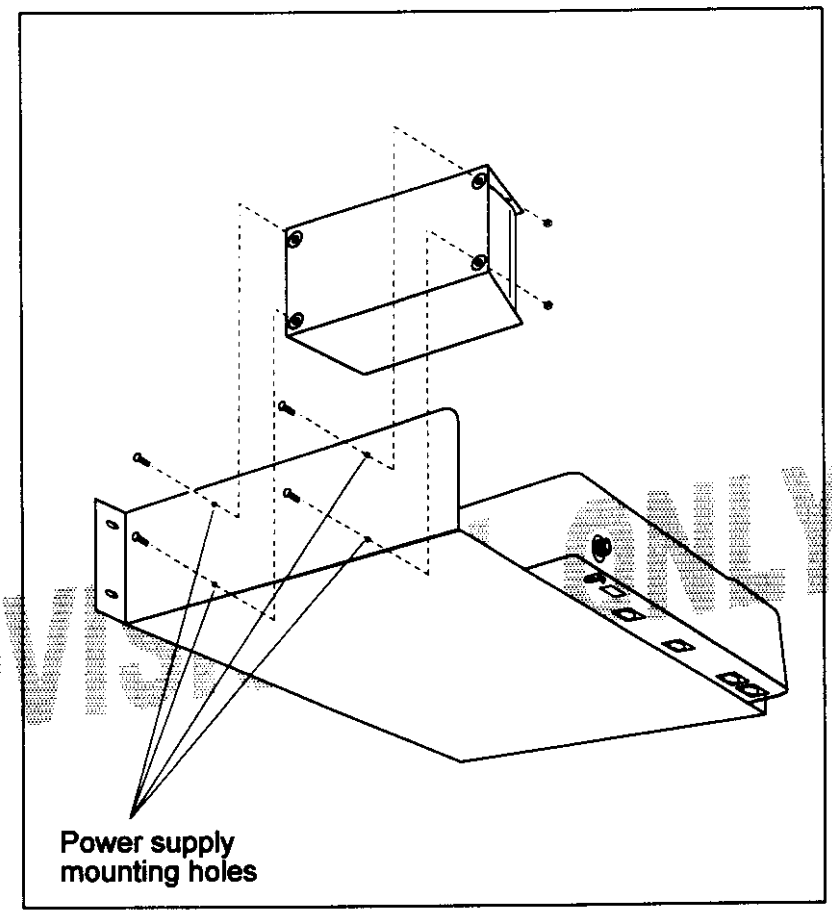


Figure 3.17: Type 2828 Mains Power Supply Positioning in Rack Mount Shelf

Installation of the Type 2461 DC-DC Converter

When the wall mount Hawk is mounted on the optional rack mount shelf, the DC-DC Converter is attached on the right hand side of the rack mount shelf, in the holes provided.

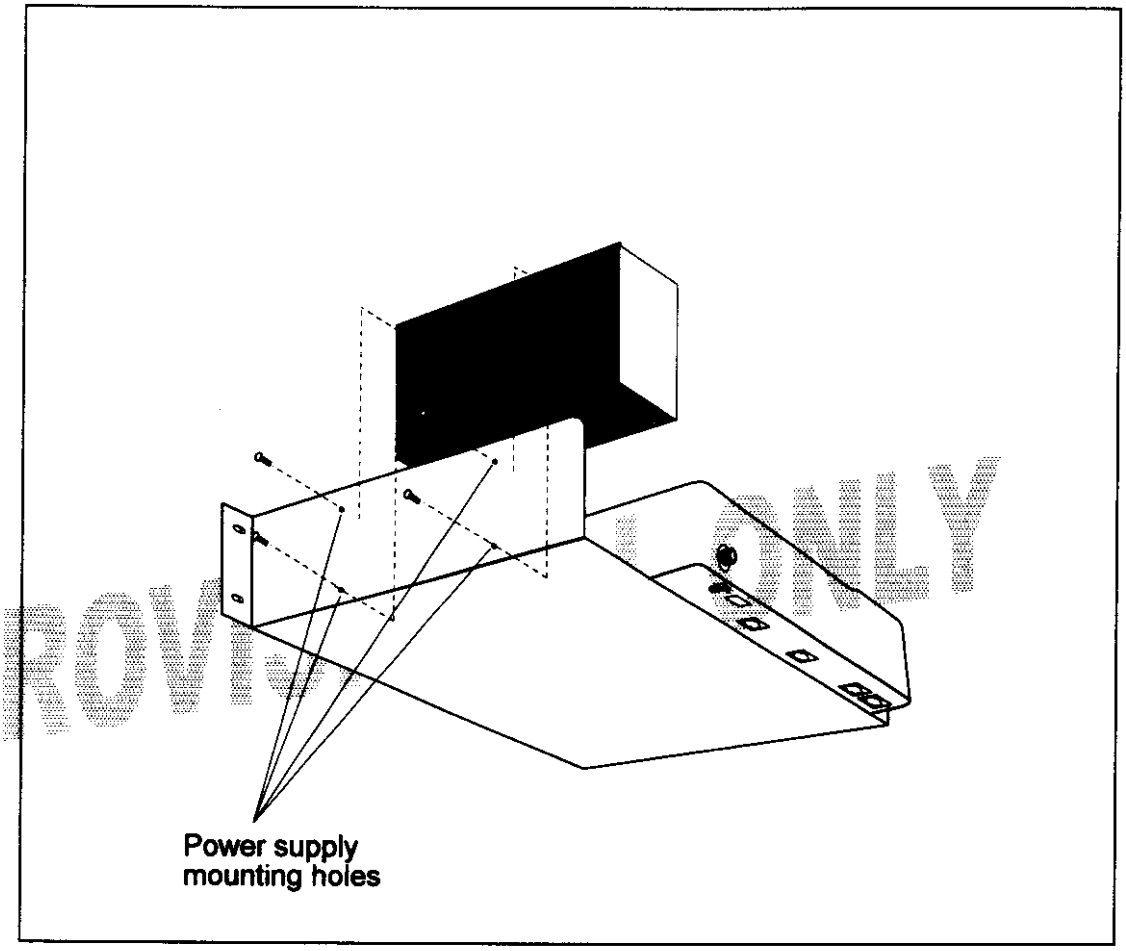


Figure 3.18: Type 2461 DC-DC Converter Positioning in Rack Mount Shelf

3.4.3 Attaching the cables to the terminal

When the wall mount terminal is in the optional rack shelf, all the connectors on the terminal protrude over the rear of the shelf, i.e., it is possible to attach or remove cables while the terminal is in the shelf. However, if you intend to perform the checks detailed in Section 3.2.4, you will need to take the terminal out of the shelf before removing the cover, and then replace the terminal in the shelf after the checks are complete.

3.5 Installing a Wall Mount Terminal in the Weatherproof Enclosure

3.5.1 General

Exicom supplies an optional Weatherproof Enclosure for use with the Hawk wall mount terminal. The enclosure is used when it is required to fit a Hawk wall mount terminal outside a building. The brackets on the rear of the enclosure are suitable for a wide range of mounting arrangements.

Note: If there is no suitable mount already at the site, Exicom can supply an optional pole mounting kit for use with the enclosure. Consult Exicom International.

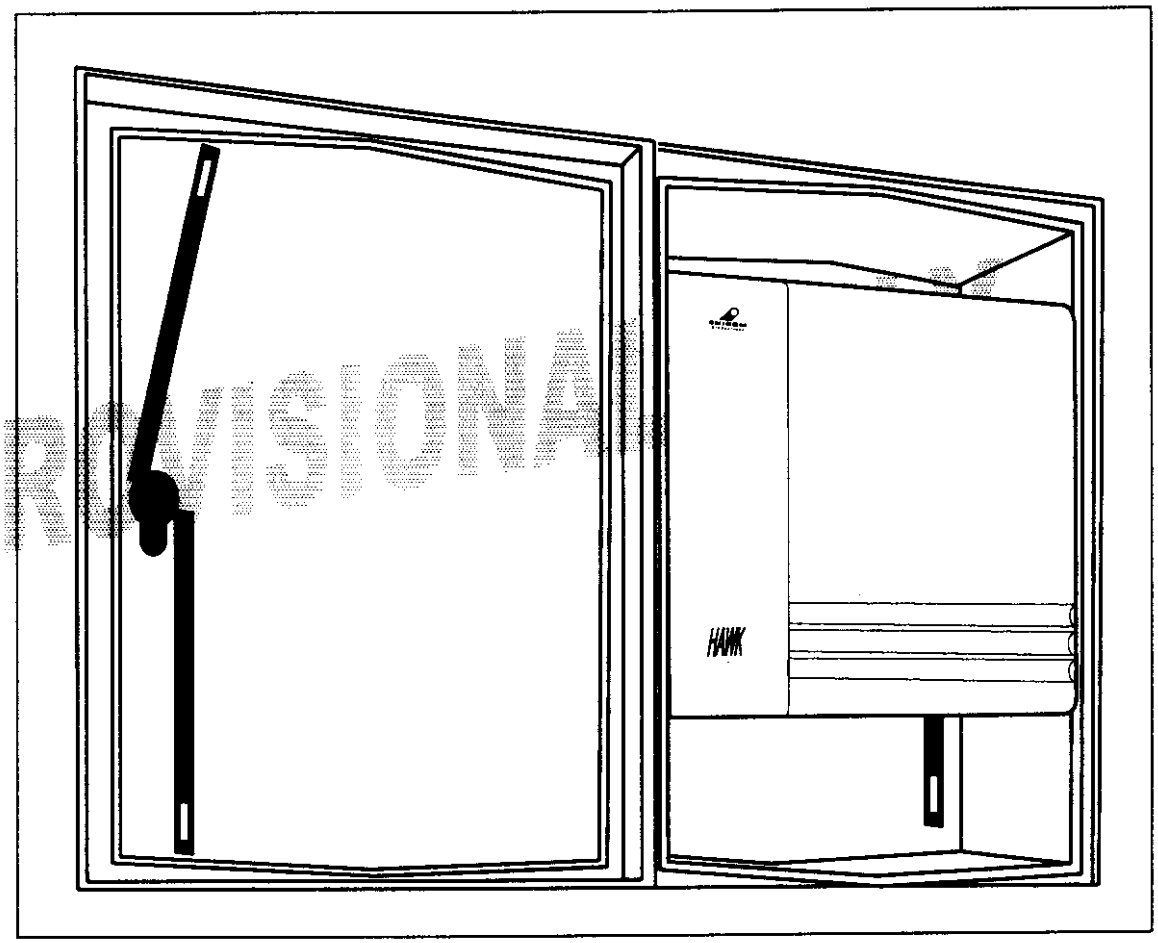


Figure 3.19: Wall Mount Positioning in the Weatherproof Enclosure

3.5.2 Fitting the Terminal in the Enclosure

The Hawk wall mount terminal is fitted in the enclosure by sliding the holders on the underside of the terminal over studs protruding from rails in the back of the enclosure.

Installation of the Type 2828 Mains Power Supply

When the wall mount Hawk is mounted in the enclosure, the power supply is placed unsecured in the bottom left hand corner of the enclosure.

Installation of the Type 2461 DC-DC Converter

When the wall mount Hawk is mounted in the enclosure, the DC-DC converter is placed unsecured in the bottom left hand corner of the enclosure.

3.5.3 Attaching the cables to the terminal

The procedure for attaching cables to the terminal is the same as detailed in Section 3.2.4. However, holes must be drilled in the enclosure, and then suitable grommets must be inserted into the holes to enable the cables to be fed into the enclosure. It is not possible to give specific instructions for this, as requirements vary from system to system. Exicom can advise on suitable grommets and their positioning if requested.

3.6 Testing the Hawk Link

3.6.1 General

The Hawk link can only be tested after both terminals have been installed and powered up. The test procedure depends on the type of link, i.e. telephone or point-to-point.

Note: It is assumed that both terminals have been powered up, and that the checks detailed at the end of the terminal installation sections have been carried out.

3.6.2 Telephone Link

Single Channel Link

To carry out a full test of the Hawk link, there should be one person at the exchange terminal and another at the subscriber terminal.

1 From the exchange, use a test telephone to dial the subscriber's number, and check that the "Active" and "M-wire" LEDs on the controller module, and the "Active" LED on the transmitter module of the exchange terminal light up. If this is not the case, check the following:

> that the cable from the exchange to the terminal is plugged into the right socket on the terminal,

> that the cable from the exchange to the terminal is connected to the right points on the MDF for the subscriber number,

> that the plug on the cable from the exchange to the terminal is correctly wired,

> that the wiring in the cable from the exchange to the terminal is undamaged.

If you have gone through the above checks without finding any problems, and the LED still do not light up when a call is made to the subscriber, consult your local supplier or Exicom International.

2 If the LED come on briefly, then go off again without the call being connected, check the following:

> that the antennas at both sites are pointing in the correct direction,

> that all cabling between the antennas and the terminals is undamaged,

> that the terminals are set to the receive and transmit frequencies,

> that the terminals RF output power is set to the specified value,

> that the terminals have the correct ident code.

Note: For details on checking and altering the frequencies, RF output power and ident codes, refer to Section 4, Setup and Alignments.

If you have gone through the above checks without finding any problems, and still cannot make a call to the subscriber, consult your local supplier or Exicom International.

3 If the call is connected, check that there are no alarm tones over the RF link (see Section 2). Also ensure that you can hear the ringing tone in the exchange telephone before the subscriber goes off-hook, and that information sent via the audio channel (phone conversation, facsimile data or modem data) is successfully reproduced at the other end when the subscriber goes off-hook. If the reproduction is unsuccessful, or of poor quality, check and (if necessary) alter the line level settings for the terminals. Refer to Section 4, Setup and Alignments.

4 After successfully concluding the call from the exchange, check that the subscriber can make a successful call to the exchange phone. If there are any problems, check the connections between the subscriber's telephone and the terminal.

5 If you intend to use the Hawk link to connect devices such as fax machines or modems, it is advisable to check the link for each machine in turn. Repeat steps 1 to 4 again with each device connected in place of the telephones.

Dual Channel Link

To test a dual channel link, carry out the tests detailed for the single channel link for the subscriber assigned to Channel A, then proceed as follows:

1 From the exchange, use a test telephone to dial the number of the subscriber assigned to Channel B of the link, and check that the "Active" and "M-wire" LEDs on the line interface module, and the "Active" LED on the transmitter module of the exchange terminal light up. If this is not the case, check the following:

> that the cable from the exchange to the terminal is plugged into the right socket on the terminal,

> that the cable from the exchange to the terminal is connected to the right points on the MDF for the subscriber number,

> that the plug on the cable from the exchange to the terminal is correctly wired,

> that the wiring in the cable from the exchange to the terminal is undamaged.

If you have gone through the above checks without finding any problems, and the LED still do not light up when a call is made to the Channel B subscriber, consult Exicom International.

2 If the call is connected, check that you can hear the ringing tone in the exchange telephone before the Channel B subscriber goes off-hook, and that information sent via the audio channel (phone conversation, facsimile data or modem data) is successfully reproduced at the other end when the subscriber goes off-hook. If the reproduction is unsuccessful, or of poor quality, check and (if necessary) alter the line level settings for the terminals. Refer to Section 4, Setup and Alignments.

3 After successfully concluding the call from the exchange, check that the Channel B subscriber can make a successful call to the exchange phone. If there are any problems, check the connections between the Channel B subscriber's telephone and the terminal.

4 If you intend to use Channel B of the Hawk link to connect devices such as fax machines or modems, it is advisable to check the link for each machine in turn. Repeat steps 1 to 3 again with each device connected in place of the telephones.

3.6.3 Point-to-point Link

Single Channel Link

To carry out a full test of the Hawk link, there should be one person at each terminal.

Note: For convenience, select one of the terminals as Terminal 1 and the other as Terminal 2 before beginning the tests.

1 Enable the M-wire at Terminal 1, and check that the "Active" and "M-wire" LEDs on the controller module, and the "Active" LED on the transmitter module of the terminal light up. If this is not the case, check the following:

> that the cable to the terminal is plugged into the right socket on the terminal,

> that the cable to the terminal is properly connected at its unterminated end,

> that the plug on the cable to the terminal is correctly wired,

> that the wiring in the cable to the terminal is undamaged.

If you have gone through the above checks without finding any problems, and the LED still do not light up when the M-wire is enabled, consult Exicom International.

2 If the point-to-point link is configured for the trunking mode, check that the "Active", "E-wire" and "M-wire" LEDs on the controller module, and the "Active" LEDs on the transmitter and receiver modules of Terminal 2 light up, and that the "E-wire" LED on the controller module, and the "Active" LEDs on the receiver module of Terminal 1 light up. This indicates the RF link has been successfully established between the terminals. If the LEDs at Terminal 1 come on briefly, then go off again without an RF link being set up to Terminal 2, check the following:

> that the antennas at both sites are pointing in the correct direction,

> that all cabling between the antennas and the terminals is undamaged,

> that the terminals are set to the correct receive and transmit frequencies,

> that the terminals RF output power is set to the specified value,

> that the terminals have the correct ident code.

Note: For details on checking and altering the frequencies, RF output power and ident codes, refer to Section 4, Setup and Alignments.

If you have gone through the above checks without finding any problems, and still cannot make a call to the subscriber, consult Exicom International.

3 If the point-to-point link is configured for the basic mode, check that the "Active", and "E-wire" LEDs on the controller module, and the "Active" LEDs on the receiver module of Terminal 2 light up. This indicates the RF link has been successfully established between the terminals. If the LEDs at Terminal 1 come on briefly, then go off again without an RF link being set up to Terminal 2, check the following:

> that the antennas at both sites are pointing in the correct direction,

> that all cabling between the antennas and the terminals is undamaged,

> that the terminals are set to the correct receive and transmit frequencies,

> that the terminals RF output power is set to the specified value,

> that the terminals have the correct ident code.

Note: For details on checking and altering the frequencies, RF output power and ident codes, refer to Section 4, Setup and Alignments.

If you have gone through the above checks without finding any problems, and still cannot make a call to the subscriber, consult Exicom International.

4 If the RF link is connected, check that any data transmitted over the link is successfully reproduced at the receiving terminal. If the reproduction is unsuccessful, or of poor quality, check and (if necessary) alter the line level settings for the terminals. Refer to Section 4, Setup and Alignments.

5 Swap the identification of the terminals, and repeat steps 1 to 4.

Dual Channel Link

To test a dual channel link, carry out the steps 1 to 4 on Channel A as detailed for the single channel link, then proceed as follows:

1 Enable the Channel B M-wire at Terminal 1, and check that the "Active" and "M-wire" LEDs on the controller module, and the "Active" LED on the transmitter module of the terminal light up. If this is not the case, check the following:

> that the cable to the terminal is plugged into the right socket on the terminal,

> that the cable to the terminal is properly connected at its unterminated end,

> that the plug on the cable to the terminal is correctly wired,

> that the wiring in the cable to the terminal is undamaged.

If you have gone through the above checks without finding any problems, and the LED still do not light up when the M-wire is enabled, consult Exicom International.

2 If the RF link is connected, check that any data transmitted over Channel B of the link is successfully reproduced at the receiving terminal. If the reproduction is unsuccessful, or of poor quality, check and (if necessary) alter the line level settings for the terminals. Refer to Section 4, Setup and Alignments.

3 Go to Step 5 of the single channel link procedure, carry out the steps 1 to 4 on Channel A as detailed for the single channel link, then carry out steps 1 and 2 of this procedure.

3.7 Final Antenna Alignment

3.7.1 General

After the terminals at both ends of the link have been installed and tested, you should carry out the final antenna alignment procedure. This should be carried out at each site, and requires two people, one at the terminal, and one to adjust the antenna.

CAUTION

Under no circumstances should any person touch the radiating element of the antenna while the "Active" LED on the transmitter module is lit.

The procedure is as follows:

1 The person at the terminal presses the top button on the controller module front panel until the LCD display shows "F0.—" or "F1.—".

2 The person at the terminal presses the bottom button on the controller module. The Hawk terminal fully powers up, and the bars "—" on the LCD display change to the ident code of the terminal at the other end of the link.

Note: A test link has now been set-up between the two terminals.

3 The person at the terminal presses the top button on the controller module until the LCD displays "F3.—".

4 The person at the terminal presses the bottom button on the controller module. The bars "—" on the display change to a number, and the "Active" LED on the transmitter module should go out.

Note: The remote terminal will continue transmitting for up to 10 minutes or until the test link is closed down by the operator. If the link "times out" before the antenna alignment is complete, go back to step 1.

5 While the person at the terminal watches the LCD, the person at the antenna should adjust the antenna alignment until the LCD shows its highest value.

CAUTION

Do not stand in front of the antenna as intense electromagnetic radiation is hazardous to your health.

Note: The person adjusting the antenna should align it from behind, and stand at least 1 metre clear of the active element so as not to influence the readings. See Figure 3.20.

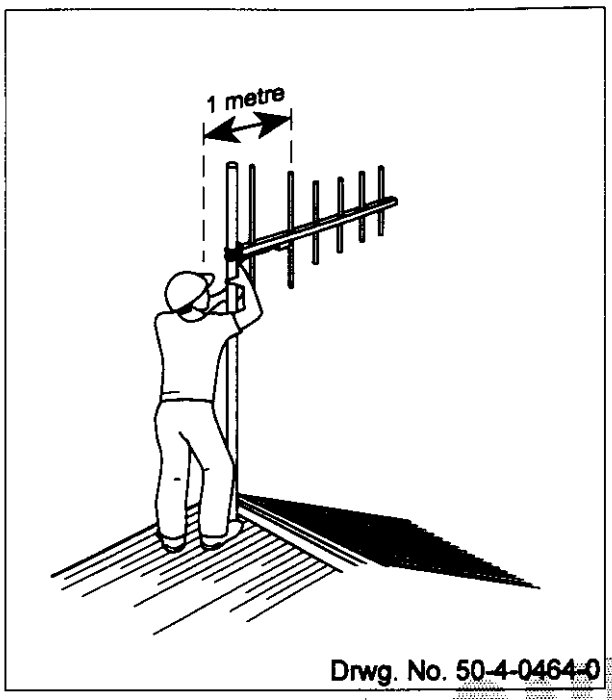


Figure 3.20: Antenna Alignment

6 The person adjusting the antenna secures it in the alignment that gives the highest number on the LCD. As soon as the antenna is secure, the person should then stand well clear.

7 The person at the terminal presses the bottom button on the controller front panel, so that the LCD shows "F3.—" again.

8 The person at the terminal holds the top button on the controller module down while pressing the bottom button until the LCD shows "F2".

9 The person at the terminal releases the top button on the controller module and then presses the bottom button.

Note: The test link is now turned off.

10 The person at the terminal holds the top button on the controller module down while pressing the bottom button until the LCD shows "OFF".

11 The person at the terminal releases the top button on the controller module and then presses the bottom button.

Note: The terminal is now in the idle state.

12 If the terminal is a wall mount terminal, replace the cover as detailed in Section 3.3.4.

Repeat this procedure at the other terminal.

3.8 Recording Common Meter Readings

When you install a system, it is useful to record the common meter readings. This will enable you to monitor the link's performance in the future. It is also a valuable aid in any future fault finding.

The common meter readings are shown in Table 3.3 .

Terminal	LCD	Description
L.RSSI	0	Local Received Signal Strength Indication (RSSI).
R.RSSI	1	Remote RSSI.
L.VSWR	2	Local VSWR.
R.VSWR	3	Remote VSWR.
L.TxPx	4	Local transmitter power.
R.TxPx	5	Remote transmitter power.
ChA.Cal	8	Channel A transmit and receive line levels.
ChB.Cal	9	Channel B transmit and receive line levels.

Table 3.3: Common Meter Readings

The procedure for obtaining the common meter readings using the buttons and LCD on the controller module is as follows:

1 Press the top button on the controller module front panel until the LCD display shows "F0.—" or "F1.—".

2 Press the bottom button on the controller module front panel. The Hawk terminal fully powers up, and a test link has now been set-up between the two terminals.

3 Use the top button to scroll through the software menu items. As each of the digits in the LCD column of Table 3.3 appears in the left of the LCD, record the value of the two digits in the right of the LCD.

4 After recording all the common meter readings, hold down the top button on the controller module while pressing the bottom button until the LCD shows "F2". Release the top button and then press the bottom button.

Note: The test link is now turned off.

5 Hold the top button on the controller module down while pressing the bottom button until the LCD shows "OFF".

6 Release the top button on the controller module and then press the bottom button.

Note: The terminal is now in the idle state.

7 If the terminal is a wall mount terminal, replace the cover as detailed in Section 3.3.4.

Repeat this procedure at the other terminal.

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4
System Setup and Alignment

4.1 General

System setup and alignment takes place in both the Hawk's software and hardware. The adjustments covered in this section are:

> Telephone link configuration,

> Point-to-point link configuration,

> Terminal RF output power,

> Terminal send and receive line levels,

> Terminal transmit and receive frequencies,

> Addition of a new power supply,

> Adapting the link for payphone operation.

4.2 Telephone Link Configuration

4.2.1 Line Interface Set-up

Each Hawk terminal must be configured for exchange or subscriber operation with either a 2-wire or a 4-wire plus E and M line interface. The configuration for a single channel link or Channel A of a dual channel link is set on the PCB of the Type 2832 Controller and Line Interface module. The configuration for Channel B of a dual channel link is set on the PCB of the Type 2825 Line Interface module. The configurations are set by linking or leaving unlinked pins in the plugs on the PCB.

Before the pin configurations on either of the PCB can be checked or altered, the PCB must be removed from the module. Due to the differences in module locations and fixings, there is a different procedure for the rack mount and wall mount terminals.

Rack Mount Terminal

To remove the PCB from either a Type 2832 Controller and Line Interface or a Type 2825 Line Interface module, proceed as follows:

1. Extract the module from the rack by depressing the securing bar at the front of the rack and pulling the module towards you.

2. In the module face plate, undo each of the four screws in the face plate corners (see Figure 4.1). Put the screws in a safe place for refitting the PCB.

CAUTION

The face plate screws have No.2 Japan Industry Standard (JIS) heads. Damage to screw heads may result if the incorrect screw tips are used. The closest alternative is a No.2 Phillips.

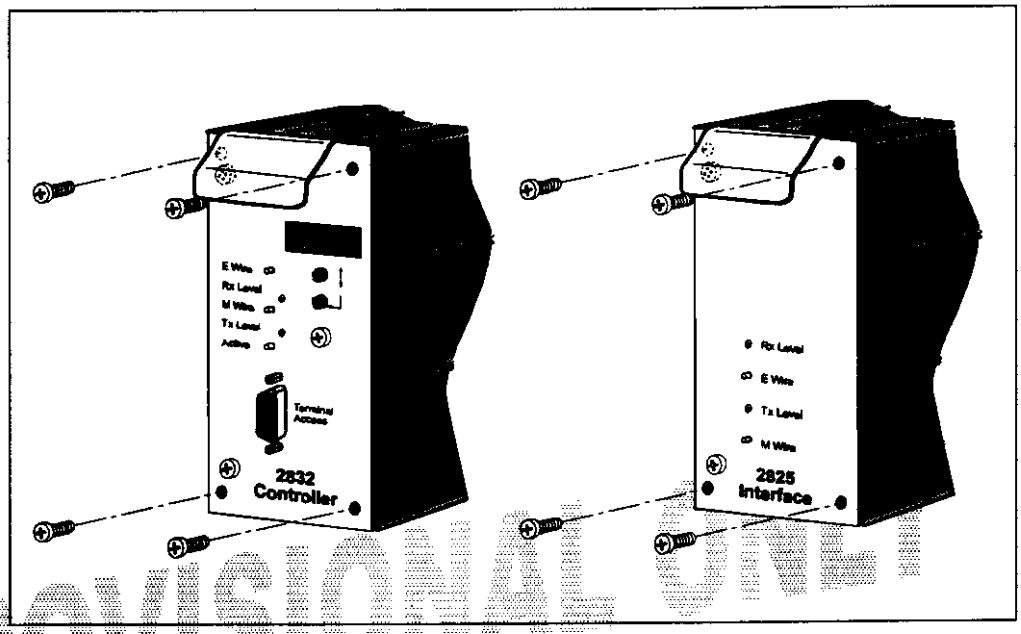

Figure 4.1: Module Face Plate Screws

3. In the module rear plate, undo the two screws on either side of the connector that protrudes through the plate (see Figure 4.2). Put the screws in a safe place for refitting the PCB.

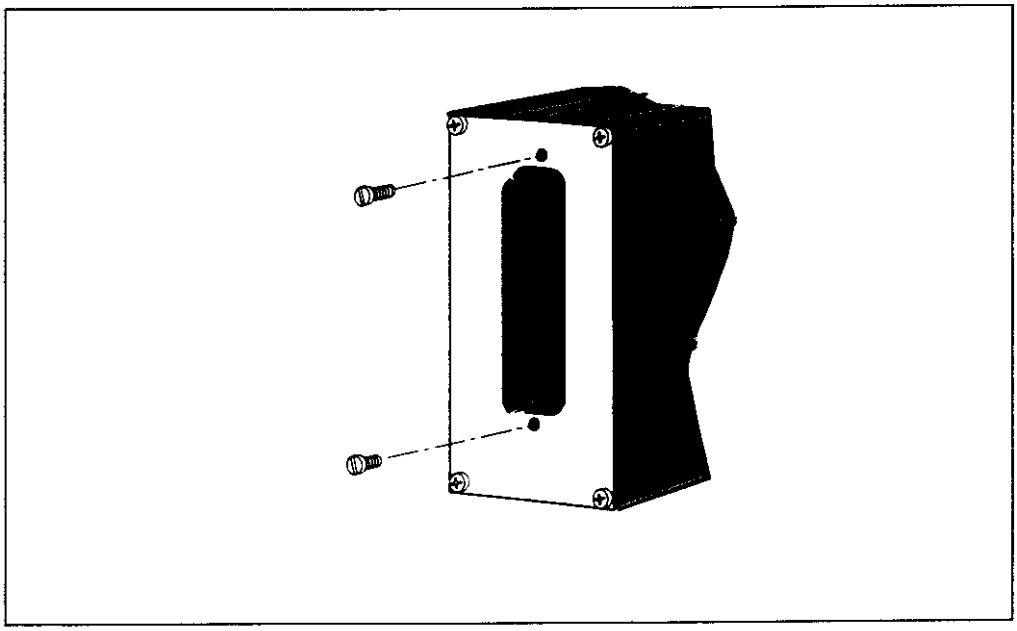

Figure 4.2: Module Rear Plate Screws

4. Extract the PCB from the module by pulling gently on the front plate.

To insert a PCB into either a Type 2832 Controller and Line Interface or a Type 2825 Line Interface module, proceed as follows:

1. Insert the PCB through the front of the module, taking care to ensure the PCB connector fits through the hole for it in the rear plate. Ensure that the screw holes in the connector are aligned with the holes in the rear plate.
2. Using the two screws kept from the removal of the PCB, insert a screw into each of the holes in the PCB connector through the holes provided in the module rear plate (see Figure 4.2). Tighten the two screws a half-turn at a time.
3. Using the four screws kept from the removal of the PCB, insert and tighten a screw through each of the holes in the corners of the module face plate (see Figure 4.1).

CAUTION

The face plate screws have No.2 Japan Industry Standard (JIS) heads. Damage to screw heads may result if the incorrect screw tips are used. The closest alternative is a No.2 Phillips.

4. Insert the module into position in the rack by depressing the securing bar at the front of the rack and carefully pushing the module into the rack along the guides.

Wall Mount Terminal

To gain access to the Type 2832 Controller and Line Interface module or a Type 2825 Line Interface PCB the wall mount cover must be removed as described in Section 3.3.4. As the Type 2825 Line Interface PCB is secured to the top of the Type 2832 Controller and Line Interface module, it can be accessed as soon as the cover is removed.

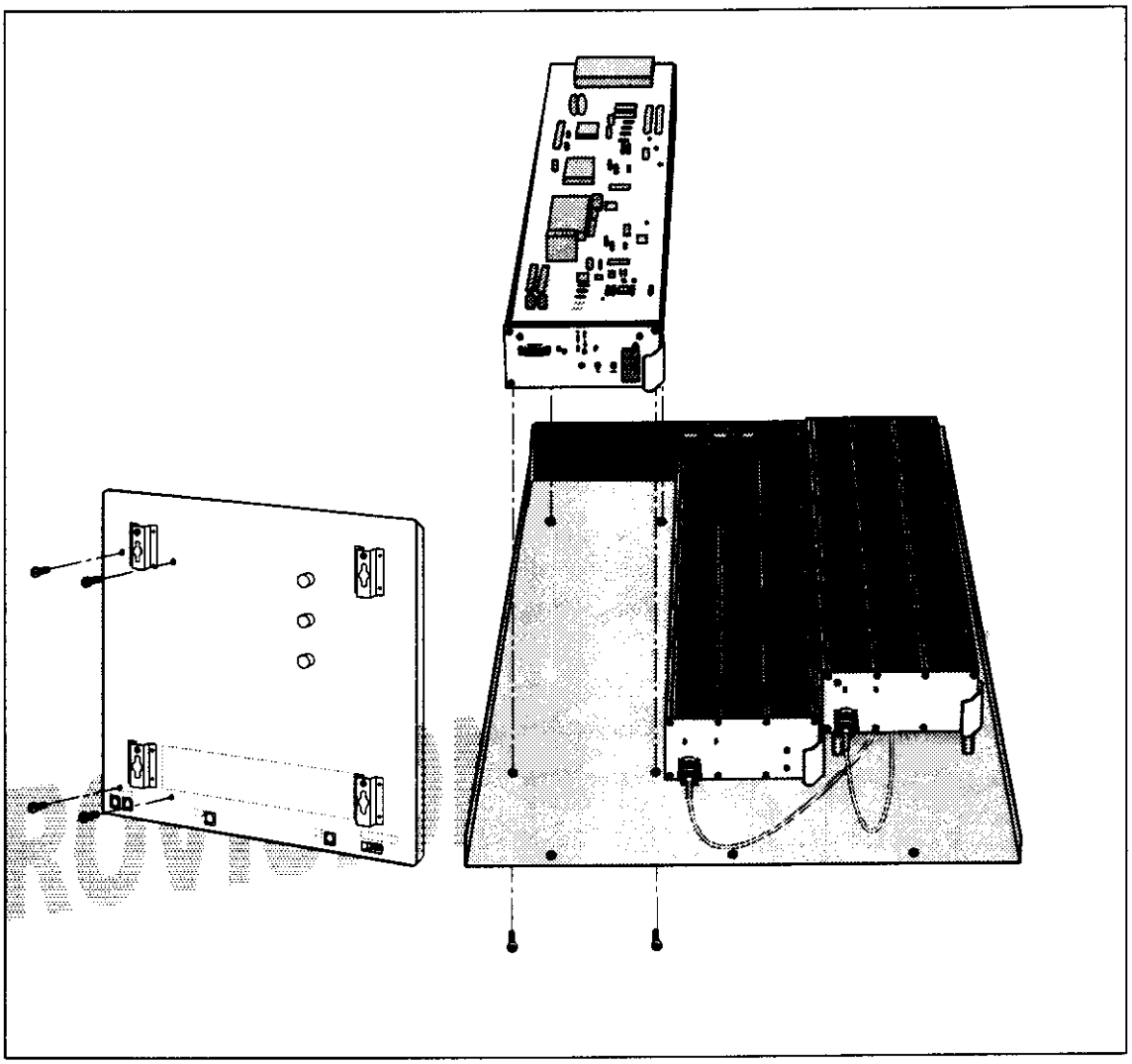

Figure 4.3: Removing Controller Module from Wall Mount Terminal

To remove the PCB from a Type 2832 Controller and Line Interface module, proceed as follows:

1. Identify and remove the four screws on the underside of the wall mount chassis that hold the controller module in position. Put the screws in a safe place for refitting the PCB.
2. Pull the controller module away from the motherboard PCB, taking care to ensure the module PCB connector comes out cleanly from the socket on the motherboard PCB.

CAUTION

If the line interface PCB is fitted, ensure that its' PCB connector comes out of its' socket on the motherboard.

3. In the module face plate, undo each of the four screws in the face plate corners (see Figure 4.1). Put the screws in a safe place for refitting the PCB.

The face plate screws have No.2 Japan Industry Standard (JIS) heads. Damage to screw heads may result if the incorrect screw tips are used. The closest alternative is a No.2 Phillips.

4. In the module rear plate, undo the two screws on either side of the connector that protrudes through the plate (see Figure 4.2). Put the screws in a safe place for refitting the PCB.

5. Extract the PCB from the module by pulling gently on the front plate.

To insert a PCB into a Type 2832 Controller and Line Interface module, proceed as follows:

1. Insert the PCB through the front of the module, taking care to ensure the PCB connector fits through the hole for it in the rear plate. Ensure that the screw holes in the connector are aligned with the holes in the rear plate.

2. Using the two screws kept from the removal of the PCB, insert a screw into each of the holes in the PCB connector through the holes provided in the module rear plate. Tighten the two screws a half-turn at a time.

3. Using the four screws kept from the removal of the PCB, insert and tighten a screw through each of the holes in the face plate corners.

The face plate screws have No.2 Japan Industry Standard (JIS) heads. Damage to screw heads may result if the incorrect screw tips are used. The closest alternative is a No.2 Phillips.

4. Align the module into position on the wall mount chassis, taking care that the four holes in the module line up with the four spacers on the chassis, and that the PCB connector on the module fits cleanly into the socket on the motherboard.

If the line interface PCB is fitted, ensure that its' PCB connector comes out of its' socket on the motherboard.

5. Using the four screws kept from the removal of the module, insert a screw into each of the holes in the module through the holes and spacers provided in the wall mount chassis. Tighten the screws to secure the module in position.

Configuration pin locations

Figures 4.4 and 4.5 show the locations of the configuration pins on the Controller and Line Interface PCBs.

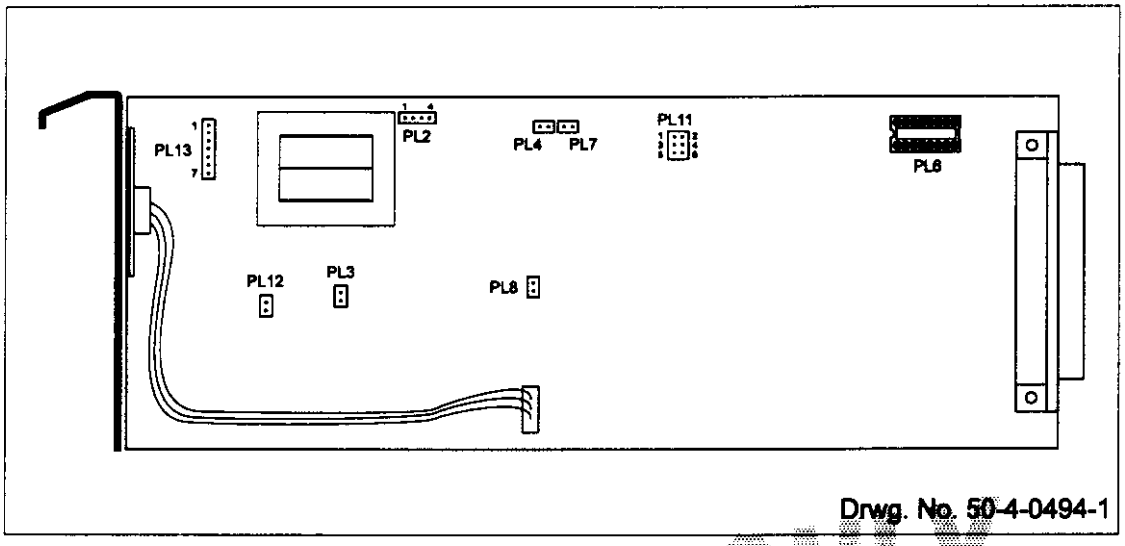

Figure 4.4: Controller PCB Pin Locations

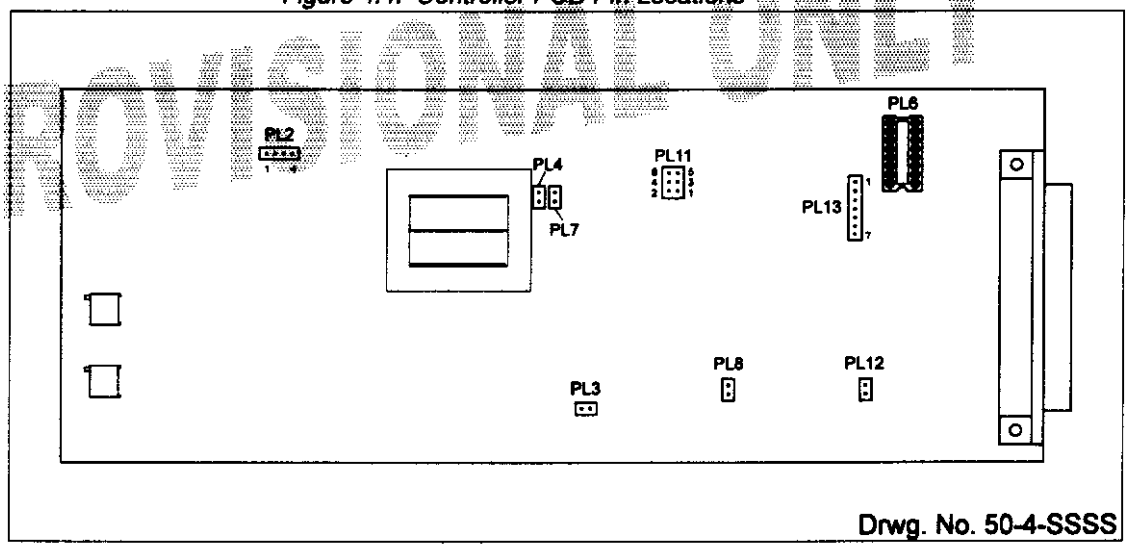

Figure 4.5: Line Interface PCB Pin Locations

2-wire Exchange Set-up

For a 2-wire exchange configuration, the settings are as follows:

Note: Refer to Figure 4.4 or 4.5 for the pin locations.

> PL2 - pins 2 and 3 linked,

> PL3 - both pins linked,

> PL4 - both pins linked,

> PL6 - no pins linked,

> PL7 - both pins linked,

> PL8 - no pins linked,

> PL11 - pins 5 and 6 linked,

> PL12 - no pins linked,

> PL13 - pins 1 and 2 linked.

4-wire plus E and M Exchange Set-up

For a 4-wire plus E and M exchange configuration, the settings are as follows:

Note: Refer to Figure 4.4 or 4.5 for the pin locations.

> PL2 - pins 2 and 3 linked,

> PL3 - both pins linked,

> PL4 - both pins unlinked,

> PL6 - all pins linked,

> PL7 - both pins unlinked,

> PL8 - both pins linked,

> PL11 - pins 1 and 2 linked,

> PL12 - both pins linked,

> PL13 - pin 3 linked to pin 4, and pin 6 linked to pin 7.

2-wire Subscriber Set-up

For a 2-wire subscriber configuration, the settings are as follows:

Note: Refer to Figure 4.4 or 4.5 for the pin locations.

> PL2 - pin 1 linked to pin 2, and pin 3 linked to pin 4,

> PL3 - both pins unlinked,

> PL4 - both pins linked,

> PL6 - all pins unlinked,

> PL7 - both pins linked,

> PL8 - all pins unlinked,

> PL11 - pin 1 linked to pin 2, and pin 3 linked to pin 4,

> PL12 - all pins linked,

> PL13 - pin 2 linked to pin 3, and pin 4 linked to pin 5.

4.2.2 Telephone Loop Current

Subscriber terminal

If more than one phone is connected to a subscriber terminal channel, the loop current needs to be increased to provide extra microphone current.

The loop current for phones connected to the Channel A socket may be increased to 45 mA by removing the controller PCB from the module, as described in Section 4.2.1, and linking pins 5 and 6 of PL11 on the controller PCB (see Figure 4.4).

The loop current for phones connected to the Channel B socket may be increased to 45 mA by removing the line interface PCB from the module, as described in Section 4.2.1, and by linking pins 5 and 6 of PL11 on the line interface PCB (see Figure 4.5).

Exchange terminal

It may be necessary to increase the loop current at the exchange terminal if the terminal is to interface with a current limiting exchange.

The loop current for the Channel A socket may be increased to 45 mA by removing the controller PCB from the module, as described in Section 4.2.1, and by linking pins 3 and 4 of PL11 on the controller PCB.

The loop current for the Channel B socket may be increased to 45 mA by removing the line interface PCB from the module, as described in Section 4.2.1, and by linking pins 3 and 4 of PL11 on the line interface PCB.

4.2.3 Adjusting Software Parameters

Any software adjustable parameters should have been pre-set by your Exicom International supplier and you should not require to adjust them. However, the following operations can be carried out in the field:

CAUTION

Do not attempt to alter any parameters other than those here without first consulting Exicom International.

- Viewing and changing the Hawk link Ident Code,
- Enabling or disabling Caller Line Identity,
- Viewing and changing the hardware configuration byte,
- Viewing and changing the payphone hold-up time,
- Viewing and changing the modem wake-up sequence.

Viewing and Changing the Hawk Link Ident Code

The ident code is the identification number for the link, and needs to be the same for both terminals. For a telephone link, the ident code can be from 0-9.

The ident code can be viewed or changed using the buttons and LCD on the controller module, or an HHT or VDT.

Note: The ident code must be the same for both terminals if the link is to work.

To view or change the ident code using the buttons and LCD on the controller module, proceed as follows:

1. Press the top button on the module if the LCD is blank. This activates the terminal.
2. Continue to press the top button until the LCD shows "id-x", where x is the ident code.
3. To change the ident code, press the bottom button and the LCD will flash. Press the top button on the module until the code you want appears on the LCD. Hold the bottom button down until the LCD stops flashing (approximately five seconds). The code is now changed.
4. Press the top button on the module until the LCD shows "OFF". Press the bottom button until the LCD goes blank.

To view or change the ident code using an HHT or VDT, proceed as follows:

1. Press any key on the HHT or VDT if the screen is blank. This activates the terminal.

   Note: If the VDT or HHT is attached to the terminal via a modem, follow the instructions that appear on the screen.

2. Press "N" on the keypad until you see "ID code: x" displayed on the screen, where x is the ident code.
3. Press "Enter" and the prompt "Old Ident x Enter 0-9 or P:" is displayed on the screen.
4. Enter the new ident code using the keypad, then press "Enter". The ident code is changed when the screen displays "ID code: x" where x is the new code.
5. Press "Q" on the keypad. or press "N" on the keypad until you see "Go to sleep" displayed on the screen, then press "Enter".

Viewing and Changing the Hardware Configuration Byte

The Hardware Configuration Byte controls receiver cycling, the disabling of alarm tones, and whether a payphone can be fitted to the Hawk link. The functions are enabled when the associated bits of the Hardware Configuration byte are set. The following table shows the relationship between the bits and the functions they enable.

Note: The bits of the Hardware Configuration Byte can only be set using an HHT or VDT.

Bit	Function
4	Exchange terminal receiver cycles when idle.
8	Subscriber terminal receiver cycles when idle.
64	Alarm tones disabled.
128	Payphone fitted.

The bits are not set individually, instead the values of the bits required to be set are added together. For example, for a link with exchange terminal receiver cycling, alarm tones disabled and payphone fitted the value of the byte = 196 (4 + 64 + 128). This number is then input to set the configuration.

To view or change the Hardware Configuration Byte using an HHT or VDT, proceed as follows:

1. Press any key on the HHT or VDT if the screen is blank. This activates the terminal.

   Note: If the VDT or HHT is attached to the terminal via a modem, follow the instructions that appear on the screen.

2. Press "N" on the keypad until you see "Alt L.Sys Param" displayed on the screen.
3. Press "Enter" and the prompt "Location:" is displayed on the screen.
4. Press "8" on the keypad, then press "Enter". The present value of the Hardware Configuration Byte is displayed.
5. If you require to change the present value of the byte, input the new value using the keypad and press "Enter". The displayed value of the Hardware Configuration Byte then changes to the new value.
6. Press "N" on the keypad until you see "Alt R.Sys Param" displayed on the screen.
7. Repeat Steps 3 to 5 for the Hardware Configuration Byte of terminal at the other end of the link.

   Note: The Hardware Configuration Byte must be set to the same value at both terminals.

8. Press "Q" on the keypad. or press "N" on the keypad until you see "Go to sleep" displayed on the screen. then press "Enter".

Viewing and Changing the Payphone Hold-up Time

The Payphone Hold-up Time is the length of time the Hawk link will listen for late payphone meter pulses after the call has been terminated. This value is set in both the subscriber and exchange terminals, and must be the same as the exchange the Hawk is connected to. Multiply the number stored at this address by 5 to get the same time in milliseconds.

Note: The Payphone Hold-up Time can only be set using an HHT or VDT.

To view or change the Payphone Hold-up Time, proceed as follows:

1. Press any key on the HHT or VDT if the screen is blank. This activates the terminal.

   Note: If the VDT or HHT is attached to the terminal via a modem, follow the instructions that appear on the screen.

2. Press "N" on the keypad until you see "Alt L.Sys Param" displayed on the screen.
3. Press "Enter" and the prompt "Location:" is displayed on the screen.
4. Press "44" on the keypad, then press "Enter". The present value of the Payphone Hold-up Time is displayed. Multiply this value by 5 to get the time in milliseconds.
5. If you require to change the current value of the time, input the new value using the keypad and press "Enter". The displayed value of the time then changes to the new value.
6. Press "N" on the keypad until you see "Alt R.Sys Param" displayed on the screen.
7. Repeat Steps 3 to 5 for the Payphone Hold-up Time of terminal at the other end of the link.

   Note: The Payphone Hold-up Time must be set to the same value at both terminals.

8. Press "Q" on the keypad. or press "N" on the keypad until you see "Go to sleep" displayed on the screen. Press "Enter". The terminal is now turned off.

Viewing and Changing the Modem Wake Up Sequence

A special wake up sequence is used when a modem is connected as for standard operation to the Controller's RS232 port. This prevents modem shut-down waking up the Hawk. When accessing the Controller with a terminal, a series of three key presses (after button wakeup) within a defined time is required, otherwise the Hawk will shut down. The required key and acceptance time is user defined.

Note: The Modem Wake Up Sequence can only be set using an HHT or VDT.

To view or change the key pressed to initiate the Modem Wake Up Sequence, proceed as follows:

1. Press any key on the HHT or VDT if the screen is blank. This activates the terminal.

Note: If the VDT or HHT is attached to the terminal via a modem, follow the instructions that appear on the screen.

2. Press "N" on the keypad until you see "Alt L.Sys Param" displayed on the screen.
3. Press "Enter" and the prompt "Location:" is displayed on the screen.
4. Press "31" on the keypad, then press "Enter". The value displayed is that of the ASCII character which is input for the sequence.
5. If you require to change the present value of the byte, input the new value using the keypad and press "Enter". The displayed value then changes to the new value.

   Note: If you wish to disable the function, the new value should be 255.

6. If you require to change the key pressed to initiate the Modem Wake Up Sequence at the terminal at the other end of the link, press "N" on the keypad until you see "Alt R.Sys Param" displayed on the screen, then repeat Steps 3 to 5.
7. Press "Q" on the keypad. or press "N" on the keypad until you see "Go to sleep" displayed on the screen. Press "Enter". The terminal is now turned off.

To view or change the time within which the key sequence must be input to initiate the Modem Wake Up Sequence, proceed as follows:

1. Press any key on the HHT or VDT if the screen is blank. This activates the terminal.

   Note: If the VDT or HHT is attached to the terminal via a modem, follow the instructions that appear on the screen.

2. Press "N" on the keypad until you see "Alt L.Sys Param" displayed on the screen.
3. Press "Enter" and the prompt "Location:" is displayed on the screen.
4. Press "32" on the keypad, then press "Enter". The value displayed is that of the time available to input the key sequence in seconds.
5. If you require to change the present key sequence time, input the new time using the keypad and press "Enter". The displayed value then changes to the new value.

   Note: The time must be greater than 2 seconds.

6. If you require to change the key sequence time for the terminal at the other end of the link, press "N" on the keypad until you see "Alt R.Sys Param" displayed on the screen, then repeat Steps 3 to 5.
7. Press "Q" on the keypad. or press "N" on the keypad until you see "Go to sleep" displayed on the screen. Press "Enter". The terminal is now turned off.

Calling Line Identity

Note: To use the Calling Line Identity (CLI) function the subscriber must have a telephone capable of reading the information.

When the Calling Line Identity (CLI) function is enabled, the Hawk link can carry CLI information in either the DTMF or FSK format from the exchange to the subscriber.

Note: The CLI function can only be accessed using an HHT or VDT.

To enable or disable the CLI function proceed as follows:

1. Press any key on the HHT or VDT if the screen is blank. This activates the terminal.

   Note: If the VDT or HHT is attached to the terminal via a modem, follow the instructions that appear on the screen.

2. Press "N" on the keypad until you see "Alt L.Sys Param" displayed on the screen.
3. Press "Enter" and the prompt "Location:" is displayed on the screen.
4. Press "35" on the keypad, then press "Enter". The value displayed is "255" if the CLI function is disabled. Any other value indicates the CLI function is enabled.
5. If you require to enable the CLI function, input any value except 255 using the keypad and press "Enter". The displayed value then changes to the new value.
6. If you require to disable the CLI function, input the value 255 using the keypad and press "Enter". The displayed value then changes to 255.
7. Press "N" on the keypad until you see "Alt R.Sys Param" displayed on the screen, then repeat Steps 3 to 6, as required (the CLI function must be enabled/disabled at both terminals).
8. Press "Q" on the keypad. or press "N" on the keypad until you see "Go to sleep" displayed on the screen. Press "Enter". The terminal is now turned off.

4.3 Point-to-Point Link Configuration

4.3.1 Line Interface and Loop Current Set Up

To configure the link for point-to-point operation, set up **both** terminals for 4-wire E plus M exchange interface as detailed in Section 4.2.1. If the exchange the terminal is attached to is current limiting, increase the loop current from the terminal as detailed in Section 4.2.2.

4.3.2 Changing Point-To-Point Software Parameters

General

In a point-to-point link, each audio channel has its own ident code. PP1 is used for single channel point-to-point links, or Channel A of dual channel point-to-point links. PP2 is used for Channel B of dual channel point-to-point links. The adjustable software parameters are set for each individual audio channel.

Any software adjustable parameters should have been pre-set by your Exicom International supplier and you should not require to adjust them. However, the following operations can be carried out in the field.

CAUTION

Do not attempt to alter any parameters other than those here without first consulting Exicom International.

Viewing and Changing Adjustable Software Parameters

The various functions that are available over an audio channel are each assigned a numerical value. The hexadecimal number shown after the ident code is the sum of the codes of the functions that are enabled for this link. For example, if PP1 was basic point-to-point using high alarm tones and external alarms, the code would be C in hexadecimal (0 + 4 + 8). The function codes are shown in the table below.

Ident Code	Code	Function
PP1	0	Basic
	1	Trunking
	4	High alarm tones
	8	External alarms
PP2	0	Basic
	1	Trunking
	8	Basic telephone

The table below shows how to convert decimal numbers to hexadecimal.

Hex Digit	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Number	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

The software parameters can be viewed or changed using the buttons and LCD on the controller module, or an HHT or VDT.

To view or change the software parameters using the buttons and LCD on the controller module, proceed as follows:

1. Press the top button on the module if the LCD is blank. This activates the terminal.
2. Continue to press the top button until the LCD shows "PP1" or "PP2", whichever is required.
3. To set the point-to-point parameters, press the bottom button and the LCD will flash. Press the top button until the code you want appears on the LCD. Hold the bottom button down until the LCD stops flashing (approximately five seconds). The point-to-point parameters are now set.
4. Press the top button on the module until the LCD shows "OFF". Press the bottom button until the LCD goes blank.

To view or change the ident code using an HHT or VDT, proceed as follows:

1. Press any key on the HHT or VDT if the screen is blank. This activates the terminal.

   Note: If the VDT or HHT is attached to the terminal via a modem, follow the instructions that appear on the screen.

2. Press "N" on the keypad until you see "ID code: PP1" or "ID code: PP2" whichever is required

3. Enter "P" using the keypad, then press "Enter". The prompt "Old PP1 code: x" Enter Hex# 0-F" or "Old PP2 code: x" Enter Hex# 0-F" displays.

4. Enter the required Hex number. The code is changed when the prompt returns to "PP1 code x" or "PP2 code x" where x is the number you entered.

5. Press "Q" on the keypad. or press "N" on the keypad until you see "Go to sleep" displayed on the screen. Press "Enter". The terminal is now turned off.

Mixed Operation on a Point-to-point Link

If you have set up Channel B of a dual channel link for telephone operation, you must set up the telephone software parameters as described in Section 4.2.3.

4.4 Terminal RF Output Power Adjustment

4.4.1 General

The RF output power is adjusted using a multi-turn potentiometer in the transmitter module. Rotating the potentiometer in a clockwise direction increases the power and rotating in an anti-clockwise direction decreases the power. The potentiometer is adjusted through a hole on the right hand side of the module shroud (see Figure 4.6).

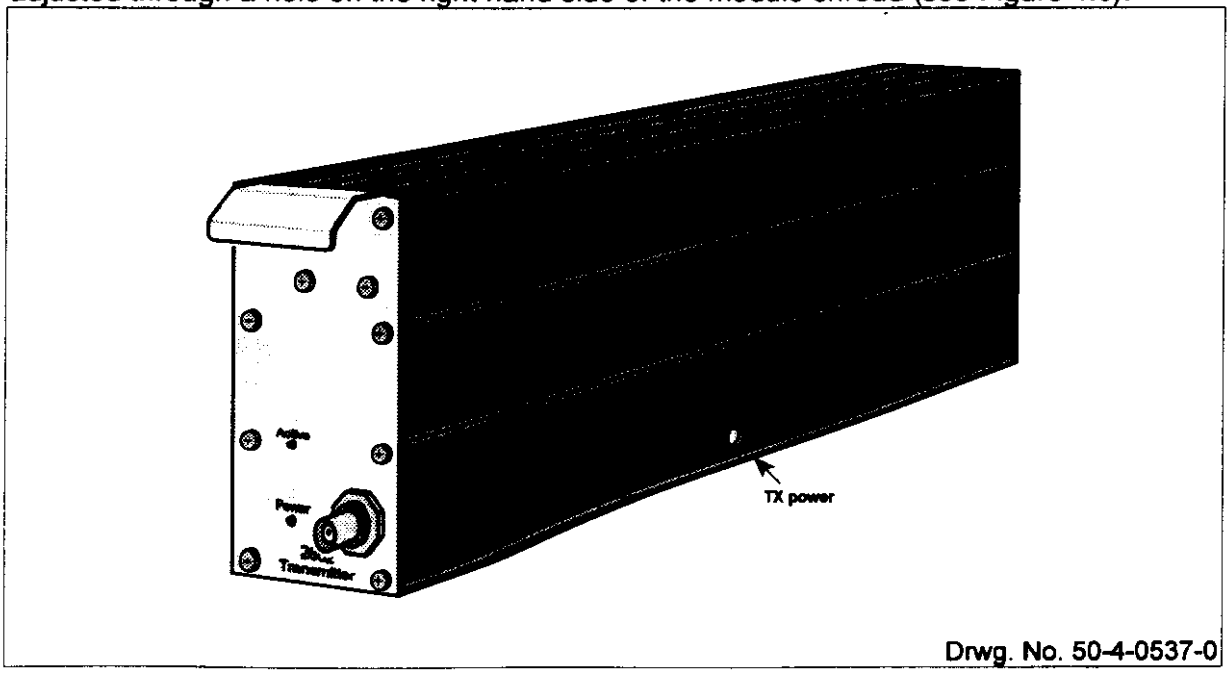

Figure 4.6: Transmitter Module Power Adjustment

To adjust the RF output power of a wall mount terminal, proceed as follows:

1. Lift the terminal off the wall,
2. Identify the hole on the underside of the terminal through which the potentiometer can be adjusted (see Figure 1.3, item 12),
3. Using a suitable screwdriver, adjust the potentiometer as required,
4. Refer to Section 4.4.2 and check the RSSI at the remote terminal. If this is unsatisfactory, readjust the potentiometer until the reading is within acceptable levels,
5. Refer to Section 4.4.3 and recalibrate the transmitter,
6. Refit the terminal on the wall.

The procedure for adjusting the RF output power of a rack mount terminal depends on whether an extender cable is used or not. Without the cable, proceed as follows:

1. Switch off any external power to the terminal,
2. Disconnect the transmitter module from the lead to the duplexer module, and then remove the transmitter module from the terminal,
3. Using a suitable screwdriver, adjust the potentiometer as required,
4. Replace the transmitter module in the terminal, and reconnect the lead to the duplexer module,
5. Power up the terminal, and check the RSSI at the remote terminal as described in Section 4.4.2. If the reading is unsatisfactory, repeat Steps 1 to 4 until the reading is within acceptable levels,
6. Refer to Section 4.4.3 and recalibrate the transmitter.

To adjust the RF output power of a rack mount terminal with an extender cable[1] proceed as follows:

1. Switch off any external power to the terminal,
2. Disconnect the transmitter module from the lead to the duplexer module, and then remove the transmitter module from the terminal,
3. Connect the extender cable between the connector on the rear of the transmitter module and the transmitter socket on the motherboard, and reconnect the transmitter module to the lead from the duplexer,
4. Apply external power to the terminal,
5. Using a suitable screwdriver, adjust the potentiometer as required,
6. Check the RSSI at the remote terminal as described in Section 4.4.2. If the reading is unsatisfactory, repeat Step 5 until the reading is within acceptable levels,

[1] A slight drop in RF output power will be noticed when running the transmitter on the extender cable, due to supply voltage drop over the length of cable.

7. Switch off any external power to the terminal,
8. Disconnect the transmitter module from the extender cable and the lead to the duplexer module, remove the extender cable from the motherboard, insert the transmitter module back in the rack, and reconnect the lead from the duplexer module,
9. Apply external power to the terminal, refer to Section 4.4.3, and recalibrate the transmitter.

4.4.2 Checking the Remote Terminal RSSI

The RSSI at the remote terminal can be checked using the buttons and the LCD on the front of the controller module, or using the VDT or HHT.

To view the RSSI at the remote terminal using the buttons and LCD on the controller module, proceed as follows:

1. Press the top button on the module if the LCD is blank. This activates the terminal.
2. Continue to press the top button until the LCD shows "F0–". Press the bottom button to set up a test link to the remote terminal.
3. Continue to press the top button until the LCD shows "1-" followed by two digits. These digits indicate the RSSI at the remote terminal. Their value must not be less than 60. If this is the case, the adjustment of the transmitter power must be done again.
4. Press the top button on the module until the LCD shows "F2". Press the bottom button to close down the test link.
5. Press the top button on the module until the LCD shows "OFF". Then press the bottom button to close down the terminal.

To view the RSSI at the remote terminal using an HHT or VDT, proceed as follows:

1. Press any key on the HHT or VDT if the screen is blank. This activates the terminal.

   Note: If the VDT or HHT is attached to the terminal via a modem, follow the instructions that appear on the screen.

2. Press "N" on the keypad until you see "Force a link:" then press "Enter". A test link is now set up between the terminals.
3. Press "N" on the keypad until you see "R.RSSI:" then press "Enter". A percentage is shown after the "R.RSSI", indicating the RSSI at the remote terminal. This percentage should not be less than 60%. If this is the case, the adjustment of the transmitter power should be done again.
4. Press "N" on the keypad until you see "Cleardown link:" then press "Enter". The test link is now shut down.
5. Press "Q" on the keypad. or press "N" on the keypad until you see "Go to sleep" displayed on the screen. Press "Enter". The terminal is now turned off.

4.4.3 Recalibrating the Local Terminal Transmitter

The transmitter must be recalibrated every time the RF output power is adjusted. This is because the RF output of a transmitter is expressed in terms of the output measured at the last time the transmitter was calibrated. Since a reading of less than 99% of the calibrated power RF output is taken to mean a fault in the transmitter, failure to re-calibrate the transmitter after adjusting its output power will cause fault indications to be given during normal operation.

To recalibrate the transmitter using the buttons and LCD on the controller module, proceed as follows:

1. Press the top button on the module if the LCD is blank. This activates the terminal.
2. Continue to press the top button until the LCD shows "F8", then press the bottom button to carry out the calibration function.
3. Press the top button on the module until the LCD shows "OFF", then press the bottom button to close down the terminal.

To re-calibrate the transmitter using an HHT or VDT, proceed as follows:

1. Press any key on the HHT or VDT if the screen is blank. This activates the terminal.

   Note: If the VDT or HHT is attached to the terminal via a modem, follow the instructions that appear on the screen.
2. Press "N" on the keypad until you see "Tx Meter Cal:" then press "Enter" to carry out the calibration function.
3. Press "Q" on the keypad. or press "N" on the keypad until you see "Go to sleep" displayed on the screen. Press "Enter". The terminal is now turned off.

4.5 Terminal Send and Receive Line Levels

4.5.1 General

The send and receive line levels of a terminal should have been set before it left the factory, but you may require to adjust them to compensate for line loss at either terminal.

CAUTION

Do not attempt to alter line levels to compensate for a single piece of equipment because if any other equipment is connected to the line they will be operating at the wrong level.

Note: If you have any concerns as to the performance of the Hawk with regards to noise and speech overload parameters, refer to your Exicom International supplier.

The line levels you set will depend on the initial settings of your system and any line loss between terminals. However, the following guidelines should be observed:

> The receive level at a terminal should always be -3 dBm lower than the send level at the other terminal. This is to prevent hybrid singing over the link.

> It is not usual to have a send level lower than -16 dBm, and not possible to have a send level greater than +4 dBm.

4.5.2 Line Level Adjustment Procedure

Refer to Figures 4.7 and 4.8 for location of adjustment points.

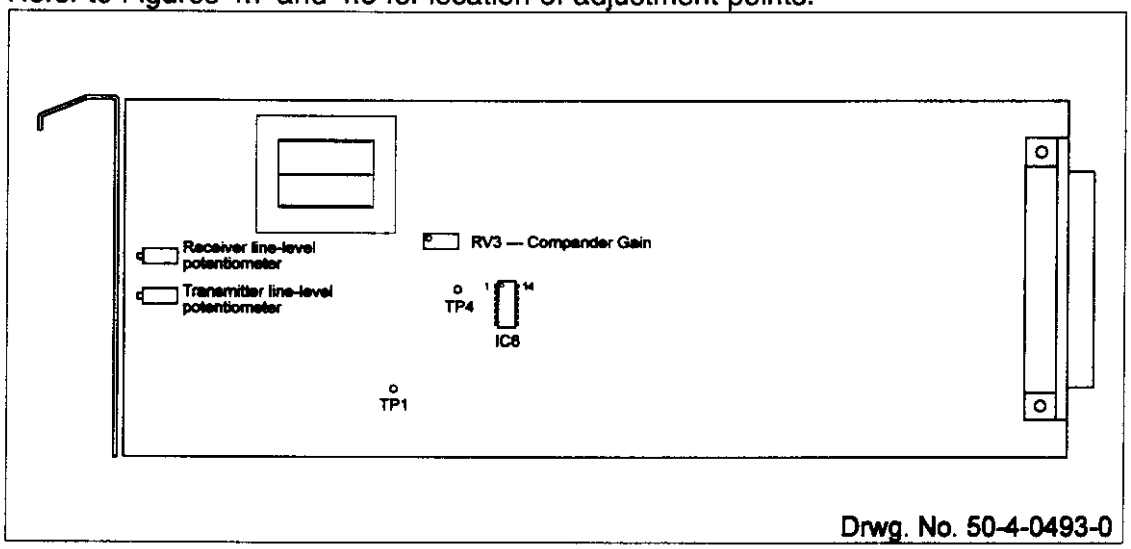

Figure 4.7 Controller Line Level Measurement and Adjustment Locations

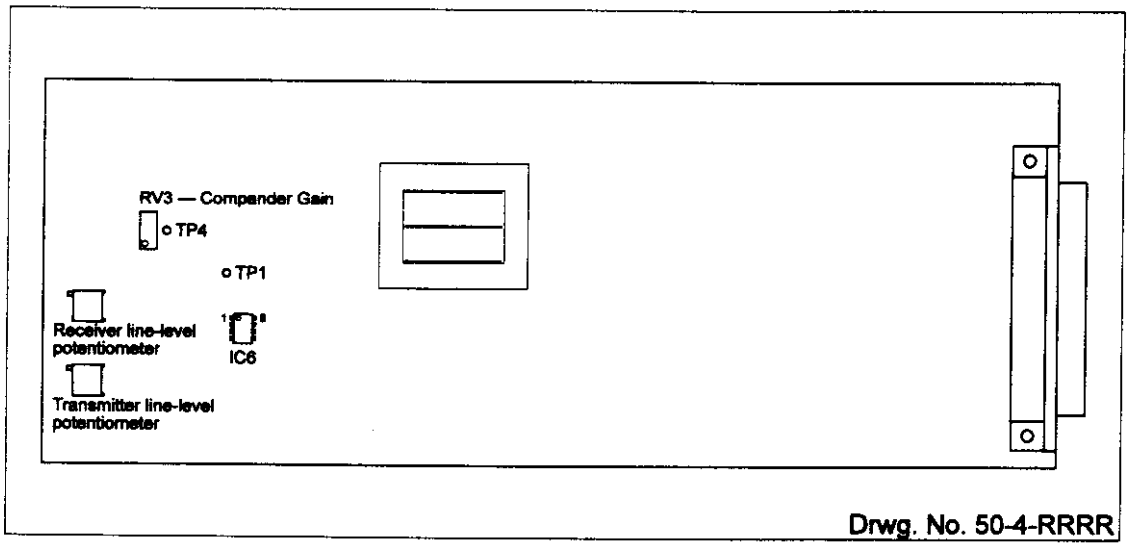

Figure 4.8 2825 Interface Line Level Measurement and Adjustment Locations

Tools Required

You will need an audio oscillator and a level meter. Both of these must have 600 Ω termination impedance's and be able to tolerate the loop current in their interface transformers without introducing distortion.

Send Line Level Setting

To adjust the Send Line Level for a single channel system, or for Channel A of a dual channel system, proceed as follows:

1. Press the top button on the controller module if the LCD is blank. This activates the terminal.
2. Continue to press the top button until the LCD shows "8-" followed by two digits.
3. Connect the audio oscillator to whichever Channel A socket (2-wire or 4-wire + E and M) is in use,
4. Use the audio oscillator to apply a 1 kHz tone at the desired transmit line level,
5. Adjust the Tx Level potentiometer on the controller module front panel until the LCD reads "8-50". This completes the adjustment.

To adjust the Send Line Level for Channel B of a dual channel system, proceed as follows:

1. Press the top button on the controller module if the LCD is blank. This activates the terminal.
2. Continue to press the top button until the LCD shows "9-" followed by two digits.
3. Connect the audio oscillator to whichever Channel B socket (2-wire or 4-wire + E and M) is in use,
4. Use the audio oscillator to apply a 1 kHz tone at the desired transmit line level,

5. Adjust the Tx Level potentiometer on the line interface module front panel (rack mount) or the line interface PCB (wall mount) until the LCD reads "9-50". This completes the adjustment.

Receive Line Level Setting

To adjust the Receive Line Level for a single channel system, or for Channel A of a dual channel system, proceed as follows:

1. Press the top button on the controller module if the LCD is blank. This activates the terminal.
2. Continue to press the top button until the LCD shows "8-" followed by two digits.
3. Connect the level meter to whichever Channel A socket (2-wire or 4-wire + E and M) is in use,
4. Press the bottom button on the controller to send a calibrated 1 kHz tone to the Channel A socket (2-wire or 4-wire plus E and M),
5. Adjust the Rx Level potentiometer on the controller module front panel until the desired line level reading is shown on the meter. This completes the adjustment.

To adjust the Receive Line Level for Channel B of a dual channel system, proceed as follows:

1. Press the top button on the controller module if the LCD is blank. This activates the terminal.
2. Continue to press the top button until the LCD shows "9-" followed by two digits.
3. Connect the line level meter to whichever Channel B socket (2-wire or 4-wire + E and M) is in use,
4. Press the bottom button on the controller to send a calibrated 1 kHz tone to the Channel B socket (2-wire or 4-wire plus E and M),
5. Adjust the Rx Level potentiometer on the line interface module front panel (rack mount) or the line interface module PCB (wall mount) until the desired line level reading is shown on the meter. This completes the adjustment.

4.6 Terminal Transmit and Receive Frequency Adjustment

To adjust the frequencies on which the Hawk link operates, you will need to adjust the frequency of the transmitter and receiver modules in the terminal. These can be varied within ±0.5MHz of the frequency set in the factory. Adjusting the frequency of an RF module outside this range requires realignment of the module and retuning of the duplexer. Refer to the sections in this manual that describe the module and the duplexer for details. The transmitter and receiver module frequencies are selected using the three switches on the side of the modules as shown in Figure 4.9.

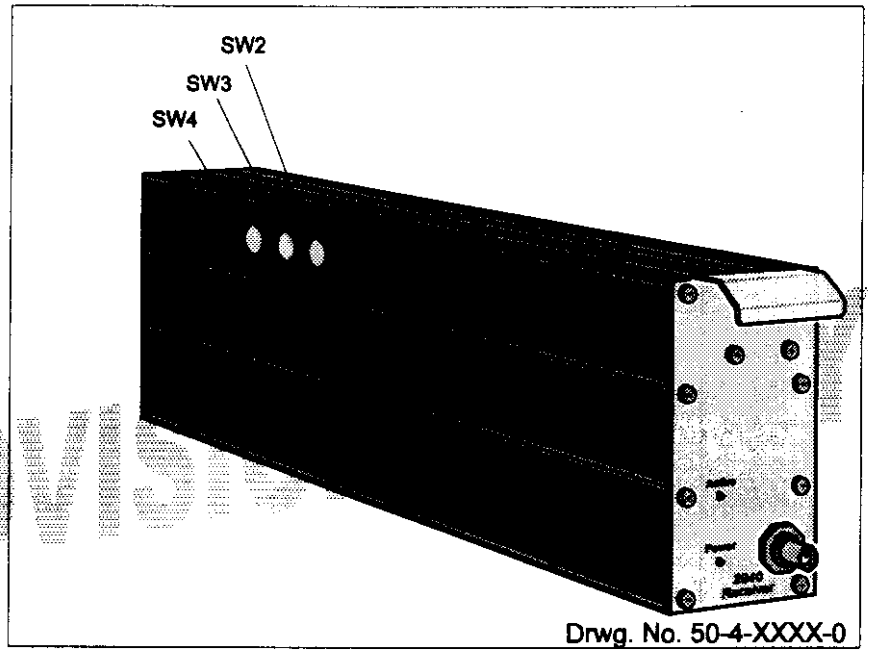

Figure 4.9: Frequency Selection Switches

The simplest method of adjusting a module's frequency is to use the known frequency increment of each switch to calculate the switch settings for any specified frequency. This method depends on the synthesised increment option of the system, which will be given on the labels fixed to the terminals. There are two options, 6.25 kHz and 5 kHz.

6.25 kHz Option

Select the bottom of the band frequency by setting each of the three switches to zero, then proceed as follows:

1 Subtract the bottom of the band frequency from the frequency the module is to be set to,

2 Subtract 1.6 MHz from the result of Step 1 until the remainder is less than 1.6 MHz, then increment SW2 by the number of subtractions,

3 Subtract 100 kHz from the remainder obtained in Step 2 until the remainder is less than 100 kHz, then increment SW3 by the number of subtractions,

4 Subtract 6.25 kHz from the remainder obtained in Step 3 until zero remains, then increment SW4 by the number of subtractions. The module frequency is now set.

Note: If you are left with a non-zero remainder less than 6.25 kHz in Step 4, you have made a mistake in your calculations. Return to Step 1 and try again.

5 kHz Option

Select the bottom of the band frequency by setting each of the three switches to zero, then proceed as follows:

1 Subtract the bottom of the band frequency from the frequency the module is to be set to,

2 Subtract 1.28 MHz from the result of Step 1 until the remainder is less than 1.28 MHz, then increment SW2 by the number of subtractions,

3 Subtract 80 kHz from the remainder obtained in Step 2 until the remainder is less than 80 kHz, then increment SW3 by the number of subtractions,

4 Subtract 5 kHz from the remainder obtained in Step 3 until zero remains, then increment SW4 by the number of subtractions. The module frequency is now set.

Note: If you are left with a non-zero remainder less than 5 kHz in Step 4, you have made a mistake in your calculations. Return to Step 1 and try again.

4.7 Power Supply Options

Exicom can provide two power supply options for the Hawk:

- The Type 2828 mains power supply,
- The Type 2461 DC - DC converter.

When ordering either of these items from Exicom, be sure to specify the input supplies they are to handle, and the type of mounting you wish to use. Refer to Sections 4.7.1 and 4.7.2 for details. The cable connections between the supplies and the Hawk terminals are as detailed in Section 3.

4.7.1 Type 2828 Mains Power Supply Installation

Rack Mount Hawk

For this option, the Type 2828 Mains Power Supply is mounted on a bracket, which enables it to be installed in the left hand end of the rack, in the rails provided. The cables to and from the supply are fed out the back of the rack, past the motherboard PCB.

Wall Mount Hawk

For a wall mount Hawk fixed on a wall, the Type 2828 Mains Power Supply is secured on the wall, near to the Hawk, by inserting four screws into the wall through the holes provided in the power supply plate.

If the wall mount Hawk is mounted on the optional rack mount shelf, the power supply is attached on the right hand side of the shelf, using the screws and nuts provided.

If the wall mount Hawk is mounted in the optional weather-proof enclosure, the power supply is placed in the bottom left hand corner of the enclosure..

4.7.2 Installation of the Type 2461 DC-DC Converter

Rack Mount Hawk

For this option, the Type 2461 DC-DC converter is installed in the left hand end of the rack, in the rails provided. The cables to and from the supply are fed out the back of the rack, past the motherboard PCB.

Wall Mount Hawk

For a wall mount Hawk fixed on a wall, the Type 2461 DC-DC Converter is supplied attached to a bracket. The converter is secured on the wall, near to the Hawk, by inserting two screws into the wall, then fitting the slots in the bracket over the heads of the screws. When inserting the screws, ensure that their positions correspond to the slots in the bracket, and that their heads are left protruding from the wall by about 5mm.

If the wall mount Hawk is mounted on the optional rack mount shelf, the converter is attached on the right hand side of the shelf, using the tap-tights provided.

If the wall mount Hawk is mounted in the optional weather-proof enclosure, the converter is placed in the bottom left hand corner of the enclosure.

4.8 Payphone Interface Installation

Exicom can provide two payphone interface options:

> Type 2835 Meter Pulse Payphone Interface, for use with 12 or 16 kHz meter pulse payphones,

> Type 2854 Line Reversal Payphone Interface, for use with line reversal payphones.

When ordering either of these items from Exicom, be sure to specify whether they are to work with a dual or single channel system, and the type of mounting you wish to use. (refer to Sections 4.8.1 and 4.8.2 for details). In addition, you must specify the frequency of the pulses (12 or 16 kHz) for the Type 2835. The cable connections between the interfaces and the Hawk terminals are as detailed in Section 3.

4.8.1 Type 2835 Meter Pulse Payphone Interface Set-up

Note: If it is necessary to change the frequency of the payphone pulses, a complete realignment of the interface is required. Refer to the Hawk Technical Manual for details.

Subscriber/Exchange Terminal Configuration

The Type 2835 Payphone Interface needs to be configured to operate with either a subscriber or an exchange terminal. The configuration is set by placing jumpers across the pins of PL7 and PL16 on the interface PCB. The jumper positions are indicated on the PCB. For an exchange terminal, the jumpers are placed in the "det" positions, and for a subscriber terminal they are placed in the "gen" positions.

Mounting in the Wall Mount

To install the Type 2835 Payphone Interface PCB in a wall mount terminal, the wall mount cover must be removed as described in Section 3.3.4. As the Type 2825 Line Interface PCB is secured to the top of the Type 2832 Mount the payphone interface PCB on its adhesive stand-offs on the transmitter module at the front edge. Fit the sockets on the end of the ribbon cables to the appropriate payphone plugs on the motherboard PCB. The cable from PL1 on the interface PCB goes to SK2 Payphone A on the motherboard PCB, and the cable from PL2 on the interface PCB goes to SK3 Payphone B on the motherboard PCB. Replace the wall mount cover.

Mounting in the Rack Mount

Insert the bracket on which the payphone interface is mounted into the spare rails at the left-hand end of the Hawk. Fit the sockets on the end of the ribbon cables to the appropriate payphone plugs on the motherboard PCB. The cable from PL1 on the interface PCB goes to SK2 Payphone A on the motherboard PCB, and the cable from PL2 on the interface PCB goes to SK3 Payphone B on the motherboard PCB.

Software Setup

Refer to the "Hardware Configuration (Address 8)" in Section 2 and set the software bit for the "Payphone Fitted" option.

Refer to "Payphone Hold-Up Time" in Section 2 and set the software byte for the required value. This value is set in both the subscriber and exchange terminals and must be the same as the exchange the Hawk is connected to. Multiply the number stored at this address by 5 to get the same time in milliseconds.

Address	Description
44	Hold-up for payphone meter pulses (the Link listens for late payphone meter pulses for this length of time after the call is terminated).

4.8.2 Type 2854 Line Reversal Payphone Interface Set-up

It is necessary to select the correct position for the links on the PCB.

Exchange terminal link settings are:

PL3	DET
PL4	DET
PL6	Not Linked
PL7	DET
PL8	DET
PL9	Not Linked

Subscriber terminal link settings are:

PL3	GEN
PL4	GEN
PL6	Linked
PL7	GEN
PL8	GEN
PL9	Linked

10
UHF Transmitter Type 2950

10.1 Introduction

The transmitter is synthesiser driven and direct frequency modulated.

Minimal audio processing occurs in the 2950 module. It is intended that this takes place in the Type 2832 Controller Module, or the Type 2825 Line Interface Module.

The UHF Transmitter module contains semi-conductor components that are sensitive to electrostatic damage.

Electrostatic sensitive devices should only be stored and transported inside electrically conductive static shielding bags. Repair work on the modules should be carried out at "electrostatically safe work stations" where the work bench surface, soldering iron and the operator are all earthed to prevent the build up of harmful electrostatic charges.

The UHF transmitter module has components that contain beryllium dioxide. These are the MTS101 and the RF Power output module. These must not be broken, ground, hammered or tampered with in any way, and should be disposed of in a safe manner as specified in local environmental and safety legislation. If safe disposal is a problem, they should be sealed in an appropriate container and returned to Exicom for disposal. In this case, it is the senders' responsibility to ensure that all precautions are taken to ensure safe delivery to Exicom.

The transmitter VCO is **NOT** field serviceable. Repairing and testing of the VCO is best done in the factory.

10.2 Specifications

Transmitter Type	Synthesised with direct frequency modulation
Synthesiser Step Size	5 kHz or 6.25 kHz
Available Frequency Bands	335-356 MHz, 380-403 MHz, 403-423 MHz, 410-430 MHz, 450-470 MHz, 470-490 MHz, 480-500 MHz, 490-512 MHz
Output Impedance	50 Ω
RF Output Power	1-15 W
Current Drain **10 W RF Output** **15 W RF Output**	 3.8 A 4.2 A (maximum)
RF Power Regulation **Over specified bandwidth** **With Supply Voltage** **With Temperature**	 ±0.5 dB ±1 dB for 10.6 V_{DC} to 15.5 V_{DC} ±1 dB for -30 °C to +60 °C
Duty Cycle	100% from -30 °C to +60 °C up to an altitude of 3000 m
Power Up Delay	<40 ms normal, <10 ms in fast key mode
Frequency Stability	±1.0 ppm from -30 °C to +60 °C and with a supply voltage of 10.6 V_{DC} to 15.5 V_{DC}
Spurious Outputs	<0.25 µW (-36 dBm) from 100 kHz to 4 GHz
Adjacent Channel Power	<-25 dBm for 25 kHz Channel Spacing <-18 dBm for 12.5kHz Channel Spacing
VSWR Protection	Withstands VSWR of 20:1 at any phase angle
Thermal Protection	Integral. RF output power automatically reduced when module heatsink temperature reaches 95 °C ±5 °C
Modulation **Distortion** **Deviation**	Direct frequency modulation <1.0% at 3 kHz deviation weighted Adjustable 1.5 kHz to 5 kHz
Modulation Input Impedance	Hi "Z" (36 kΩ) differential input
Modulation Input	775 mV_{rms}
Audio Frequency Response	±0.3 dB from 1 kHz to 8.2 kHz with DC response option
Hum and Noise	>39 dB unweighted wide band >45 dB unweighted narrow band
Transmitter Switching Bandwidth	21 MHz for 335 to 356 MHz band 23 MHz for 380 to 403 MHz band 20 MHz for 403 to 512 MHz band
Residual AM	<0.5%
Carrier Leakage	<-65 dBm

Environmental	Operates within -30 °C to +60 °C, up to 95% relative humidity, non-condensing
Operational Voltage Range	10.6 V_{DC} to 15.5 V_{DC}

10.3 Circuit Description

The following section provides a detailed description of the operation of the circuit.

10.3.1 Voltage Controlled Oscillator (VCO) and Modulator

CAUTION

The transmitter VCO is **NOT** field serviceable. Repairing and testing of the VCO is best done in the factory.

The VCO contains the resonator, oscillator and frequency control varicap, in a factory enclosed assembly. The VCO is tuneable via a trimmer that is accessible through the top of the shield.

10.3.2 Frequency Synthesiser Circuitry

When the module is powered-up, the three parallel to serial converters, U303, U304 and U305, receive inputs from the DIP switch SW301 and the Hexadecimal frequency select switches, SW302, SW303 and SW304. These parallel inputs are fed or "clocked" serially to pin 12 of the microcontroller U302. The twenty-four clock pulses required by U303, U304 and U305 are generated by U302.

The channel spacing is set to 5kHz if R305 is fitted, otherwise it is set to 6.25 kHz. U302 uses this input and the data it receives on pin 12 to derive the frequency data sent to the Phase Locked Loop IC U307. U307 compares the output from the VCO on pin 8 with the TCXO signal on pin 1 to derive the VCO control signal, which it outputs on pin 5. The signal is then filtered by the loop filter operational amplifier U308. The output signal from the filter, VCOTUNE, controls the VCO and can be monitored on TP301.

U307 also sends status information from pin 7 to U302, which indicates whether or not U307 has successfully "locked" to the required frequency. When U307 has acheived frequency lock, U302 takes pin 17 low. The output from pin 17 is the LOCK_DET signal, this can be monitored on TP403.

10.3.3 Reference Oscillator

This comprises a 9.60 MHz TCXO. A trimmer on the TCXO can be adjusted so that the TCXO provides exactly 9.600000 MHz.

10.3.4 VCO Supply

U401 is a switching regulator which inverts its supply voltage when used with C405 and C407. This voltage is applied to bias the VCO and the audio stage.

10.3.5 Audio Line Input and Level Control

Balanced audio input of 775 mV_{rms} (for nominal deviation) is applied to pins 8 and 20 (SK101) which is protected against Electromagnetic Interference (EMI) by the inductor capacitor filters (L106, L107 and C125, C126, C128 and C129). This signal is applied to U101D which provides common mode rejection against external hum and noise at the two wire line input. This voltage may be monitored at TP102 and TP104.

The test point TP107 may be used for fault tracing, with an oscilloscope. A 775 mV_{rms} sinewave at this point should cause 3 kHz of FM deviation.

Audio processing and filtering is external to the transmitter.

10.3.6 RF Driver

Q501 a dual gate FET and Q502 form a broad band RF amplifier with 30 dB gain and 400 mW output capability. Gate 2 of Q501 regulates the transmitter output power by adjusting the stage gain.

The input to Q501 is via C501, L508 and L501. These components form an impedance matching network, similar matching is used between Q501 and Q502. Output matching to 50 Ω is performed by a modified pi network C523, C527, C528 and L509. All of these networks are relatively low Q giving 1dB bandwidths of at least 40 MHz at UHF frequencies.

10.3.7 RF Power Amplifier

The power amplifier consists of a broad band hybrid power module. RF drive is fed to the power amplifier via a coaxial cable. U601 is supplied with 10 V on pin 2 and 12 V on pins 3 and 4. Thermal protection is given by U653 (refer to Section 10.3.11).

10.3.8 Dual Directional Coupler

Output of the power amplifier module is fed via a low pass elliptical filter to the dual directional coupler. This provides sample voltages for forward and reflected power, which are used to give an indication of the VSWR of the transmitter load. The forward power voltage is also used in the power control loop to keep the transmitter output power constant.

10.3.9 High Pass Filtering

The RF output from the power amplifier module is also fed to an absorbative high pass elliptical filter. This keeps the harmonic energy to a minimum.

10.3.10 RF Power Output Control

Voltage from the forward power port of the dual directional coupler feeds the constant output power loop. The loop consists of U702B and Q501 with RV701 enabling the transmitter output power to be adjusted from 1 W to 15 W.

As the voltage at the forward power port of the dual directional coupler increases, the voltage on Gate 2 of Q501 is reduced by the control loop and so the transmitter output power is reduced (and vice versa). This keeps the output power constant for supply voltage variations.

By grounding the base of Q702 through D710 at pin 5 of the rear panel socket (thus interrupting the constant power loop), the power output can be reduced externally, e.g. from the receiver module when the receiver is overloaded.

10.3.11 Thermal Protection of the RF Power Amplifier Module

U653 is mounted on the flange of U601 and increases its output voltage at a rate of 10 mV/°C. When its output reaches 950mV (indicating a heatsink temperature of 95 °C), it turns Q701 on, which reduces Q702 emitter voltage. This controls the operation of the output power control loop reducing the power output of the transmitter until thermal equilibrium is reached.

10.3.12 VSWR Alarm

The forward and reflected power voltages from the dual directional coupler are fed to a differential amplifier U702/A via two logarithmic elements contained in D703. The output of U702/A is thus a function of VSWR and is fed to the monitor. Q704 switches the VSWR ALARM and its threshold is set by RV702.

10.3.13 Audio and synthesiser power supply

This 10 V supply is based on U152 which uses a 4 V reference set up by R151 and R152. This is compared to a feedback voltage and varies the conduction of Q152 via Q151 to maintain 10 V. U151 is an unswitched 8 V regulator which supplies U152 and the 4 V reference. U152 is switched on at Tx power up and may be permanently powered up by the "fast key" shunt PL151. This provides for faster Tx activation as the synthesiser is maintained powered on and in a locked state.

10.3.14 RF power supply

This 10 V supply has the same operation as the audio and synthesiser power supply. It is only switched on when the synthesiser is locked and the transmitter enabled, being switched via R655 by a low on the RF EN line. Q652 is able to supply the higher current demands of pin 2 of U601 and the driver stage.

10.3.15 Monitor Facilities

Eight monitor inputs are examined with the aid of a 1 of 8 analogue multiplexer U701. Any one of these eight inputs may be selected to be connected to the controller via rear plug pin 3.

Monitor inputs are selected by the binary number fed into rear plug pins 2, 13 and 14. This binary coded decimal number may be selected on the control module front panel, or the test unit.

The analogue monitor outputs, their binary coded decimal number designation and associated pins on U701 are shown below.

Decimal No.	Function	Pin No. on U701
0	Forward Power	13
1	VSWR	14
2	Lock Detect	15
3	Control Loop Voltage	12
4	0 V	1
5	Driver Output	5
6	Module Temp	2
7	+10 V Regulator Output	4

10.4 Transmitter Frequency Selection

10.4.1 General

The transmitter frequencies are selected using the three Hexadecimal switches on the transmitter PCB. The Hexadecimal switches can be accessed through holes in the transmitter shroud. Figure 10.1 shows the position of the switches.

Note: The selected frequencies are restricted to those on 5.0 kHz or 6.25 kHz synthesiser increments.

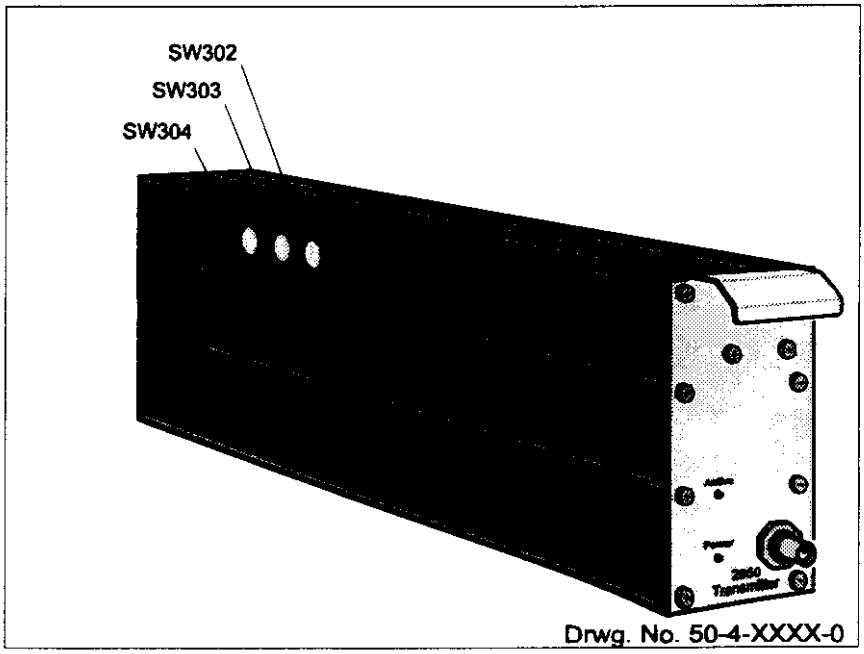

Figure 10.1: Frequency Selection Switches

The simplest method of adjusting a module's frequency is to use the known frequency increment of each switch to calculate the switch settings for any specified frequency. This method depends on the the synthesiser step size of the module. There are two options, 6.25 kHz and 5 kHz.

Note: If R302 is fitted to the module PCB, the synthesiser step size will be 5 kHz. If R302 is not fitted, the synthesiser step size will be 6.25 kHz.

6.25 kHz Option

Select the bottom of the band frequency by setting each of the three switches to zero, then proceed as follows:

1 Subtract the bottom of the band frequency from the frequency the module is to be set to,

2 Subtract 1.6 MHz from the result of Step 1 until the remainder is less than 1.6 MHz, then increment SW302 by the number of subtractions,

3 Subtract 100 kHz from the remainder obtained in Step 2 until the remainder is less than 100 kHz, then increment SW303 by the number of subtractions,

4 Subtract 6.25 kHz from the remainder obtained in Step 3 until zero remains, then increment SW304 by the number of subtractions. The module frequency is now set.

Note: If you are left with a non-zero remainder less than 6.25 kHz in Step 4, you have made a mistake in your calculations. Return to Step 1 and try again.

5 kHz Option

Select the bottom of the band frequency by setting each of the three switches to zero, then proceed as follows:

1 Subtract the bottom of the band frequency from the frequency the module is to be set to,

2 Subtract 1.28 MHz from the result of Step 1 until the remainder is less than 1.28 MHz, then increment SW302 by the number of subtractions,

3 Subtract 80 kHz from the remainder obtained in Step 2 until the remainder is less than 80 kHz, then increment SW303 by the number of subtractions,

4 Subtract 5 kHz from the remainder obtained in Step 3 until zero remains, then increment SW304 by the number of subtractions. The module frequency is now set.

Note: If you are left with a non-zero remainder less than 5 kHz in Step 4, you have made a mistake in your calculations. Return to Step 1 and try again.

10.4.2 Frequency Selection Procedure

The method of frequency selection depends upon whether the transmitter is used in a rack mount or a wall mount terminal.

Rack Mount Terminal Procedure

To select the frequency of a transmitter in a rack mount terminal, proceed as follows:

1 Switch off the power to the terminal.

2 Extract the transmitter from the rack by depressing the securing bar at the front of the rack and pulling the module towards you.

3 Using the method detailed in Section 10.4.1, set the hexadecimal switches on the transmitter to the required frequency.

4 Insert the module into position in the rack by depressing the securing bar at the front of the rack and carefully pushing the module into the rack along the guides. After the transmitter has been fitted into the rack, switch on the power supply to the rack.

Wall Mount Terminal Procedure

To select the frequency of a transmitter in a wall mount terminal, proceed as follows:

1 Turn off the power supply to the terminal, remove the terminal from the wall, and separate the terminal from all cabling, including the antenna cable.

2 Lay the terminal on a flat surface, with the terminal chassis uppermost.

3 Identify the three taptights inserted into the cover through the terminal chassis. They are located near the connectors on the terminal (see Figure 10.2). Remove the taptights and their associated washers, and store them in a safe place.

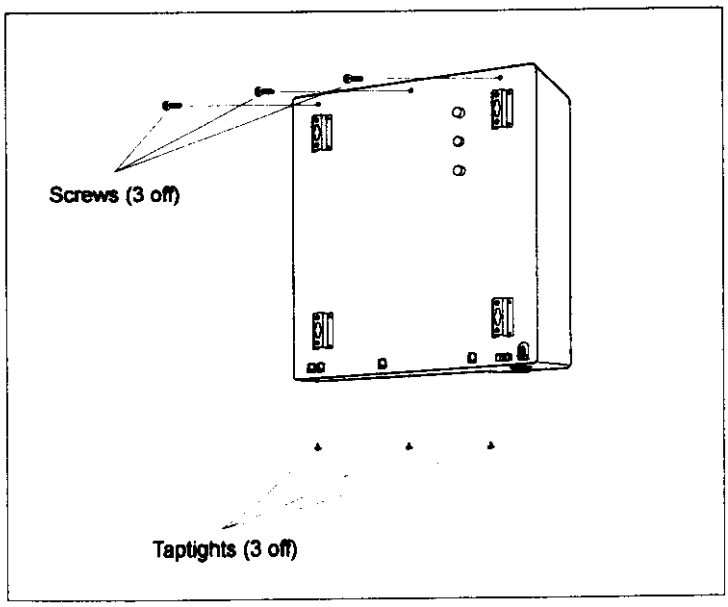

Figure 10.2: Wall Mount Cover Removal

4 Remove the three screws located at the top of the chassis and store them in a safe place, separately from the screws removed in (3).

5 Turn the terminal over so that the cover is now uppermost and lift the cover off the terminal.

6 Using the method detailed in Section 10.4.1, set the hexadecimal switches on the transmitter to the required frequency.

7 Fit the cover over the chassis then lay the terminal on a flat surface with the chassis uppermost

8 Insert each of the three screws removed in step (4) back into their positions, and tighten them into the terminal chassis through the holes in the cover.

9 Insert and tighten each of the three taptights removed in step (3) back into their positions. Ensure that each taptight has its associated washers.

10 Connect the terminal to the cabling, and fit the terminal into position on the wall.

11. Apply power to the terminal.

10.5 Transmitter Output Power Adjustment

10.5.1 General

The transmitter output power is adjusted using a multi-turn potentiometer in the transmitter module. Rotating the potentiometer in an anti-clockwise direction increases the power and rotating in a clockwise direction decreases the power. The potentiometer is adjusted through a hole on the right hand side of the module shroud (see Figure 10.3).

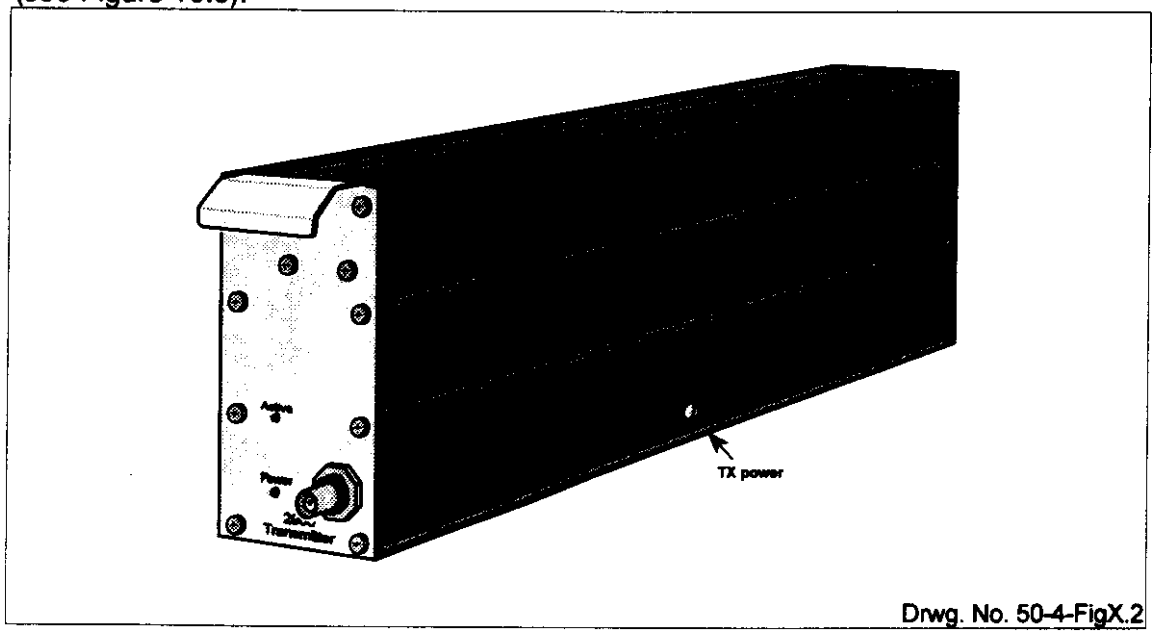

Figure 10.3: Transmitter Module Power Adjustment

The procedure used to adjust the transmitter module power depends upon whether the module is in a wall-mount or a rack mount terminal.

Wall Mount Terminal Procedure

To adjust the output power of a transmitter module in a wall mount terminal, proceed as follows:

1. Refer to steps (1) to (5) of Section 10.4.2 for cover removal details.
2. Reconnect all cabling and switch on the power supply to the terminal.
3. Identify the hole on the underside of the terminal through which the potentiometer can be adjusted (see Figure 1.3, item 12),
4. Using a suitable screwdriver, adjust the potentiometer as required,
5. Refer to Section 10.5.2 and check the RSSI at the remote terminal. If this is unsatisfactory, readjust the potentiometer until the reading is within acceptable levels,
9. Refer to Section 10.5.3 and recalibrate the transmitter.
10. After recalibrating the transmitter, switch off the power supply to the terminal, and remove the co-axial cable from the N-Type antenna connector.
11. Refer to steps (7) to (10) of Section 10.4.2 for cover replacement details.
12. Apply power to the terminal.

Rack Mount Terminal Procedure

There are two procedures for adjusting the output power of a transmitter module of a rack mount terminal, without an extender cable, and with an extender cable. Without the cable, proceed as follows:

1. Switch off any external power to the terminal,
2. Disconnect the transmitter module from the lead to the duplexer module, and then remove the transmitter module from the terminal,
3. Using a suitable screwdriver, adjust the potentiometer as required,
4. Replace the transmitter module in the terminal, and reconnect the lead to the duplexer module,
5. Power up the terminal, and check the RSSI at the remote terminal as described in Section 10.5.2. If the reading is unsatisfactory, repeat Steps 1 to 4 until the reading is within acceptable levels,
6. Refer to Section 10.5.3 and recalibrate the transmitter.

To adjust the RF output power of a rack mount terminal with an extender cable[1], proceed as follows:

1. Switch off any external power to the terminal,
2. Disconnect the transmitter module from the lead to the duplexer module, and then remove the transmitter module from the terminal,
3. Connect the extender cable between the connector on the rear of the transmitter module and the transmitter socket on the motherboard, and reconnect the transmitter module to the lead from the duplexer,
4. Apply external power to the terminal,
5. Using a suitable screwdriver, adjust the potentiometer as required,
6. Check the RSSI at the remote terminal as described in Section 10.5.2. If the reading is unsatisfactory, repeat Step 5 until the reading is within acceptable levels,
7. Switch off any external power to the terminal,
8. Disconnect the transmitter module from the extender cable and the lead to the duplexer module, remove the extender cable from the motherboard, insert the transmitter module back in the rack, and reconnect the lead from the duplexer module,
9. Apply external power to the terminal, refer to Section 10.5.3, and recalibrate the transmitter.

10.5.2 Checking the Remote Terminal RSSI

The RSSI at the remote terminal can be checked using the buttons and the LCD on the front of the controller module, or using the VDT or HHT.

Checking the Remote Terminal RSSI using the Controller LCD and Buttons

To view the RSSI at the remote terminal using the buttons and LCD on the controller module, proceed as follows:

1. Press the top button on the module if the LCD is blank. This activates the terminal.
2. Continue to press the top button until the LCD shows "F0–". Press the bottom button to set up a test link to the remote terminal.
3. Continue to press the top button until the LCD shows "1-" followed by two digits. These digits indicate the RSSI at the remote terminal. Their value must not be less than 60, and if this is the case, the adjustment of the transmitter power must be done again.

[1] A slight drop in RF output power may be noticed when running the transmitter on the extender cable, due to supply voltage drop over the length of the cable.

4. Press the top button on the module until the LCD shows "F2". Press the bottom button to close down the test link.

5. Press the top button on the module until the LCD shows "OFF". Then press the bottom button to close down the terminal.

Checking the Remote Terminal RSSI using an HHT or VDT

To view the RSSI at the remote terminal using an HHT or VDT, proceed as follows:

Note: Unless otherwise specified, any following references to keys or screens refer to the keys or screen of the HHT or VDT.

1. If the HHT or VDT is directly connected to the RS232C connector on the controller module, press any key to activate the terminal.

2. If the VDT or HHT is attached to the terminal via a modem, press any key, then follow the instructions that appear on the screen to activate the terminal.

3. After the terminal has been activated, press "N" until the screen shows "Force a link:" then press "Enter". A test link is now set up between the terminals.

4. Press "N" until you see "R.RSSI:" on the screen then press "Enter". A percentage is shown after the "R.RSSI", indicating the RSSI at the remote terminal. This percentage should not be less than 60%. If it is, the transmitter power adjustment should be done again.

5. Press "N" until you see "Cleardown link:" on the screen then press "Enter". The test link is now shut down.

6. Press "Q" on the keypad. or press "N" on the keypad until you see "Go to sleep" displayed on the screen. Press "Enter". The terminal is now turned off.

10.5.3 Recalibrating the Transmitter Output Power

The transmitter must be recalibrated every time the RF output power is adjusted. This is because the Hawk compares the current RF output power of a transmitter with the power measured the last time the transmitter was calibrated. Since a reading of less than 99% is taken to mean a fault in the transmitter, failure to recalibrate the transmitter after adjusting its output power will cause fault indications to be given during normal operation.

The transmitter can be recalibrated using the buttons and the LCD on the front of the controller module, or using the VDT or HHT.

Recalibrating the transmitter output power using the Controller LCD and Buttons

To recalibrate the transmitter output power using the buttons and LCD on the controller module, proceed as follows:

1. Press the top button on the module if the LCD is blank. This activates the terminal.

2. Continue to press the top button until the LCD shows "F8", then press the bottom button to carry out the calibration fucntion.

3. Press the top button on the module until the LCD shows "OFF", then press the bottom button to close down the terminal.

Recalibrating the transmitter output power using an HHT or VDT

To recalibrate the transmitter output power using an HHT or VDT, proceed as follows:

1. Press any key on the HHT or VDT if the screen is blank. This activates the terminal.

   Note: If the VDT or HHT is attached to the terminal via a modem, follow the instructions that appear on the screen.

2. Press "N" on the keypad until you see "Tx Meter Cal:" then press "Enter" to carry out the calibration function.

3. Press "Q" on the keypad. or press "N" on the keypad until you see "Go to sleep" displayed on the screen. Press "Enter". The terminal is now turned off.

10.6 Transmitter Alignment Procedure

Note: For details of the Test Unit Type 2501 refer to Appendix C.

10.6.1 Test Equipment Required

> Exicom Test Unit Type 2501,

> Radio Test Set, e.g. Marconi 2955 or equivalent, with 600 Ω Adapter Box,

> Modulation meter, e.g. Marconi 2305 or equivalent,

> 1 GHz Frequency counter,

> RF Power Meter, e.g. Bird 43 Thruline or equivalent, with 25C and 25D elements,

> 30 dB 50 W Attenuator, e.g. Bird Tenuline or equivalent,

> 20 MHz oscilloscope,

> 13.8 V 5 A DC Power supply,

> Digital Volt Meter (DVM), e.g. Fluke 86 or equivalent.

10.6.2 Preparation

For the full alignment procedure to be carried out, the transmitter module must be removed from the terminal and the PCB must then be removed from the module shroud. The procedure used to remove the transmitter PCB depends upon whether the transmitter is used in a rack mount or a wall mount terminal.

Rack Mount Terminal Procedure

1. Switch off the power supply to the terminal and remove the transmitter module from the rack by pressing down on the securing bar and pulling on the handle at the top of the module.
2. Remove the three Hex bolts that hold the heatsink onto the module shroud. Put the heatsink and bolts in a safe place for refitting the PCB.
3. In the module face plate, undo each of the eight screws along the face plate (see Figure 10.4). Put the screws in a safe place for refitting the PCB.

Note: The face plate screws have No.2 Japan Industry Standard (JIS) heads. Damage to screw heads may result if the incorrect screw tips are used. The closest alternative is a No.2 Phillips.

4. In the module rear plate, undo the two screws on either side of the connector that protrudes through the plate (see Figure 10.4). Put the screws in a safe place for refitting the PCB.

5. Extract the transmitter PCB from the module by pulling gently on the front plate.

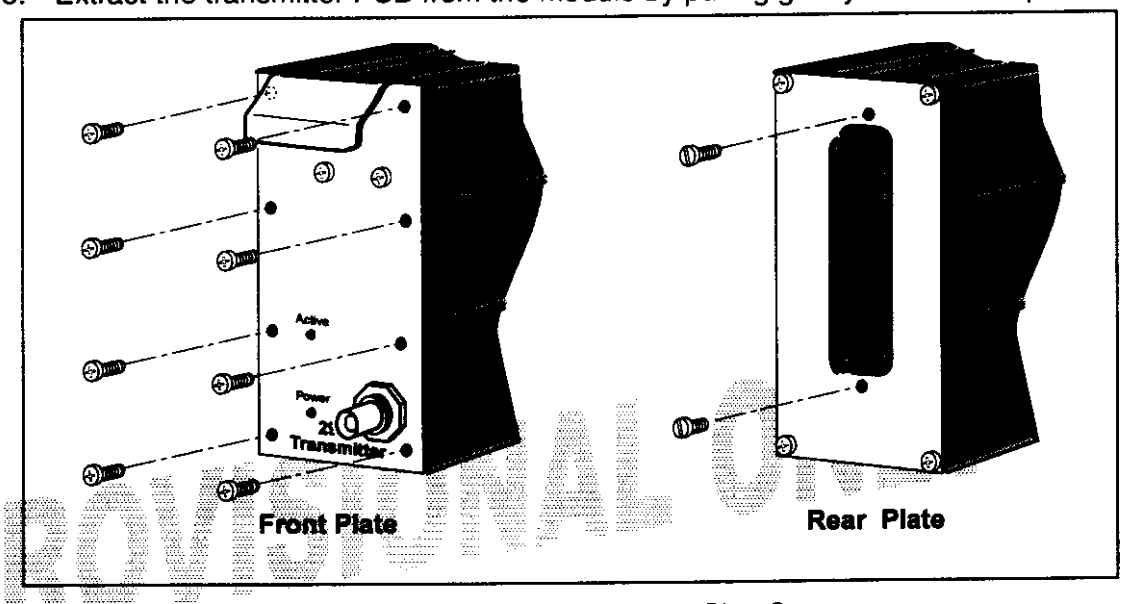

Figure 10.4: Module Face and Rear Plate Screws

Wall Mount Terminal Procedure

1. Refer to steps (1) to (5) of Section 10.4.2 for cover removal details.

2. Identify and remove the three small screws and the three Hex bolts (and associated washers) on the underside of the chassis that hold the transmitter module in position. Put the screws, bolts and washers in a safe place for refitting the PCB.

3. Pull the transmitter module away from the motherboard PCB, taking care to ensure the module PCB connector comes out cleanly from the socket on the motherboard PCB.

4. In the module face plate, undo each of the eight screws along the face plate (see Figure 10.4). Put the screws in a safe place for refitting the PCB.

   Note: The face plate screws have No.2 Japan Industry Standard (JIS) heads. Damage to screw heads may result if the incorrect screw tips are used. The closest alternative is a No.2 Phillips.

5. In the module rear plate, undo the two screws on either side of the connector that protrudes through the plate (see Figure 10.4). Put the screws in a safe place for refitting the PCB.

6. Extract the transmitter PCB from the module by pulling gently on the front plate.

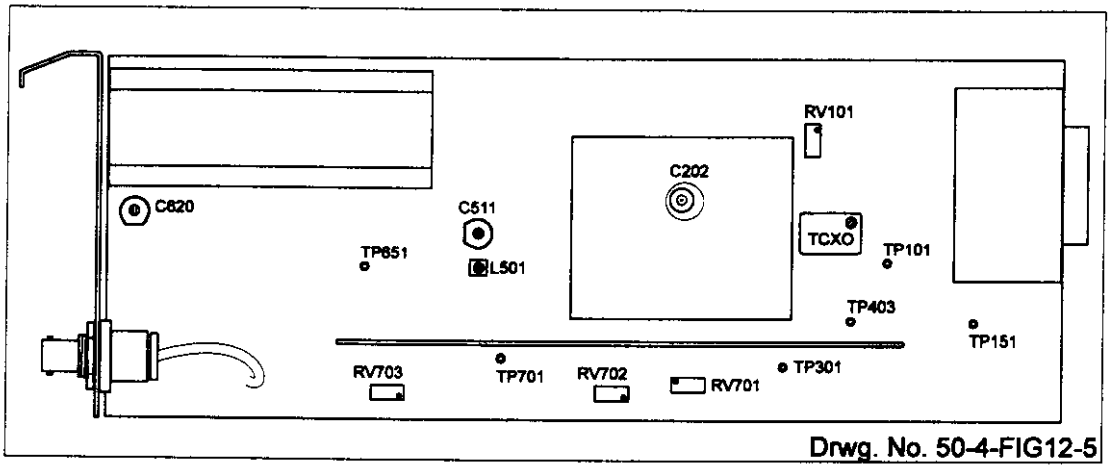

Figure 10.5: UHF Transmitter Alignment Points

10.6.3 Alignment and Functional Checks

Note: Do not use an extender cable except for fault finding as it produces significant voltage drop at high output power settings.

1. On the PCB, turn RV701 (RF Power) fully clockwise to give minimum power setting, and turn RV101 (frequency deviation control) fully clockwise to give zero deviation.

2. Set the DIP switch SW301 to the required frequency band and channel spacing, and set the frequency switches SW302, SW303 and SW304 to the middle of the band. Refer to Section 10.4 for details.

3. Connect the power supply and the digital voltmeter to the Type 2501 Test Set, then use a short ribbon cable to connect the Type 2501 to the rear plug on the transmitter PCB. Finally, use a short length of co-axial cable to connect the RF output plug on the transmitter PCB to the RF power meter, terminated with a 30 dB attenuator. Refer to Figure 10.6 for connection details.

4. Set the DVM Output switch on the Type 2501 to "Supply Voltage". Apply power to the Type 2501, and adjust the power supply to give 13.8 V as measured by the digital voltmeter.

5. Set the DVM Output switch on the Type 2501 to "Monitor Output", and the Tx/Rx switch to "TX, RX".

6. Check that the transmitter VCO is locked by observing the "Active" LED on the transmitter front panel. If this is unlit, adjust the VCO trimmer C202 until the LED comes on. Set the monitor output select switch on the Type 2501 to "2" (Lock Detect), and check that the analogue meter on the Type 2501 reads less than 0.2 (Synthesiser locked). If the meter gives a higher reading, set C202 to the minimum value of capacitance, then adjust it until the meter reading is less than 0.2. Check that the transmitter locks reliably by toggling the Tx/Rx switch on the Type 2501 to TX/RX several times. If there are any problems, increase the trimmer capacitance slightly until transmitter lock occurs reliably.

7. Set the monitor output select switch on the Type 2501 to "3" (Loop Volts). Transmitters tuned to frequencies at the top of the frequency band edge will give readings close to 0.8, those tuned to frequencies at the lower band edge will give readings close to 0.15 (these correspond to 8 V and 2 V measured on TP401). Adjust the VCO trimmer capacitance slightly to move the meter reading as close as possible to the centre of the meter range. This corresponds to a reading of 5 V on the digital voltmeter.

8. Set the monitor output select switch on the Type 2501 to "7" (+10 V Regulator Output) and check that the analogue meter on the Type 2501 reads more than 0.76 (RF power supply on). This corresponds to a reading of 2.4 V on the digital voltmeter.

9. Set the hexadecimal switches to the mid-band frequency, and set the monitor output select switch on the Type 2501 to "0" (Forward Power). Adjust L501 and C511 on the PCB for a maximum reading on the Type 2501 analogue meter.

10. Set the hexadecimal switches to the lower band edge frequency, set the monitor output select switch on the Type 2501 to "5" (Driver Output), and adjust RV701 for approximately 5 W on the power meter. Then adjust C620 for a dip in the reading on the Type 2501 analogue meter.

11. On the Transmitter PCB, adjust RV701 for required RF output power measured on the power meter.

    Note: Allow for approximately 1 dB loss in the Duplexer after the transmitter is fitted back into the terminal.

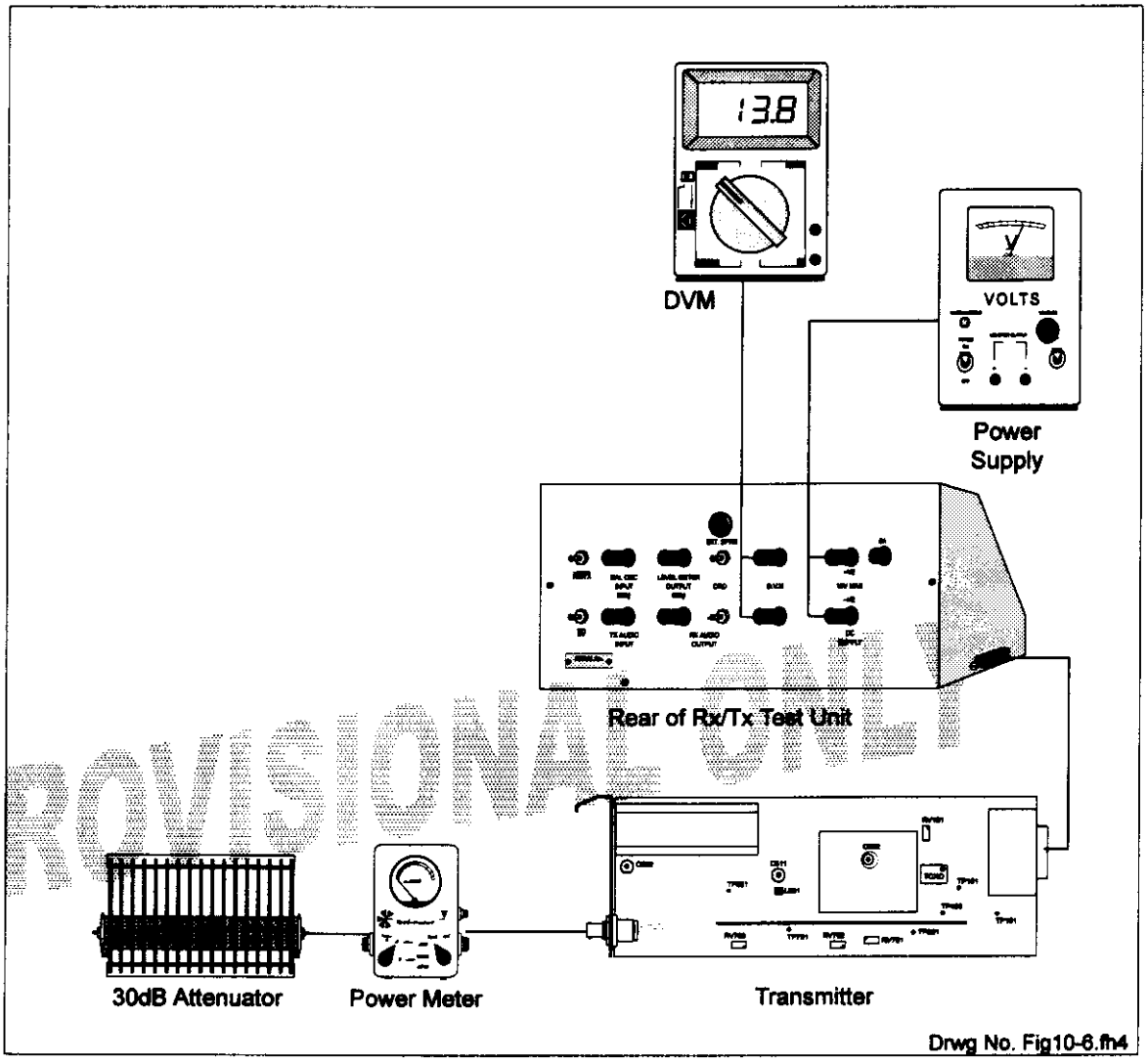

Figure 10.6: Alignment and Functional Checks Set-up

10.6.4 Modulation Deviation Setting

1. Connect the transmitter PCB to the test equipment as shown in Figure 10.7.
2. Set the radio test set to input a 555 mV_{rms} 1 kHz tone to the Tx Audio input on the Type 2501, and then use the test set to monitor both deviation and distortion at the transmitter RF output.
3. For transmitters using 12.5 kHz channel spacing turn RV101 fully clockwise, then adjust RV101 anti-clockwise on the PCB for a frequency deviation of ± 1.5 kHz.
4. For transmitters using 25 or 50 kHz channel spacing turn RV101 fully clockwise, and increase the audio signal input level to 775 mV_{rms}. Then adjust RV101 anti-clockwise on the PCB for a frequency deviation of ± 3 kHz.

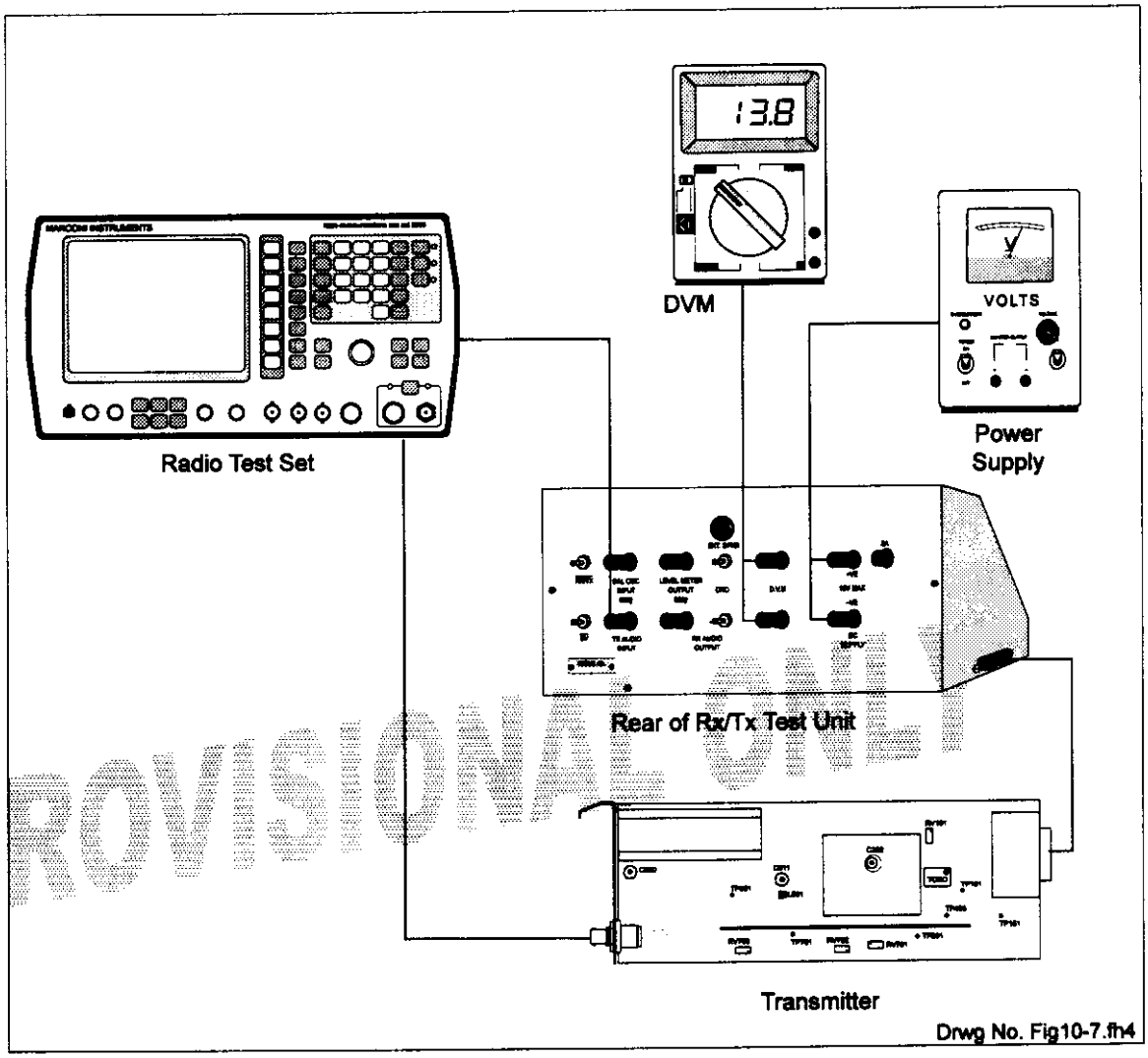

Figure 10.7: Modulation Deviation Set-up

10.6.5 Oscillator Frequency

1. Connect the transmitter PCB to the test equipment as shown in Figure 10.6. Connect the frequency counter to the output of the attenuator. Allow the equipment to be fully warmed up, then turn the modulation down to 0 mV_{rms}.

2. Monitor the transmitter frequency with the frequency counter, and check that it corresponds to that set on the frequency switches to within ±100 Hz. If this is not the case, adjust the TCXO on the transmitter PCB until the output frequency fulfils this condition.

10.6.6 VSWR Alarm

1. Connect the transmitter PCB to the test equipment as shown in Figure 10.6.

2. Set the monitor output select switch on the Type 2501 to "1" (VSWR), and adjust RV701 on the transmitter PCB until the power meter reads 5 W,

3. Connect the DVM across TP703 and TP704 on the transmitter PCB, and remove the coaxial cable from the RF connector on the transmitter PCB front panel.

4. Adjust RV703 on the transmitter PCB for a reading of 0 ± 10 mV on the Type 2501 analogue meter (this sets the zero balance for the VSWR bridge).
5. Connect a 3 dB 50 Ω attenuator to the transmitter RF output.
6. Select an open circuit or short circuit at the output of the attenuator to give the highest reading on the Type 2501 analogue meter (this gives 3:1 mismatch).
7. Adjust RV702 on the transmitter PCB so that the VSWR alarm LED on the Type 2501 just lights.

10.6.7 Efficiency Optimisation

Note: Efficiency optimisation ensures that the transmitter draws the minmum current for the required output RF power.

1. If required, remove the fast key jumper from PL151.
2. Set the Tx/Rx switch on the Type 2501 to the "Off" position.
3. Switch the Tx/Rx switch on the Type 2501 to the "Tx, Rx" position (this allows the transmitter to reload the frequency settings).
4. Set RV701 on the transmitter PCB for the required transmitter RF output power.
5. Adjust C620 to give the minimum power supply current as measured on the DVM.
6. If required, fit the fast key jumper across PL151.

10.6.8 Completion of Transmitter Alignment

Rack Mount Terminal Procedure

1. Remove all power from the test equipment, and disconnect the transmitter PCB.
2. Insert the PCB through the front of the module, taking care to ensure the PCB connector fits through the hole for it in the rear plate. Ensure that the screw holes in the connector are aligned with the holes in the rear plate.
3. Using the two screws kept from the removal of the PCB, insert a screw into each of the holes in the PCB connector through the holes provided in the module rear plate. Tighten the two screws a half-turn at a time, do not fully tighten at this time.
4. Using the eight screws kept from the removal of the PCB, insert and tighten a screw through each of the holes in the corners of the module face plate, do not fully tighten at this time.

   Note: The face plate screws have No.2 Japan Industry Standard (JIS) heads. Damage to screw heads may result if the incorrect screw tips are used. The closest alternative is a No.2 Phillips.

5. Re-attach the heatsink using the three Hex bolts. Ensure that the bolts are securely fastened then tighten all screws in the module front and rear plates.
6. Insert the transmitter module into position in the rack by depressing the securing bar at the front of the rack and carefully pushing the module into the rack along the guides.
7. Power up the terminal.

Wall Mount Terminal Procedure

1. Refer to steps (1) to (4) of the rack mount procedure above, ensure all screws are securely fastened in the module front and rear plates.
2. Align the module into position on the wall mount chassis, taking care that the holes in the module shroud line up with the holes in the chassis, and that the PCB connector on the module fits cleanly into the socket on the motherboard.
3. Using the three screws kept from the removal of the module, insert a screw into each of the holes in the module through the holes provided in the wall mount chassis. Insert the three Hex bolts and washers kept from the removal of the module Tighten all screws and bolts to secure the module in position.
4. Fit the cover over the chassis then lay the terminal on a flat surface with the chassis uppermost.
5. Insert each of the three screws removed in step (3) of Section 10.4.2 back into their positions, and tighten them into the chassis through the holes in the cover.
6. Insert and tighten each of the three taptights removed in step (3) of Section 10.4.2 back into their positions. Ensure that each taptight has its associated washers.
7. Connect the terminal to the cabling, and fit the terminal into position on the wall.