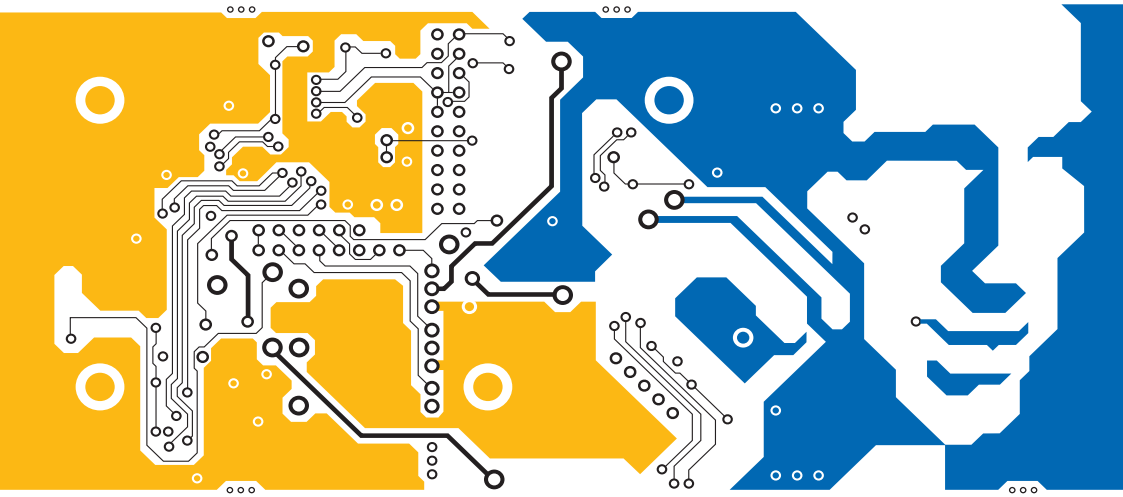
CODAN

Block Up Converter Systems

6700/6900 series

SATELLITE COMMUNICATIONS



USER GUIDE

Codan part number 15-44027-EN Issue 1, October 2006

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Introduction

This user guide is for installation technicians and operators of the Block Up Converter 6700/6900 series.

This guide contains the following sections:

Section 1 Overview—general description of the BUC

Section 2 Installation—installation instructions specific to the BUC and redundancy systems

Section 3 Setting up and operating the BUC system—setup and operating procedures, and serial interface commands

Section 4 Maintenance and fault finding—description of how to maintain and fault find a BUC and a redundancy system

Appendix A BUC model and redundancy system numbers—explains how to interpret the model number of your BUC and redundancy system

Appendix B Example outputs for the View commands—summary of the commands described on page 57, *Setting up and operating the BUC system*

Appendix C Compliance—compliance information and safety notices

Appendix D Definitions—explains the terms and abbreviations used in this guide

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1 Overview

This section contains the following topics:

Introduction

The Codan Block Up Converter 6700/6900 series is a high-performance BUC for use in a satellite earth station.

The Block Up Converter 6700/6900 series comprises:

- a BUC
- an LNB
- a TRF
- accessories

The BUC is designed to be mounted on a wide range of earth station antennas. The LNB and TRF are designed to be direct-mounted (that is, mounted on the antenna feed support structure). While some BUCs may be direct-mounted to the feed, others may be boom-mounted or pedestal-mounted.

The BUC converts transmit L-Band IF signals from the modem to the required RF band. The LNB converts received RF signals to IF signals in the L-Band frequency range to drive the modem receive IF input.

The modem generally supplies the BUC and the LNB with 10 MHz reference signals, and the LNB with the required DC power. Certain BUCs require external sources of either AC or DC supply. Certain BUCS and LNBs have internal reference sources and do not require an external 10 MHz reference signal.

NOTE If your modem cannot supply 10 MHz reference signals to the LNB and BUC, and DC power to the LNB (and BUC if this is needed), contact your Codan representative for information on accessories and options that may be available.

The TRF is a waveguide filter that ensures transmit signals do not enter and overload the LNB.

C-Band BUCs are supplied with a waveguide or N-type output. Ku-Band BUCs are supplied with a waveguide output only.

BUC system configuration

The BUC may be used in the following configurations:

Configuration...	See...
BUC with L-Band modem and LNB	Figure 1 on page 5
BUC with L-Band modem, external in-line PSU, and LNB	Figure 2 on page 6

Figure 1: BUC with L-Band modem and LNB

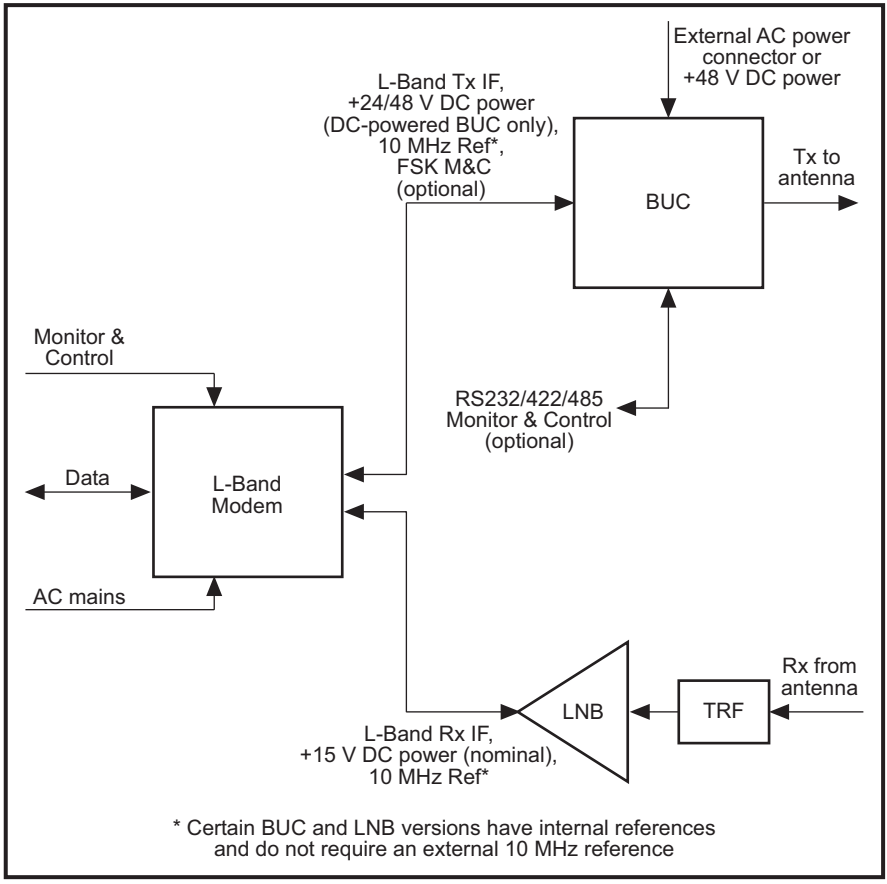
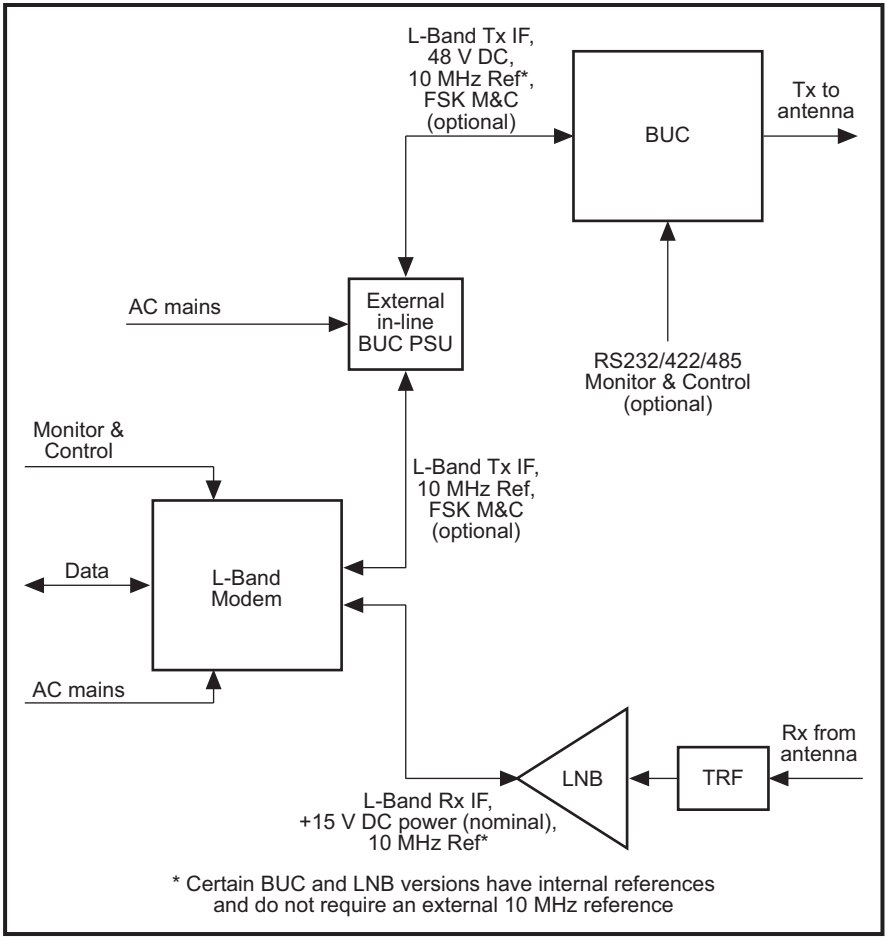


Figure 2: BUC with L-Band modem, external in-line PSU, and LNB



BUC

Transmit frequency bands

Table 1: Transmit frequency bands for C-Band and Ku-Band BUCs

BUC	Frequency band	Transmit frequency band (MHz)
C-Band	Standard	5 850 to 6425
	Extended	5 850 to 6725
Ku-Band	Standard	14000 to 14500
	Extended	13 750 to 14500

Frequency conversion plans

All 6700/6900 series BUCs are frequency inverting, that is, the higher the RF frequency required, the lower the modem IF frequency must be.

To calculate the modem IF frequency (f_{IF}) for a given RF frequency, subtract the RF frequency (f_{RF}) from the LO frequency (f_{LO}).

$$f_{IF} = f_{LO} - f_{RF}$$

Example 1:

The LO frequency of your C-Band BUC is set to 7300 MHz (see Table 3 on page 9). If you need an RF frequency of 5975 MHz, then you must set the modem IF frequency to:

f_{IF} = 7300 – 5975

= 1325 MHz

Example 2:

The LO frequency of your Ku-Band BUC is 15450 MHz (see Table 4 on page 11). If you need an RF frequency of 14500 MHz, then you must set the modem IF frequency to:

f_{IF} = 15450 – 14500

= 950 MHz

C-Band

Figure 3 to Figure 6 show the frequency conversion plan for each LO frequency of the C-Band BUCs.

Table 2: Frequency ranges for C-Band BUCs (Standard)

LO frequency (MHz) f_{LO}	**Tuning range of L-Band (MHz)** f_{IF}	**Output frequency (MHz)** $\mathbf{f_{RF}}$	**See...**
7300	950–1450	5850–6350	Figure 3 on page 9
7375	950–1525	5850–6425	Figure 4 on page 10

Table 3: Frequency ranges for C-Band BUCs (Extended)

LO frequency (MHz) f_{LO}	Tuning range of L-Band (MHz) f_{IF}	Output frequency (MHz) f_{RF}	See...
7300	950–1450	5850–6350	Figure 3 on page 9
7375	950–1525	5850–6425	Figure 4 on page 10
7600	950–1750	5850–6650	Figure 5 on page 10
7675	950–1750	5925–6725	Figure 6 on page 11

Figure 3: C-Band frequency conversion plan at an LO frequency of 7300 MHz

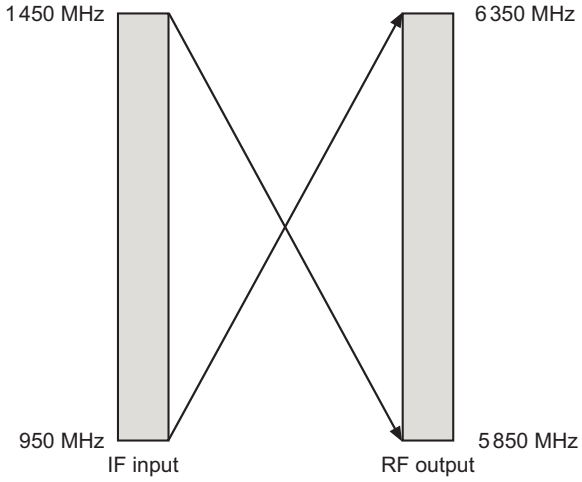


Figure 4: C-Band frequency conversion plan at an LO frequency of 7375 MHz

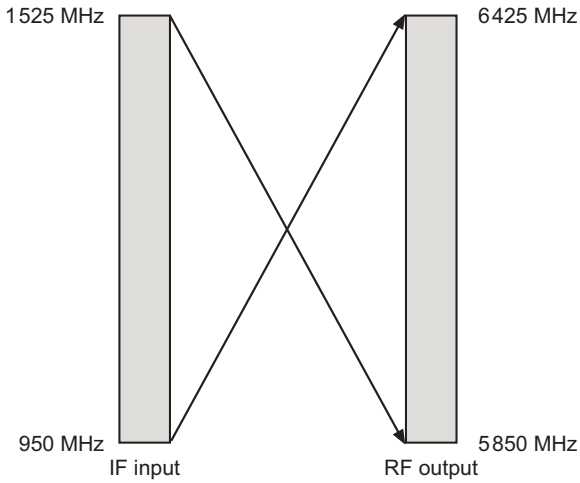


Figure 5: C-Band frequency conversion plan at an LO frequency of 7600 MHz

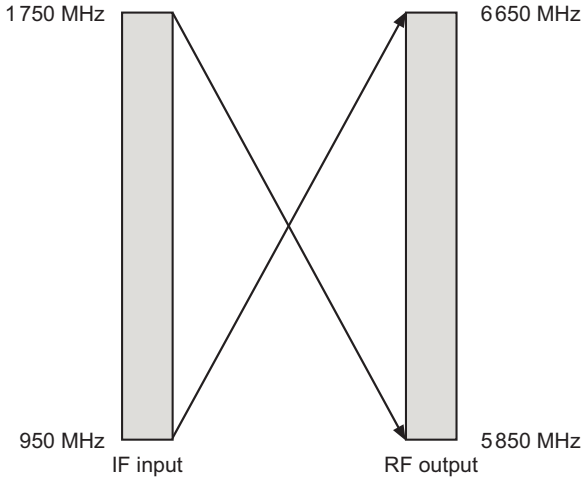
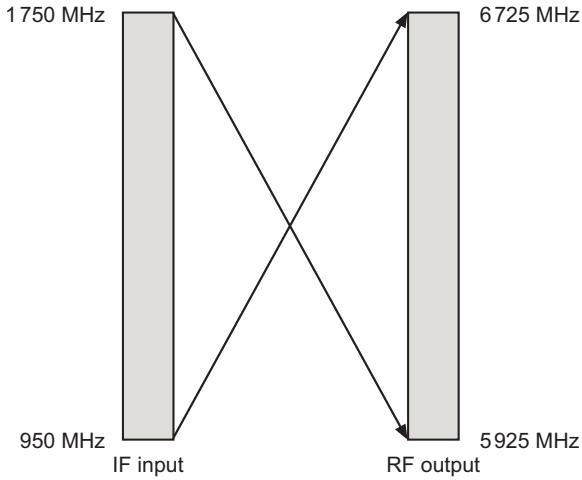


Figure 6: C-Band frequency conversion plan at an LO frequency of 7675 MHz



Ku-Band

Figure 7 and Figure 8 show the frequency conversion plans for each LO frequency of the Ku-Band BUCs.

Table 4: Frequency ranges for Ku-Band BUCs (Standard)

LO frequency (MHz) f_{LO}	Tuning range of L-Band (MHz) f_{IF}	Output frequency (MHz) f_{RF}	See...
15450	950–1450	14000–14500	Figure 7 on page 12

Table 5: Frequency ranges for Ku-Band BUCs (Extended)

LO frequency (MHz) f_{LO}	Tuning range of L-Band (MHz) f_{IF}	Output frequency (MHz) f_{RF}	See...
15450	950–1450	14000–14500	Figure 7 on page 12
15450	950–1700	13750–14500	Figure 8 on page 13

Figure 7: Ku-Band frequency conversion plan for BUCs that cover the Standard frequency band

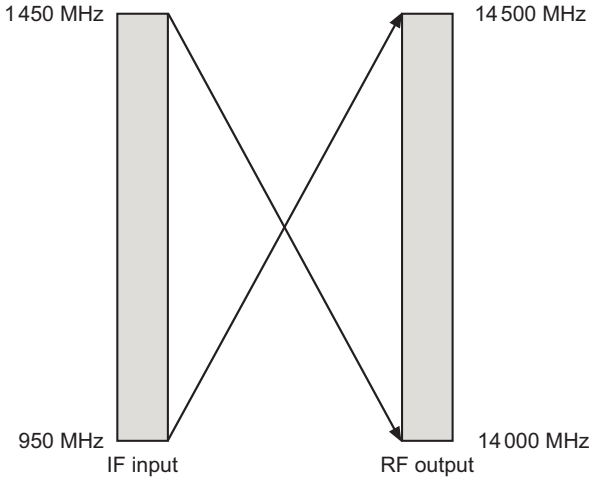
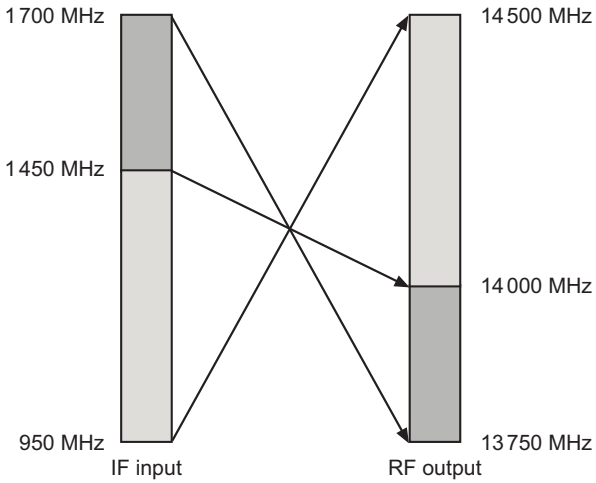


Figure 8: Ku-Band frequency conversion plan for BUCs that cover the Extended frequency band



Power supply options

The power supply option for your BUC is indicated in the model number on the serial number label. For information on how to interpret the model number see page 111, *BUC model and redundancy system numbers*.

Some BUCs are powered by 48 V DC or 24 V DC. Other BUCs are powered via an AC mains input.

Table 6: Power supply options for BUCs

Input	Power supply option	Feed to BUC
DC	24 V/48 V	via IF cable or separate cable and connector
AC	94–275 V AC	via separate cable and connector

NOTE

BUCs that are AC-powered, also draw current from the DC power input on the IF input cable for remote alarm indication purposes only.

NOTE

Certain BUCs with external DC power connectors may also have auto-sensing circuits, and can be powered from either the external connector or via the **IF INPUT** connector. If both connectors are powered, the external connector is automatically selected.

LNB

The frequency band that is down converted by the LNB is indicated on the model label of the LNB.

C-Band

The C-Band LNB is supplied for operation on the frequency band 3400 to 4200 MHz. It has an LO frequency of 5150 MHz.

NOTE The C-Band LNB is frequency inverting.

Ku-Band

The Ku-Band LNB may be supplied for operation in one of three frequency band options listed in Table 7.

Table 7: Frequency band options for the Ku-Band LNB

Band option	Receive frequency (MHz)	LO frequency (MHz)	L-Band output frequency (MHz)
1	10950–11700	10000	950–1700
2	11700–12200	10750	950–1450
3	12250–12750	11300	950–1450

Redundancy systems

The Codan Redundancy Controller 6586 is used to control two BUCs and two LNBs (when used) in a redundancy system.

When a detectable fault occurs in the on-line BUC, and the off-line BUC is serviceable, the redundancy controller switches over the two BUCs. The interruption to traffic is typically less than one second. Transmit/receive systems also include two LNBs, which are switched in parallel with the BUCS. In such systems, simultaneous switching of both BUC and LNB occurs when a fault is detected in either the on-line BUC or the on-line LNB. This is known as stream-switching.

A typical BUC-LNB system comprises:

- a BUC
- an LNB (in transmit/receive systems only)
- a TRF (optional)
- appropriate connecting cables

A typical redundancy system comprises:

- two BUCs
- two LNBs (in transmit/receive systems only)
- an Redundancy Controller 6586
- one or two RF waveguide switches or a combined RF waveguide/coaxial switch
- a Remote Controller 6570 (optional)

For information on the remote controller see the *Hand-held and Remote Controller 6560/6570 User Guide*.

Redundancy system control

You can control and monitor the redundancy switching equipment:

- locally, using a Hand-held Controller 6560 connected to the **BUC 1 Serial**/**BUC 2 Serial** connectors on the redundancy controller
- remotely, using the optional Remote Controller 6570 connected to the **Auxiliary I/O** connector on the redundancy controller

The redundancy controller

The redundancy controller is the main component of the redundancy system. It controls the switching between the on-line and off-line BUC and LNB. The redundancy controller is normally installed on the antenna pedestal near the two BUC systems. The redundancy controller is powered from the AC mains supply.

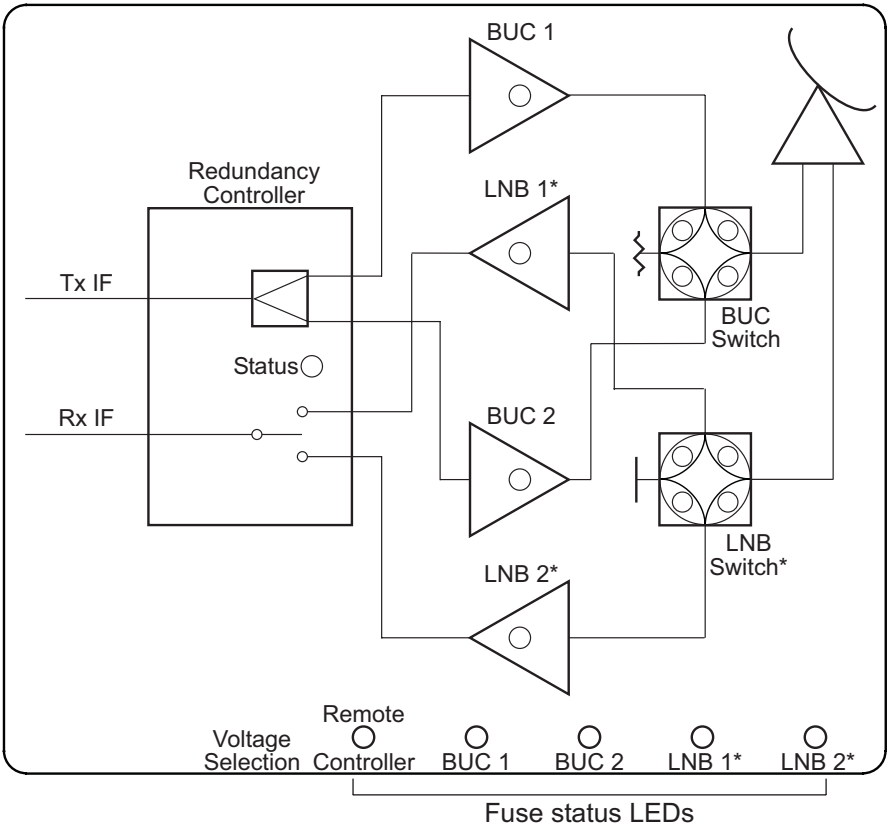
The redundancy controller performs the following functions:

- monitors the Stream 1 and Stream 2 equipment for faults
- monitors the RF waveguide switches for switch faults
- controls the RF waveguide switch positions
- directs the IF paths via high frequency relays and splitter networks
- supplies power to the BUCs, LNBs (when used), and optional Remote Controller 6570

The redundancy controller communicates with the BUCs via relay contacts. The serial interfaces of the BUCs are kept available for separate use. DC supply connections and isolated contact closures are available on the **Auxiliary I/O** connector of the redundancy controller.

The control panel inside the redundancy controller is shown in Figure 9.

Figure 9: Control panel on the redundancy controller



* Not used in transmit-only systems

LED indicators

The control panel of the redundancy controller has groups of LEDs that indicate the status of the redundancy system and its fuses. The colours and functions of these LEDs are described in Table 12 on page 60.

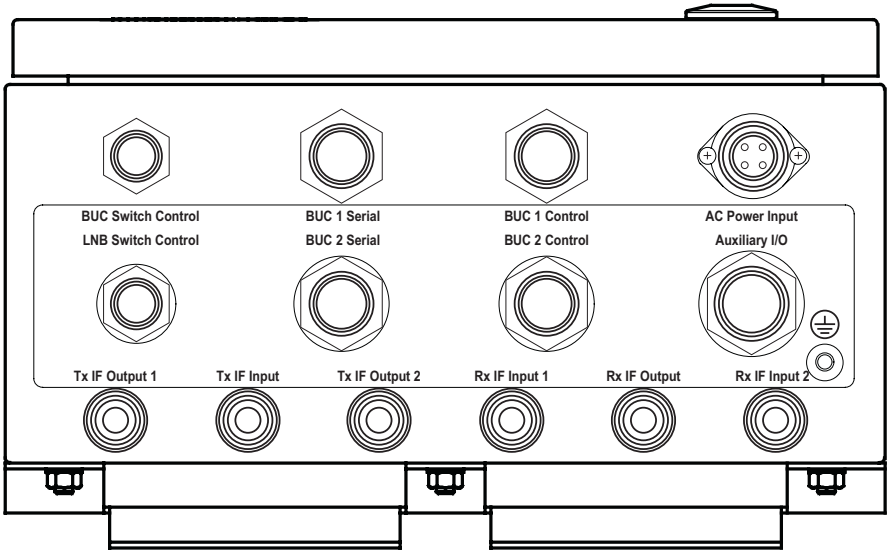
Switches

The control panel of the redundancy controller has one switch. The function of this switch is to select the AC input voltage (115 or 230 V AC).

Connectors

The connector panel is located at the bottom of the redundancy controller.

Figure 10: Connector panel on the redundancy controller



How the redundancy controller works

When you power up the system, the redundancy controller uses the current status of the BUC Switch and LNB Switch (when used) to select the on-line stream.

NOTE — If the redundancy controller detects that the switches are inconsistent, or cannot be detected, it selects Stream 1.

When the redundancy controller is operating, it monitors the two BUC and LNB (when used) streams for faults. When a detectable fault occurs in the on-line BUC and LNB, and the off-line BUC and LNB is serviceable, the redundancy controller switches over the two streams. The interruption to traffic is typically less than one second.

The redundancy controller switches:

- the receive IF signals between the LNBs (when used) and the modem equipment
- the transmit RF signals between the BUCs and the transmit antenna port
- the receive RF signal between the receive antenna port and the LNBs (when used)

The transmit IF signal is not switched. Rather, a splitter allows the transmit IF signal to feed both BUCs simultaneously. In transmit-only systems, a transmit-only connector assembly is supplied and fitted to the **LNB Switch Control** connector.

BUC faults

The redundancy controller uses a PLD to monitor the alarm signals from both BUCs. The BUCs send alarm signals via cables connected to the 14-way **BUC 1 Control** and **BUC 2 Control** connectors on the redundancy controller.

Red **BUC 1**/**BUC 2** LEDs on the control panel of the redundancy controller indicate that there is a fault with the corresponding BUC or LNB. In transmit-only systems, receive stream faults are not indicated. You should observe the LED indicators on the BUC for details of the alarm condition. For information on the LED indications on the BUC see Table 11 on page 59. You can connect a Hand-held Controller 6560 or a PC running terminal-emulating software to the **BUC 1 Serial** and **BUC 2 Serial** connectors on the redundancy controller, then diagnose the BUC faults as required. For more information on using the hand-held controller see the *Hand-held and Remote Controller 6560/6570 User Guide*. For more information on using serial commands on a terminal see page 63, *Serial interface commands*.

If you are using remote monitoring and control via a Remote Controller 6570, the **Fault** LED for a BUC will illuminate if a fault is detected. You can use the **Faults** menu in the remote controller to diagnose the fault, and the **Reset** menu to clear latched faults. For more information on using the remote controller see the *Hand-held and Remote Controller 6560/6570 User Guide*.

Power supply

The redundancy controller is powered from the AC mains supply.

Auxiliary I/O interface of the redundancy controller

The Auxiliary I/O interface of the redundancy controller enables you to perform the following functions remotely:

- monitor operation of the redundancy switching system using the isolated relay contacts
- switch streams using external signals

Most of the remote control functions are achieved by grounding the appropriate control signal to 0 V.

NOTE

The redundancy controller *does not* have a serial remote control facility. However, serial remote stream switching and monitoring of the redundancy system alarms are available using the BUC command set via either of the **BUC 1 Serial**/**BUC 2 Serial** connectors.

For details about the Auxiliary I/O interface of the redundancy controller see page 51, *Accessing the Auxiliary I/O interface on the redundancy controller*.

RF waveguide switches

RF waveguide switches control both the receive and transmit RF paths. The switches direct signals for both on-line and off-line BUCs and LNBs (when used). Transmit/receive C-Band systems may use either two RF waveguide switches or one combined RF waveguide/coaxial switch. Transmit/receive Ku-Band systems use two RF waveguide switches only. Transmit-only C-Band or Ku-Band systems use only a single RF waveguide switch.

Systems using two RF waveguide switches

In the receive path, a receive RF waveguide switch directs the received RF from the receive port of the antenna feed to one of the LNBs. The LNB waveguide inputs are coupled to ports 1 and 3 of the LNB switch. The switch is coupled via port 2 to the WR229 (C-Band) or WR75 (Ku-Band) receive port of the antenna. A blanking plate normally protects port 4 from the weather.

In the transmit path, a transmit RF waveguide switch directs the transmitted RF from the on-line BUC to the transmit port of the antenna feed. The RF from the off-line BUC is directed to either a coaxial or a waveguide load.

For transmit RF, the waveguide outputs of the BUCs are connected to the WR137 (C-Band) or WR75 (Ku-Band) BUC switch via short waveguide sections to ports 1 and 3. Port 2 of the switch connects to the antenna via flexible waveguide. A load or power attenuator terminates port 4 on the switch.

The redundancy controller verifies RF waveguide switching by monitoring the tell-back contacts of both switches. If the tell-back contacts indicate an abnormal condition, the **BUC Switch** or **LNB Switch** LEDs on the control panel of the redundancy controller illuminate red.

Systems using a combined RF waveguide/coaxial switch (C-Band only)

In the receive path, a receive RF waveguide switch directs the received RF from the receive port of the antenna feed to one of the LNBs.

In the transmit path, an RF coaxial switch directs the transmitted RF from the on-line BUC to the transmit port of the antenna feed. The RF from the off-line BUC is directed to an appropriately-rated termination. The combined RF waveguide/coaxial switch is controlled by a single cable, which is connected to the **LNB Switch Control** connector on the redundancy controller. The **BUC Switch Control** connector is not used. The redundancy controller automatically detects the presence of a combined switch and configures its monitoring accordingly.

The combined RF waveguide/coaxial switch combines waveguide and coaxial switching in a single assembly. The switch is an electrically operated, 4-port WR229 waveguide transfer switch, which is mechanically integrated with a 4-port coaxial transfer switch for transmit RF.

The LNBs are directly coupled to ports 1 and 3 of the combined RF waveguide/coaxial switch. The switch is coupled via port 2 to the WR229 receive port of the antenna. A blanking plate normally protects port 4 from the weather.

Coaxial cable connects the BUCs to ports 1 and 3 of the N-type switch. The transmit antenna feed connects to port 2 of the switch. A load or power attenuator connects to port 4.

The redundancy controller verifies RF waveguide switching by monitoring the tell-back contacts to the combined RF waveguide/coaxial switch. If the tell-back contacts indicate an abnormal condition, the **LNB Switch** LEDs on the control panel of the redundancy controller illuminate red.

NOTE In the combined RF waveguide/coaxial switch installation, the **BUC Switch** LEDs on the control panel of the redundancy controller will not illuminate.

Systems using a single transmit RF waveguide switch (transmit-only)

In the transmit path, a single transmit RF waveguide switch directs the transmitted RF from the on-line BUC to the transmit port of the antenna feed. The RF from the off-line BUC is directed into an appropriately-rated termination. The switch is controlled by a cable connected to the **LNB Switch Control** connector.

The switch is an electrically operated, 4-port WR137 (for C-Band) or WR75 (for Ku-Band) waveguide transfer switch. The BUCs are connected to ports 1 and 3 of the switch. The switch is coupled via port 2 to the transmit port of the antenna. A load or power attenuator connects to port 4.

The redundancy controller verifies RF waveguide switching by monitoring the tell-back contacts to the RF waveguide switch. If the tell-back contacts indicate an abnormal condition, the **BUC Switch** LEDs on the control panel of the redundancy controller illuminate red.

The Remote Controller 6570 and Hand-held Controller 6560

The Remote Controller 6570 provides remote control and monitoring facilities of the BUCs at a convenient indoor location. The remote controller is connected via its **BUC Interface** connector to the **Auxiliary I/O** connector on the redundancy controller using the cable supplied.

The Hand-held Controller 6560 provides local control and monitoring facilities of the BUCs at the outdoor-mounted redundancy controller. A hand-held controller may be connected to the **BUC 1 Serial** or **BUC 2 Serial** connector. Alternatively, a BUC may be directly controlled by the hand-held controller by disconnecting the M/C cable from the **M/C** connector on the BUC, and connecting the hand-held controller in its place.

2 Installation

This section contains the following topics:

Unpacking the equipment

Ensure that the packing boxes are upright as indicated by the printing on the boxes. Open each box and check for signs of damage to the equipment. If you notice any damage, contact Codan immediately to obtain an RMA. Failure to contact Codan before returning the unit may result in any warranty being void.

Installing the BUC equipment

All equipment that is mounted outdoors *must* be adequately weatherproofed.

WARNING Ensure all waveguide joints are properly sealed with the appropriate gasket.

Use self-amalgamating tape to seal connectors and cable entry points from the connector to the cable sheath.

CAUTION Water is the most common cause of poor performance in VSAT installations. Ensure that all cables and waveguide junctions are properly sealed.

WARNING A radiation hazard exists if the BUC is operated with its RF output unterminated (see page 123, *Radiation safety*).

TRF and LNB

The TRF and LNB are normally mounted directly on the antenna feed structure.

The LNB obtains the required +15 to +24 V DC power and, in certain cases, the 10 MHz reference signal from a compatible L-Band modem. The modem is connected to the receive output connector of the LNB.

BUC

BUCs are supplied with either N-type or waveguide outputs. A mounting kit is supplied with the BUC. Some mounting kits allow the BUC to be mounted on the boom or pedestal of the antenna. Other kits may also be available for different mounting options. Contact your antenna manufacturer if you have specific installation requirements.

Cables

Use an IF coaxial cable to connect the modem to the BUC (see page 32, *Cable recommendations*). It is recommended that you use the same type of cable to connect the modem to the LNB.

If you are using the RS232/422 serial interface, use an M/C cable to connect the BUC to a PC (see page 40, *Monitor and control interface of the BUC*).

DC power connection

There are two types of BUCs that are DC-powered: those powered via the **IF INPUT** connector, and those powered via an external connector.

BUCs that are powered via the **IF INPUT** connector receive DC power from a source via the IF cable. See BUC specifications or compare your BUC model number against Table 27 on page 111 for the exact voltage range of your BUC.

BUCs that are externally powered from a DC source require appropriate DC power from an external source. See BUC specifications or compare your BUC model number against Table 27 on page 111 for the exact voltage range of your BUC.

NOTE

Certain BUCs with external DC power connectors may also have auto-sensing circuits, and can be powered from either the external connector or via the **IF INPUT** connector. If both connectors are powered, the external connector is automatically selected.

AC mains connection

AC-powered BUCs operate with any AC input voltage in the range 115–230 V AC. Check BUC specifications for the exact voltage range of your BUC.

WARNING

Voltages outside of these limits may cause damage to the BUC.

To connect the BUC to the AC mains:

- ❑ Connect the AC power lead to the AC mains supply.

  WARNING

  Before applying power to the BUC, ensure that the installation complies with the safety precautions listed on page 123, *Electromagnetic compatibility and safety notices*.

- ❑ Ensure the isolating switch for the AC supply is switched off.
- ❑ Connect the AC power lead to the **AC INPUT** connector on the BUC.

If you need to make your own AC mains cable, or reterminate the cable supplied, Table 8 lists the pin connections and describes the input functions available on the **AC INPUT** connector on the BUC.

Table 8: Pinouts of the AC INPUT connector (Amphenol T 3110 000)

Pin	Description
1	Neutral
2	Not connected
3	Active
	Protective earth

It is recommended that BUCs are installed as close as possible to the antenna feed to minimise losses.

CAUTION Heavier BUCs may need to be mounted further down the boom to minimise the mechanical leverage load on the antenna.

If the waveguide output of each BUC is attached directly to the RF waveguide switch with a rigid connection, ensure that there are no undue stresses on the waveguide section when the flange hardware is tightened. Tighten the BUC mounting screws last. The long mounting rails have oversized holes to enable the BUC to be secured in the exact position required, which avoids stressing the rigid waveguide component.

Cable recommendations

Table 9 lists the recommended specifications for IF coaxial cables used in your system. These specifications place restrictions on the maximum length of the transmit IF cable. The limiting factor is most likely the 20 dB maximum cable loss. Cables that have 20 dB cable loss at L-Band frequencies usually have DC loop resistances much less than those shown below.

Table 9: Recommendations for IF coaxial cables

Characteristic	Recommendation
Cable loss at operating frequency	20 dB maximum
DC loop resistance	2 Ω maximum (+48 V BUC) 1 Ω maximum (+24 V BUC)
Screening	100 dB minimum
Nominal impedance	50 Ω
Connectors	BUC end: N-type male connector Indoor end: connector to suit the modem used

Cable loss specification

The recommended maximum cable loss is derived from the maximum output power normally provided by modems and the maximum gain of the BUC.

DC loop resistance specification

The maximum DC loop resistance is determined by the DC power drawn by a BUC and its minimum operating input voltage. Some BUCs are not powered via the cable, so the DC loop resistance of the IF cable is not a consideration for such BUC installations.

CAUTION To ensure correct operation, the DC loop resistance figure must not be exceeded.

Cable screening specification

Cable screening is derived from regulatory requirements related to the radiation of spurious signals from the antenna. Screening is more critical if the BUC is co-located with other radio transmitting equipment, for example, mobile-phone towers.

Cable lengths

Table 10 shows the maximum lengths of different types of cables to ensure the 20 dB loss recommendation is not exceeded. The cable lengths are shown in metres and feet.

Table 10: Cable lengths resulting in a 20 dB loss

Frequency (MHz)	RG223 (m (ft))	Belden 9914 (m (ft))	Belden 9913F (m (ft))	Times Microwave LMR-400 (m (ft))
950	43 (141)	104 (341)	125 (410)	150 (492)
1450	34 (111)	81 (266)	99 (325)	120 (394)
1700	31 (102)	74 (243)	91 (299)	111 (364)
1750	31 (102)	73 (240)	89 (292)	109 (358)

IF levels

The figures and tables in this section show the single carrier IF levels required to achieve rated P1dB output power from the BUC using various types and lengths of IF cables. Your actual IF levels may be different from those shown if you are operating with multiple carriers and you require output back off to control intermodulation product levels.

Examples are provided for short cables (with a 3 dB loss) and long cables (with a 20 dB loss).

The figures in this section are provided as examples only. You should determine the loss of your selected cable from its length and your operating frequency (see Table 10 on page 33). You can then set the modem IF output level and the BUC attenuator to achieve the required output power.

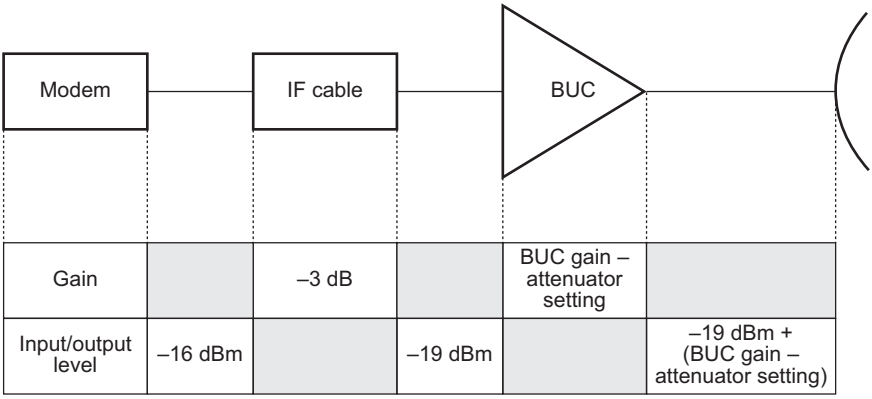
As a general principle, you should set the BUC attenuator at the highest possible attenuation setting given the available modem IF output power and the cable loss. This reduces the susceptibility of the system to external interference.

Using short IF cables

Figure 11 shows the IF levels required when using short IF cables such as the following:

- 5 m RG223
- 12 m 9914
- 15 m 9913F
- 18 m LMR-400

Figure 11: IF levels required for short cables



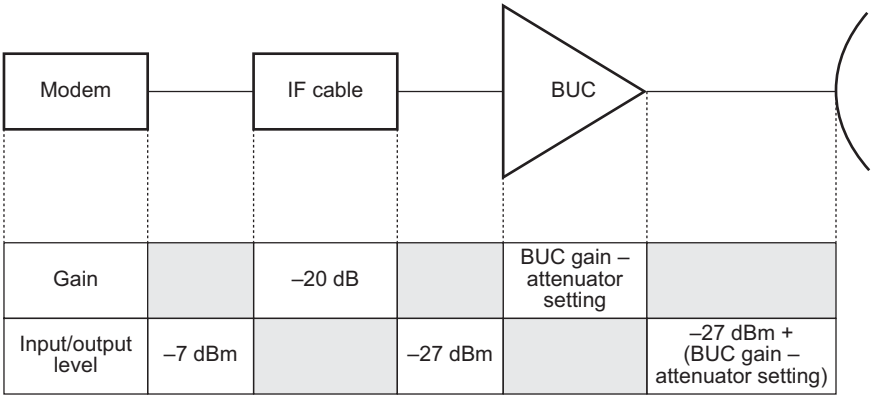
Refer to the relevant specifications sheets for the detailed specifications for your BUC

Using long IF cables

Figure 12 shows the IF levels required when using long IF cables such as the following:

- 34 m RG223
- 80 m 9914
- 100 m 9913F
- 120 m LMR-400

Figure 12: IF levels required for long cables



Refer to the relevant specifications sheets for the detailed specifications for your BUC

Serial interfaces

The following serial interfaces are provided:

- RS232 and RS422/485 available on the **M/C** connector on the BUC
- FSK available on the **IF INPUT** connector on the BUC

RS232 interface

The RS232 serial interface supports both the ASCII and the Codan packet protocols simultaneously. Responses to commands are returned in the same protocol format as they are sent. The RS232 serial interface operates with the following parameters:

data rate	9600 bps
word length	8 bits
parity	none
stop bit	1

The fixed data rate and protocol simplifies the connection during installation and commissioning, and enables a PC running a terminal-emulation program to be used to configure the BUC. For information on protocols, contact your Codan representative.

The BUC is able to detect the connection of an RS232 interface. When an RS232 interface is used, the BUC inhibits the use of the Set and Reset commands on the RS422/485 and FSK interfaces. View and Output commands can still be used on these interfaces. This functionality is provided for safety reasons.

NOTE If you disabled transmission, don't forget to re-enable it before you remove the RS232 connection.

For example, a technician working on a BUC at the antenna can make an RS232 connection and disable transmissions. Transmissions cannot be re-enabled at another source, but the other interfaces can still monitor the BUC parameters. When the RS232 connection is removed and transmission is restored using the RS232 interface, normal monitor and control operation is restored.

RS422/485 interface

The RS422/485 interface can be operated in either 2-wire or 4-wire mode. The RS422/485 interface enables monitor and control of the BUC over long distances using other protocols that are not available for use with the RS232 interface.

FSK interface

The FSK interface enables monitor and control of the BUC over long distances using other protocols that are not available for use with the RS232 interface. The FSK interface does not require an extra monitor and control serial cable, but does require a modem with FSK monitor and control capability. If an appropriate modem is not available, contact your Codan representative to find out what accessories are available to access the FSK interface.

Connecting the serial interface

To set the operating parameters of the BUC, the BUC must be connected to a terminal (for example, a Hand-held Controller 6560, a Remote Controller 6570, a PC, or an organiser emulating a terminal).

The connection may be permanent as part of the installation or temporary for the purpose of setting the operating parameters of the BUC.

Permanent interface connection

A permanent interface connection can be provided via the monitor and control interface of the BUC (see Figure 13 on page 41). The RS232 serial interface may only be used for distances less than 15 m. The RS422/485 serial interface may be used for distances up to approximately 1 km.

The Remote Controller 6570 is designed as a permanent interface connection and is supplied with a standard 50 m cable.

Temporary interface connection

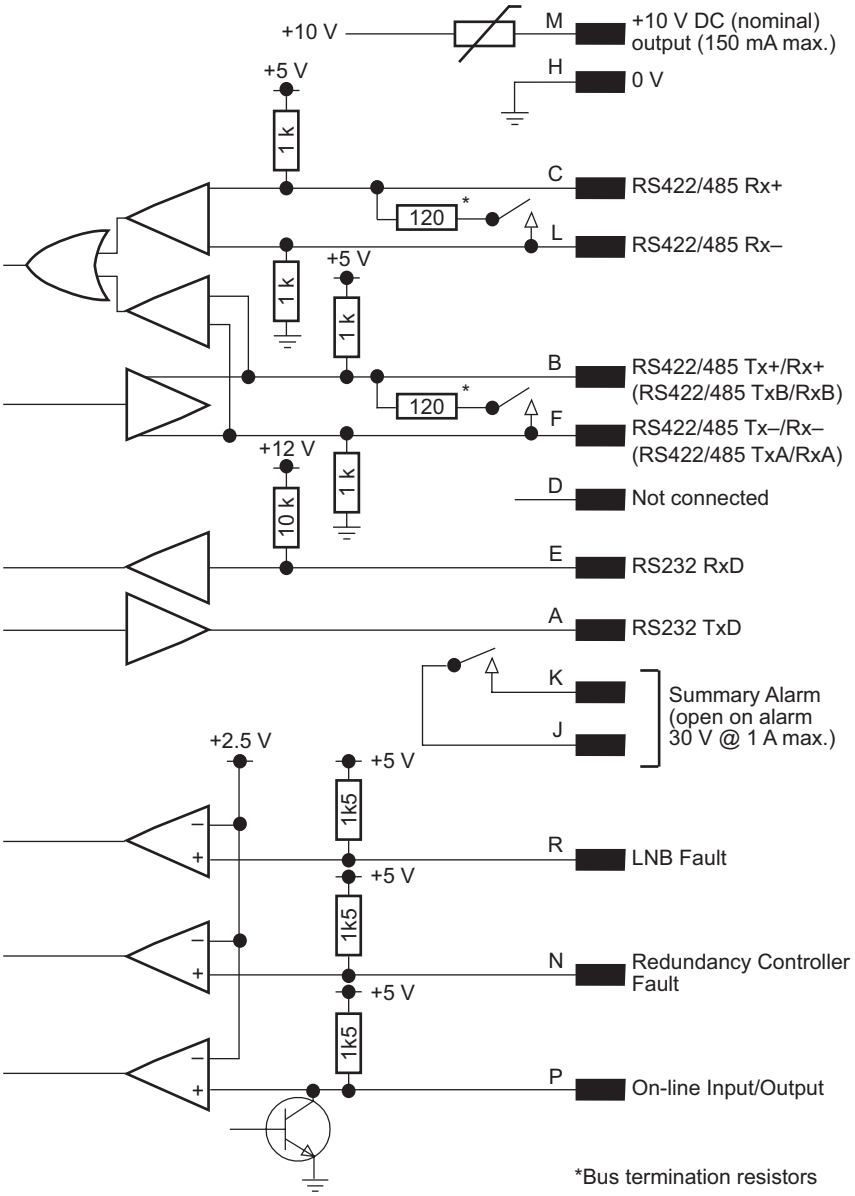
A serial interface cable is available to connect the BUC to the RS232 serial port of a PC or an organiser emulating a terminal, or you may connect a Hand-held Controller 6560.

If using a PC, connect the cable between the **M/C** connector of the BUC and the serial port of the PC. This cable provides a 14-way female MS-style connector to 9-way D-type female connector for connection to the PC. If connection to a 25-way D-type serial port is required, use a standard 25-way female to 9-way male adaptor.

Monitor and control interface of the BUC

The monitor and control interface of the BUC provides a relay contact to indicate the fault status of the BUC. See Figure 13 for the pin assignments of the **M/C** connector. A MIL-C-26482 12-14P connector (for example, MS3116F12-14P) is required to mate with the **M/C** connector.

Figure 13: Monitor and control interface of the BUC



Installing the redundancy system

Mounting the redundancy controller

The redundancy controller has two mounting flanges. Each flange has 10 mounting holes. If you are going to use the mounting kit supplied, fitting instructions are provided in the kit.

Mount the redundancy controller upright on or near the antenna structure. A protected position is preferable however, the redundancy controller can withstand exposure to outdoor conditions.

Installing separate transmit and receive RF waveguide switches

WARNING Handle the switches with care. They are easily damaged.

Transmit RF waveguide switch

To install the transmit RF waveguide switch (BUC switch):

- ❑ Connect ports 1 and 3 of the transmit RF waveguide switch to the BUC outputs using the waveguide sections and flange kits as shown in the mounting drawings.

NOTE In C-Band installations, use the appropriate flange kit.

NOTE In Ku-Band installations, ensure the appropriate o-ring is used, otherwise sealing will be compromised or correct mating of the waveguide flanges will not be possible.

- ❑ Connect port 2 of the transmit RF waveguide switch to the transmit flange of the antenna feed using gasket kits and rigid or flexible waveguide as appropriate.

NOTE — If connecting the Ku-Band transmit RF waveguide switch to a waveguide section that has clearance holes for 6-32 UNC hardware, a waveguide adaptor kit is available.

- ❑ Connect the off-line BUC load to port 4 of the transmit RF waveguide switch as shown in the mounting drawings.

CAUTION — Ensure all joints are completely weatherproof.

NOTE — Spare flange kits are provided with the redundancy package. The universal Ku-Band flange kit contains a selection of flat gaskets and circular cross-section gaskets (both large and small cross-sectional diameter).

- ❑ In transmit-only systems, fit the transmit-only connector assembly to the **LNB Switch Control** connector.
- ❑ Connect the transmit RF waveguide switch to the **BUC Switch Control** connector using the cable supplied.

Receive RF waveguide switch (transmit/receive systems only)

To install the receive RF waveguide switch (LNB switch):

- ❑ Fit the TRF (if used) to the receive port of the antenna feed using the appropriate flange kit for C-Band and Ku-Band, selecting the correct gasket.
- ❑ Hold waveguide port 2 of the receive RF waveguide switch against the receive port of the antenna feed or TRF (if fitted). Decide which way the switch is to face.
- ❑ For Ku-Band installations, attach the 2" rigid WR75 waveguide sections to ports 1 and 3 of the receive RF waveguide switch using the appropriate flange kit.
- ❑ Attach the LNBs to:
  - ports 1 and 3 of the receive RF waveguide switch using the appropriate flange kit for C-Band
  - the 2" rigid waveguide sections using the appropriate flange kit for Ku-Band

  NOTE — For Ku-Band installations, ensure the appropriate o-ring is used, otherwise sealing will be compromised or correct mating of the waveguide flanges will not be possible.

- ❑ Clamp the gaskets tightly to ensure perfect seals.
- ❑ If the blanking plate was not factory fitted, attach it to port 4 of the receive RF waveguide switch using the appropriate flange kit.
- ❑ If you want to allow for dry air pressurisation, fit the supplied air nozzle to the blanking plate. If this is not required, fit the M5 screw with seal into the blanking plate.
- ❑ Attach the receive RF waveguide switch to the receive port of the antenna feed using the appropriate flange kit.

If connecting the Ku-Band receive RF waveguide switch to a receive port of the antenna feed that has clearance holes for 6-32 UNC hardware, a waveguide adaptor kit is available.

NOTE

Spare flange kits are provided with the redundancy package. The universal Ku-Band flange kit contains a selection of flat gaskets and circular cross-section gaskets (both large and small cross-sectional diameter).

- ❑ Connect the receive RF waveguide switch to the **LNB Switch Control** connector using the cable supplied.

Installing the combined RF waveguide/coaxial switch (C-Band transmit/receive systems only)

WARNING Handle the switch with care. It is easily damaged.

To install the combined RF waveguide/coaxial switch:

- ❑ Fit the TRF (if used) to the receive port of the antenna feed using the appropriate flange kit.
- ❑ Hold waveguide port 2 of the combined RF waveguide/coaxial switch against the antenna receive feed. Decide which way the switch is to face.
- ❑ Attach the LNBs to ports 1 and 3 of the RF waveguide section of the switch using the appropriate flange kit.
- ❑ Clamp the gaskets tightly to ensure perfect seals.
- ❑ If the blanking plate was not factory fitted, attach it to port 4 of the waveguide section of the switch using the appropriate flange kit (see the mounting and interconnection drawings).

- ❑ If you want to allow for dry air pressurisation, fit the supplied air nozzle to the blanking plate. If this is not required, fit the M5 screw with seal into the blanking plate.
- ❑ Connect the off-line BUC termination to port 4 of the coaxial section of the switch as shown in the mounting and interconnection drawings.

  NOTE In some configurations, the termination consists of multiple parts.

- ❑ Connect the outputs of the BUCs to the corresponding N-type connectors of the coaxial section of the switch using the coaxial cables supplied.
- ❑ Connect port 2 of the coaxial section of the switch to the transmit port of the antenna feed using the coaxial cable supplied.
- ❑ Seal all N-type connections with self-amalgamating tape.

  CAUTION Ensure all joints are completely weatherproof.

  NOTE Spare flange kits are supplied with the redundancy package to provide for various installation requirements.

- ❑ Connect the combined RF waveguide/coaxial switch to the **LNB Switch Control** connector using the cable supplied.

  NOTE The **BUC Switch Control** connector is not used in this configuration.

Connecting the power cables

The redundancy controller is AC mains powered.

To connect the power cable to the redundancy controller:

- ☐ Connect the supplied cable to the **AC Power Input** connector on the redundancy controller.

Connecting the control cables

To connect the control cables:

- ❑ Connect the **BUC 1 Control** connector and the **BUC 2 Control** connector on the redundancy controller to the corresponding **M/C** connector on each BUC using the control cables supplied.

  For high-power BUC systems, connect the **BUC 1 Control** connector and the **BUC 2 Control** connector on the redundancy controller to the corresponding **M/C** connector on each BUC *and* the corresponding **CONTROL** connector on each high-power SSPA using the specific control cables supplied.

Connecting the IF from the redundancy controller to the BUCs

To connect the IF cables:

- ❑ Connect the **Tx IF Output 1** connector and the **Tx IF Output 2** connector on the redundancy controller to the corresponding **IF INPUT** connector on each BUC using the coaxial cables supplied.

Connecting the IF cables between an L-Band IF modem (or other equipment) and the redundancy controller

To connect the IF cables:

- ❑ Connect the transmit IF output connector on the L-Band IF modem (or other equipment) to the **Tx IF Input** connector on the redundancy controller using a suitable coaxial cable.
- ❑ In systems other than transmit-only, connect the receive IF input connector on the L-Band IF modem (or other equipment) to the **Rx IF Output** connector on the redundancy controller using a suitable coaxial cable.

Connecting the IF from the LNBs to the redundancy controller

To connect the IF cables:

- ❑ Connect the corresponding N-type IF output connector on each LNB to the **Rx IF Input 1** connector and the **Rx IF Input 2** connector on the redundancy controller using the coaxial cable supplied.

Grounding the installation

To ground the installation:

- ❑ Connect a separate earth strap from the protective earth terminal on each unit directly to the common earth stake.

Serial interfaces of the BUCs from the redundancy controller

The **M/C** connector on each BUC includes the serial interface of the BUC. Although the redundancy controller plugs into this connector, the redundancy controller uses relay contacts to communicate with the BUC.

You can access the serial interface of each BUC via the 14-way **BUC 1 Serial** or **BUC 2 Serial** connector on the redundancy controller. These connectors are suitable for temporary connection of a PC or Hand-held Controller 6560 as they have the same RS232 serial pin connections as the **M/C** connector on the BUC.

The RS485 serial interfaces for both BUCs are included in the 19-way **Auxiliary I/O** connector interface of the redundancy controller for remote monitor and control applications via the Remote Controller 6570.

Accessing the Auxiliary I/O interface on the redundancy controller

Remote control and monitoring of the redundancy switching system is accessible via the 19-way **Auxiliary I/O** connector on the redundancy controller.

To use this 19-way connector, you need a 19-way Mil-C-26482 series plug, part number MS3116J14-19P.

Figure 14 on page 52 shows the monitor and control interface at the **Auxiliary I/O** connector of the redundancy controller. Contacts are shown in their de-energised state.

Relay contacts indicate the following faults and operational status of the redundancy system (the four relay contacts share a common contact connection):

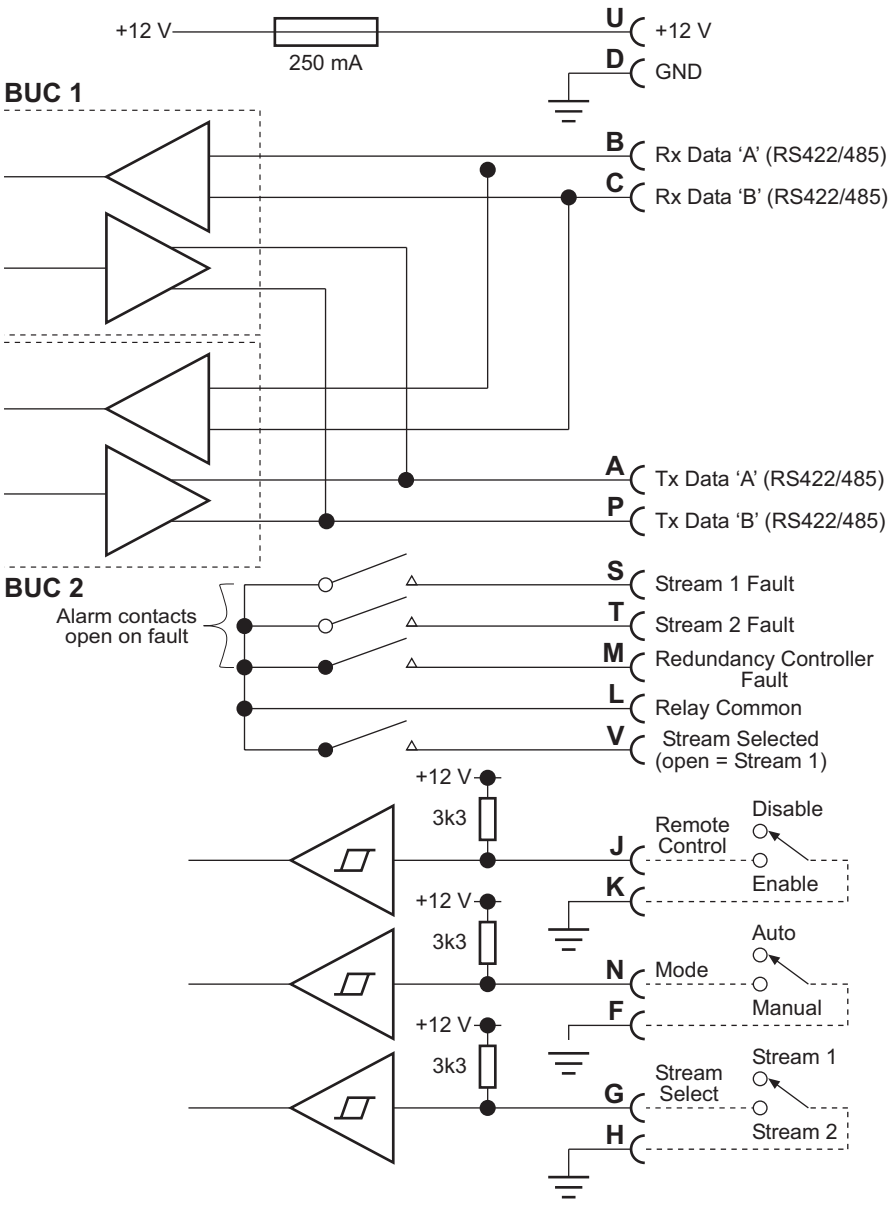
- Stream 1 Fault
- Stream 2 Fault
- Stream Selected
- Redundancy Controller Fault

Inputs are provided to allow remote control via contact closures:

- control source
- Auto or Manual Mode
- stream selection

The RS485 connections parallel the two BUC RS485 interfaces to enable remote control of both BUCs using a Remote Controller 6570, or using serial commands with a PC running terminal-emulating software.

Figure 14: Auxiliary I/O interface of the redundancy controller



Setting up the redundancy switching equipment

To set up the redundancy switching equipment:

- ❑ Set the AC voltage selector on the control panel of the redundancy controller to the appropriate voltage for your operating environment.
- ❑ Switch on the modem(s), then switch off the carrier(s).
- ❑ Apply power to the redundancy controller and the BUCs.
- ❑ Connect a Hand-held Controller 6560 to the **BUC 1 Serial** connector, then to the **BUC 2 Serial** connector on the redundancy controller, and set the following parameters:

Parameter	Menu	Setting
Tx state	Control	**Tx off** (initially)
Redundancy mode	Auxiliary	**Hot standby** (preferred) **Warm standby**
IF comp freq/**RF comp freq**	Main	Both BUCs must have the same settings
Tx attenuation	Main	
LO	Auxiliary	
Tx default	Auxiliary	

Parameter	Menu	Setting
Serial parity	Auxiliary	For information on the required serial parameters for a Remote Controller 6570 see the *Hand-held and Remote Controller 6560/6570 User Guide*
Serial stop bits	Auxiliary	
RS485 termination	Auxiliary	
Serial protocol	Auxiliary	
Serial address	Auxiliary	
Serial echo	Auxiliary	

- ❑ Set the **Online state** of the required BUC to **Online**.
- ❑ Set the **Tx state** of both BUCs to **Tx on**.

NOTE If the **Redundancy mode** is **Warm standby**, the output from the power amplifier in the off-line BUC is not enabled.

NOTE High-power SSPAs in a high-power BUC system must be configured for stand-alone use in BUC stream redundancy. For more information on high-power systems see the relevant SSPA documentation.

The control panel of the redundancy controller shows the stream selection states. All fuse LEDs and **BUC**/**LNB** LEDs should be green.

NOTE In transmit-only systems, the **LNB** fuse LEDs remain green and the **LNB 1** and **LNB 2** LEDs are always off.

NOTE In C-Band systems that use a combined RF waveguide/coaxial switch, the **BUC 1** and **BUC 2** LEDs are always off.

Connecting the remote controller

The optional Remote Controller 6570 is connected to the **Auxiliary I/O** connector on the redundancy controller using a 19-way cable.

NOTE

Before connecting a Remote Controller 6570, you should ensure that the serial address and packet protocol in each BUC has been set up correctly using a Hand-held Controller 6560, or other serial device such as a PC. For more information see the *Hand-held and Remote Controller 6560/6570 User Guide*.

To connect the remote controller:

- ❑ Plug the 25-way D-type socket on the 19-way cable into the **BUC Interface** connector on the rear of the remote controller.
- ❑ Plug the 19-way MS plug on the 19-way cable into the **Auxiliary I/O** connector on the redundancy controller.

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3 Setting up and operating the BUC system

This section contains the following topics:

Switching on the BUC

CAUTION Ensure that the modem provides the correct DC voltages to power the particular BUC and LNB models being used.

To switch on the BUC:

- ❑ Switch on the modem, and if you have installed an externally-powered BUC, switch on the power to the BUC.
- ❑ If you need to set up the BUC, switch off the carrier at the modem.

  Connect the BUC to a PC (see page 39, *Connecting the serial interface*), then set up the BUC using the Set commands in Table 14 on page 65.

  Switch on the carrier at the modem.

LED indicators

There are three LED indicators on the BUC. These LEDs indicate the state of the BUC (see Table 11).

Table 11: LED indicators on the BUC and their states

LED	State	Indicates...
PWR	Green	Power is supplied to the BUC
Tx	Yellow	The BUC PA is on
FLT	Off	No faults or latched faults are present
	Constant red	One or more of the following hardware faults have been detected in the BUC: • overtemperature fault (> 90°C) • PA fault • LO fault • fan fault • output power threshold • hardware/firmware incompatibility For information on fault finding see page 81, *Maintenance and fault finding*
	Flashing red (2 flashes every second)	One or more of the following faults have been detected in the system: • an external fault in the LNB (when in redundancy configuration only) • an external fault in the redundancy controller (when in redundancy configuration only) • a non-volatile memory fault in the BUC
	Flashing red (1 flash every 2 seconds)	The fault information from a latched fault has been stored, however the fault is no longer present (firmware V1.10 or earlier)

NOTE Use the **VFS** command to view the fault status.

The control panel of the redundancy controller has groups of LEDs that indicate the status of the redundancy system and its fuses.

Table 12: LED indicators on the control panel of the redundancy controller

LED	Colour	Indicates...
BUC 1	green	BUC 1 is OK In a high-power BUC system, the BUC and high-power SSPA in Stream 1 are OK
	red	BUC 1 or LNB 1 is faulty In a high-power BUC system, the BUC, high-power SSPA or LNB in Stream 1 is faulty
BUC 2	green	BUC 2 is OK In a high-power BUC system, the BUC and high-power SSPA in Stream 2 are OK
	red	BUC 2 or LNB 2 is faulty In a high-power BUC system, the BUC, high-power SSPA or LNB in Stream 2 is faulty
LNB 1	green	LNB 1 is OK
	red	LNB 1 is faulty
LNB 2	green	LNB 2 is OK
	red	LNB 2 is faulty
BUC Switch	green	BUC transmit waveguide switch is OK (LED pairs indicate switch position)
	red	Switch is faulty (all four LEDs are red)
LNB Switch	green	LNB receive waveguide or combined transmit/receive switch is OK (LED pairs indicate switch position)
	red	Switch is faulty (all four LEDs are red)

Table 12: LED indicators on the control panel of the redundancy controller (cont.)

LED	Colour	Indicates...
Redundancy Controller Status	green	Redundancy system and switches are OK
	red	Redundancy system is faulty or switches are inconsistent
Remote Controller fuse	green	Remote controller fuse OK
	red	Remote controller fuse has blown
BUC 1/**BUC 2** fuse	green	BUC 1 or BUC 2 fuse is OK
	red	BUC 1 or BUC 2 fuse has blown
LNB 1/**LNB 2** fuse	green	LNB 1 or LNB 2 fuse is OK
	red	LNB 1 or LNB 2 fuse has blown

NOTE The **LNB 1**, **LNB 2** and **LNB Switch** LEDs are fitted, but not operational in transmit-only systems.

Serial interface monitor and control

To view or change the operating parameters of the BUC, the BUC must be connected to a terminal (for example, a Hand-held Controller 6560, a Remote Controller 6570, a PC, or an organiser emulating a terminal).

To establish communications between the PC and the BUC see page 39, *Connecting the serial interface*.

For more advanced remote control applications, contact your Codan representative.

The BUC is monitored and controlled using 3-letter operating commands followed, in some cases, by data. These commands are described in Table 13 to Table 17.

NOTE

The commands listed in Table 13 to Table 17 are used with common installations. If you have other requirements for your installation, contact your Codan representative for the facilities and commands available.

Serial interface commands

This section describes the serial interface commands you can use to set parameters and display information about the BUC. The descriptions given are based on using ASCII protocol.

The commands consist of a 3-letter mnemonic and, in some cases, command data.

Generally, the first letter of the command determines the type of command (that is, H = Help, S = Set, O = Output, V = View, R = Reset) and the last two letters uniquely define the command.

The BUC is insensitive to the case of the command text.

NOTE For example output of a command set see page 115, *Example outputs for the View commands*.

For the...	See...
Help commands	Table 13 on page 64
Set commands	Table 14 on page 65
Output commands	Table 15 on page 72
View commands	Table 16 on page 73
Reset commands	Table 17 on page 74

Table 13: Help commands

Command	Function	Enter...	Data required
Help	Lists the Help commands.	HLP	None
Help for Set commands	Lists the Set commands and the possible settings. NOTE Some settings are dependent on the model of the BUC, or another setting.	HSC	None
Help for Output commands	Lists the Output commands.	HOC	None
Help for View commands	Lists the View commands.	HVC	None
Help for Reset commands	Lists the Reset commands.	HRC	None

Table 14: Set commands

Command	Function	Enter...	Data required
Set transmit on	Switches transmit on or off by controlling the PA of the BUC. To switch on the PA, all three serial interfaces (RS232, RS422/485 and FSK) must be set to **STO1**. **STO1** is the default setting for all of the serial interfaces. A built-in safety feature only allows transmit to be switched on via the interface that was used to switch it off originally. **STO1** cannot be used to switch on transmit if an internal fault has occurred in the BUC. NOTE For CE-certified operation you must set the transmit default state to Off (**STD0**). When **STD0** is used (see page 69, *Set transmit default*), you must use **STO1** after powerup to switch transmit on.	STOn	n = 0, switches transmit off n = 1, switches transmit on

Table 14: Set commands (cont.)

Command	Function	Enter...	Data required
Set compensation frequency	Sets either the IF or RF compensation frequency of the carrier in MHz. The BUC determines from the value entered whether you have set the IF or RF compensation frequency, and calculates the corresponding RF or IF compensation frequency. The IF or RF compensation frequency range is dependent on the model of the BUC and the LO setting. The BUC uses the specified RF frequency for the internal temperature compensation and other calibration functions. It does not affect the carrier frequency. If the carrier frequency is unknown, set the IF or RF compensation frequency to zero. If multiple carriers are being transmitted and the frequency is limited to a narrow band (for example, over one transponder), set the IF or RF compensation frequency to the nominal centre frequency of the operating band.	SCFn	For C-Band Standard and Extended frequency band BUCs: LO = 7300 MHz IF: 950 ≤ n ≤ 1450 RF: 5850 ≤ n ≤ 6350 LO = 7375 MHz IF: 950 ≤ n ≤ 1525 RF: 5850 ≤ n ≤ 6425 LO = 7600 MHz IF: 950 ≤ n ≤ 1750 RF: 5850 ≤ n ≤ 6650 LO = 7675 MHz IF: 950 ≤ n ≤ 1750 RF: 5925 ≤ n ≤ 6725 For Ku-Band Standard and Extended frequency band BUCs: LO = 15450 MHz IF: 950 ≤ n ≤ 1700 RF: 13750 ≤ n ≤ 14500 LO = 15450 MHz IF: 950 ≤ n ≤ 1450 RF: 14000 ≤ n ≤ 14500 Use n = 0 for broadband operation (this forces broadband calibration data to be used)

Table 14: Set commands (cont.)

Command	Function	Enter...	Data required
Set transmit attenuator	Sets the transmit attenuator of the BUC in dB. To minimise the possible effects of interference it is preferable to have a high transmit attenuation and a high IF level from the modem. Therefore, the BUC attenuator should be set as high as possible, consistent with the required BUC output power, transmit IF cable loss and maximum IF output level capability of the modem.	STAn	n = 0 to 12 dB Certain firmware versions allow 4 dB steps, while other firmware versions allow 1 dB steps.
Set transmit power alarm threshold	Sets the transmit power alarm threshold in dBm. The allowable threshold range depends upon the model of the BUC. Use **VLD** to display the upper and lower limits of the allowable range for your BUC (see page 73, *View limit data*). If the transmit power falls below the set threshold, a transmit power alarm is generated.	SATn	n = value within the allowable threshold range for your BUC n = 0, disables the transmit power alarm

Table 14: Set commands (cont.)

Command	Function	Enter...	Data required
Set burst mode power threshold	Sets the burst mode power threshold in dBm. NOTE When you set a new burst mode power threshold, the current, minimum and maximum burst power readings are reset to zero (see page 72, *Output burst powers*). You can set the threshold level above which transmitted TDMA bursts or similar signals are recorded. The allowable threshold range depends upon the model of the BUC. Use **VLD** to display the upper and lower limits of the allowable range for your BUC (see page 73, *View limit data*).	SBTn	n = value within the allowable threshold range for your BUC n = 0, disables burst detection

Table 14: Set commands (cont.)

Command	Function	Enter...	Data required
Set local oscillator	Sets the LO frequency in MHz. NOTE Before you change the LO setting you should switch off transmission using **STO0**. NOTE It is not necessary to use **SLOn** with Ku-Band BUCs as they only have one LO frequency.	SLOn	For C-Band Standard frequency range BUCs: n = 7300 or 7375 MHz For C-Band Extended frequency band BUCs: n = 7300, 7375, 7600 or 7675 MHz
Set transmit default	Sets the default transmit state at powerup. NOTE For CE-certified operation you must set the transmit default state to Off (**STD0**). When **STD0** is used you must use **STO1** after powerup to switch transmit on (see page 65, *Set transmit on*).	STDn	n = 0, keeps transmit off (that is, PA off) at powerup n = 1, returns to transmit state prior to last powerdown
Set redundant mode	Sets the BUC to operate in a redundancy system. NOTE For a system without redundancy you must always set the redundant mode to zero.	SRMn	n = 0, system without redundancy n = 1, warm standby system n = 2, hot standby system

Table 14: Set commands (cont.)

Command	Function	Enter...	Data required
Set on line	Sets the on-line or off-line state of the BUC in a warm standby or hot standby redundant system, that is, **SRM1** or **SRM2** has been set. NOTE If a BUC is forced off line when the alternative BUC in the redundancy system is faulty, the redundancy system automatically switches the non-faulty BUC back on line.	SOLn	n = 0, forces the selected BUC off line n = 1, forces the selected BUC on line
Set serial interface	Sets the data format of the RS422/485 and FSK serial interfaces. The data format for these interfaces cannot be set independently. This command can only be used on the RS232 port.	SSIr,w, p,s,t	r = baud rate (1200, 2400, 4800, 9600, 19200) w = word length in bits (7 or 8) p = parity N/n (none), E/e (even), O/o (odd) s = number of stop bits (1 or 2) t = RS422/485 bus terminated or unterminated (T/t, U/u)

Table 14: Set commands (cont.)

Command	Function	Enter...	Data required
Set packet protocol	Sets the packet protocol used on the RS422/485 and FSK serial interfaces. The packet protocols for these interfaces cannot be set independently. This command can only be used on the RS232 port.	SPPn	n = 0, ASCII protocol n = 1, Codan protocol n = 2, SAbus protocol n = 3, Comstream protocol n = 4, NDSatcom protocol
Set packet address	Sets the packet address. The packet address range depends on the packet protocol selected (see page 71, *Set packet protocol*). For information on protocols, contact your Codan representative.	SADn	$1 \leq n \leq 126$, Codan protocol $49 \leq n \leq 111$, SAbus protocol $1 \leq n \leq 31$, Comstream protocol $1 \leq n \leq 15$, NDSatcom protocol
Set echo	Switches the echoing of characters on or off in ASCII protocol mode on the RS232 interface only. Echo is always off on the FSK and RS422/485 interfaces.	SECn	n = 0, disables echoing n = 1, enables echoing

Table 15: Output commands

Command	Function	Enter...	Data required
Output power output	Displays the RF power output of the BUC in dBm. If the output power is less than the lower limit, 0.0 dBm is displayed. If the output power is greater than the upper limit, 99.9 dBm is displayed.	OPO	None
Output burst powers	Displays the current, minimum and maximum burst output powers of the BUC in dBm. If the burst power is less than the lower limit, 0.0 dBm is displayed. If the burst power is greater than the upper limit, 99.9 dBm is displayed.	OBP	None

Table 16: View commands

Command	Function	Enter...	Data required
View system status	Displays the status and parameter settings of the BUC.	VSS	None
View operational data	Displays the operational data of the BUC.	VOD	None
View fault status	Displays the fault status of the BUC. In a transmit/receive redundancy system it also displays the fault status of the LNB and the redundancy controller. It displays both current faults and latched faults (that is, faults that have previously occurred but may have cleared).	VFS	None
View identity and configuration data	Displays the identification and configuration data of the BUC.	VID	None
View limit data	Displays the frequency and power ranges for the BUC.	VLD	None
View protocol data	Displays the serial interface protocol information.	VPD	None
View build standard data	Displays the build standard information of the BUC.	VBS	None

Table 17: Reset commands

Command	Function	Enter...	Data required
Reset	Resets the BUC settings to the settings at powerup (that is, it has the same effect as switching the power off then on again). The maximum and minimum readings for the burst mode power are cleared, the LO synthesiser is reloaded and, if the transmit default state is set to off, the PA of the BUC is switched off.	RST	None
Reset latched faults	Clears all latched faults except those that are still current.	RLF	None
Reset to default values	Resets the parameters that are changed via the Set commands to their factory default settings. NOTE: If you have a C-Band BUC, you should switch off the carrier at the modem before using this command. This prevents transmission on an undesired frequency. When you have reset the LO frequency, switch transmission on. The default settings are: transmit: on (for RS232, RS422/485 and FSK) RF compensation frequency: 0 MHz IF compensation frequency: 0 MHz transmit attenuator: 12 dB	RDV	None

Table 17: Reset commands (cont.)

Command	Function		Enter...	Data required
Reset to default values (cont.)	output power threshold	0 dBm (off)		
	burst mode power threshold	0 dBm (off)		
	LO frequency	C-Band: 7375 MHz Ku-Band: 15450 MHz		
	transmit default	PA returns to transmit state prior to powerdown		
	redundant mode	non-redundant mode		
	serial interface	9600 baud 8 bits no parity 1 stop bit unterminated RS422/485 bus		
	packet protocol	NDSatcom protocol		
	packet address	1 for Codan 49 for SAbus 1 for Comstream 1 for NDSatcom		
	echo	on		

Switching the redundancy system on and off

When you power up the redundancy controller, the redundancy switching system resumes operation using the current state of the switches.

You can switch off the redundancy switching system at any time by simply switching off the redundancy controller at the AC mains supply. In some BUC systems, the BUCs are also powered down.

Checking the operation of the LED indicators and controls

The redundancy controller has 18 indicators on the internal control panel (see Figure 9 on page 18 and Table 12 on page 60).

Switching between streams

The redundancy controller enables automatic and manual switching of streams.

The redundancy controller automatically switches streams when it receives an alarm from the on-line stream. The redundancy controller always switches transmit and receive paths together.

You can manually force the system to switch between Stream 1 and Stream 2.

Operating the redundancy system

If you are not using the contact closure inputs on the **Auxiliary I/O** connector, the redundancy controller runs automatically. You can manually switch streams by setting the **Online state** of a BUC using a Hand-held Controller 6560 or a PC connected to the **BUC 1 Serial** or **BUC 2 Serial** connectors, or a Remote Controller 6570 connected to the **Auxiliary I/O** connector.

If you want to exert external control via the contact closures on the **Auxiliary I/O** connector (see Figure 14 on page 52) you must:

- ❑ Ground pin J.

  This enables remote control.

- ❑ Select Manual Mode by grounding pin N, or select Auto Mode by not grounding pin N.

- ❑ If Manual Mode was selected in the previous step, then you may select Stream 2 by grounding pin G, or select Stream 1 by not grounding pin G.

  NOTE External stream selection in Manual Mode is independent of any faults.

Controlling the redundancy system

For correct operation of the redundancy system, both BUCs must be switched on.

To switch on the BUCs:

- ❑ Switch on the modem, and if you have installed an externally-powered BUC system, switch on the power to the BUC.

The standby state of the off-line BUC is dependent on how the Redundancy mode is set. The off-line BUC can be set to two states:

- power amplifier on (hot standby system)
- power amplifier off (warm standby system)

NOTE In a high-power BUC system, the high-power SSPA is always activated.

Hot standby

In hot standby, the power amplifier of each BUC is activated ready for immediate use. A hot standby system has greater power consumption than any other redundancy system configuration.

To set the BUCs to operate in hot standby:

- ❑ Set the **Redundancy mode** to **Hot standby** using a Hand-held Controller 6560, a Remote Controller 6570, or serial commands on a PC running terminal-emulating software.

NOTE

Codan recommends that you set the **Redundancy mode** of both BUCs to **Hot standby**. This keeps the off-line stream in hot standby ready for immediate operation. It also enables detection of faults in the power amplifier of the off-line BUC through the normal fault detection system, or via the transmit power alarm threshold facility.

Warm standby

In warm standby, only the power amplifier of the on-line BUC is activated. This provides a lower power consumption than the hot standby system. The power amplifier of the off-line BUC is automatically activated when the stream switches to on line.

To set the BUCs to operate in warm standby:

- ❑ Set the **Redundancy mode** to **Warm standby** using a Hand-held Controller 6560, a Remote Controller 6570, or serial commands on a PC running terminal-emulating software.

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4 Maintenance and fault finding

This section contains the following topics:

Precautions

Connections to power supplies

In general, exposed connector pins do not carry DC supply voltages.

WARNING Care should be taken at all times to avoid short circuiting connector pins.

Servicing requirements

If you find that any module is faulty, contact your Codan representative or Codan customer service staff. Before returning goods to Codan you must obtain an RMA to authorise the return of your goods.

WARNING Do not attempt to repair the module as you may cause further faults and void the manufacturer's warranty.

RF waveguide switches

Handle all RF waveguide switches with care. They are easily damaged.

WARNING It is critical to weatherproof waveguide and control joints for long-term switch reliability.

The RF waveguide switch is a precision microwave electromechanical assembly. *Do not* attempt to repair it yourself. Return all faulty RF waveguide switches to Codan for repair.

Fuses and overcurrent protection in the Redundancy Controller 6586

Table 18 lists the types of fuses on the control panel of the redundancy controller and the device protected. For information on changing fuses see page 102, *Replacing fuses in the redundancy controller*.

Table 18: Fuses in the redundancy controller

Label	Type	Protects...
BUC 1/BUC 2	Delay 20 × 5 mm, 5 A	BUC 1/BUC 2
LNB 1/LNB 2	Delay 20 × 5 mm, 1 A	LNB 1/LNB 2
Remote Controller	Delay 20 × 5 mm, 250 mA	Remote Controller 6570

NOTE LNB fuses are fitted, but are not used in transmit-only systems.

If technical assistance is required...

If the fault diagnosis guidelines do not locate the faulty module or cable, or if further technical assistance is required for any other reason, please refer to the contact details supplied with the equipment. These details are also available on the internet at www.codan.com.au. In the Satellite Communications section, click on Product Support.

Outside of normal office hours, Codan has Customer Service Engineers on call to provide emergency technical assistance. They will either answer your call immediately or return your call as soon as possible.

If you are connected to a voice mail system when you call, please follow the instructions carefully, that is, leave your name and contact phone number (including the country code), then a brief, clear description of your problem.

Finding faults in the BUC system

The fault finding information provided in this section is designed to locate faulty modules and cables, and to determine if correct operating procedures have been followed. Faults are indicated by the LEDs on the BUC (see Table 11 on page 59).

If a fault is indicated on the BUC it is recommended that you check the cables and the cable connections.

Using the BUC fault diagnosis charts

The tests indicated in the diagnosis charts are at the end of this section. When an '*' appears in a diagnosis chart, it indicates that you are to refer to the relevant test.

You should be able to locate simple faults with minimal test equipment. A terminal or a computer emulating a terminal is required for checking the BUC. The most effective technique when dealing with complex faults, or if a terminal is not available, is to substitute modules.

CAUTION

During fault finding or performance testing, disconnect the transmit IF signal and/or terminate the BUC output into a suitably-rated dummy load. This ensures that unwanted signals are not transmitted.

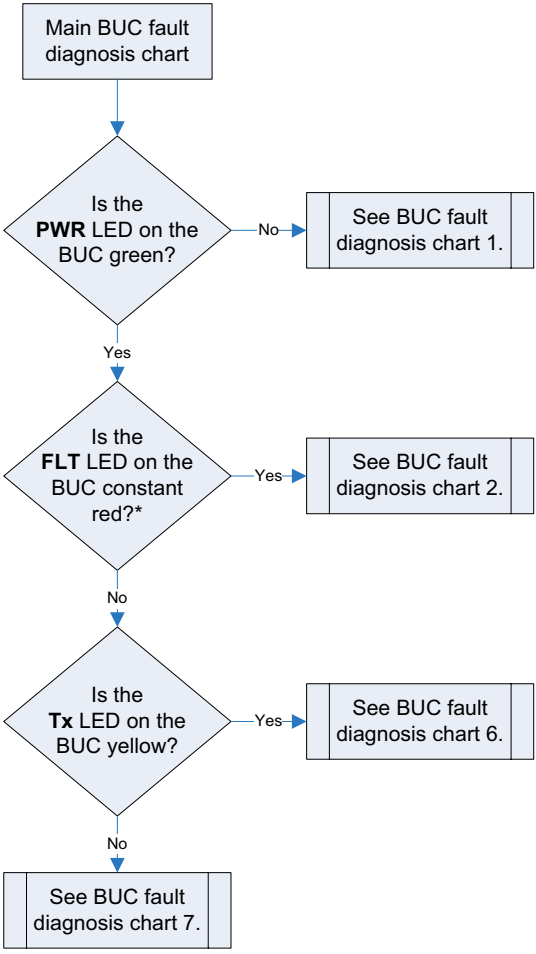
You can commence fault finding using the:

- Main BUC fault diagnosis chart (Figure 15 on page 86)
- LNB fault diagnosis chart (Figure 25 on page 96)

NOTE

The following flow charts assume the BUC is in non-redundant mode. If the BUC is set to either of the two redundancy modes and is *not* installed in a redundancy system, LNB and redundancy controller faults are permanently indicated and cannot be cleared.

Figure 15: Main BUC fault diagnosis chart



* The **FLT** LED on earlier-version BUCs may flash red to indicate the presence of latched faults. Latched faults are reset using the **RLF** command.

Figure 16: BUC fault diagnosis chart 1

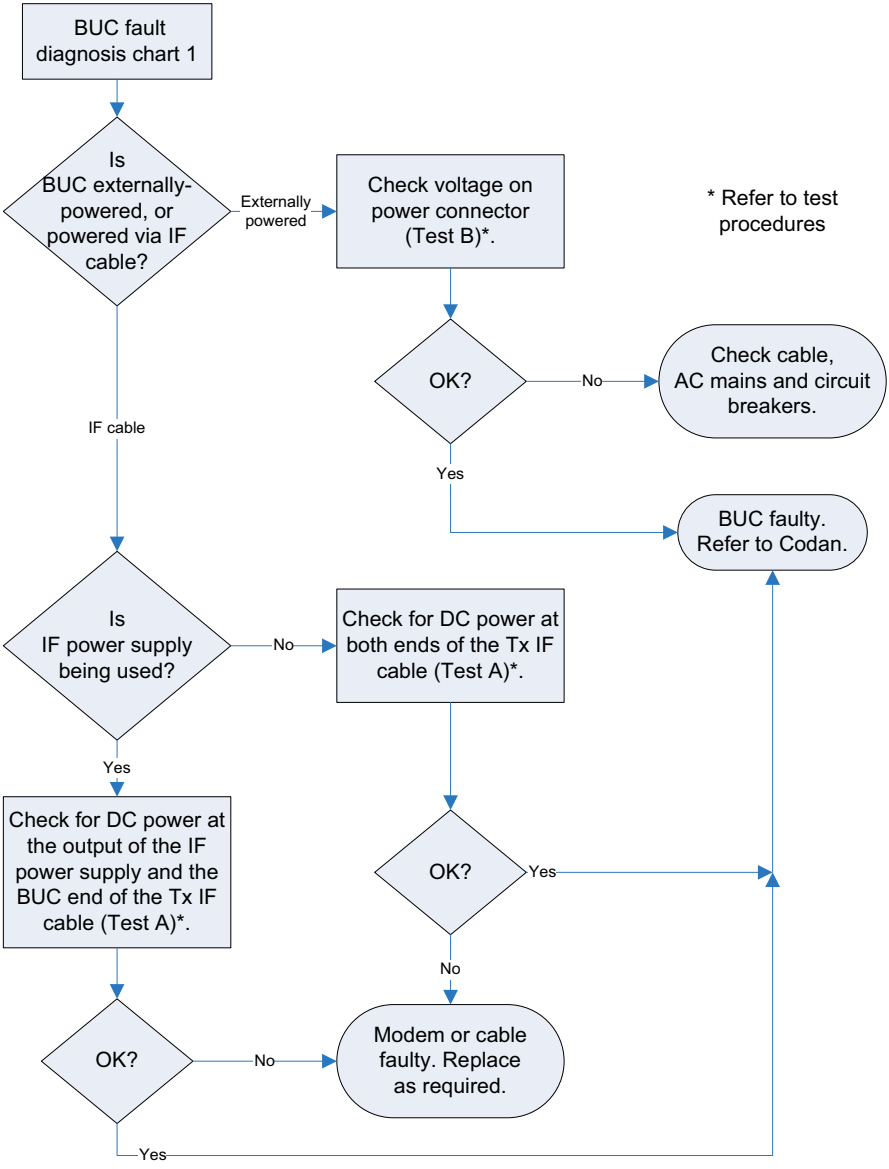


Figure 17: BUC fault diagnosis chart 2

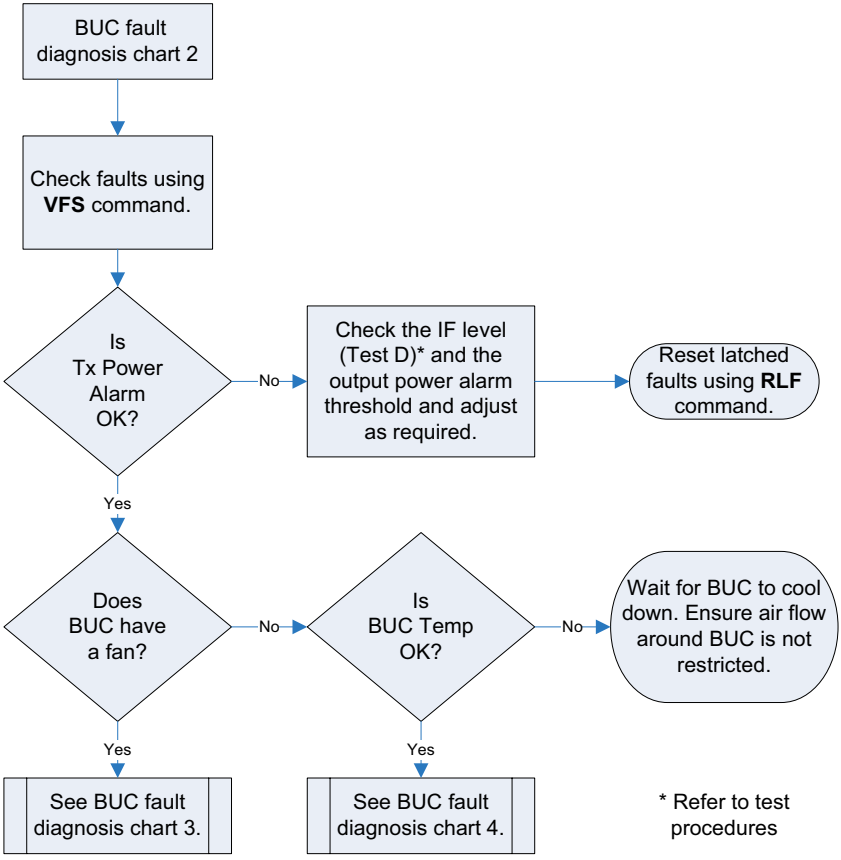


Figure 18: BUC fault diagnosis chart 3

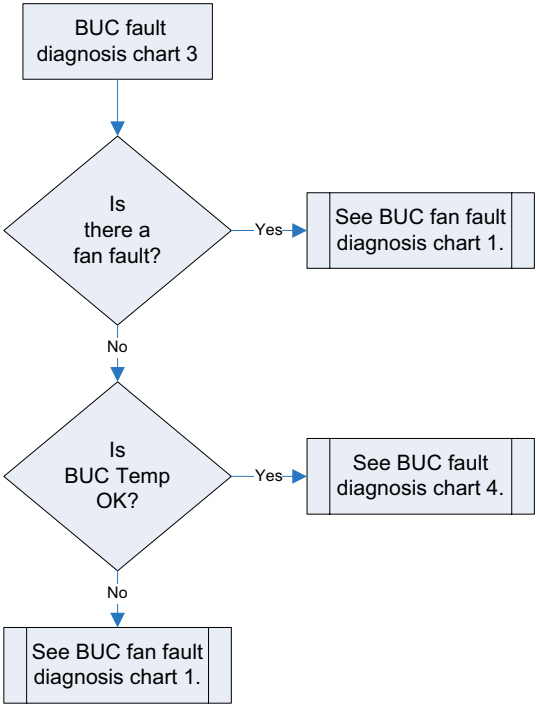


Figure 19: BUC fault diagnosis chart 4

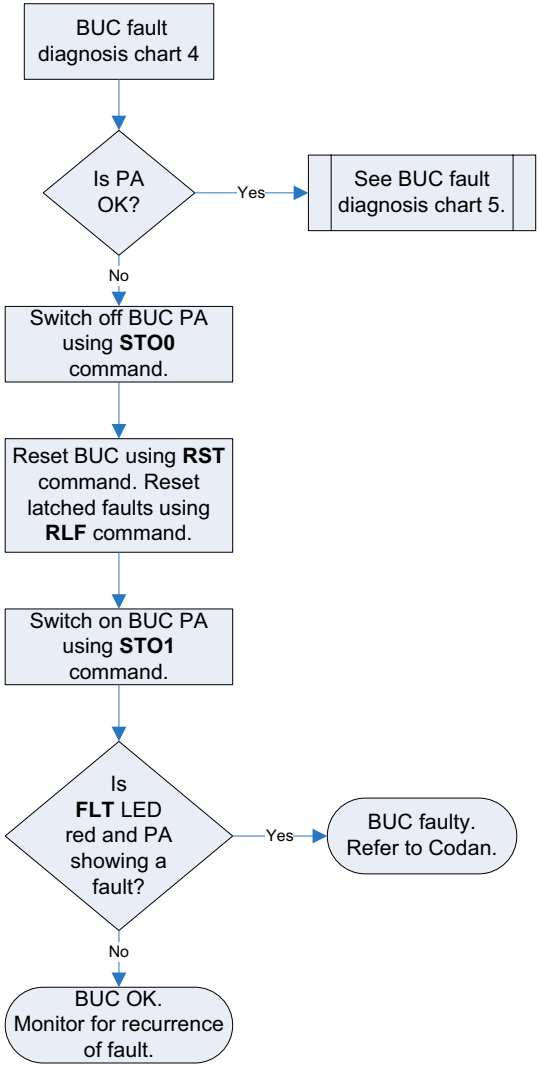


Figure 20: BUC fault diagnosis chart 5

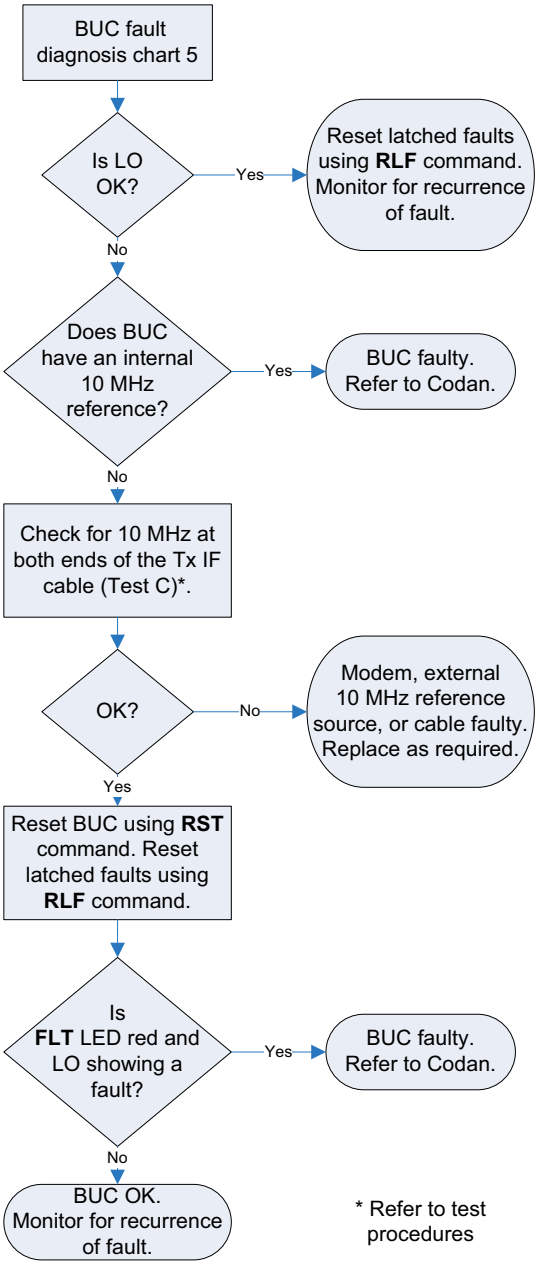


Figure 21: BUC fault diagnosis chart 6

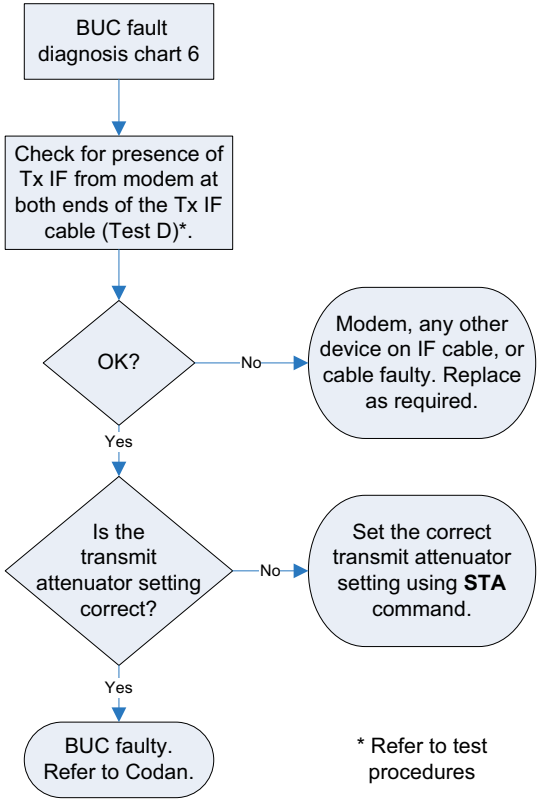


Figure 22: BUC fault diagnosis chart 7

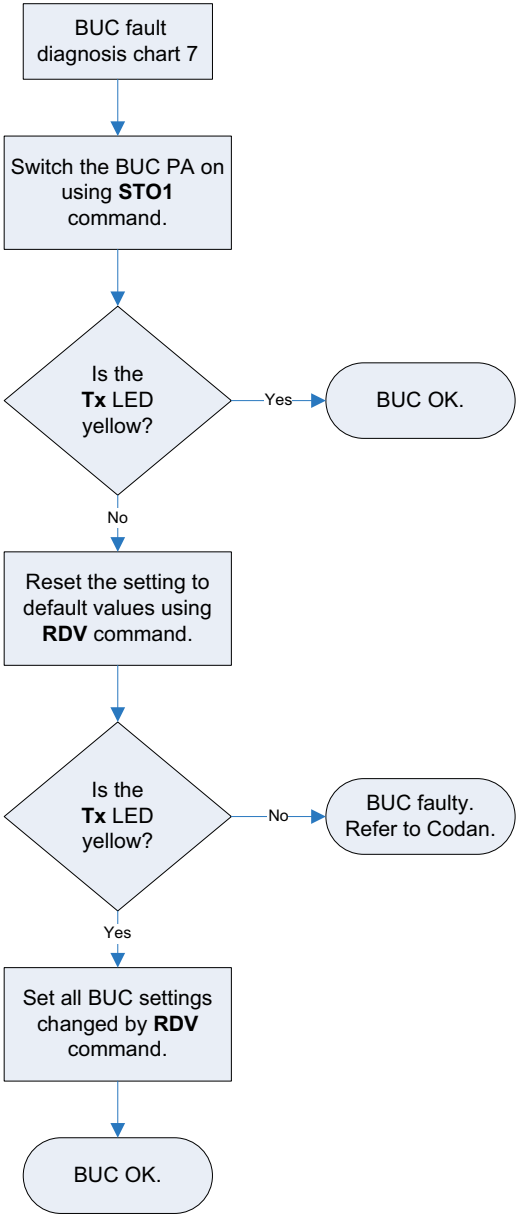


Figure 23: BUC fan fault diagnosis chart 1

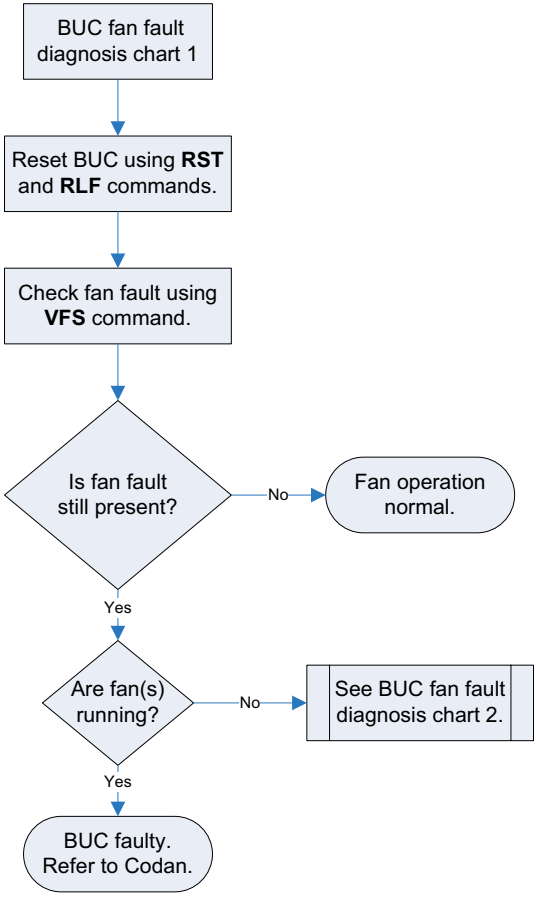


Figure 24: BUC fan fault diagnosis chart 2

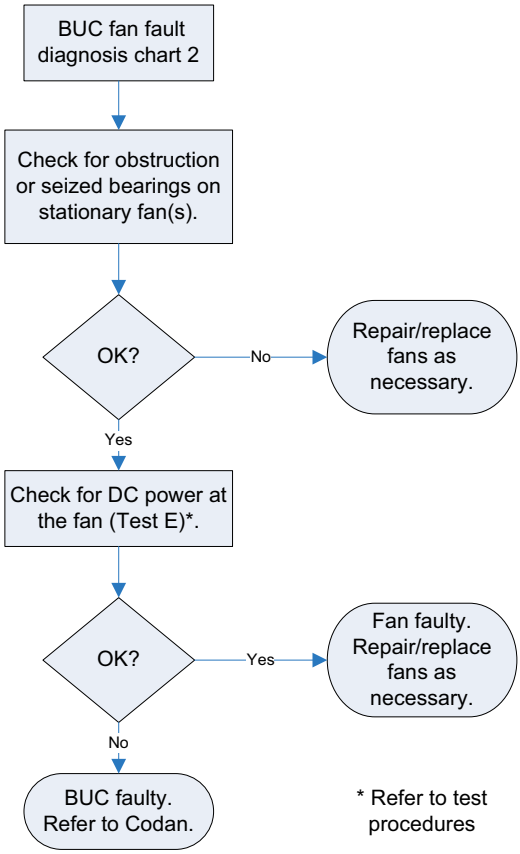
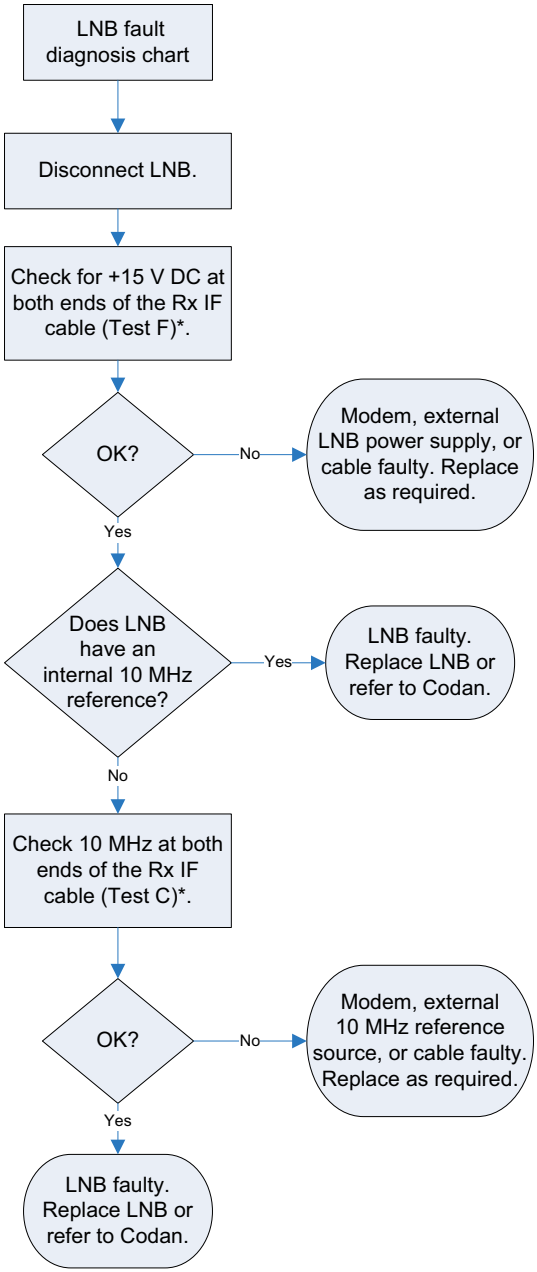


Figure 25: LNB fault diagnosis chart



Test procedures

Use the following tests in conjunction with the fault finding diagnosis charts.

Table 19: Test A

Procedure	Comment
Measure the DC voltage at both ends of the transmit IF cable. Connect positive to the centre pin and negative to ground (to the screen).	For +24 V BUCs, the DC voltage should be +19 to +35 V DC. For +48 V BUCs, the DC voltage should be +42 to +60 V DC.

Table 20: Test B

Procedure	Comment
Measure the voltage on the connector that plugs into the BUC. WARNING Care needs to be taken when performing this measurement as a severe electric shock and personal injury may result. For pinouts of the **AC INPUT** connector see Table 8 on page 31.	For AC-powered BUCs, the measured AC mains voltage must be between 94 and 275 V AC. For DC-powered BUCs, the measured voltage range should be as stated in Test A (Table 19 on page 97).

Table 21: Test C

Procedure	Comment
Measure 10 MHz at both ends of the transmit or receive IF cable as required.	The 10 MHz signal level should be –5 to +5 dBm. WARNING A DC block may be required to protect the test equipment from the DC voltage on the IF cable.

Table 22: Test D

Procedure	Comment
Measure IF level at both ends of the transmit IF cable. NOTE It is recommended that a spectrum analyser is used to measure the IF level. A power meter may be used but the reading will be misleading unless the 10 MHz signal can be filtered out.	The IF signal level should be consistent with the IF level plan for the BUC. WARNING A DC block may be required to protect the test equipment from the +24/48 V DC on the transmit IF cable.

Table 23: Test E

Procedure	Comment
Measure the DC voltage at the fan feed-through connections on the BUC, positive and negative as marked.	Depending on the BUC, the DC voltage should usually be either: • 9 to 10.2 V DC, or • 12 V ±1 V DC Refer to your Codan representative for exact specifications for your BUC.

Table 24: Test F

Procedure	Comment
Measure the DC voltage at both ends of the receive IF cable.	The DC voltage should be +15 to +24 V DC.

Finding faults in the redundancy switching equipment

A fault in the redundancy switching equipment is likely when a fault in the on-line BUC or high-power BUC system does not cause streams to switch, or you cannot manually switch streams. If this occurs, view the control panel of the redundancy controller to assess the probable cause of the fault.

The probable faults for the redundancy switching equipment are:

- blown fuses
- inconsistent stream selections, indicated by two **BUC Switch** LEDs and two **LNB Switch** LEDs illuminated green on opposing streams
- faults in the RF waveguide switches, indicated by four **BUC Switch** LEDs and/or four **LNB Switch** LEDs being illuminated red
- faults in the redundancy controller, indicated by the **Redundancy Controller Status** LED illuminated red, following the elimination of blown fuses, and RF waveguide switch and cable faults

Blown fuses

If the control panel of the redundancy controller indicates that any fuses are blown, replace the fuses (see page 102, *Replacing fuses in the redundancy controller*).

Inconsistent stream selections

During stream selection, an RF waveguide switch may fail to switch completely between the streams. In this situation, the **BUC Switch** or **LNB Switch** LEDs indicate that one stream is selected in transmit and the other selected in receive. If this fault is indicated, continue from page 103, *Resolving inconsistent stream selections*.

Faults in the RF waveguide switches

Faults in the RF waveguide switches are caused inside the switches or in the switch cables. Such faults are likely if:

- the **BUC Switch** or **LNB Switch** LEDs on the control panel of the redundancy controller are illuminated red, which indicates inconsistencies from the RF waveguide switch tell-back contacts
- there is a loss of the transmit or receive signal

If these faults are indicated, continue from page 103, *Finding faults in an RF waveguide switch*.

Faults in the redundancy controller

Faults in the redundancy controller are caused by faults in the controller unit itself or the cables connected to the controller. These types of faults are indicated by the failure of the redundancy switching equipment when an RF waveguide switch fault is unlikely. To determine where the fault may be, continue from page 107, *Finding faults in the redundancy controller*.

NOTE In transmit-only systems, the **LNB Switch** LEDs are not operational.

NOTE In C-Band transmit/receive systems that use combined RF waveguide/coaxial switches, the **BUC Switch** LEDs are not operational.

Replacing fuses in the redundancy controller

WARNING Make sure that the AC mains power is switched off before replacing fuses or disconnecting power cables.

To replace a blown fuse:

- ❑ Switch off the redundancy controller at the AC mains.
- ❑ Disconnect all the cables from the redundancy controller except for the power cables.
- ❑ Replace the blown fuse on the control panel of the redundancy controller.
- ❑ Switch on the AC mains supply to the redundancy controller.
- ❑ If the fuse blows again, the redundancy controller is faulty. Contact your Codan representative for assistance.
- ❑ If the fuse does not blow, reconnect all cables one by one.

  If the fuse blows, the last unit connected, or its cable, is faulty.

  If the fuse *does not* blow after reconnecting all cables, the original fuse may have blown because of a temporary power supply surge.
- ❑ If a problem persists, contact your Codan representative for assistance.

Resolving inconsistent stream selections

To resolve inconsistent stream selections:

- ❑ Use serial commands on a PC running terminal-emulating software, a Hand-held Controller 6560, or a Remote Controller 6570 to switch streams remotely (see page 76, *Switching between streams*).
- ❑ Switch streams several times to ensure that the switches are operating correctly in both streams.
- ❑ If the inconsistent stream selections persist, continue below at *Finding faults in an RF waveguide switch*.

Finding faults in an RF waveguide switch

The redundancy controller monitors the tell-back contacts in the RF waveguide switch.

If Stream 1 is on line:

- position 1 tell-back contact should be closed to the tell-back common contact
- position 2 tell-back contact should be open

The opposite should be true when Stream 2 is on line.

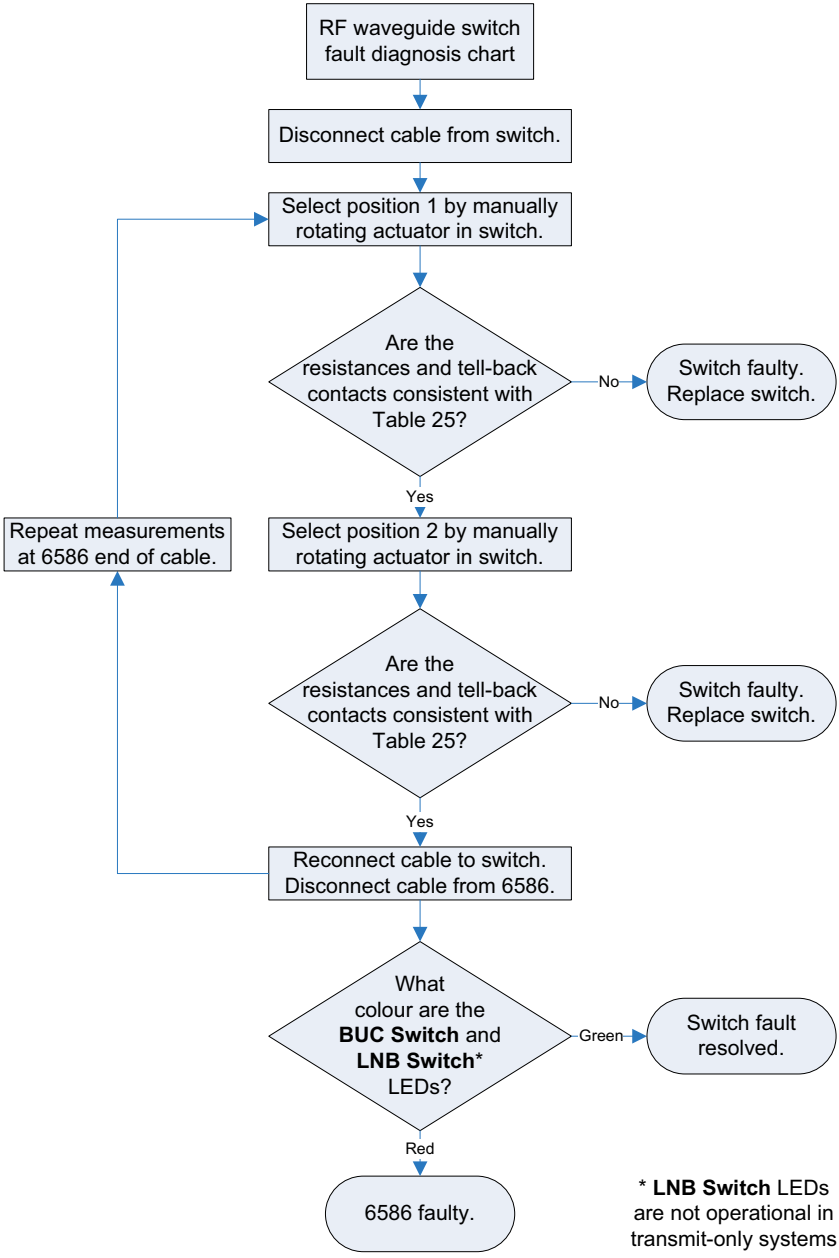
If the redundancy controller detects that either tell-back contact is set incorrectly, the **BUC Switch** or **LNB Switch** LEDs illuminate red.

RF waveguide switch faults might be caused by:

- an open or short in the control cable for the switch
- a jammed switch or switch that does not rotate through its full 90° arc
- a burnt-out coil in the switch
- faulty tell-back contacts

Use Figure 26 on page 104 to check for faults in an RF waveguide switch.

Figure 26: RF waveguide switch fault diagnosis chart



Checking the resistance of an RF waveguide switch

To check the resistance of an RF waveguide switch:

- ❑ Disconnect the control cable from the RF waveguide switch.
- ❑ Use a multimeter to check the resistance of the coils and tell-back contacts at the connector on the switch.

  Table 25 shows the expected results at RF waveguide switch position 1 and position 2.

NOTE — To manually change a switch position, remove the cover on the actuator of the switch, then rotate the actuator.

NOTE — The pin numbers in Table 25 apply to the connectors at both ends of the cable connecting the RF waveguide switch to the redundancy controller.

Table 25: Resistance of coils when the RF waveguide switch is in positions 1 and 2

RF waveguide switch	Resistance of pin A (coil 1) to pin B (common)	Resistance of pin C (coil 2) to pin B (common)	Tell-back contact
Position 1 (coil 1 open circuit)	Very high	100 Ω (WR137, WR75) 24 Ω (WR229)	D–E closed F–E open
Position 2 (coil 2 open circuit)	100 Ω (WR137, WR75) 24 Ω (WR229)	Very high	D–E open F–E closed

NOTE — The resistance of pin C to pin B for position 1 of the RF waveguide switch is not applicable to transmit-only systems.

If both coils of an RF waveguide switch have high resistance, it is possible that the switch has burnt out. If the resistance of the coils is within the range, the switch may be jammed.

Checking a jammed RF waveguide switch

To check an RF waveguide switch that appears to be jammed:

- ❑ Remove the RF waveguide switch from the waveguide components and check for foreign material.
- ❑ Reconnect the control cable to the RF waveguide switch.
- ❑ Try to manually operate the RF waveguide switch using a Remote Controller 6570 or Hand-held Controller 6560 while someone observes the internal waveguide mechanism (see page 76, *Switching between streams*).
- ❑ If the RF waveguide switch does not move, remove the control cable and the actuator cover from the RF waveguide switch.

  Try physically rotating the RF waveguide switch by hand.
- ❑ If the RF waveguide switch functions correctly, reinstall the RF waveguide switch to the waveguide components.
- ❑ If the RF waveguide switch fails to operate correctly, bypass the switch by connecting the LNB or BUC directly to the receive port or transmit port of the antenna feed respectively.
- ❑ Return the RF waveguide switch to Codan for repair.

Finding faults in the redundancy controller

To check for faults in the redundancy controller:

- ❑ In a BUC system, check the voltage between the centre pin and body of the **Tx IF Output 1** and **Tx IF Output 2** connectors.

  WARNING Do not short circuit the outputs.

- ❑ If 36 to 60 V DC is not present, check the fuses.

  If the fuses have not blown, the power supply inside the redundancy controller is faulty. Contact your Codan representative for assistance.

Disconnecting a faulty BUC

If you determine that a BUC is faulty and you cannot rectify the fault, you may need to remove the faulty BUC from the system so that it can be repaired.

To remove a faulty BUC while maintaining a communication path:

- ❑ Disconnect the cable from the **BUC 1 Control** or **BUC 2 Control** connector on the redundancy controller, as required.
- ❑ If you are removing an externally-powered BUC from the system, switch off the power supply to the BUC.
- ❑ Disconnect the cable from the **Tx IF Output 1** or **Tx IF Output 2** connector on the redundancy controller, as required.

  This will not interrupt traffic. The redundancy controller will continue to run the on-line BUC.
- ❑ Disconnect any unused cables from the redundancy controller and fit the supplied dust caps.

Reverting to a single-BUC earth station

If it is necessary to remove the redundancy controller from the system because it is faulty, you can restore communications by reverting to a basic, single-BUC earth station. You can either leave the RF waveguide switches in place or remove them.

To revert to a single-BUC earth station:

- ❑ Switch off the redundancy controller.
- ❑ Remove the control and IF coaxial cables between the redundancy controller, BUCs and LNBs (if used).
- ❑ At the redundancy controller, unplug the two IF coaxial cables that connect to the modem or other equipment. Reconnect these cables directly to the on-line BUC.

  If you are unsure of the position of the RF waveguide switches, use a multimeter to check the tell-back contacts at the control connector for the RF waveguide switch (see Table 26).

Table 26: Tell-back contacts for switch positions 1 and 2

Switch position 1	**Switch position 2**
D–E closed	D–E open
F–E open	F–E closed

- ❑ Remove any remote interface cable from the **Auxiliary I/O** connector on the redundancy controller.
- ❑ If you need to remove a faulty RF waveguide switch, connect the BUC or LNB directly to the antenna feed.
- ❑ Seal all N-type connections with self-amalgamating tape.

CAUTION Ensure all joints are completely weatherproof.

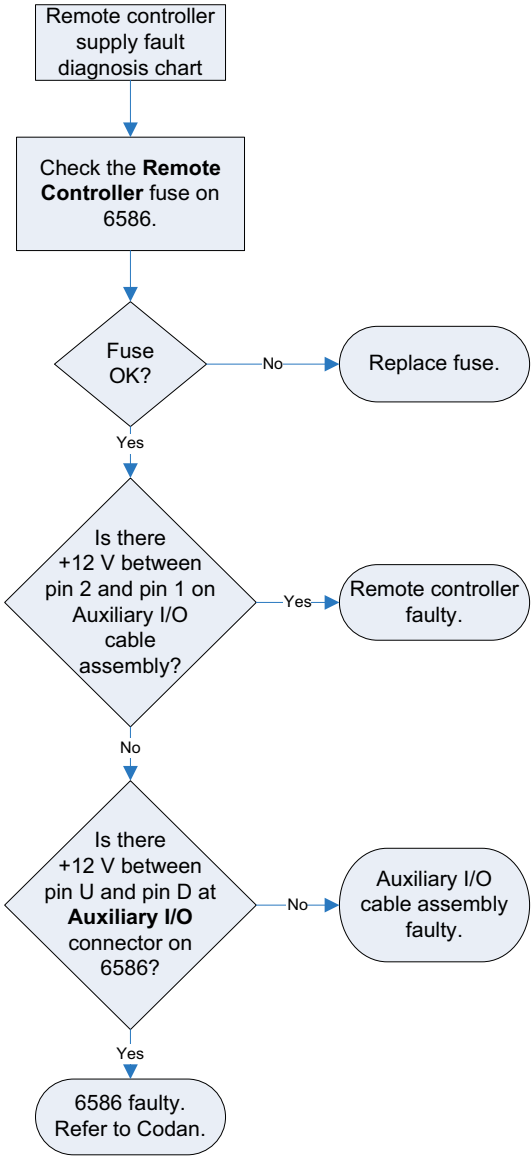
Finding faults in the remote controller

The remote controller or its associated cable is faulty if the LEDs on the remote controller are not illuminated, or actions taken on the remote controller are not reflected in the redundancy system.

Checking for supply faults

Use Figure 27 on page 110 to check for supply faults to the remote controller.

Figure 27: Remote controller supply fault diagnosis chart



Appendix A—BUC model and redundancy system numbers

BUC model numbers

The model number of your BUC indicates various options available in your BUC.

Figure 28: Segments of the BUC model number

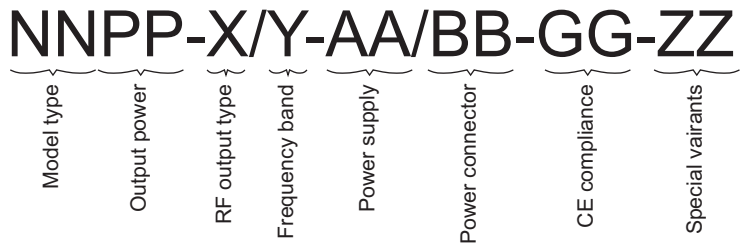


Table 27: Definition of the BUC model number

Option	Description	Code
Model type	C-Band	67
	Ku-Band	69
Output power	Output power For example: PP is represented as 10 for a 10 W BUC PP is represented as 12H for a 120 W BUC	PP
RF output type	N-type	N
	Waveguide	W

Table 27: Definition of the BUC model number (cont.)

Option	Description	Code
Frequency band	Standard: 5.850 to 6.425 GHz for C-Band 14.0 to 14.5 GHz for Ku-Band	S
	Extended: 5.850 to 6.725 GHz for C-Band 13.75 to 14.50 GHz for Ku-Band	E
Power supply	24 V DC	24
	48 V DC	48
	AC	AC
Power connector	IF N-type connector	IF
	External power connector	EX
CE certification	CE-certified	CE
	Not CE-certified	Segment omitted
Special variants	Codes allocated as required	

For example, the model number 6725-W/E-AC/EX-CE represents a C-Band 25 W MBUC with waveguide output using the Extended frequency band. It is AC powered via an external power connector, and is CE-certified. It has no special variants.

Redundancy system numbers

The number of your redundancy system indicates various options available in your system.

Figure 29: Segments of the redundancy system number

Table 28: Definition of the redundancy system number

Option	Description	Code
Frequency band	C-Band	C
	Ku-Band	Ku
BUC output connector	N-type coaxial (C-Band only)	N
	Waveguide (C-Band and Ku-Band)	W

Table 28: Definition of the redundancy system number (cont.)

Option	Description		Code
BUC model and power group	LBUC	C-Band: 5 W, 10 W, 20 W Ku-Band: 4 W, 8 W, 16 W	L1
	MBUC	C-Band: 25 W, 40 W Ku-Band: 16 W C-Band: 60 W Ku-Band: 25 W	M1 M2
	HBUC	C-Band: 120 W Ku-Band: 40 W	H1
System type	Transmit-only (BUC)		TO
	Transmit/receive (BUC & LNB)		TR

For example, the model number 6586-C/W-M2-TO represents a C-Band transmit-only redundancy system using 60 W MBUCs with waveguide output.

Appendix B—Example outputs for the View commands

NOTE These outputs show example data only. The data displayed can vary between BUC systems and firmware versions.

View system status

The figures in brackets are the parameter values enabled for the Set commands that were used to achieve the settings displayed.

NOTE In a system without redundancy:

- the BUC is always On Line; this setting cannot be changed
- the Redundant Mode must always be set to non-redundant (0)

```
-----------------------System Status-------------------------------
PA State            Off           Transmit Atten       4
Transmit On (RS232) On  (1)       Tx Alarm Thresh      0.0
Transmit On (RS485) Off (0)       Burst Pwr Thresh     19.0
Transmit On (FSK)   On  (1)       Serial I/face        9600,8,N,1,T
Transmit Default    Off (0)       Packet Protocol      Codan (1)
Compensation Freq   0             Packet Address       126
IF Comp Freq        0             Red'cy -Mode         Non (0)
LO Freq             7375                 -On/Off Line  On (1)
-------------------------------------------------------------------
```

View operational data

```
---------------------Operational Data----------------------
Output Power        0.0           Burst Power          0.0
Min Burst Power     0.0           Max Burst Power      99.9
Temperature(C)      31
-----------------------------------------------------------
```

View fault status

```
-------------Fault Status-------------
                 Current       Latched
PA                  OK            OK
Fan                 OK            OK
Tx Power Alarm      OK            OK
BUC Temp            OK            OK
LO                  OK            OK
Internal            OK            OK
LNB                 -             -
Red'cy Controller   -             -
---------------------------------------
```

NOTE If there is no fan in the BUC, the current and latched status for the fan shows a dash.

View identity and configuration data

```
--------------------------Identity Data-----------------------------
Model No            6704/48       Serial No           3232676a0005
Firmware P/No       90-20621-001  Firmware Version    1.06
--------------------------------------------------------------------
```

View limit data

The data displayed depends on the model of the BUC and the current LO setting.

```
----------------------Limit Data---------------------------
Min Tx IF Freq      950           Max Tx IF Freq       1525
Min Tx RF Freq      5850          Max Tx RF Freq       6425
LO1 Freq            7300          LO2 Freq             7600
LO3 Freq            7375          LO4 Freq             7675
Min Power Meter     19.0          Max Power Meter      36.0
-----------------------------------------------------------
```

View protocol data

```
----------------------Protocol Data--------------------
Protocol 0          ASCII
Protocol 1          Codan          Address Range 1..126
Protocol 2          SAbus          Address Range 49..111
Protocol 3          Comstream      Address Range 1..31
Protocol 4          NDSatcom       Address Range 1..15
-------------------------------------------------------
```

View build standard data

```
-----------Build Standard -------------
                  H/W Std      S/W Std
M&C PCB             1             1
RF  PCB             1             1
LO  PCB             1             1
Pwr PCB             1             -
---------------------------------------
```

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Appendix C—Compliance

This section contains the following topics:

Introduction

The Block Up Converter 6700/6900 series is manufactured in a number of variants. CE-certified versions are marked with the CE0682!, CE0682 or CE symbols.

This section describes how to ensure the Block Up Converter 6700/6900 series and Redundancy Controller 6586 comply with the European Electromagnetic Compatibility Directive 89/336/EEC and the European Low Voltage Directive 73/23/EEC as called up in the European R&TTE Directive 1999/5/EC.

European R&TTE Directive

CE-certified versions of the Block Up Converter 6700/6900 series and Redundancy Controller 6586 have been assessed and comply with the following standards (articles of the R&TTE Directive):

- Article 3.1a: EN 60950
- Article 3.1b: ETSI EN 301 489-1
- Article 3.1b: ETSI EN 301 489-12
- Article 3.2: ETSI EN 301 428
- Article 3.2: ETSI EN 301 443

Compliance with these standards is sufficient to fulfil the requirements of the R&TTE Directive 1999/5/EC, which encompasses the following directives:

- European EMC Directive, 89/336/EEC
- European Low Voltage Directive, 73/23/EEC with no lower voltage limit

Product marking and labelling

Any equipment supplied by Codan that satisfies these requirements is identified by the CE0682!, CE0682 or CE markings on the model label of the product.

Declaration of conformity

The CE declarations of conformity for each specific product can be made available upon request to Codan or a Codan-authorised supplier.

Protection of the radio spectrum

CAUTION

Some countries may restrict the use of satellite communications equipment on certain frequency bands or require such equipment to be licensed. It is the user's responsibility to check the specific requirements with the appropriate communications authorities.

It is the responsibility of the user to ensure any modem used in conjunction with the Block Up Converter 6700/6900 series and Redundancy Controller 6586 complies with EN 301 428 or EN 301 443 so that CE-certification with respect to radiated spurious signals is maintained. If necessary, contact Codan for more information.

To set up the BUC for CE-certified operation you must:

- ❑ Enter the **STD0** command.

  This sets the default transmit state on powerup to Off.

- ❑ Enter the **STO1** command to activate the BUC.

Health requirements (human exposure to electromagnetic fields)

The Block Up Converter 6700/6900 series and Redundancy Controller 6586 have been assessed against the health requirements in article 3.1a of the R&TTE Directive (1999/5/EC) complying with VDE0848, ICNIRP and FCC health requirements.

The Redundancy Controller 6586 is non-transmitting ancillary equipment according to ETSI EN 301 428 and ETSI EN 301 443, and does not cause or increase the risk of human exposure to electromagnetic fields.

Electromagnetic compatibility and safety notices

Radiation safety

WARNING

A radiation hazard exists if the BUC is operated with its RF output unterminated. Do *not* operate the BUC without a load or termination attached to the RF output.

Electromagnetic compatibility

To ensure compliance with the EMC Directive is maintained, you must:

- ❑ Use standard shielded cables supplied from Codan (where applicable).
- ❑ Ensure the covers for the equipment are fitted correctly.

CAUTION

If it is necessary to remove the covers at any stage, they must be refitted correctly before using the equipment.

CAUTION

The dust caps supplied with the Redundancy Controller 6586 must always be fitted to the relevant connectors when the connections are not in use. This enables any electrostatic charge on service personnel or equipment to discharge safely via the dust cap prior to connecting a cable to the port.

Electrical safety

To ensure compliance with the European Low Voltage Directive is maintained, you must install the Block Up Converter 6700/6900 series in accordance with the following safety precautions. These precautions must be checked before applying power to the BUC.

WARNING

For DC-powered BUCs, a protective earth connection must be connected to the protective earth terminal on the BUC (see page 126, *Earth symbols*).

For AC-powered BUCs:

- A protective earth connection must be included in the mains wiring to the BUC (see page 126, *Earth symbols*).

WARNING

- As these BUCs are intended for permanent connection to the mains supply, a readily accessible switch or circuit breaker must be incorporated in the mains wiring to enable easy isolation of the unit.
- The isolating switch must disconnect both poles simultaneously. However, if you can positively identify the neutral conductor, you may have a single-pole isolating device in the live conductor.

The Redundancy Controller 6586 is intended for permanent installation and is suitable for Mains Transient Voltages in Overvoltage Category II (as identified in EN 60950-1 or AS/NZS 60950-1 Table G.1.).

Touch temperatures at the top of the control panel of the Redundancy Controller 6586 and the external casing of the Block Up Converter 6700/6900 series are within allowable limits of EN 60950-1 and AS/NZS 60950-1, but may become high, depending on load conditions. The label indicating high temperature areas is shown in Table 29 on page 125.

Hazardous voltages exist behind the control panel of the Redundancy Controller 6586 and care should be taken by service personnel when the panel is removed. The label indicating that hazardous voltages are present is shown in Table 29.

Table 29: Electrical safety symbols

Symbol	Meaning
	High touch temperatures may exist, depending on load conditions
	Hazardous voltages exist within the unit

A hard-wired permanent protective earth must be connected at all times to the Redundancy Controller 6586 using the protective earth terminal provided (see Table 30 on page 126).

WARNING — Double pole/neutral fusing: For servicing where the control panel of the Redundancy Controller 6586 is removed, disconnect the mains supply from the redundancy controller by unplugging the mains supply.

All circuits within the Redundancy Controller 6586 (apart from AC mains circuits) are earthed SELV circuits, provided that the protective earth terminal on the redundancy controller is connected to earth.

Earth symbols

Earth connection points are provided on the Block Up Converter 6700/6900 series. The symbols shown in Table 30 are used to identify the earths on the equipment.

Table 30: Earth symbols

Symbol	Meaning
	Chassis earth
	Protective earth

Warning labels

The labels shown in Table 31 are used to identify potential hazards on the equipment.

Table 31: Warning labels

Label	Meaning
	Non-ionising radiation may be emitted
WARNING TERMINATION FOR OUTPUT ISOLATOR CONTAINS BERYLLIUM	If you intend to process or recycle this product refer to the current Material Safety Data Sheet

Appendix D—Definitions

This section contains the following topics:

Standards and icons

The following standards and icons are used in this guide:

This typeface	Means...
Bold	a LED or a connector
Bold	a command that you enter or keyboard key that you press
`Courier`	a segment of text that is taken directly from a computer screen
Italics	a cross-reference or text requiring emphasis

This icon	Means...
❑	a step within a task
NOTE	the text provided next to this icon may be of interest to you
CAUTION	your actions may lead to loss of data, privacy or signal quality
WARNING	your actions may cause harm to yourself or the equipment

Acronyms and abbreviations

This term	Means...
AC	alternating current
ASCII	American standard code for information interchange
BUC	block up converter
DC	direct current
EMC	electromagnetic compatibility
ETSI	European Telecommunications Standards Institute
FCC	Federal Communications Commission
FLT	fault
FSK	frequency shift keying
H/W	hardware
IF	intermediate frequency
INCIRP	International Commission on Non-Ionising Radiation Protection
LED	light emitting diode
LNB	low noise block down converter
LO	local oscillator
M/C	monitor and control
MS	military standard
O/P	output
PA	power amplifier
PC	personal computer

This term	Means...
PLD	programmable logic device
PWR	power
RF	radio frequency
RMA	return materials authorisation
R&TTE	radio and telecommunications terminal equipment
Rx	receive
SELV	safety extra low voltage
TDMA	time division multiple access
TRF	transmit reject filter
Tx	transmit
VSAT	very small aperture terminal

Units

Measurement	Unit	Abbreviation
Attenuation	decibel	dB
Current	ampere	A
Data rate	bits per second	bps
Frequency	hertz	Hz
Impedance	ohm	Ω
Length	metre	m
Power	decibels relative to 1 mW	dBm
Power	watt	W
Temperature	degrees Celsius	°C
Voltage	volt	V

Unit multipliers

NOTE

Units are expressed in accordance with ISO 1000:1992 ‘SI units and recommendations for the use of their multiples and of certain other units’.

Unit	Name	Multiplier
m	milli	0.001
d	deci	0.1
k	kilo	1000
M	mega	1000000
G	giga	1000000000

About this issue

This is the first issue of the Block Up Converter Systems 6700/6900 series User Guide. This document provides general information on the range of Codan L-Band BUCs and the Redundancy Controller 6586. Other information relating to BUC systems is covered below in *Associated documents* and *Associated specifications*.

Associated documents

These documents include:

- handbooks for various ancillary items used with Codan BUCs
- type-approval certificates and declarations of conformity
- specifications for equipment
- product price lists and part numbers
- BUC system solutions

Associated specifications

The following specifications associated with the Block Up Converter 6700/6900 series are available from Codan upon request:

- 6700/6900 series BUC user serial commands and responses
- ASCII Protocol
- Codan Packet Protocol
- packet protocols associated with third-party network management systems

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