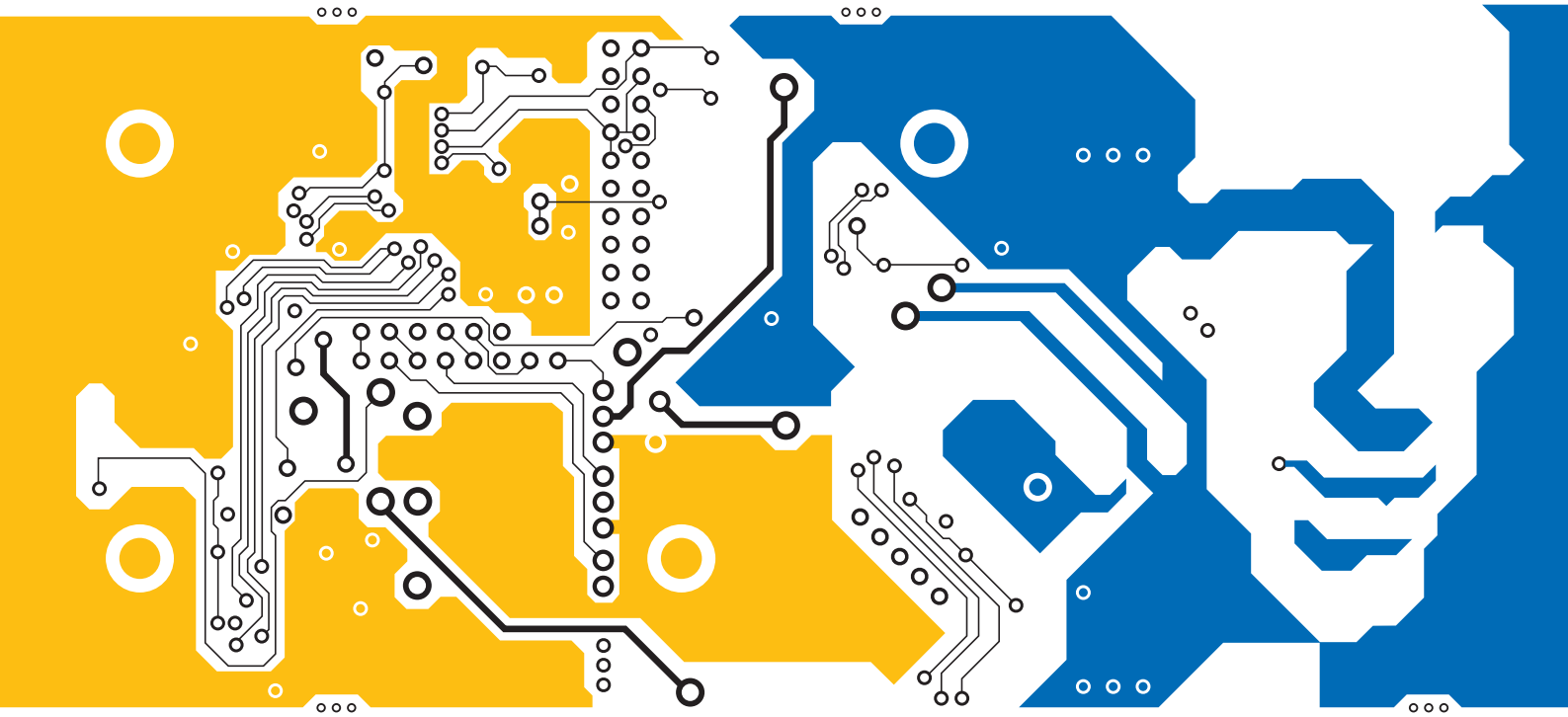
CODAN

Ku-Band Transceiver

5900 series

SATELLITE COMMUNICATIONS



REFERENCE MANUAL

Codan part number 15-44005-EN Issue 2, March 2002

The Certification Body of the Russian Federation State Committee of Communications and Information Technology confirms that the Ku-Band Transceiver 5900 series conforms to the technical specifications of Russian Interconnected Communication System.

ССЭ
СЕРТИФИКАТ

№ ОС/1-СС-249

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1 About this manual

This reference manual is for installation technicians and operators of the Ku-Band Transceiver 5900 series.

This manual has ten chapters and one appendix:

Chapter 1 About this manual—lists all terms, abbreviations and units used in this guide

Chapter 2 Ku-Band transceiver compliance—describes how to ensure CE compliance of the Ku-Band transceiver is maintained

Chapter 3 Overview—general description of the transceiver

Chapter 4 Specifications—specifications for all the transceiver modules

Chapter 5 How the transceiver works—brief technical description of the transceiver

Chapter 6 Installation—how to unpack and install the transceiver

Chapter 7 Setting up the transceiver—how to set up the transceiver ready for operation

Chapter 8 Operating the transceiver—operating procedures and serial interface commands

Chapter 9 Maintenance and fault finding

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Appendix A Summary of serial interface commands—summary of commands described in Chapter 8, *Operating the transceiver*

An index can be found at the end of the manual.

Standards and icons

The following standards and icons are used in this manual:

This typeface	Means...
BOLD/Bold	a button, switch, connector, LED or displayed text
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
UPPER CASE	a switch position

This icon	Means...
	a warning—your actions may cause harm to yourself or the equipment
	a caution—proceed with caution as your actions may lead to loss of data, privacy or signal quality
	a note—the text provided next to this icon may be of interest to you
❑	a step to follow

Definitions

Acronyms and abbreviations

This term	Means...
AC	alternating current
AGC	automatic gain control
ASCII protocol	American standard code for information interchange
AWG	American wire gauge
BW	bandwidth
CTS	clear to send
CW	continuous wave, carrier wave
DC	direct current
DCE	data communication equipment
DIP	dual inline package
EMC	electromagnetic compatibility
FET	field effect transistor
FM	frequency modulation
GaAs	Gallium Arsenide
GCP	gain compression point
GND	ground
G/T	gain/temperature
H	hexadecimal
H/W	hardware
HEMT	high electron mobility transistor
HPA	high power amplifier
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IF	intermediate frequency
LED	light emitting diode
LNB	low noise block converter
LO	local oscillator

This term	Means...
LSB	least significant bit
MS	military specification
MSB	most significant bit
NC	normally closed
NO	normally open
OMT	ortho-mode transducer
OPBO	output back off
PC	personal computer
PLL	phase locked loop
PSU	power supply unit
QPSK	quadrature phase shift keying
RD	receive data
RES	radio equipment and systems
RF	radio frequency
RTS	request to send
R&TTE	radio and telecommunications terminal equipment
Rx	receive
SHF	super high frequency
SSB	single sideband
SSPA	solid state power amplifier
TD	transmit data
TRF	transmit reject filter
TWTA	travelling wave tube amplifier
Tx	transmit
VSWR	voltage standing wave ratio

Glossary

This term	Means...
Carrier	RF signal used to carry information.
Demodulator	Device used to extract digital information from a modulated RF carrier.
High power transceiver	Transceiver system that uses an SSPA rated at 40 W and above.
Ku-Band	Frequency band nominally covering the range 11.0 GHz to 14.5 GHz.
Low power transceiver	Transceiver system that uses an SSPA rated at 16 W and below.
Modem	Device used to convert digital information to a modulated RF carrier and to extract digital information from a modulated RF carrier.
Packet protocol	Serial communication method using a structured addressable packet of ASCII characters.
Transceiver	Equipment comprising the converter, SSPA and low noise block converter, connecting cables and mounting brackets.
Transponder	The equipment on a satellite that receives signals, translates their frequency, and re-transmits these signals.

Units

Measurement	Unit	Abbreviation
Antenna gain	decibels relative to an isotropic radiator	dBi
Attenuation	decibel	dB
Current	ampere	A
Data rate	bits per second	bps
Frequency	hertz	Hz
Impedance	ohm	Ω
Length	metre	m
Noise temperature	kelvin	K
Pressure	pascal	Pa
Power	decibels relative to a carrier	dBc
Power	decibels relative to 1 mW	dBm
Power	watt	W
Temperature	degrees Celsius	°C
Voltage	volt	V
Weight	gram	g

Unit multipliers

Unit	Name	Multiplier
m	milli	10^{-3}
d	deci	10^{-1}
k	kilo	10^{3}
M	mega	10^{6}
G	giga	10^{9}

About this issue

This is the second issue of the Ku-Band Transceiver 5900 series Reference Manual covering the CE compliance regulations introduced in April 2001.

This issue has been updated to include all the details required to operate your transceiver with a 5940 SSPA.

Associated documents

This manual is one of a series of publications related to the Ku-Band Transceiver 5900 series. Associated publications are:

- C-Band and Ku-Band Hub-mount SSPAs 5760/5712H and 5940 Reference Manual (Codan part number 15-44011-EN)
- Hand-Held Controller 5560 User Guide (Codan part number 15-44009-EN)
- Remote Controller 5570 User Guide (Codan part number 15-44010-EN)
- Ku-Band Transceiver 5900 series Redundancy Switching Equipment Reference Manual (Codan part number 15-44007-EN)

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2 Ku-Band transceiver compliance

This chapter describes how to ensure the Ku-Band Transceiver 5900 series complies with the Radio and Telecommunications Terminal Equipment Directive 1999/5/EC. Only those transceivers fitted with the transmit frequency Band 1 option have been tested and certified for compliance with this Directive.

Electromagnetic compatibility and safety notices

The Ku-Band Transceiver 5900 series has been tested and complies with the following standards:

- ETSI EN 301 428 V1.2.1 (2001–02) ‘Satellite Earth Stations and Systems (SES); Harmonized EN for Very Small Aperture Terminal (VSAT); Transmit-only, transmit/receive or receive-only satellite earth stations operating in the 11/12/ 14 GHz frequency bands covering essential requirements under article 3.2 of the R&TTE directive’
- ETSI EN 301 489-1 V1.2.1 (2000–08) ‘Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements’
- ETSI EN 301 489-12 V1.1.1 (2000–12) ‘Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 12: Specific conditions for Very Small Aperture Terminal, Satellite Interactive Earth Stations operated in the frequency ranges between 4 GHz and 30 GHz in the Fixed Satellite Service (FSS)’
- EN 60950 ‘Safety of Information Technology Equipment, including electrical business machines’, 2000

Compliance with these standards is sufficient to fulfil the requirements of the Radio and Telecommunications Terminal Equipment 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

Equipment supplied by Codan that satisfies these requirements is identified by the CE0682 ⓘ markings on the model label of the product.

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.

Complying with the European Radio and Telecommunications Terminal Equipment Directive

Electromagnetic compatibility

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

- ❑ Use standard shielded cables supplied from Codan for all connections (see Table 6-1 on page 6-16 for the appropriate cables).

  It is not necessary to use shielded cables from the DC supply to the converter.

- ❑ Ensure the covers for the equipment are correctly fitted.

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

Electrical safety

To ensure compliance with the European Low Voltage Directive is maintained, you must install the Ku-Band Transceiver 5900 series in accordance with the following safety precautions. These precautions must be checked before applying AC power to the transceiver.

- A protective earth connection must be included in the mains wiring to the transceiver (see page 2-6, *Earth symbols*).
- As the transceiver is 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.
- If the unit is connected to the mains supply via a non-detachable power supply cable, the socket-outlet must be installed near the equipment and must be easily accessible.
- When terminating the mains supply cable to the 5582B terminal block, ensure the protective earth wire (green/yellow) is at least 10 mm longer than the live and neutral wires.
- Where the transceiver uses a 5582B PSU, the PSU must be set to the required AC mains voltage and the correct fuses must be fitted (see page 6-7, *Power supply unit*).
- The protective cover must be secured above the AC input terminal block.

- ❑ Use the standard DC supply cable shown to connect the DC power to the converter:

PSU/SSPA	Cable (Codan part number)
5582B	08-05634-xxx
5940	08-05961-xxx

These cables have conductors with red insulation for the +ve supply connections, and conductors with black insulation for the –ve supply connections.

Radiation safety

Do not look into the unterminated output of the SSPA or point it towards anyone.

Always fit the correct termination to the SSPA or fit the blanking plate (waveguide only).

Earth station antennas radiate electromagnetic fields that may be harmful to humans. Ensure that you maintain the minimum safe distance for the elevation angle of the antenna in your earth station (see Table 2-1).

R&TTE Directive 1999/5/EC article 3.1(a) specifies essential requirements for protection of the health and safety of the user and any other person in the vicinity of an earth station antenna. ICNIRP guidelines have been used to determine how close a person may approach the front of the antenna without exceeding the ICNIRP general public reference level for electromagnetic fields.

A suitable fence or other barrier must be provided to prevent casual occupancy of the area in front of the antenna within the safe distance given in Table 2-1. As the antenna size is increased or the transceiver output power rating is reduced, the required safe distance becomes smaller.

Table 2-1 specifies the minimum safe distance versus elevation angle for a 1.2 m diameter antenna fitted with a 16 W transceiver system. Table 2-2 specifies similar information for a 3.8 m diameter antenna fitted with a 40 W transceiver system.

Table 2-1: Safe distance for 1.2 m diameter antenna with 16 W transceiver

Antenna elevation angle (degrees)	Safe distance (m)
7.5	23.5
15	11
30	5.5
45	3.5
60	2.5
75	1.5

Table 2-2: Safe distance for 3.8 m diameter antenna with 40 W transceiver

Antenna elevation angle (degrees)	Safe distance (m)
7.5	26.5
15	13.0
30	6.5
45	4.5
60	3.5
75	3.0

In the limit case, a 3.8 m diameter antenna with a 16 W transceiver system does not require a fence or barrier.

Protection of radio spectrum

It is the responsibility of the user to ensure any modem used in conjunction with the transceiver complies with EN 301 428 so that CE compliance with respect to radiated spurious signals is maintained. If necessary, consult Codan for more information.

For CE compliance, the transceiver must be set up so that it does not enter the transmit on state upon power up.

To set up the transceiver for CE compliant operation you must:

- ❑ Enter the **SPU1** command.
- ❑ Set the **SSPA** switch on the converter to REMOTE.
- ❑ Ensure the remote opto-isolated Req SSPA Activate input is either in the off state or left disconnected.
- ❑ Enter the **SPA1** command to activate the SSPA.

Earth symbols

Earth connection points have been provided on the transceiver. To comply with the European Low Voltage Directive, the symbols shown in Table 2-3 are used to identify the protective earth and earth on the equipment.

Table 2-3: Earth symbols

Symbols	Meaning
	Protective earth
	Earth

Warning labels

The symbols shown in Table 2-4 are used to identify potential hazards on the equipment.

Table 2-4: Warning labels

Symbols	Meaning
	The surface may be hot to touch
	Non-ionising radiation may be emitted

3 Overview

This chapter describes:

- the Ku-Band Transceiver 5900 series (3-2)
- transceiver control and monitoring (3-3)
- the features of the converter control panel (3-4)
- the converter options (3-6)
- the transceiver configuration (3-9)
- a brief description of the outdoor modules of the transceiver (3-13)
- accessories (3-16)

Introduction to the Ku-Band Transceiver 5900 series

The Codan Ku-Band Transceiver 5900 series is a high performance transceiver for use in a satellite earth station. It is ideally suited to single or multicarrier rural and remote area telephony and data communication.

The transceiver is designed for direct mounting on a wide range of earth station antennas.

The transceiver is based on field-proven, high-reliability microwave modules. It complies with major international standards for Ku-Band equipment.

The Ku-Band Transceiver 5900 series range of equipment comprises:

- Converter Module 5900
- 4 W Solid State Power Amplifier 5904
- 8 W Solid State Power Amplifier 5908
- 16 W Solid State Power Amplifier 5916
- 40 W Solid State Power Amplifier 5940
- Power Supply Unit 5582B
- low noise block converter
- transmit reject filter
- Hand-Held Controller 5560
- Remote Controller 5570

The LNB and TRF are not designed or manufactured by Codan but are available from Codan.

The operation of the hand-held controller and the remote controller is not covered in this manual.

Transceiver control and monitoring

The operating parameters of the transceiver are controlled via the converter. To view or change the operating parameters of the transceiver, the converter must be connected to a Hand-Held Controller 5560, a Remote Controller 5570 or a terminal.

A hand-held controller or a remote controller provide the simplest and most convenient way to set the parameters of the transceiver. For details of how to use a hand-held controller or a remote controller, see the *Hand-Held Controller 5560 User Guide* or the *Remote Controller 5570 User Guide*.

Users who do not have a hand-held controller or a remote controller can create a temporary interface connection to the transceiver via the serial port of a personal computer (see page 7-14, *Serial interface control during setup*).

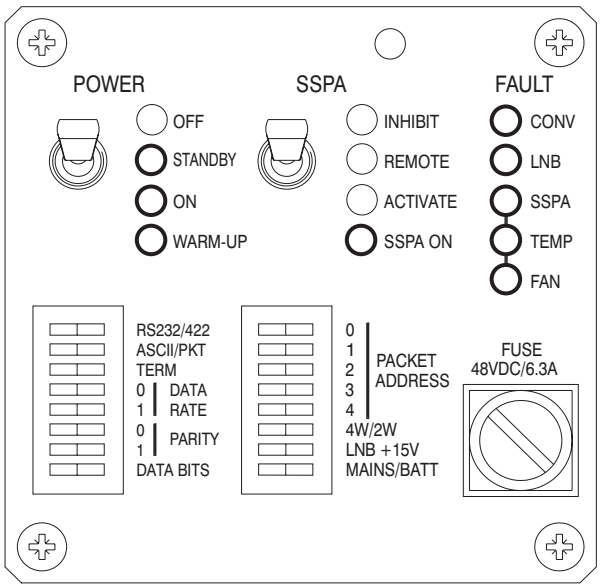
Control panel of the converter

The control panel of the converter provides all the major operational status indicators and controls for the converter, the LNB and the SSPA.

The control panel of the converter consists of:

- three power status indicators and one switch position marker
- one SSPA status indicator and three switch position markers
- five fault indicators
- two sets of DIP option switches

Figure 3-1: Control panel of the converter



Power status indicators and switch position marker

There are three power status indicators on the control panel of the converter:

- **STANDBY**
- **ON**
- **WARM-UP**

There is one power switch position marker (OFF) on the control panel of the converter.

SSPA status indicator and switch position markers

There is one SSPA status indicator (**SSPA ON**) on the control panel of the converter.

There are three SSPA switch position markers on the control panel of the converter:

- INHIBIT
- REMOTE
- ACTIVATE

Fault indicators

There are five red fault indicators on the control panel of the converter:

- **CONV**
- **LNB**
- **SSPA**
- **TEMP**
- **FAN**

The **CONV**, **LNB** and **SSPA** LEDs will illuminate to indicate faults in the converter, LNB and SSPA. The **TEMP** and **FAN** LEDs indicate SSPA temperature and SSPA fan faults.

The converter may be used with a range of SSPAs and LNBs, some of which may not require fault reporting via the converter module. The unused fault indicators can be disabled.

DIP option switches

There are two sets of eight DIP option switches on the control panel of the converter. These switches enable you to select:

- the serial interface that will operate the parameters of your transceiver
- mains or battery operation
- LNB +15 V operation

For information on how to set the converter option switches, see page 7-2, *Setting the converter option switches*.

Converter options

The model label on the converter indicates the transmit frequency band and the bandwidth options used by the converter. For example, **1/W** indicates that the converter transmits within Band 1 and provides wide bandwidth.

Transmit frequency band options

The converter may be supplied for operation on frequency band 1 or 2.

Band option 1 on the converter must be specified for use with a 5940 SSPA.

Table 3-1: Transmit frequency band options

Band option	Transmit frequency (MHz)
1	14000 to 14500
2	13750 to 14500

Bandwidth options

The converter may be supplied with one of two IF bandwidths:

Narrow	40 MHz (indicated by an **N** in the second position on the model label of the converter)
Wide	80 MHz (indicated by a **W** in the second position on the model label of the converter)

If the converter is a narrow bandwidth model, the user can select IF operation at either 70 MHz or 140 MHz.

If the converter is a wide bandwidth model, IF operation is at 140 MHz only.

Low noise block converter options

Frequency band options

The LNB may be supplied for operation on one of three different frequency bands.

Table 3-2: Frequency band options for the LNB

Band option	Receive frequency (MHz)
1	10950 to 11700
2	11700 to 12200
3	12250 to 12750

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

Solid state power amplifier options

Frequency band options

The SSPA may be supplied for operation on frequency band 1 or 2.

Table 3-3: Frequency band options for the 5904/5908/5916 SSPAs

Band option	Transmit frequency (MHz)
1	14000 to 14500
2	13750 to 14500

The frequency band used by the SSPA is indicated on the model label of the SSPA.

The 5940 SSPA can only operate on Band 1 (14000 to 14500 MHz).

Output option

The 5904/5908/5916/5940 SSPAs are provided with waveguide output as standard.

Monitor port option

The 5940 SSPA is provided with a monitor port as standard.

Transceiver configuration

Transceivers with 5904/5908/5916 SSPAs can be powered in two ways:

- the DC supply configuration, or
- the AC supply configuration with a Power Supply Unit 5582B

For both configurations, interconnection of IF signals to baseband equipment is via the converter.

Transceivers with a 5940 SSPA are powered via the AC supply connected to the SSPA. The SSPA supplies 48 V DC to the converter.

DC supply configuration (5904/5908/5916 SSPAs)

The DC supply configuration provides a complete transceiver system. It does not require any indoor equipment (see Figure 3-2). Power is provided from a 48 V DC source.

AC supply configuration (5904/5908/5916 SSPAs)

The AC supply configuration is supplied with a Power Supply Unit 5582B and enables the transceiver to be powered from AC mains (see Figure 3-3).

The PSU may be mounted outdoors to:

- reduce the requirement for long DC power cables
- minimise the DC power cable voltage drop
- remove the need for indoor equipment associated with the transceiver

AC supply configuration (5940 SSPA)

The 5940 SSPA can only be powered from AC mains. The power supply for the converter in a high power configuration comes from the high power SSPA (see Figure 3-4).

Figure 3-2: DC supply configuration

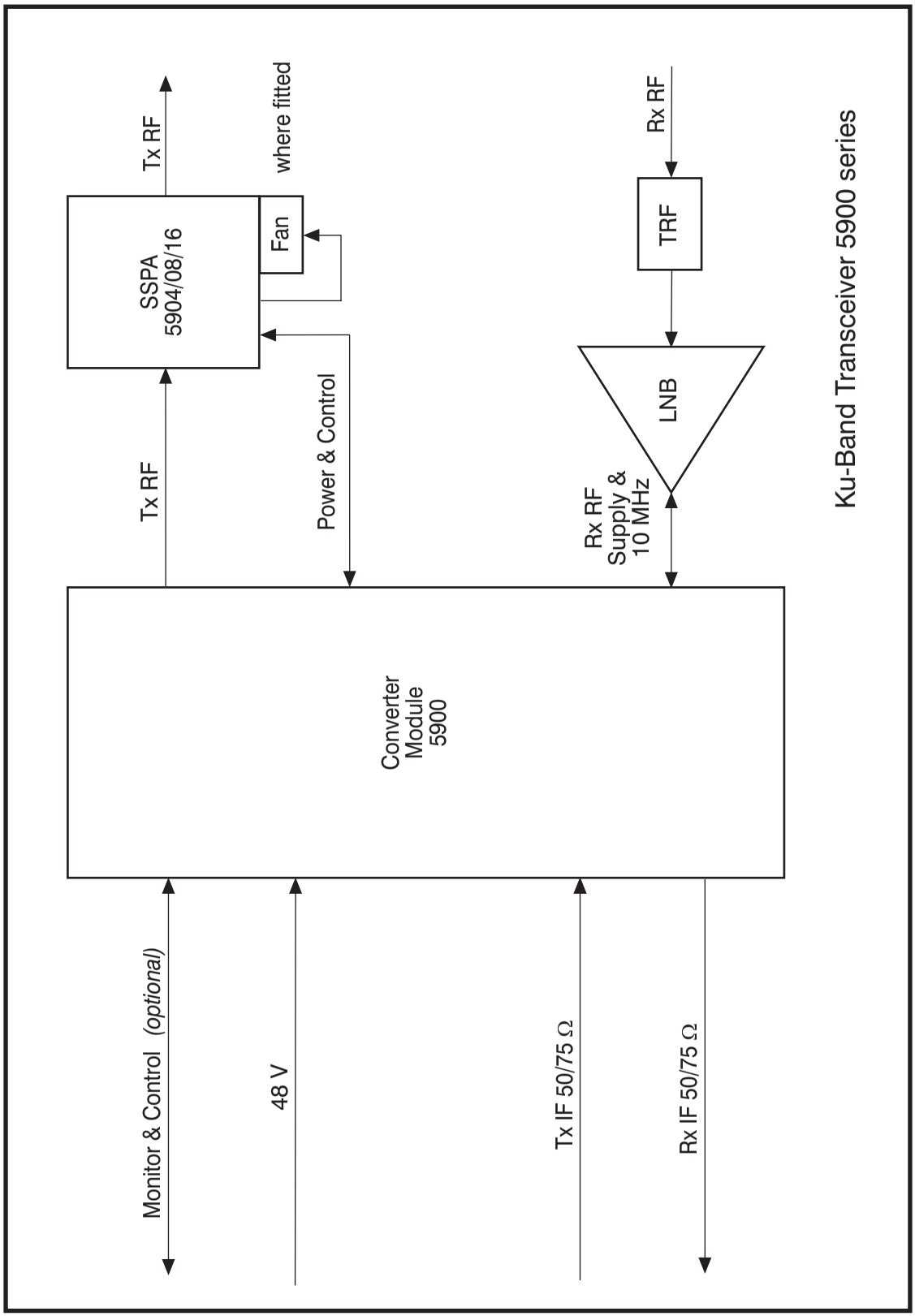


Figure 3-3: AC supply configuration

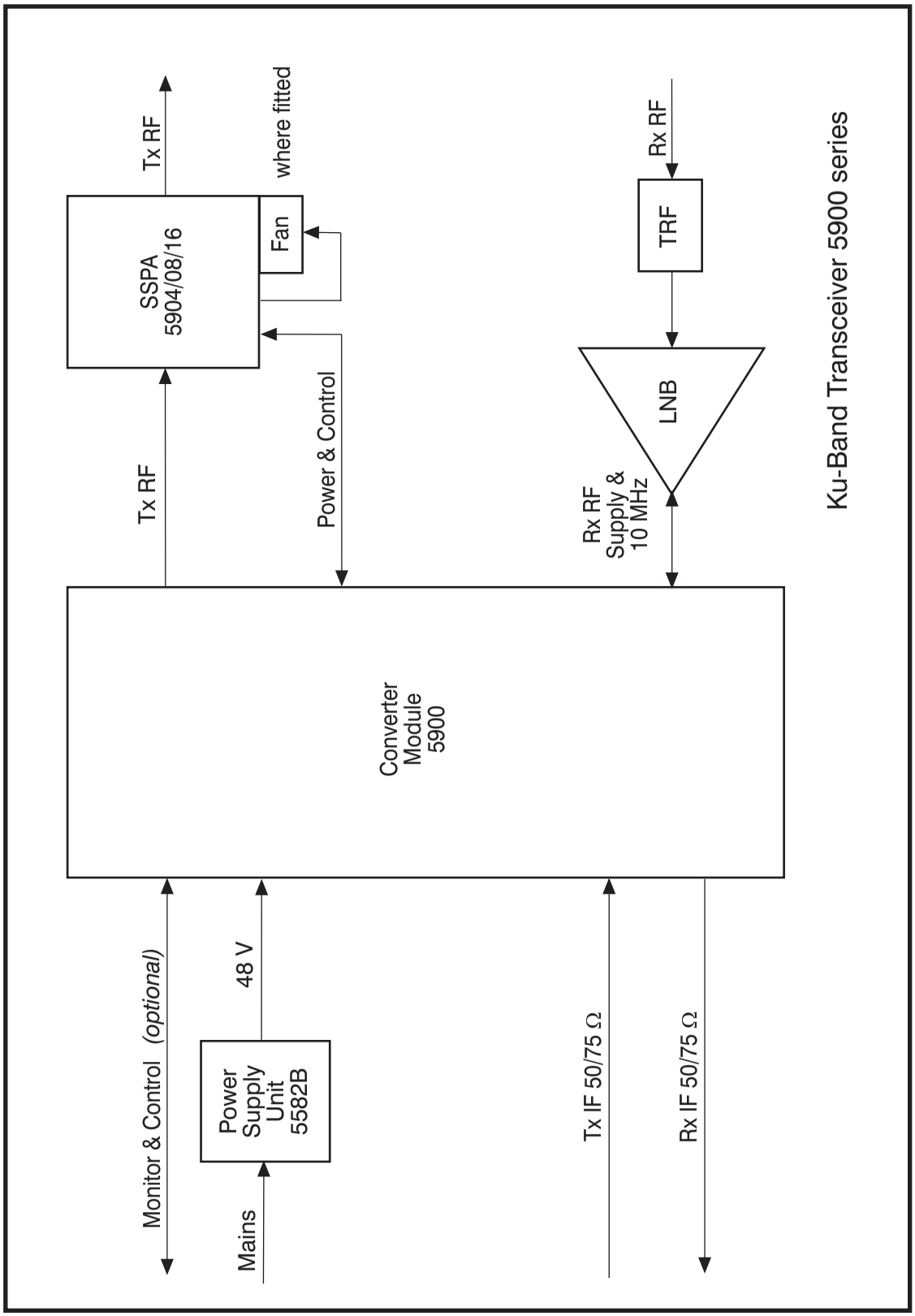
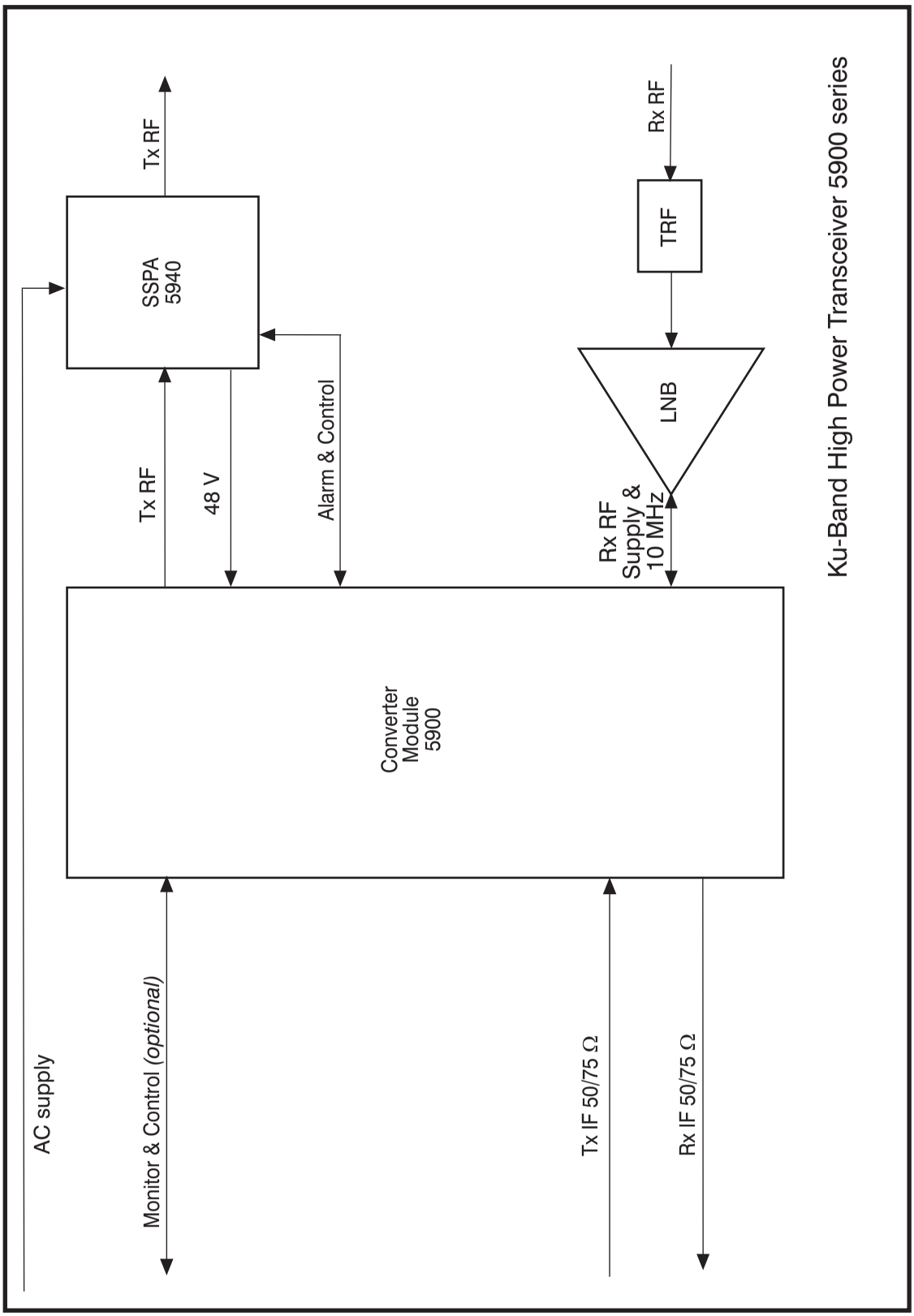


Figure 3-4: High power transceiver configuration



Outdoor modules

The Ku-Band transceiver consists of up to five outdoor-mounting modules:

- Converter Module 5900
- Solid State Power Amplifier 5904/5908/5916/5940
- low noise block converter
- transmit reject filter
- Power Supply Unit 5582B (optional, not required with 5940)

The outdoor modules of the transceiver can be mounted on the antenna or feed support structure. Although a protected position is preferable, the modules are designed to withstand exposure to outdoor weather conditions.

The modules are supplied with brackets and hardware to enable universal mounting.

Diagrams of significant panels and connectors for this equipment are provided in Chapter 10, *Drawings*.

Converter module

The converter performs the frequency conversion in the transceiver. It is a single, integrated outdoor-mounted module.

The converter uses dual conversion and synthesised frequency control in 1 MHz increments. It is protected against transmitting on out-of-band frequencies.

All oscillators are phase locked to the internal reference frequency. The status of all phase locked loops is monitored at all times. If any loop becomes unlocked, the converter indicates a fault.

The converter also has the capability to provide automatic gain versus temperature compensation for the SSPA. This feature is not utilised when used with the 5940 as it is internally compensated.

A specific feature of the converter is its low spurious output specification. This feature makes the system ideally suited to multicarrier applications.

5904/5908/5916 SSPAs

The Codan Ku-Band transceiver is available with a 4 W, 8 W or 16 W SSPA.

The 4 and 8 W SSPAs have a single power output stage. The 16 W SSPA has a parallel output stage. The SSPAs provide high DC power efficiency while maintaining excellent multicarrier intermodulation performance.

The SSPAs are designed to be mounted at the antenna feed or on the feed support close to the antenna feed to minimise transmission losses.

The combination of low power consumption and high speed activation from an external control line makes the transceiver ideal for solar powered systems.

5940 SSPA

The 5940 provides high performance together with compact size, rugged construction and optimum thermal characteristics. Innovative RF power combining technology, the latest GaAs FET devices and surface mount technology are used. Remote operation of all control and status functions is possible via a serial interface.

The 5940 features an output isolator for operation into any load. Alarm thresholds can be set for low or high power and the gain of the SSPA is adjustable over a 20 dB range. Gain variation versus temperature is automatically compensated in firmware.

The SSPA is designed to be mounted on the antenna support structure close to the antenna feed to minimise transmission losses.

Low noise block converter and transmit reject filter

The low noise block converter performs the initial block frequency conversion in the receive path, generating an L-Band output which is further frequency converted by the converter module.

The LNB and TRF are mounted directly on the antenna feed Rx port. In addition to the standard LNB, an optional higher performance LNB is available. Other LNBs may also be used.

The transceiver is designed to interface to LNBs that require power and a 10 MHz reference signal via the RF output connector of the LNB.

Power supply unit

The PSU provides DC power to the transceiver from a 50/60 Hz, 115/230 V AC source. The PSU contains a simple transformer/rectifier supply.

The robust design of the module enables the transceiver to operate reliably when the AC mains supply fluctuates.

Accessories

There are two accessories available for the Ku-Band Transceiver 5900 series:

- the Hand-Held Controller 5560
- the Remote Controller 5570

The hand-held controller is a fully portable controller that is used to display and change the installation parameters of the transceiver.

The remote controller is a rack-mounted controller that is used to display the operating status of the transceiver and to change the transceiver's operating parameters. This controller has an in-built security function to protect the transceiver's parameters from being changed unintentionally or by unauthorised people.

Both controllers connect to the transceiver via the **MONITOR/CONTROL** connector on the converter.

The operation of these controllers is covered in their respective user guides.

4 Specifications

This chapter lists the specifications of the transceiver:

Transmit

IF input

Frequency range	
narrow BW option	70±20 MHz/140±20 MHz selectable
wide BW option	140±40 MHz
Impedance	50/75 Ω selectable
Connector	N-type female
Return loss	18 dB minimum

Gain specification

Gain (includes 2 dB loss for converter to SSPA RF cable)

5904	64 dB nominal
5908	68 dB nominal
5916	71 dB nominal
5940	78 dB nominal (0 dB SSPA gain setting)
Attenuator range	0 to 25 dB nominal
Attenuator step size	1 dB nominal
Gain flatness	
Over IF	
narrow BW option	±1.0 dB maximum, 40 MHz
wide BW option	±2.0 dB maximum, 80 MHz
Over frequency range	±2.0 dB maximum
Gain stability	
5904/5908/5916	±1.5 dB maximum, –40°C to +55°C
5940	±2.0 dB maximum, –40°C to +55°C

RF output

Frequency range	
Band 1	14.0 to 14.5 GHz
Band 2	13.75 to 14.5 GHz

5904 4 W SSPA

Output power (1 dB GCP)	+36 dBm minimum
Connector	WR75, PBR120 flange with M4 tapped holes
VSWR	1.5:1 maximum
Carrier to intermodulation ratio	–27 dBc, two carriers each at 6 dB OPBO from 1 dB GCP

5908 8 W SSPA

Output power (1 dB GCP)	+39 dBm minimum
Connector	WR75, PBR120 flange with M4 tapped holes
VSWR	1.5:1 maximum
Carrier to intermodulation ratio	–26 dBc, two carriers each at 6 dB OPBO from 1 dB GCP
Output power detector range	+25 to +39 dBm

5916 16 W SSPA

Output power (1 dB GCP)	+42 dBm minimum
Connector	WR75, PBR120 flange with M4 tapped holes
VSWR	1.5:1 maximum
Carrier to intermodulation ratio	–25 dBc, two carriers each at 6 dB OPBO from 1 dB GCP
Output power detector range	+28 to +42 dBm

5940 40 W SSPA

Output power (1 dB GCP)	+46.0 dBm minimum @ 25°C
Connector	WR75, PBR120 flange with M4 tapped holes
VSWR	1.25:1 maximum
Carrier to intermodulation ratio	–25 dBc, two carriers each at 6 dB OPBO from 1 dB GCP

Spurious outputs (including harmonics)	Meets ETSI EN 301 443 when used with an antenna compliant with ETSI ETS 301 159 and having a gain of 54 dBi

Phase noise (SSB)

100 Hz	–60 dBc/Hz maximum
1 kHz	–70 dBc/Hz maximum
10 kHz	–75 dBc/Hz maximum
100 kHz	–85 dBc/Hz maximum

Synthesiser step size	1 MHz

Frequency stability

–40°C to +55°C	$\pm 2 \times 10^{-8}$
Aging	$\pm 1 \times 10^{-7}$/year

Cable compensation[a]

Range	
narrow BW option	0 to +1.2 dB nominal, 16 steps
wide BW option	0 to +2.5 dB nominal, 16 steps

a. Cable compensation facility is not provided in converters with D prefix serial numbers.

Receive (excluding LNB)

RF input

Frequency range	950 to 1700 MHz
Impedance	50 Ω
Connector	N-type female
VSWR	1.4:1 maximum
Noise figure	20 dB typical
DC output (switch selectable)	+15 V @ 30 to 425 mA
10 MHz output (switch selectable)	0 dBm ±1 dB

IF output

Frequency range	
narrow BW option	70±20 MHz/140±20 MHz selectable
wide BW option	140±40 MHz
Impedance	50/75 Ω selectable
3rd order intercept	+15 dBm minimum
Connector	N-type female
Return loss	18 dB minimum

Gain specification

Gain	35 dB nominal
Attenuator range	0 to 25 dB nominal
Attenuator step size	1 dB nominal
Gain flatness	
Over IF	
narrow BW option	±1.0 dB maximum, 40 MHz
wide BW option	±2.0 dB maximum, 80 MHz
Over frequency range	±2.0 dB maximum
Gain stability	±3.0 dB maximum, –40°C to +55°C

Image rejection	50 dB minimum
Spurious output	–65 dBm maximum

Phase noise (SSB)

100 Hz	–60 dBc/Hz maximum
1 kHz	–70 dBc/Hz maximum
10 kHz	–80 dBc/Hz maximum
100 kHz	–90 dBc/Hz maximum

Synthesiser step size	1 MHz

Frequency stability

–40°C to +55°C	$\pm 2 \times 10^{-8}$
Aging	$\pm 1 \times 10^{-7}$/year

L-Band IF monitor port

Gain	10±3 dB Rx RF I/P to L-Band monitor
Gain ripple	±2 dB maximum
Output frequency range	950 to 1700 MHz
Output power (1 dB GCP)	0 dBm minimum
Connector	N-type female
Impedance	50 Ω
Return loss	15 dB minimum
DC isolation	Up to 50 V DC

Low noise block converter

The following specifications are for standard LNBs from Codan. LNBs to cover other frequency bands are also available.

Input

Frequency range	Band 1	10.95 to 11.70 GHz
	Band 2	11.70 to 12.20 GHz
	Band 3	12.25 to 12.75 GHz
Interface	WR75, PBR120 flange with M4 tapped holes	
VSWR	2.5:1 typical	

Noise figure	1.2 dB at 25°C maximum 1.0 dB typical

Gain specification

Gain	60 dB typical
Gain flatness	±1.5 dB maximum full band

Output

1 dB GCP	0 dBm minimum
3rd order intercept	+11 dBm minimum
Impedance	50 Ω
Connector	N-type female
VSWR	1.5:1 typical

Transmit reject filter

The following specifications are for standard TRFs from Codan. TRFs to cover other frequency bands are also available.

Pass band	10.95 to 12.75 GHz
Insertion loss	0.05 dB maximum
Reject band	13.75 to 14.5 GHz
Rejection	55 dB minimum

General

Input voltage

5904/5908/5916	42 to 72 V DC (floating input) standard 115/230 V AC, ±15% with optional PSU
5940	104 to 274 V AC, 47 to 63 Hz

Power consumption

DC	5904	115 W maximum with SSPA on
	5908	165 W maximum with SSPA on
	5916	250 W maximum with SSPA on 50 W maximum with SSPA off
AC	5904	180 VA maximum SSPA on
	5908	260 VA maximum SSPA on
	5916	390 VA maximum SSPA on
	5940	500 VA typical SSPA on (all @ nominal AC voltage)

Monitor and control facilities

Indicators	**STANDBY** **ON** **WARM-UP** **SSPA ON** **CONV FAULT** **LNB FAULT** **SSPA FAULT** **TEMP FAULT** **FAN FAULT**
Controls	Power control: OFF/STANDBY/ON SSPA control: INHIBIT/REMOTE/ACTIVATE Serial interface settings LNB supply via **Rx RF I/P** connector MAINS/BATT supply select

Remote monitor and control facilities

Serial interface standards	RS232 RS422 (RS485)
Protocol standards	ASCII Packet (RS485); various standards available
Packet protocol address range	0 to 127
Remote monitoring functions (serial interface)	Standby On Warm-up SSPA on Converter fault LNB fault SSPA fault Temperature fault Fan fault SSPA output power Converter temperature SSPA temperature SSPA inhibit control SSPA activate control Transmit frequency Receive frequency Transmit attenuation Receive attenuation Power up mode Cable compensation Reference oscillator override SSPA alarm enable LNB alarm enable Temperature compensation select Packet address (ASCII mode only) Packet address range (ASCII mode only) Packet protocol select SSPA control mode select Converter lock Status change poll IF impedance IF frequency

Remote monitor and control facilities (cont.)

Remote control functions (serial interface)	Power control: standby/on SSPA inhibit control SSPA activate control Transmit frequency Receive frequency Transmit attenuation Receive attenuation Power up mode Cable compensation Reference oscillator override SSPA alarm enable LNB alarm enable Temperature compensation select Address range select (ASCII mode only) Packet protocol select SSPA control mode select Reset Reset change bits IF impedance IF frequency
Remote monitoring functions (contact closure)	Standby Warm-up SSPA activated Converter fault LNB fault SSPA fault Temperature fault Fan fault
Remote control functions (contact closure)	Power control: standby/on SSPA inhibit control SSPA activate control

Environmental

Converter module and SSPAs

Temperature	–40°C to +55°C
Relative humidity	100%
Cooling	
5900	Convection
5904	Convection
5908/5916	Forced air
5940	Forced air
Weatherproofing	
Converter	Sealed to 34 kPa
5904/5908/5916	Sealed to 34 kPa
5940	Sealed to IP66

Power supply unit

Temperature	–40°C to +55°C
Relative humidity	100%
Cooling	Convection
Weatherproofing	Sealed to IP65

Physical

All dimensions are measured over the connectors.

Size

Converter module	110 mm W × 410 mm D × 240 mm H
SSPA module	
5904	140 mm W × 300 mm D × 145 mm H
5908	140 mm W × 335 mm D × 195 mm H
5916	140 mm W × 335 mm D × 195 mm H
5940	280 mm W × 355 mm D × 495 mm H
Power supply unit 5582B	200 mm W × 160 mm D × 370 mm H

Weight

Converter module	8 kg
SSPA module	
5904	5.1 kg
5908/5916	6 kg
5940	27 kg
Power supply unit 5582B	10 kg

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5 How the transceiver works

This chapter provides a brief technical description of the main operating components of the transceiver:

- converter module (5-2)
- solid state power amplifier (5-4)
- low noise block converter (5-5)
- transmit reject filter (5-5)
- power supply unit (5-5)

Converter module

The Converter Module 5900 together with the associated LNB provides the IF/RF frequency conversion functions required in a Ku-Band satellite earth station. The converter consists of an up converter and a down converter.

Up converter

The up converter converts the Tx IF input signals up to the appropriate Tx RF output via dual conversion. The actual IF frequency, IF bandwidth and RF frequency are dependent on:

- the options fitted to the converter
- the IF selected (narrow bandwidth option only)
- the Tx frequency selected

The up converter provides a step attenuator and a gain control prior to the first frequency conversion with the Tx LO. The gain control compensates for gain variations due to temperature changes in both the up converter and the SSPA.

The first conversion output signal is filtered by a high-Q interdigital filter, amplified, then applied to the second conversion stage together with the Tx synthesiser output. The resultant signal is filtered and amplified to provide the final Tx RF output signal.

Down converter

The down converter converts the L-Band input signals from the LNB down to the appropriate Rx IF output via dual conversion. The actual RF frequency, IF bandwidth and IF frequency are dependent on:

- the options fitted to the converter
- the IF selected (narrow bandwidth option only)
- the Rx frequency selected

The L-Band input signal is band-pass filtered and applied to the first conversion stage together with the Rx synthesiser signal. The resultant signal is amplified and filtered again, then applied to the second conversion stage together with the Rx LO. The second conversion output is then further amplified and passed through the Rx step attenuator control to provide the final Rx IF output.

Synthesisers

The Tx synthesiser contains two phase locked loops to produce a synthesised output at approximately 4.5 GHz. This output is then multiplied by three to produce the SHF LO output with a resolution of 3 MHz. The Tx LO operates in 1 MHz steps over the appropriate 3 MHz range. The resolution of the frequency control is 1 MHz.

The Rx synthesiser contains two phase locked loops to produce the required synthesiser output. The resolution of the frequency control is 1 MHz.

All oscillators and synthesisers are phase locked to the internal reference frequency.

Control and fault detection

A microprocessor in the converter provides the control logic and fault detection for the converter and LNB.

The status of all phase locked loops in the converter is monitored and a converter fault is indicated if any loop becomes unlocked. During an up converter fault period, the converter inhibits transmission by shutting down power to the final transmit stages.

The converter monitors the supply current of the LNB to detect LNB failure and incorporates overcurrent shutdown circuit protection.

Receive L-Band monitor

The Ku-Band Transceiver 5900 series has a receive L-Band monitor. The receive L-Band monitor provides a similar output to the low noise block converter without the DC supply voltage or the 10 MHz reference signal. This output can be used when aligning the antenna and/or for TV receive-only applications.

Solid state power amplifier

The SSPA modules use GaAs FETs, and in the 5940 SSPA, RF power combining technology to amplify signals in the specified frequency range.

The SSPAs incorporate a WR75 waveguide output and an integral heatsink.

A cooling fan and shroud are standard on all SSPAs except the 5904 SSPA. The fan operates whenever the SSPA is activated.

In the 5940 SSPA, the Ku-Band input signal is amplified by a variable gain driver module, which then feeds the final power module. The final power module amplifies the signal and divides the signal into four parts by a divider. The four outputs are amplified by four parallel power stages. The outputs of these power stages are combined in a waveguide power combiner.

The SSPAs are internally protected from damage in conditions of:

- overcurrent
- high temperature
- output short circuit
- output open circuit

Low noise block converter

The LNB uses HEMT FETs to amplify signals in the specified receive frequency range. The input is via WR75 waveguide and connects directly to the feed to maintain a low noise input.

The LNB performs the initial frequency conversion from the Rx RF frequency to the L-Band frequency range. The conversion oscillator signal is phase locked to a 10 MHz reference signal from the converter.

The LNB obtains power and the required 10 MHz reference signal via the **Rx RF I/P** connector of the converter and the Rx RF coaxial cable.

Transmit reject filter

The TRF is a low-pass, waveguide filter. It has a low insertion loss in the specified receive pass band and high attenuation in the specified transmit reject band.

The increased isolation between the receive and transmit ports provided by the TRF ensures that the transmit signals will not enter and overload the LNB or down converter.

Depending upon the isolation provided by the ortho-mode transducer, a TRF may not be necessary on some antennas.

Power supply unit

The Power Supply Unit 5582B is a robust, wide-range power supply. It is specifically designed to provide the nominal 48 V DC supply required by the Ku-Band transceiver. The supply source is 50/60 Hz, 115/230 V AC mains.

The PSU is unregulated and behaves like a simple transformer/rectifier supply. The DC voltage output to the transceiver will be somewhere between 37 V (at very low mains) and 72 V (at high mains).

The positive output of the PSU is earthed for protection. An auxiliary 48 V DC output is provided for powering a redundancy system.

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6 Installation

This chapter covers the following topics:

Unpacking the equipment

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

If all units are in a satisfactory condition, follow the safety precautions and installation procedure in this chapter.

Safety precautions

Before switching the transceiver on, the following safety precautions must be taken.

Radiation warning

The 5940 SSPA is capable of both high gain and high power. The output should be connected to the antenna feed, a suitably rated load or the supplied blanking plate. Ensure that the output is always correctly terminated to prevent possible oscillations due to feedback. When activated, the SSPA could emit high levels of non-ionising radiation from its output if it has not been terminated.

Do not look into the unterminated output or point it towards anyone.

High voltage warning

Regardless of the AC mains voltage used, the power supply unit in the 5940 SSPA produces a DC output voltage in excess of 300 V DC.

The DC output voltage can be lethal.

Do not operate the SSPA with the covers removed.

Installing the outdoor equipment

Ensure you follow all sealing precautions listed in this chapter. If the modules or cable connections are not sealed correctly, the equipment may be damaged or the performance of the satellite station may deteriorate over time.

Converter module

The converter may be mounted on the antenna feed support boom or adjacent to the SSPA. Although a protected position is preferable, the module is designed to withstand exposure to outdoor weather conditions. However, you should avoid areas where water runoff is likely to be channelled into concentrated streams across any connectors.

The converter is supplied with brackets for mounting on a flat surface. The locations of the four M8 clearance mounting holes are shown in drawing 03-01012 in Chapter 10, *Drawings*.

Where a flat surface is not available, use the appropriate kit to mount the converter. Fitting instructions for mounting the converter onto circular or rectangular structures are shown in drawing 15-42000-001 sheet 1 in Chapter 10, *Drawings*.

If the 5940 SSPA has been mounted using the SSPA mounting kit provided, the converter can be mounted on the same mounting frame using the converter bracket plate supplied. Fitting instructions for mounting the converter on the SSPA mounting frame are shown in drawing 15-40196-001 in Chapter 10, *Drawings*.

Mount the converter so that you have easy access to and a clear view of the control panel. Also, ensure that the position of the converter allows interconnecting cables to be run neatly.

For cable interconnection information, see Table 6-1 on page 6-16.

The DC power input is floating so either polarity output may be earthed when connecting the converter to a battery or regulated supply.

The converter has a removable transparent cover that is sealed with a gasket. There is a second seal between the control panel and the internal sections of the converter.

To minimise the chance for moisture to enter the module, the cover should be taken off the equipment only when absolutely necessary. Great care should be taken not to allow rain to enter the control panel area.

Ensure that you use the protective covers supplied with the converter to weatherproof any unused connectors.

You need to set up the converter after you have installed it (see page 7-2, *Setting the converter option switches*).

5904/5908/5916 SSPA

The 5904 SSPA may be mounted directly on the Tx port of the OMT/antenna feed. The input end of the SSPA must be supported to reduce stress on the waveguide output. A tapped M6 hole in the axis of the waveguide output port is provided for this purpose.

If feed-mounting is not possible for the 5904 SSPA, mount the SSPA on the antenna feed support boom with the Tx output as close as possible to the feed.

Mount the 5908/5916 SSPAs on the antenna feed support boom with the Tx output as close as possible to the feed. Ensure that the fan shroud is in the lower-most position and that the open end of the shroud is facing downwards.

Although a protected position is preferable, the module is designed to withstand exposure to outdoor weather conditions. However, you should avoid areas where water runoff is likely to be channelled into concentrated streams across any connectors.

The SSPA is supplied with brackets for mounting on a flat surface. The locations of the four M8 clearance mounting holes for the 5904 SSPA and the 5908/5916 SSPAs are shown in drawings 03-01004 and 03-01006 respectively in Chapter 10, *Drawings*.

Where a flat surface is not available, use the appropriate boom-mounting kit for mounting the SSPA onto circular or rectangular structures. Fitting instructions are shown in drawing 15-42000-001 sheet 2 in Chapter 10, *Drawings*.

SSPAs that are mounted on the boom can be connected to the antenna feed transmit flange with a length of flexible WR75 waveguide and waveguide bends as required. Ensure all waveguide joints are correctly gasketed. Waveguide joints should consist of a grooved flange, such as on the SSPA output, mated with an ungrooved (cover) flange. A standard flange kit, Codan part number 15-40173, is provided with the SSPA. This kit contains an o-ring suitable for the 0.050" o-ring groove in the SSPA.

A WR75 waveguide adaptor kit (Codan part number 15-40183) is available for connecting the SSPA output of the Ku-Band Transceiver 5900 series to waveguide flanges that have holes intended for 6-32 UNC screws. The holes of the waveguide flanges may not accept the M4 screws supplied. The waveguide adaptor kit consists of the adaptor and a flange kit with 6-32 UNC hardware and an allen key. The adaptor is attached to the SSPA using the M4 flange kit supplied with the SSPA.

For cable interconnection information, see Table 6-1 on page 6-16.

You do not need to set up or adjust the SSPA after you have installed it.

If you are using an SSPA other than that provided by Codan, contact your Codan representative for supplementary information.

5940 SSPA

The SSPA may be damaged if the SSPA is driven beyond the level required to produce 1 dB gain compression (see page 8-9, *Transceiver output level (5940 SSPA only)*).

Ensure the transmit input level, the converter transmit attenuation and SSPA gain setting are correct before applying transmit IF input signal.

Mount the SSPA on the antenna support structure with the Tx waveguide output orientated towards the feed.

Ensure the air flow for the cooling fans is not obstructed.

Although a protected position is preferable, the module is designed to withstand exposure to outdoor weather conditions. However, you should avoid areas where water runoff is likely to be channelled into concentrated streams across any connectors.

The SSPA is supplied with brackets for mounting purposes. The locations of the four M12 clearance mounting holes are shown in drawing 0969D23 in Chapter 10, *Drawings*.

For mounting onto circular or rectangular structures, an appropriate mounting kit for the SSPA is supplied. Fitting instructions are shown in drawing 15-40196-001 in Chapter 10, *Drawings*.

The waveguide output of the SSPA can be connected to the antenna feed transmit flange with flexible WR75 waveguide, straight WR75 waveguide and waveguide bends as required. Ensure all waveguide joints are correctly gasketed. Waveguide joints should consist of a grooved flange, such as on the SSPA output, mated with an ungrooved (cover) flange. A standard flange kit is provided with the SSPA. This kit contains an o-ring suitable for the 0.050" o-ring groove in the SSPA.

A WR75 waveguide adaptor kit (Codan part number 15-40183) is available for connecting the SSPA output of the Ku-Band High Power Transceiver 5900 series to waveguide flanges that have holes intended for 6-32 UNC screws. The holes of the waveguide flanges may not accept the M4 screws supplied. The waveguide adaptor kit consists of the adaptor and a flange kit with 6-32 UNC hardware and an allen key. The adaptor is attached to the SSPA using the M4 flange kit with the SSPA.

For cable interconnection information, see Table 6-1 on page 6-16.

You need to set up the SSPA after you have installed it (see page 7-10, *Setting the interface configuration on the 5940 SSPA*).

Before applying power to the SSPA, ensure the installation complies with the safety precautions listed on page 2-3, *Complying with the European Radio and Telecommunications Terminal Equipment Directive*.

Low noise block converter and transmit reject filter

To maintain a good station G/T performance, the LNB should be connected directly to the feed receive port.

If a TRF is required, you can bolt the LNB and TRF together before connecting them directly to the feed receive port.

Ensure all waveguide joints are correctly gasketed. Waveguide joints should consist of a grooved flange, such as on the LNB output, mated with an ungrooved (cover) flange. A flange kit is provided with the LNB. This kit contains an o-ring suitable for the 0.080" o-ring groove in the LNB.

Power supply unit

You may mount the PSU on the antenna support. Although a protected position is preferable, the module is designed to withstand exposure to outdoor weather conditions. However, you should avoid areas where water runoff is likely to be channelled into concentrated streams across any connectors.

The PSU should be positioned with the cable glands at the bottom.

There are two mounting flanges on the top and bottom of the PSU, with six mounting holes in each flange. The location of the mounting holes is shown in drawing 03-00994 in Chapter 10, *Drawings*. You can use these holes to secure the PSU to an appropriate flat surface.

Where a flat surface is not available, use the appropriate pole-mounting kit for mounting the PSU onto circular structures. Fitting instructions are shown in drawing 15-40128-001 in Chapter 10, *Drawings*.

Before applying power to the PSU, ensure the installation complies with the safety precautions listed on page 2-3, *Complying with the European Radio and Telecommunications Terminal Equipment Directive*.

The PSU may be damaged if an incorrect voltage is selected or an incorrect fuse is used.

Selecting the operating voltage and checking the fuse

To select the correct operating voltage and check the fuse:

- ❑ Locate the **Voltage Selector** switch on the internal panel of the PSU.
- ❑ Using a small flat-bladed screwdriver, position the **Voltage Selector** switch for the required AC mains voltage.
- ❑ Using a flat-bladed screwdriver, depress and rotate the cap of the fuse holder 1/8th of a turn counter-clockwise. Remove the cap.

- ❑ Ensure the correct AC line fuse is fitted:

Power supply	Fuse
115 V	5 A/250 V-T
230 V	2.5 A/250 V-T

- ❑ Re-insert the fuse and cap into the fuse holder.
- ❑ Using a flat-bladed screwdriver, depress and rotate the cap of the fuse holder 1/8th of a turn clockwise. Ensure the cap is locked into position.

For cable interconnection information, see Table 6-1 on page 6-16.

The connection details of the 48 V DC power cable to the PSU or other DC source can be found in drawing 08-05634 in Chapter 10, *Drawings*.

The positive output of the nominal 48 V DC supply from the PSU is connected to the chassis of the PSU and hence the mains supply protective earth. Do not connect the negative output to earth, or connect the supply output to equipment in which the negative supply is earthed.

Grounding recommendations

Precautions *must* be taken to ensure the installation is adequately protected against voltage potential differences that may occur between the outdoor and indoor equipment.

These potential differences may occur:

- if there is a fault in the AC mains reticulation system
- when high power electrical machinery located nearby is switched on or off
- if a lightning strike occurs in the area

It is highly recommended that the antenna metal structures and the cases of the outdoor equipment be connected together and grounded with earth stakes, or in the case of rooftop sites, be connected to the lightning grid and earth system of the building. The protective earth screws on the transceiver modules are provided specifically to provide this protection. This practice will also reduce the likelihood of the mains supply or RF interfering with the serial interface signals.

In the case of lightning strikes, huge ground currents occur for several hundred metres around a strike area, causing large voltage potentials between separate earth points. For this reason, some lightning engineers recommend the use of large copper earth straps (or braid) to connect the indoor and outdoor equipment earth systems.

For critical installations in lightning-prone areas, it is strongly advised that you seek expert advice on lightning protection.

Welding precautions

When arc welding on or near the antenna structure, take the following precautions to minimise the danger of large welding currents flowing through the communications cables:

- ❑ Disconnect all cables from the indoor equipment, including power, control and IF cables.
- ❑ Disconnect all cables between the PSU, converter, SSPA and LNB.

Serial interface

The serial interface can be configured for either RS232 or RS422/RS485 interface standard. The protocol can be configured for either ASCII or packet mode. The most common mode of interface operation is with RS232 interface and ASCII protocol selected. All four operating modes are summarised as follows:

Interface/Protocol	Application
RS232/ASCII	Normal RS232 interface for use with a dedicated control computer or a ‘dumb’ terminal (short distances)
RS422/ASCII	RS422 interface for use with a dedicated control computer or a ‘dumb’ terminal (long distances)
RS232/Packet	Enables the RS485 bus to be extended via an RS232 link such as a standard data modem
RS422/Packet	RS485 interface for use in a multidrop bus computer control environment

When RS422/Packet is selected, four packet protocol options are available:

- CODAN (see page 8-16, *Packet protocol*)
- Mode 1
- Mode 2
- Mode 3

If you want to use a packet protocol other than CODAN, contact your Codan representative for more information on the specifications of the alternative protocols.

The appropriate packet protocol can only be selected when using ASCII protocol.

When RS422/Packet is selected, there is an option of either 2-wire or 4-wire interface available.

Set the mode of operation of the serial interface using the appropriate configuration DIP option switch on the control panel of the converter. The options that can be set include the data rate, parity, number of bits per byte and the packet address. The packet protocol and packet address range are not set using the DIP option switches.

RS232 interface

The RS232 interface is specified as a DCE connection. The RS232 interface is a general purpose interface for local point to point communications. Descriptions of the interface connections are as follows:

- RD (receive data)—receive data is sent from the transceiver to the controlling source.
- TD (transmit data)—transmit data is sent to the transceiver from the controlling source.
- CTS (clear to send)—set to the inactive state immediately upon power-on. It is not set to the active state until the transceiver is able to accept serial data (that is, it is held inactive during the power-on reset period and until the transceiver has performed all its initialisation functions). When it is ready to accept serial data, the transceiver uses this output to control the data flow from the controlling source.
- RTS (request to send)—the transceiver transmits serial data either after receiving a request for information, at a periodic time for temperature and/or output power logging, or following a change in status of the transceiver. In all cases, the amount of data is minimal and the need to control data transmission from the transceiver is not required.
- GND (ground)—reference ground connected to the chassis and 0 V.

RS422 interface

The RS422 interface uses a pair of signal lines operating in a differential mode. This provides much greater distance and noise immunity than the RS232 interface. No external data flow control signals are used with the RS422 interface.

The RS422 interface is also suitable for multidrop bus applications, for example, where multiple transceivers or modems are connected to one controlling source such as a computer. In this situation, each RS422 driver on the bus must only switch on when transmission from that device is required.

Although no external data flow control signals are used with the RS422 interface, each bus device internally controls the transmit status of its RS422 driver.

When ASCII protocol is selected in the converter, the RS422 driver is permanently enabled.

When packet protocol is selected, the RS422 driver is enabled only during the transmission periods. This method of operation also enables the driver and receiver lines to be connected together, thus requiring only two wires to interconnect the bus devices and the controlling source. However, 4-wire operation is preferred as it places less restriction on the operation of the controlling source.

Descriptions of the interface connections are as follows:

- Rx+ (receive data +)—receive data sent to the transceiver from the controlling source.
- Tx+ (transmit data +)—transmit data sent from the transceiver to the controlling source.
- Rx– (receive data –)—the complement of the receive data sent to the transceiver from the controlling source.
- Tx– (transmit data –)—the complement of the transmit data sent from the transceiver to the controlling source.
- GND (ground)—reference ground connected to the chassis and 0 V.

When operating in a 2-wire mode, the Tx+ and Rx+ signals are connected together and the Tx– and Rx– signals are connected together.

The general requirement for wiring the RS422 interface is a low impedance (120 Ω) transmission line (twisted pair) from the controlling source to the farthest bus device from the controlling source.

Connections can be made to the other bus devices along the length of the transmission line. Under these conditions, only the controlling source and the far end device should be terminated. All other bus devices should be unterminated. Use the **TERM** DIP option switch on the control panel of the converter to terminate the RS422 lines as required.

Monitor and control interface

The **MONITOR/CONTROL** connector interface of the converter provides relay contacts to indicate the faults and operational status of the transceiver. The following contacts share a common contact connection.

SSPA Fault	Closed when there is an undervoltage or overcurrent condition in the SSPA, or if the SSPA is disconnected
Temp Fault	Closed when the SSPA temperature is in excess of: 75°C nominal for 5904/5908/5916 SSPAs, 80°C nominal for 5940 SSPA, or if the SSPA is disconnected
Warm-up	Closed during the warm-up period Switches on and off if the reference oscillator override option is selected
SSPA O/P Fault	Closed when the SSPA is not activated or when the SSPA RF output power is below the threshold setting
Fan Fault	Closed when a fan fault has been detected (not used with 5904 and 5940 SSPAs)
Conv Fault	Closed when a converter fault has been detected
Standby	Closed when in standby mode
LNB Fault	Closed when an LNB fault has been detected

Opto-isolated control inputs and DC supply connections are provided. DC supply connections should only be used when isolated contact closures are available.

The opto-isolated control inputs are:

System On	Used to switch the transceiver from standby to on
Req SSPA Activate	Turns the SSPA on
SSPA Inhibit	Unconditionally prevents radiating a carrier by preventing the SSPA from being switched on

The serial interface connections depend on which serial interface operating mode has been selected. This is determined by three DIP option switches:

- **RS232/422** switch
- **ASCII/PKT** switch
- **4W/2W** switch

Details of the appropriate connections are as follows:

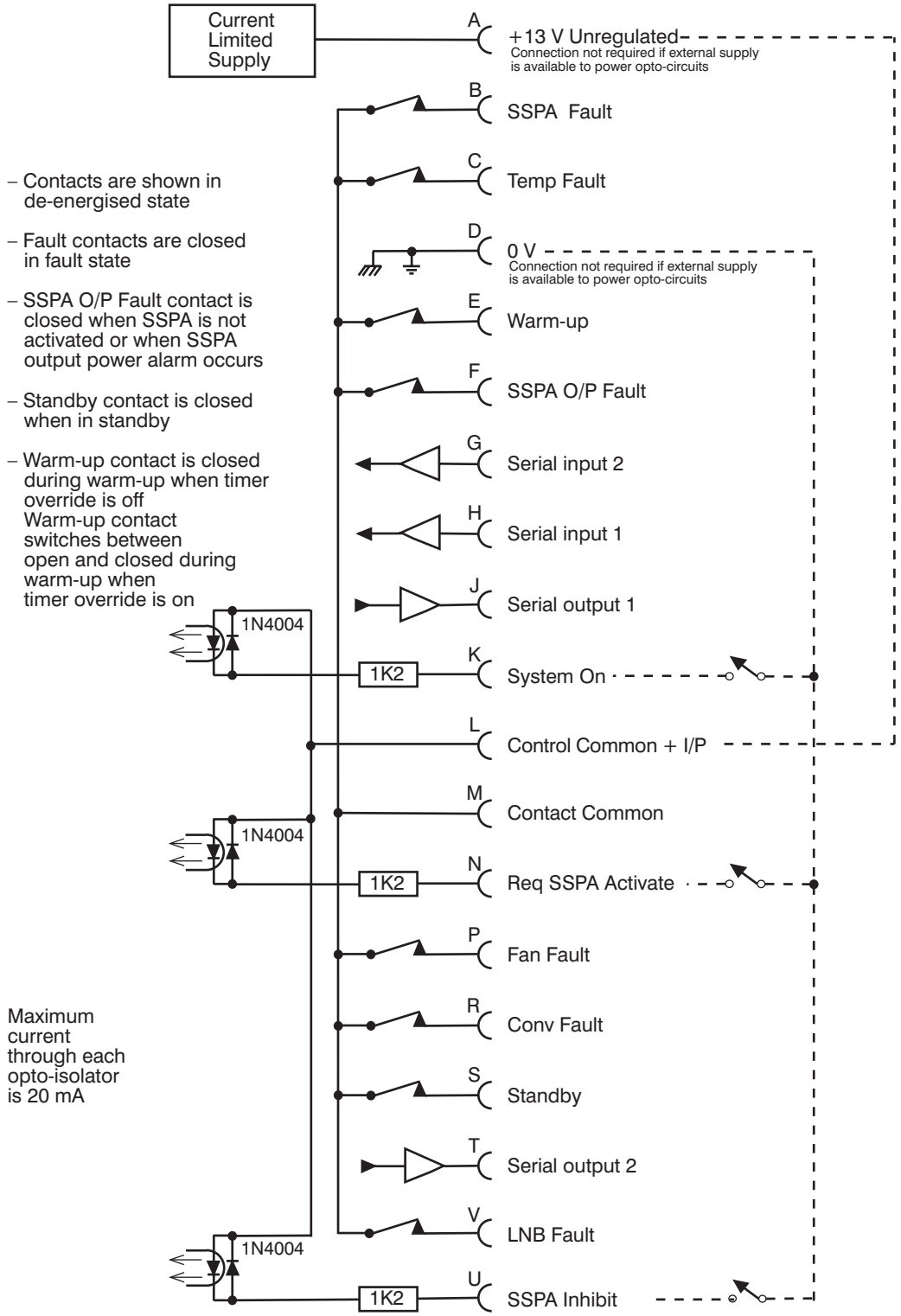
Description	RS232	RS422/ASCII or RS422/Packet/4W	RS422/Packet/2W
Serial output 1	RD	Tx+	Tx+ and Rx+
Serial input 1	TD	Rx+	No connection required
Serial input 2	RTS	Rx–	No connection required
Serial output 2	CTS	Tx–	Tx– and Rx–

The Monitor and Control connector interface of the converter is shown in Figure 6-1.

The **MONITOR/CONTROL** connector is a MIL-C-26482 14-19S socket.

For information on the serial interface signals, see page 6-10, *Serial interface*.

Figure 6-1: Monitor and Control connector interface of the converter



Low noise block converter interface

The LNB supplied with the transceiver obtains the required DC power and 10 MHz reference signal via its **Rx RF O/P** connector. The +15 V DC power and 10 MHz reference signal is fed from the **Rx RF I/P** connector of the converter. This connector is capable of supplying up to 450 mA.

Cables

You *must* use standard shielded Codan cables to make the interconnections as shown in Table 6-1 on page 6-16. These cables conform with the EMC Directive (see Chapter 2, *Ku-Band transceiver compliance*).

The 48 V DC power cable is the only cable that does not require shielding (see page 6-18, *48 V DC power cable (5582B to 5900)* and page 6-18, *Converter 48 V DC power cable (5940 to 5900)*).

The last three digits of each part number (shown as xxx in Table 6-1) represent a code for the cable length. This will vary with different cables and systems.

In installations where the cables are not supplied by Codan, the cable requirements on page 6-17, *Cable fabrication* should be noted.

For details of the installation requirements, see page 6-19, *Cable installation*.

Table 6-1: Interconnection of standard cables

Cable		**From**		**To**	
Part No.	**Type**	**Equip.**	**Connector**	**Equip.**	**Connector**
Systems using 5904/5908/5916 SSPAs					
–	AC Mains to Flying leads	AC Mains	As required	5582B	AC input Terminal Block
08-05634-xxx	Flying leads to MS3106F18-11S	DC supply	As required	5900	**DC POWER**
08-05634-xxx	Flying leads to MS3106F18-11S	5582B	Transceiver 48 V Terminal Block	5900	**DC POWER**
08-05887-xxx	MS3116F12-10P to MS3116F12-10S	5900	**SSPA DC/ CONTROL**	5904/5908/ 5916	DC/Control

Table 6-1: Interconnection of standard cables (cont.)

Cable		From		To	
Part No.	**Type**	**Equip.**	**Connector**	**Equip.**	**Connector**
Systems using a 5940 SSPA					
04-0969A-12	AC Mains to Amphenol T 3109 001	AC Mains	As required	5940	**AC INPUT**
08-05961-xxx	MS3106F18-11P	5940	**–48 V DC OUTPUTS**	5900	**DC POWER**
08-05857-xxx	MS3116F12-10P to MS3116F14-19S	5900	**SSPA/DC CONTROL**	5940	**CONTROL**
Common cables					
08-05597-xxx	N(P) to N(P) coaxial cable	5900	**Tx RF O/P**	5904/5908/ 5916/5940	**RF INPUT**
08-05536-xxx	N(P) to N(P) coaxial cable	5900	**Rx RF I/P**	LNB	Output
–	WR75 Flex W/G	5904/5908/ 5916/5940	**RF OUTPUT**	Antenna feed	Tx Flange
–	N(P) to N(P) coaxial cable	5900	**Tx IF I/P**	User IF equipment	Tx IF Output
–	N(P) to N(P) coaxial cable	5900	**Rx IF O/P**	User IF equipment	Rx IF Input

Cable fabrication

For connector requirements, refer to the Cable type column in Table 6-1 on page 6-16. Note that all N-type connectors are 50 Ω impedance, even when using 75 Ω impedance IF cables.

To conform with the EMC Directive (see Chapter 2, *Ku-Band transceiver compliance*), all cables *must* be assembled as shown in drawings 08-05301, 08-05634, 08-05961, 08-05857 and 08-05887 in Chapter 10, *Drawings*.

48 V DC power cable (5582B to 5900)

The 48 V DC power cable should be wired as shown in drawing 08-05634 in Chapter 10, *Drawings*. The total cable loop resistance must not exceed 0.35 Ω.

Ensure that you use the wire colours specified in drawing 08-05634 to comply with the EMC Directive (see Chapter 2, *Ku-Band transceiver compliance*).

The minimum input voltage required by the transceiver is 37 V DC. You must ensure the voltage at the DC power connector of the converter does not fall below this voltage. Ensure you take into account the DC power cable resistance and battery/power supply regulation at full load.

For example, to manufacture a 50 m (164 ft) cable use 4-core cable with each wire 50/0.25 (2.5 mm^2, approximately 13 AWG). Connect the wires in parallel to produce two conductors, each with a total cross-sectional area of 5 mm^2.

Converter 48 V DC power cable (5940 to 5900)

The 48 V DC power cable should be wired as shown in drawing 08-05961 in Chapter 10, *Drawings*.

Ensure that you use the wire colours specified in drawing 08-05961 to comply with the EMC Directive (see Chapter 2, *Ku-Band transceiver compliance*).

The wire size should be suitable for the required connectors.

IF cables

The transmit input IF and receive output IF impedances of the converter can be set to either 50 Ω or 75 Ω. However the converter is only fitted with 50 Ω N-type sockets.

The 75 Ω N-type connector has a centre pin of smaller diameter than that of the 50 Ω N-type connector. Due to this, the 75 Ω N-type plugs cannot be connected to the 50 Ω N-type sockets on the converter. If you want to use 75 Ω IF cables, you must fit 50 Ω N-type plugs to the converter ends of the IF cables.

When purchasing a 50 Ω N-type plug to use with a 75 Ω cable, ensure the size of the cable entry point at the rear of the plug is sufficient to fit the thicker 75 Ω coaxial cable.

The use of 50 Ω connectors in a 75 Ω system operating at IFs of 70 MHz or 140 MHz does *not* affect performance.

Cable installation

General guidelines

Use the most direct route possible for the cable runs. Secure the cable runs with cable ties or other suitable clamps.

You may install the indoor/outdoor interconnecting cables underground (for example, in 75 mm PVC pipe), or supported by an overhead catenary wire. Since the transmit and receive IF coaxial cables are identical, mark the cables at each end before you install them. Also, ensure that there is enough slack left to make antenna adjustments without straining the cables.

Transmit RF cable

A high performance RF cable, Codan part number 08-05597-xxx, is supplied with the SSPA for connecting the **Tx RF O/P** connector of the converter and the **Rx RF I/P** connector of the SSPA.

Do not use another cable for this connection.

Corrugated cable may fracture if bent sharply or if bent a number of times.

AC input connection (AC supply to 5582B or 5940)

Connect the AC mains to the 5582B using flexible 3-core cable. The cable should be secured and sealed with the sealing gland supplied. This gland is suitable for cables with an outer diameter between 5 mm and 10 mm.

The 5940 SSPA should be connected to the AC mains using the cable supplied.

Before connecting the AC mains, ensure you take the precautions listed on page 2-3, *Complying with the European Radio and Telecommunications Terminal Equipment Directive*.

The mains cable (including any fixed building wiring) should be of sufficient gauge to ensure that the mains voltage at the mains input of the PSU does not fall by more than 1% when the transceiver is switched on and the SSPA is activated (i.e. 1.2 V @ 120 V AC input or 2.4 V @ 240 V AC input).

Waveguide flange connections

There are two standard o-ring groove depths, 0.050" and 0.080", used for WR75 waveguide components.

Ensure the appropriate o-ring is used, otherwise sealing will be compromised or correct mating of the waveguide flanges will not be possible. Kit 15-40173 is used for o-ring groove depths of 0.050", and kit 15-40172 is used for o-ring groove depths of 0.080".

Connector sealing

All cable connection points require special care during installation, particularly the N-type connections. The slightest amount of water in a microwave coaxial connection will almost completely attenuate the signal.

There are three main areas where N-type connectors leak:

- around the connector junction, where the plug is screwed onto the socket
- the plug itself, between the turning and fixed parts of the plug
- the cable (or heliax) connection to the back of the plug

The connector junction must be well taped with a self-amalgamating tape, such as 3M type 23 Scotch self-amalgamating tape. The tape must cover the connector junction so that no water can creep into the thread between the plug and socket.

To prevent water entering the plug, cover between the turning and fixed parts of the plug with self-amalgamating tape.

It is not sufficient to rely on heatshrink tubing over the connector body to seal the cable (or heliax) connection to the back of the plug. Even the best heatshrink glues do not adhere reliably to the cable outer sheath or to the shiny metal connector body. It is essential to tape this area with self-amalgamating tape to prevent water getting into the back of the N-type plug.

The N-type connections should be carefully taped from the plug/socket junction right to the cable itself.

All other connectors must also be taped. Although many control and power connections are made with MS connectors, it is still recommended that these junctions are fully taped in the same way as the N-type connections outlined above. Tape from the fixed equipment socket (or plug body), right over the cable connector, to the cable sheath.

When using self-amalgamating tape, do not stretch it too much, especially over the protruding parts of MS connectors. If the tape is over-stretched, it tends to break away after a few weeks or months.

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7 Setting up the transceiver

This chapter covers the following topics:

Setting the converter option switches

Two sets of DIP option switches (2 × 8) are located on the control panel of the converter. These switches enable you to select:

- mains or battery operation
- LNB +15 V operation
- serial interface parameters

Table 7-1: Option switches

Option switch 1

Switch	Option
1	RS232/RS422 interface select
2	ASCII/Packet protocol select
3	RS422 interface termination
4 & 5	Data rate select
6 & 7	Parity select
8	Number of data bits select

Option switch 2

Switch	Option
1–5	Packet protocol address select
6	4-wire/2-wire mode select (RS485 only)
7	LNB +15 V on/off
8	Mains/battery select

To gain access to the option switches, use a 2.5 mm Allen key to remove the transparent cover on the control panel of the converter.

When you are replacing the transparent cover after changing the options, ensure the gasket is in place and that the screws are *not* overtightened.

Selecting mains or battery operation

The Mains/Battery option enables you to select the turn-on voltage of the transceiver. Selecting the correct turn-on voltage provides clean switch-on and switch-off characteristics during unreliable voltage supply conditions.

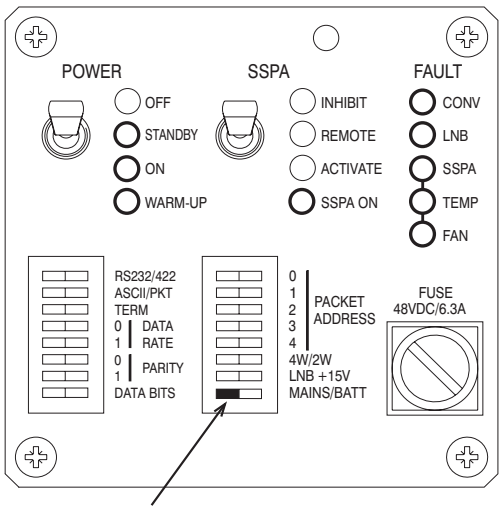
The turn-on voltage required by the transceiver depends on which supply source is used. If you are using an unregulated supply source, such as the Power Supply Unit 5582B, a high turn-on voltage (52 V) is required. In this situation, set the **MAINS/BATT** switch to MAINS (Off).

If you are using the supply from the 5940 SSPA, a 48 V DC battery system or a regulated 48 V DC supply, a low turn-on voltage (42 V) is required. In this situation, set the **MAINS/BATT** switch to BATT (On).

For switch positions, see Figure 7-1.

The turn-off voltage is 37 V in both cases.

Figure 7-1: Mains/Battery switch



Note: The shaded area represents the depressed part of the switch.

Selecting the voltage at the RF connector

The LNB +15 V option enables you to switch on or off the +15 V DC supply to the **Rx RF I/P** connector.

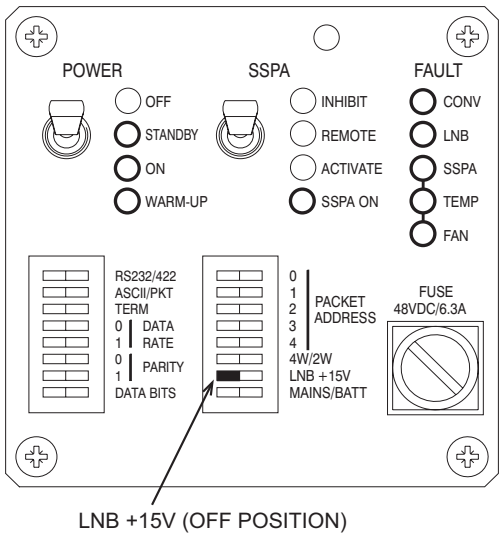
If you are connecting the LNB, set the **LNB +15 V** switch to ON.

If you wish to connect test equipment, set the **LNB +15 V** switch to OFF.

For switch positions, see Figure 7-2.

Ensure that the **LNB +15 V** switch is set to OFF if any test equipment connected is not designed to be powered via its RF output connector. If the switch is set to ON, the equipment may be damaged.

Figure 7-2: LNB +15 V switch position



Note: The shaded area represents the depressed part of the switch.

Selecting serial interface parameters

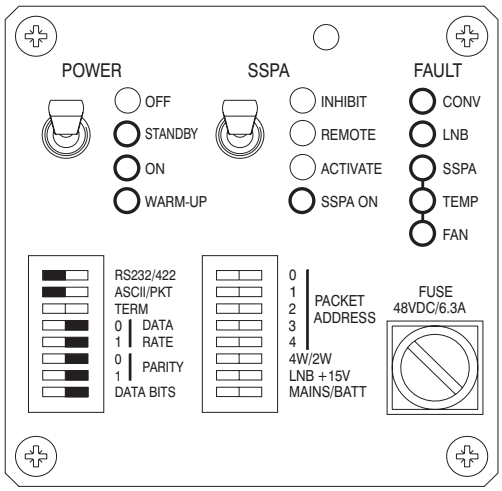
The serial interface option switches enable you to select the serial interface operating parameters of the transceiver.

The recommended and most common mode of interface operation is:

- RS232 interface
- ASCII protocol
- 9600 bits/second
- 8 data bits
- no parity

Figure 7-3 shows the switch positions for the mode of serial interface operation listed above.

Figure 7-3: Recommended serial interface switch settings



Note: The shaded area represents the depressed part of the switch.

Before setting the serial interface parameters, check that they are within the specific requirements or capabilities of the equipment used in your installation.

If your installation requires different settings to those listed above, see the serial interface parameter options in Tables 7-2, 7-3 and 7-4.

Selecting the operating mode

Two DIP option switches enable you to select the serial interface operating mode. The parameter options are shown in Table 7-2.

Table 7-2: Position of DIP option switches for serial interface operating mode

Switch position	**RS232/422**
OFF	RS232
ON	RS422
Switch position	**ASCII/PKT**
OFF	ASCII
ON	PACKET

Setting general serial interface parameters

The general parameter DIP option switches enable you to select the general serial interface operating parameters. They are applicable to all serial interface operating modes and should be set to match the corresponding settings of the terminal to be connected. The parameter options are shown in Table 7-3.

Table 7-3: Position of DIP option switches for general serial interface parameters

Switch positions		
Switch 0	**Switch 1**	**Data rate (bit/sec)**
OFF	OFF	1200
ON	OFF	2400
OFF	ON	4800
ON	ON	9600
Switch position		**Data bits**
OFF		7 data bits[a]
ON		8 data bits
Switch positions		
Switch 0	**Switch 1**	**Parity**
OFF	OFF	Do not use[b]
ON	OFF	Odd
OFF	ON	Even
ON	ON	None[a]

a. When 7 data bits with no parity is selected, the transmission format changes from the normal one stop bit to two stop bits.

b. At switch-on, this switch setting will cause the stored parameter settings to be reset to the factory default settings.

If your converter is fitted with software prior to version 2.00 and switches 0 and 1 are set to OFF, apart from the parameter settings being reset to the factory default settings, the following information is deleted:

- the serial number
- the internal attenuation figures set in the factory
- the custom converter temperature compensation table

The deletion of the serial number may cause problems with third party monitor and control software that expects to be able to read the serial number of the converter.

The deletion of the internal attenuation figures will cause a slight increase in gain, which may drive the connected SSPA into saturation.

The deletion of the custom converter temperature compensation table will cause the 5900 Converter to default to the standard converter compensation table. This may cause a slight change in the gain versus temperature compensation in the converter, but it will not be significant.

Selecting RS422 interface parameters

The RS422 DIP option switches enable you to select the serial interface operating parameters applicable to the RS422 interface only. They should be set based on the type of installation. The selection of 2-wire or 4-wire operation is possible only if packet operation (RS485) is selected. The parameter options are shown in Table 7-4.

Table 7-4: Position of DIP option switches for serial interface RS422

Switch position	**4W/2W**
OFF	4-wire RS485 operation
ON	2-wire RS485 operation
Switch position	**TERM**
OFF	Not terminated
ON	Terminated

Setting the packet address

The packet address DIP option switches enable you to select a serial interface packet address. The address is applicable only when the packet protocol mode is selected. It is determined by network requirements.

The address switches provide an address selection capability of up to 31. Use these switches in conjunction with the set address range command to expand the address selection capability to 127.

The address should not be set to 0 as this is reserved for the controller’s address.

The significance of each address switch and the minimum and maximum address switch settings are shown in Table 7-5.

Table 7-5: Position of DIP option switches for serial interface packet address

Switch positions					**Packet address**
Switch 0	**Switch 1**	**Switch 2**	**Switch 3**	**Switch 4**	
OFF	OFF	OFF	OFF	OFF	0
ON	OFF	OFF	OFF	OFF	1
OFF	ON	OFF	OFF	OFF	2
OFF	OFF	ON	OFF	OFF	4
OFF	OFF	OFF	ON	OFF	8
OFF	OFF	OFF	OFF	ON	16
ON	ON	ON	ON	ON	31

Setting the interface configuration on the 5940 SSPA

The monitor and control interface in the 5940 SSPA must be set to specifically drive the Converter 5900. For information on how to change the setup of the SSPA using the SSPA Manager software, see *Chapter 7, Operating the solid state power amplifier* in the *C-Band and Ku-Band Hub-mount SSPAs 5760/5712H and 5940 Reference Manual*. The converter connection must be set to Codan.

Switching on the transceiver

Before you can complete setting up the transceiver, the transceiver must be switched on. The steps involved in switching on the transceiver depend on the configuration of your installation. The configuration depends on your power source:

- DC supply configuration
- AC supply configuration with the PSU

These procedures are used when operating the transceiver with a Codan SSPA. Follow the appropriate configuration section below when you want to switch on the transceiver and verify correct basic operation.

The 5940 SSPA may be damaged if the SSPA is driven beyond the level required to produce 1 dB gain compression (see page 8-9, *Transceiver output level (5940 SSPA only)*).

Ensure the transmit input level, the converter transmit attenuation and SSPA gain setting are correct before applying transmit IF input signal.

DC supply configuration (5904/5908/5916 SSPAs only)

To switch on the transceiver configured with a DC supply and verify correct basic operation:

- ❑ Ensure power is connected to the converter.
- ❑ Use a 2.5 mm Allen key to remove the transparent cover on the control panel of the converter.
- ❑ Set the **SSPA** switch on the converter to INHIBIT.
- ❑ Set the **POWER** switch on the converter to STANDBY.
- ❑ Check that:
  - the **STANDBY** LED is on
  - the **WARM-UP** LED is on (if the reference oscillator override has been selected, the **WARM-UP** LED will flash until the warm-up period has elapsed)
  - all the **FAULT** LEDs are on momentarily indicating that all **FAULT** LEDs are operational

- ❑ Set the **POWER** switch on the converter to ON and check that:
  - the **ON** LED is on
  - the **STANDBY** LED is off
  - the **CONV FAULT** and **LNB FAULT** LEDs are off (these are on momentarily when power is turned on)

  See Chapter 9, *Maintenance and fault finding*, if either the **CONV FAULT** or the **LNB FAULT** LED remain on.
- ❑ Set the **SSPA** switch on the converter to ACTIVATE.
- ❑ Check that the **SSPA ON** LED is on.

  If the **SSPA ON** LED is not on, see Chapter 9, *Maintenance and fault finding*.
- ❑ Check that all **FAULT** LEDs are off.

  If any **FAULT** LEDs are on, see Chapter 9, *Maintenance and fault finding*.
- ❑ If a remote control will be used to activate the system, switch the **POWER** switch on the converter to STANDBY.
- ❑ If a remote control will be used to activate the SSPA, switch the **SSPA** switch on the converter to REMOTE.
- ❑ Replace the transparent cover on the control panel of the converter.

When you are replacing the transparent cover, ensure the gasket is in place and that the screws are *not* overtightened.

AC supply configuration with a 5582B or 5940 SSPA

To switch on the transceiver and verify correct basic operation:

- ❑ Use a 2.5 mm Allen key to remove the transparent cover on the control panel of the converter.
- ❑ Set the **SSPA** switch on the converter to INHIBIT.
- ❑ Switch the AC power on via the isolation switch.
- ❑ If you are using a 5582B, open the door of the PSU and check that the green **48 V On** LED is on, indicating the power supply is activated.
- ❑ Set the **POWER** switch on the converter to STANDBY.
- ❑ Check on the converter that:
  - the **STANDBY** LED is on
  - the **WARM-UP** LED is on (if the reference oscillator override has been selected, the **WARM-UP** LED will flash until the warm-up period has elapsed)
  - all the **FAULT** LEDs are on momentarily indicating that all **FAULT** LEDs are operational

- ❑ Set the **POWER** switch on the converter to ON and check that:
  - the **ON** LED is on
  - the **STANDBY** LED is off
  - the **CONV FAULT** and **LNB FAULT** LEDs are off (on momentarily when power is turned on)

  See Chapter 9, *Maintenance and fault finding*, if either the **CONV FAULT** or the **LNB FAULT** LED remain on.
- ❑ Set the **SSPA** switch on the converter to ACTIVATE.
- ❑ Check that the **SSPA ON** LED on the converter is on.

  If the **SSPA ON** LED is not on, see Chapter 9, *Maintenance and fault finding*.
- ❑ Check that all **FAULT** LEDs are off.

  If any **FAULT** LEDs are on, see Chapter 9, *Maintenance and fault finding*.
- ❑ If you are using a remote control to activate the system, switch the **POWER** switch on the converter to STANDBY.
- ❑ If you are using a remote control to activate the SSPA, switch the **SSPA** switch on the converter to REMOTE.
- ❑ Replace the transparent cover on the control panel of the converter.

  When you are replacing the transparent cover, ensure the gasket is in place and that the screws are *not* overtightened.

- ❑ Close the door of the PSU.

Serial interface control during setup

To set the remaining operating parameters of the transceiver, the transceiver must be connected to one of the following:

- a Hand-Held Controller 5560
- a Remote Controller 5570
- a terminal (such as a dedicated terminal, a personal computer, a laptop or an organiser emulating a terminal)

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

The Hand-Held Controller 5560 or the Remote Controller 5570 provide the simplest and most convenient way to set the parameters of the transceiver. For details of how to use the hand-held controller or the remote controller, see the user guides for these items of equipment.

For users who do not have one of the controllers mentioned above, the following section describes the temporary connection of a personal computer running Microsoft Windows 95/98®. This system is readily available and includes a terminal emulation program called HyperTerminal©. Other operating systems also provide terminal emulation programs. Use the following sections as a guide to the parameters that must be set up for the operation of these other systems.

Temporary interface connection

A serial interface cable is available to connect the transceiver to the serial port of a personal computer. Connect the appropriate cable (Codan part number 08-05301-002) between the **MONITOR/CONTROL** connector of the converter and a PC. This cable provides a 9-way D-type female connector for connection to the PC. Details of the wiring of this cable are shown in drawing 08-05301 in Chapter 10, *Drawings*. If connection to a 25-way D-type serial port is required, use a standard 25-way female to 9-way male adaptor.

HyperTerminal

Setting up HyperTerminal

The terminal emulation program supplied with Microsoft Windows 95/98® is HyperTerminal. Use this procedure to configure HyperTerminal to match the interface settings of the transceiver. For additional help, consult Windows 95/98 on-line help.

To set up the HyperTerminal:

- ❑ From the Windows 95/98 Start icon, select Programs, then Accessories.
- ❑ Click on HyperTerminal to open the HyperTerminal folder.
- ❑ Double click on the HyperTrm (or Hypertrm.exe) icon.

  The Hyperterminal starts and the Connection Description window is displayed. This window enables you to name and select an icon from which you can start the terminal emulation program for the transceiver.
- ❑ In the Name field, enter a name for the icon, e.g. 5900 Terminal.
- ❑ In the Icon field, scroll to the icon you want and select it by clicking on it.
- ❑ Click OK.

  The Phone Number window is displayed.
- ❑ In the Connect using field, click on the drop list arrow and select the communications port on your computer to which the transceiver will be connected. Do one of the following:
  - If COM1 is *not* being used by another device, select COM1.
  - If COM1 is being used, select another COM port (e.g. COM2).
- ❑ Click OK.

  The selected COM port Properties window is displayed depending on the communications port you selected.
- ❑ To select the port settings, click on the drop list arrow for each setting and select the following:

Bits per second	9600
Data bits	8
Parity	None
Stop bits	1
Flow control	None

- ❑ Click OK to close the COM port Properties window.

  The 5900 Terminal-Hyperterminal window is displayed.

- ❑ From the File menu, select Properties.

  The Properties window is displayed.

- ❑ Select the Settings tab.
- ❑ In the Emulation field, click on the drop list arrow and select VT100.
- ❑ Click on the ASCII Setup... button.

  The ASCII Setup window is displayed.

- ❑ Ensure the Echo typed characters locally check box is *not* ticked.
- ❑ Click OK.
- ❑ Click OK on the Properties window.

  The computer is now configured to emulate a terminal capable of communicating with the transceiver.

Saving the emulation configuration

To save the configuration you created in the previous steps:

- ❑ From the File menu, select Save.

Retrieving the emulation configuration

To retrieve the saved emulation configuration:

- ❑ From the Windows 95/98 Start icon, select Programs, then Accessories.
- ❑ Click on HyperTerminal to open the HyperTerminal folder.
- ❑ Within the HyperTerminal folder, double click on the 5900 Terminal icon to open the 5900 Terminal application.

Starting the HyperTerminal emulation for the 5900 transceiver

To start the HyperTerminal emulation for the 5900 transceiver:

- ❑ From the Windows 95/98 Start button, select Programs, then Accessories, then HyperTerminal.

  The HyperTerminal window is displayed.

- ❑ Double click the icon created for the 5900 transceiver terminal emulation (for example, 5900 Terminal).

  The HyperTerminal main window is displayed.

Changing the communications settings used by the HyperTerminal

To change the communications settings used by the HyperTerminal to coincide with the settings on the Converter 5900:

- ❑ From the File menu, select Properties.

  The Properties window is displayed.

- ❑ Click on the Configure... button.

  The COM port Properties window is displayed depending on the communications port you selected when you set up the emulation.

- ❑ Click on the drop list arrows of the port settings you want to change and select the new settings accordingly.

- ❑ Click OK.

- ❑ Click OK on the Properties window.

To force the HyperTerminal to recognise these new settings:

- ❑ From the Call menu, select Disconnect.

- ❑ From the Call menu, select Connect.

Exiting HyperTerminal

To exit the HyperTerminal program:

- ❑ From the File menu, select Exit.

  A message is displayed asking if you want to disconnect now.

- ❑ Click Yes.

Checking the connection between the terminal and transceiver

To verify that the terminal is communicating with the converter:

- ❑ Check that the **POWER** switch on the converter is set to STANDBY.
- ❑ Press **Enter** on the terminal keyboard.

  The prompt symbol (>) should be displayed on the terminal screen indicating that communication has been established.
- ❑ Enter **VPS** to view all the parameter settings of the transceiver.

  If VPS is not visible on the terminal screen after you have entered it, enter **SEC1** to enable the transceiver to echo command entries back to the terminal.

You can now complete setting up the transceiver.

Setting converter parameters

This section contains procedures on how to set the operating parameters via the serial interface.

Some configuration and operating parameters are set via the converter serial interface and are stored by the converter. For high power systems, some parameters are entered via the SSPA serial interface and are stored by the SSPA. For details on how to set up parameters on the SSPA, see the *C-Band and Ku-Band Hub-mount SSPAs 5760/5712H and 5940 Reference Manual.*

Certain configuration and operational settings in the 5900 Converter and the 5940 SSPA must be set up specifically for operation in the Ku-Band high power transceiver system.

Power up mode

For CE compliance, the transceiver must be set up so that the SSPA does not activate upon power up.

To set the power up mode:

- ❑ Enter **SPU0** to allow the SSPA to resume operation in the last state before power off.
- ❑ Enter **SPU1** to select the CE compliant mode of operation.

  This ensures that any prior **SPA1** commands do not automatically re-activate the SSPA after power up.

Frequency

The frequency of operation must be set in accordance with the system requirements. The transmit and receive frequencies must be set independently.

Setting the transmit frequency

To set the transmit frequency:

- ❑ Enter **STFnnnnn** (where nnnnn is the frequency required).

  The range of transmit frequencies depends upon the transmit band option (see Table 7-6). The frequency can be set in 1 MHz increments.

  The 5940 SSPA is only compatible with the Band 1 option of the converter. The range of transmit frequencies available for Band 1 are shown in Table 7-6.

Table 7-6: Available transmit frequency ranges

Band option	Tx low (MHz)	Tx high (MHz)
1	14000	14500
2	13750	14500

Setting the receive range

To set the receive range:

- ❑ Enter **SRRn** (where n is the frequency range setting required).

  The receive range matches the receive range of the converter with the frequency range of the LNB (see Table 7-7).

Table 7-7: Available receive range settings

Receive range setting	Rx low (MHz)	Rx high (MHz)
0	950	1700
1	10950	11700
2	11700	12200
3	12250	12750

Setting the receive frequency

To set the receive frequency:

- ❑ Enter **SRFnnnnn** (where nnnnn is the frequency required).

  The range of receive frequencies depends upon the receive range band setting of the converter (see Table 7-8). The frequency can be set in 1 MHz increments.

Table 7-8: Available receive frequency ranges

Band option	Rx low (MHz)	Rx high (MHz)
0	950	1700
1	10950	11700
2	11700	12200
3	12250	12750

SSPA control mode

The SSPA control mode selects the method that the converter uses to monitor and control the SSPA. The 5900 Converter does not use serial data to control and monitor the 5940 SSPA so the SSPA control mode *must* be set to Basic.

To set the SSPA control mode:

- ❑ Use Table 7-9 to determine the appropriate command settings for your application.

Table 7-9: SSPA control mode commands

Application	**Command**
Using a 5904/5908/5916 SSPA, select Extended mode	SPM0
Using a 5940 or non-Codan SSPA, select Basic mode	SPM1

If the converter in your installation is in a stand-alone situation, such as where the HPA system is independent and not controlled or monitored via the converter, it does not matter how the SSPA control mode is set, provided the SSPA fault enable is set to disabled.

Fault enable commands

The converter may be used with SSPAs that either require or do not require fault reporting via the converter. Any unwanted fault indications may be disabled in the converter.

To enable fault reporting for your installation:

❑ Use Table 7-10 to determine the appropriate command settings for your application.

Table 7-10: Fault enable commands

Application	**Command**
Using an LNB that requires fault reporting	SLE1
Using an LNB in which either the alarm system is maintained separately, or the LNB does not have a set of compatible alarm contacts	SLE0
Using an SSPA that requires fault reporting via the converter (e.g. 5940)	SPE1
Using an SSPA without monitor and control via the converter	SPE0

Converter temperature compensation type

The converter temperature compensation type option enables you to select the gain versus temperature compensation characteristic of the converter.

To set the converter temperature compensation type:

❑ If you are using the standard converter compensation characteristic, enter **SCT0**.

If the 5900 Converter is provided with a custom temperature compensation characteristic, enter **SCT1**.

Use the view table data (**VTD**) command to determine if there is custom data available (see page 8-41, *View table data*).

SSPA temperature compensation type

The SSPA temperature compensation type option enables you to select the gain versus temperature compensation characteristic of the SSPA.

The 5940 is internally temperature compensated. For operation with the 5940, the SSPA temperature compensation provided by the converter is automatically set to off when the **SPM1** command is used to set the SSPA control mode to basic. In this mode, the **SPT** command (which is normally used to select the SSPA temperature compensation) is not allowed.

To set the SSPA temperature compensation type:

❑ Use Table 7-11 to determine the appropriate command settings for your application.

Table 7-11: Standard SSPA type

Application	**Command**
Using a 5904/5908/5916 SSPA	SPT1
Using a 5904/5908/5916 SSPA with a custom SSPA temperature compensation characteristic[a]	SPT2

a. Use the view table data (**VTD**) command to determine if there is custom data available (see page 8-28, *View table data*).

Cable compensation

For converters with a D prefix serial number fitted with software version 3.00 or later, a cable compensation facility is not provided.

The cable compensation facility enables you to correct the frequency response roll-off of the transmit IF cable. The transmit frequency response is important because variations in the transmit level will affect the quality of the received signal at the receiving earth station. Any receive response variations of the IF are not as important because the demodulator AGC system of the receiving equipment will compensate for them.

The cable compensation facility provides 16 boost increments, from flat (0 dB boost) to 1.2 dB boost for the 70 MHz IF, or 2.5 dB boost for the 140 MHz IF.

To set the cable compensation:

- ❑ Enter **SCCn** or **nn** (where n = 0 to 15).

  To determine the most suitable cable compensation setting based on the type and length of the transmit IF cable, use Table 7-12 for 70 MHz IF operation, or Table 7-13 for 140 MHz IF operation.

  The settings listed in Table 7-12 and Table 7-13 typically provide compensation to within ±0.2 dB over the IF range.

  If a more accurate compensation is required, use a signal generator and power meter to measure the total system frequency response from IF to RF at the SSPA output. Adjust the cable compensation to achieve a minimum output variation across the frequency band being used. This compensates not only for the IF cable, but also for both the up converter and the SSPA on the transponder being used.

Table 7-12: Cable compensation settings (70 MHz IF)

Cable length		RG58	RG8	FSJ1-50A Heliax	Belden 9913	RG6	RG11	Belden 9116
Metres	**Feet**	**50 Ω**	**50 Ω**	**50 Ω**	**50 Ω**	**75 Ω**	**75 Ω**	**75 Ω**
0–5	0–16	1	0	0	0	0	0	0
6–10	17–33	3	1	1	1	1	1	1
11–15	34–49	5	2	2	1	2	2	3
16–20	50–66	7	3	3	2	3	3	4
21–25	67–82	9	4	3	2	5	4	5
26–30	83–98	12	5	4	3	6	5	6
31–35	99–115	14	6	5	3	6	6	7
36–40	116–131	15	7	6	3	7	7	8
41–45	132–148	–	7	6	4	8	7	9
46–50	149–164	–	8	7	4	9	8	10
51–55	165–180	–	9	8	5	11	9	11
56–60	181–197	–	10	9	5	12	10	12
61–65	198–213	–	11	9	6	12	11	13
66–70	214–230	–	12	10	6	13	12	14
71–75	231–246	–	12	11	7	14	12	15
76–80	247–262	–	13	12	8	15	13	–
81–85	263–279	–	14	12	8	–	14	–
86–90	280–295	–	15	13	9	–	15	–
91–95	296–312	–	–	14	9	–	–	–
96–100	313–328	–	–	15	10	–	–	–

Table 7-13: Cable compensation settings (140 MHz IF)

Cable length		RG58	RG8	FSJ1-50A Heliax	Belden 9913	RG6	RG11	Belden 9116
Metres	**Feet**	**50 Ω**	**50 Ω**	**50 Ω**	**50 Ω**	**75 Ω**	**75 Ω**	**75 Ω**
0–5	0–16	1	0	0	0	0	0	0
6–10	17–33	2	1	1	1	1	1	1
11–15	34–49	4	2	1	1	2	2	2
16–20	50–66	5	2	2	1	2	2	3
21–25	67–82	7	3	2	2	3	3	4
26–30	83–98	8	3	3	2	4	3	5
31–35	99–115	10	4	3	3	5	4	5
36–40	116–131	11	5	4	3	5	5	6
41–45	132–148	13	5	4	4	6	5	7
46–50	149–164	14	6	5	4	7	6	8
51–55	165–180	15	6	6	4	7	6	9
56–60	181–197	–	7	6	5	8	7	10
61–65	198–213	–	8	7	5	9	8	11
66–70	214–230	–	8	7	6	10	8	11
71–75	231–246	–	9	8	6	10	9	12
76–80	247–262	–	10	8	7	11	10	13
81–85	263–279	–	10	9	7	12	10	14
86–90	280–295	–	11	9	7	12	11	15
91–95	296–312	–	11	10	8	13	11	15
96–100	313–328	–	12	10	8	14	12	–

Intermediate frequency

The ability to change the IF frequency depends on whether the converter in your installation is fitted with the wide or narrow bandwidth option. Wide bandwidth operation is indicated by a **W** in the second position on the model label of the converter. Narrow bandwidth operation is indicated by an **N**.

If the converter is fitted with the wide bandwidth option (80 MHz), the IF frequency is preset to 140 MHz.

If the converter is fitted with the narrow bandwidth option (40 MHz), you will be able to select IF operation at either 70±20 MHz or 140±20 MHz.

To select the 70 MHz range:

- ❑ Enter **SIF0**.

To select the 140 MHz range:

- ❑ Enter **SIF1**.

IF impedance

You can select one of two IF impedances.

To select 50 Ω IF impedance:

- ❑ Enter **SIM0**.

To select 75 Ω IF impedance:

- ❑ Enter **SIM1**.

Reference oscillator override

When the transceiver is switched from OFF to STANDBY or ON, the internal reference oscillator needs time to warm up. It needs between 30 seconds and 15 minutes, depending on the ambient temperature and the length of time the transceiver was switched off.

If the reference override setting is disabled, transmission from the converter during the warm-up period is prevented. If the reference oscillator override setting is enabled, transmission from the converter during the warm-up period is enabled.

If transmission during the warm-up period is enabled, the accuracy of the transmit frequency during this period cannot be guaranteed.

To inhibit transmission during the warm-up period:

- ❑ Enter **SRO0** (this is the recommended setting).

To enable transmission during the warm-up period:

- ❑ Enter **SRO1**.

Mandatory high power transceiver settings

Certain configuration and operational settings in the 5900 Converter and the 5940 SSPA must be set up specifically for operation in the Ku-Band high power transceiver system.

Converter settings

The mandatory settings for the converter when used in a high power transceiver system are given in Table 7-14.

Table 7-14: Mandatory converter settings

Parameter	**Setting**	**Refer to...**
Fault enable—SSPA	SPE1	pages 7-22, 8-33
MAINS/BATT DIP switch	BATT	page 7-3
SSPA control mode	SPM1	pages 7-21, 8-31

SSPA settings

The mandatory settings for the 5940 when used in a high power transceiver system are given in Table 7-15. For details on how to change these settings using the SSPA Manager software, see the *C-Band and Ku-Band Hub-mount SSPAs 5760/5712H and 5940 Reference Manual.*

Table 7-15: Mandatory SSPA settings

Parameter	**Setting**
Converter connection	Codan
Temperature compensation	On
RF gain	–10 dB—this setting can be changed if required to optimise system performance

Recommended SSPA settings

The recommended settings for the 5940 when used in a high power transceiver system are given in Table 7-16. For details on how to change these settings using the SSPA Manager software, see the *C-Band and Ku-Band Hub-mount SSPAs 5760/5712H and 5940 Reference Manual*.

Table 7-16: Recommended SSPA settings

Parameter	**Setting**
Auxiliary Alarm Sense	This setting can be left in either state because it is not used when the SSPA is operating with the Converter 5900.
Maximum power alarm threshold	Disabled—the SSPA will indicate an internal alarm if the RF power exceeds the limit set, however this alarm will not be indicated as an SSPA alarm on the converter.
Minimum power alarm threshold	Disabled—the SSPA will indicate an internal alarm if the RF power falls below the limit set, however this alarm will not be indicated as an SSPA alarm on the converter.
RF mute	This setting can be left in either state. However, if the SSPA has been muted via the converter (e.g. if the **SSPA** switch on the converter is set to INHIBIT), it will *not* be possible to select the RF On state.
SSPA Alarm Style	Latched—if a fault occurs it will be stored until viewed and reset by the operator. If alarms are set to Fleeting, it is possible that alarms may occur and then clear automatically without the operator seeing the cause of the alarm.

Aligning the antenna

If an antenna tracking system is available, use this to align the antenna on the peak of the signal received. Take care that you do not select side lobe peaks.

If an antenna tracking system is not available, connect a spectrum analyser to the **Rx IF O/P** connector and manually adjust the antenna to receive the maximum signal level. Alternatively, use a received signal strength meter within the demodulator and manually adjust the antenna to receive the maximum signal level.

Adjusting the polarisation

It is important that the polarisation of the antenna is set correctly. If you transmit without correctly adjusting the polarisation, it may cause signal interference to other satellite users.

The polarisation is adjusted by rotating the OMT, which is installed between the feed subassembly and the SSPA and LNB subassemblies.

It is necessary to know the polarisation offset angle for the assigned transponder at the installation site. The polarisation offset angle is usually provided by the satellite operator.

Using the L-Band receive monitor port to view a broad spectrum of carriers being transmitted from the satellite allows one to see other carriers being transmitted on both the assigned and opposing polarities. If no receive carriers are visible, the polarisation must be adjusted with the assistance of the satellite operator.

To provide voice communication between your station and the satellite operator, an orderwire circuit or other communication channel is required.

The polarisation setting is initially adjusted in receive-only mode by nulling out reception of the opposite polarity rather than peaking the reception of carriers of the required polarity. Nulling out reception of the opposite polarity is the preferred method as the opposing null is sharper than the required peak and therefore, a null is a more accurate measure of the polarisation.

Once the carriers have been nulled out as best as possible, the final alignment is made with the assistance of the satellite operator. The operator will measure your signal as you adjust the polarisation setting and advise you when the correct setting is achieved.

Setting the transmit attenuation

The transmit attenuation value sets the attenuator of the up converter and can therefore be used to set the output level of the SSPA. See the RF/IF Level Diagram, drawing 03-01007 or 03-01061 in Chapter 10, *Drawings*, as a guide when setting the level.

It is good practice to monitor the SSPA output power when changing the transmit attenuation. If you are switching the SSPA on for the first time or reconnecting a modem of unknown output level, set the transmit attenuation of the converter to maximum (25 dB) and then reduce attenuation while monitoring the output level of the SSPA.

Damage may occur if the 5940 SSPA is driven beyond the level required to produce 1 dB gain compression (see page 8-9, *Transceiver output level (5940 SSPA only)*).

Ensure the transmit input level, the converter transmit attenuation and SSPA gain setting are correct before applying transmit IF input signal.

You must deactivate the SSPA before disconnecting the SSPA output from the antenna or power meter.

To adjust the transmit attenuation:

- ❑ Use a 2.5 mm Allen key to remove the transparent cover on the control panel of the converter.
- ❑ Note the position of the **SSPA** switch on the control panel of the converter module because you will have to reset it to this position after the adjustment.
- ❑ Set the **SSPA** switch on the converter to INHIBIT.
- ❑ Disconnect the SSPA output from the antenna.
- ❑ Connect the SSPA output to an appropriately rated load and a power meter.

  Alternatively, the output power function provided by the transceiver may be used.
- ❑ Set the modem (or other IF signal source) to transmit a carrier at a frequency near the centre of the IF band (70 MHz or 140 MHz).
- ❑ Use a power meter or spectrum analyser to check that the IF level is correct.
- ❑ Switch the **SSPA** switch on the converter to ACTIVATE.

  Ensure the SSPA is not inhibited elsewhere.

- ❑ Enter **STAn** or **nn** (where n is between 0 and 25 dB) to adjust the transmit attenuation until the RF level is within ±1 dB of the required level (reducing attenuation increases the RF level).

  The Monitor port provides an output at a nominal 40 dB below the SSPA output (reducing attenuation increases the RF level).

- ❑ Set the **SSPA** switch on the converter to INHIBIT and set the modem to the transmit off state.
- ❑ Disconnect all test equipment and reconnect the SSPA output to the antenna.
- ❑ Switch the **SSPA** switch on the converter to its normal operating state.
- ❑ Replace the transparent cover on the control panel of the converter.

When you are replacing the transparent cover, ensure the gasket is in place and that the screws are *not* overtightened.

Setting the receive attenuation

The receive attenuation sets the received carrier level presented to the demodulators. Because of the wide input range capability of typical demodulators, absolute gain setting accuracy is not as important as that required for the transmit path. See the RF/IF Level Diagram, drawings 03-01007 and 03-01061 in Chapter 10, *Drawings*, as a guide when setting the level.

To adjust the receive attenuation:

- ❑ Connect a spectrum analyser to the **Rx IF O/P** connector of the converter.
- ❑ Select a carrier at a level suitable for reception at the earth station.

  If no such carrier is available, arrange for a carrier to be transmitted either from another earth station, or by looping back via the satellite from your earth station.
- ❑ Enter **SRAn** or **nn** (where n is between 0 and 25 dB) to adjust the receive attenuation until the IF level is within ±2 dB of the required level (reducing attenuation increases the receive IF output level).
- ❑ Turn off the loop back carrier (if used) and disconnect all test equipment.

8 Operating the transceiver

This chapter contains information on operating the transceiver and SSPA, serial interface protocol formats and associated commands. It includes information on:

- how to switch on the transceiver (8-2)
- how to select the operating mode (8-5)
- how the LED indicators operate (8-7)
- how the LNB operates (8-8)
- the transceiver output level (8-9)
- activation control of the SSPA (8-10)
- operation of the fan (8-13)
- serial interface monitor and control (8-14)
- protocol formats (8-15)
- operating commands (8-20)

For specific details on operating the SSPA, see the *C-Band and Ku-Band Hub-mount SSPAs 5760/5712H and 5940 Reference Manual*.

Switching on the transceiver

The steps involved in switching on the transceiver depend on the configuration of your installation:

- DC supply configuration
- AC supply configuration with a PSU

To switch the transceiver on, follow the section below that is appropriate for your configuration.

DC supply configuration (5904/5908/5916 SSPAs only)

To switch on the transceiver configured with a DC supply and verify correct operation:

- ❑ Ensure power is connected to the converter.
- ❑ Use a 2.5 mm Allen key to remove the transparent cover on the control panel of the converter.
- ❑ Set the **SSPA** switch on the converter to INHIBIT.
- ❑ Set the **POWER** switch on the converter to STANDBY.
- ❑ Check that:
  - the **STANDBY** LED is on
  - the **WARM-UP** LED is on (if the reference oscillator override has been selected, the **WARM-UP** LED will flash until the warm-up period has elapsed)
  - all the **FAULT** LEDs are on momentarily indicating that all **FAULT** LEDs are operational
- ❑ Set the **POWER** switch on the converter to ON and check that:
  - the **ON** LED is on
  - the **STANDBY** LED is off
  - the **CONV FAULT** and **LNB FAULT** LEDs are off (on momentarily when power is turned on)

  See Chapter 9, *Maintenance and fault finding*, if either the **CONV FAULT** or the **LNB FAULT** LED remains on.
- ❑ Set the **SSPA** switch on the converter to ACTIVATE.

- ❑ Check that the **SSPA ON** LED is on.

  If the **SSPA ON** LED is not on, see Chapter 9, *Maintenance and fault finding*.

- ❑ Check that all **FAULT** LEDs are off.

  If any **FAULT** LEDs are on, see Chapter 9, *Maintenance and fault finding*.

- ❑ If a remote control will be used to activate the system, switch the **POWER** switch on the converter to STANDBY.

- ❑ If a remote control will be used to activate the SSPA, switch the **SSPA** switch on the converter to REMOTE.

- ❑ Replace the transparent cover on the control panel of the converter.

  When you are replacing the transparent cover, ensure the gasket is in place and that the screws are *not* overtightened.

AC supply configuration with a 5582B or 5940 SSPA

Damage may occur if the SSPA is driven beyond the level required to produce 1 dB gain compression (see page 8-9, *Transceiver output level (5940 SSPA only)*).

Ensure the transmit input level, the converter transmit attenuation and SSPA gain setting are correct before applying transmit IF input signal.

To switch on the transceiver and verify correct operation:

- ❑ Use a 2.5 mm Allen key to remove the transparent cover on the control panel of the converter.
- ❑ Set the **SSPA** switch on the converter to INHIBIT.
- ❑ Switch the AC power on via the isolation switch.
- ❑ If you are using a 5582B, open the door of the PSU and check that the green **48 V On** LED is on, indicating the power supply is activated.
- ❑ Set the **POWER** switch on the converter to STANDBY.
- ❑ Check on the converter that:
  - the **STANDBY** LED is on
  - the **WARM-UP** LED is on (if the reference oscillator override has been selected, the **WARM-UP** LED will flash until the warm-up period has elapsed)
  - all the **FAULT** LEDs are on momentarily indicating that all **FAULT** LEDs are operational

- ❑ Set the **POWER** switch on the converter to ON and check that:
  - the **ON** LED is on
  - the **STANDBY** LED is off
  - the **CONV FAULT** and **LNB FAULT** LEDs are off (on momentarily when power is turned on)

  See Chapter 9, *Maintenance and fault finding*, if either the **CONV FAULT** or the **LNB FAULT** LED remain on.
- ❑ Set the **SSPA** switch on the converter to ACTIVATE.
- ❑ Check that the **SSPA ON** LED is on.

  If the **SSPA ON** LED is not on, see Chapter 9, *Maintenance and fault finding*.
- ❑ Check that all **FAULT** LEDs are off.

  If any **FAULT** LEDs are on, see Chapter 9, *Maintenance and fault finding*.
- ❑ If you are using a remote control to activate the system, switch the **POWER** switch on the converter to STANDBY.
- ❑ If you are using a remote control to activate the SSPA, switch the **SSPA** switch on the converter to REMOTE.
- ❑ Replace the transparent cover on the control panel of the converter.

  When you are replacing the transparent cover, ensure the gasket is in place and that the screws are *not* overtightened.

- ❑ Close the door of the PSU.

Power control

Standby mode

To switch the transceiver to standby mode locally:

- ❑ Switch the AC power on via the isolation switch.
- ❑ Use a 2.5 mm Allen key to remove the transparent cover on the control panel of the converter.
- ❑ Switch the **POWER** switch on the converter to STANDBY.
- ❑ Replace the transparent cover on the control panel of the converter.

When you are replacing the transparent cover, ensure the gasket is in place and that the screws are *not* overtightened.

To switch the transceiver to standby mode via a remote control facility:

- ❑ Ensure that the:
  - remote serial interface system on command is set to standby (see page 8-25, *Set control commands*), and
  - remote opto-isolated System On input is not activated (see page 6-13, *Monitor and control interface*)

  The setting of the **POWER** switch and the System On input may be checked by using the view control status (**VCS**) command.

Operating mode

To switch the transceiver to operating mode locally:

- ❑ Switch the AC power on via the isolation switch.
- ❑ Use a 2.5 mm Allen key to remove the transparent cover on the control panel of the converter.
- ❑ Switch the **POWER** switch on the converter to ON.
- ❑ Replace the transparent cover on the control panel of the converter.

When you are replacing the transparent cover, ensure the gasket is in place and that the screws are *not* overtightened.

To switch the transceiver to operating mode via a remote control facility:

- ❑ Leave the **POWER** switch on the converter set to STANDBY and either:
  - set the remote serial interface system on command to on (see page 8-25, *Set control commands*), or
  - activate the remote opto-isolated System On input (see page 6-13, *Monitor and control interface*)

Warm-up operation

When the transceiver is switched from OFF to STANDBY or ON, the internal reference oscillator needs time to warm up. It needs between 30 seconds and 15 minutes, depending on the ambient temperature and the length of time the transceiver was switched off.

If the reference oscillator override is disabled, the **WARM-UP** LED on the control panel of the converter will be on during the warm-up period (in both standby and operating mode). During this time, transmission from the converter is prevented. The **WARM-UP** LED goes off when the oscillator reaches its correct operating temperature. Transmission can then occur if the transceiver is in operating mode.

If the reference oscillator override is enabled, the transmit disable function during the warm-up period is overridden. In this situation, the **WARM-UP** LED on the control panel of the converter flashes during the warm-up period (in both standby and operating mode). During this time, transmission from the converter can occur if the transceiver is ON, but it should be noted that the accuracy of the transmit frequency may not be within specifications.

LED indicators

The LED indicators listed in Table 8-1 are located on the control panel of the converter.

When you switch the transceiver from OFF to STANDBY, no faults will be indicated. When you switch the transceiver to operating mode (ON), the **CONV FAULT**, **LNB FAULT**, and **TEMP FAULT** LEDs will indicate the status of the converter, LNB and SSPA temperature respectively. When you switch the **SSPA** switch on the converter to ACTIVATE, the **SSPA FAULT** and **FAN FAULT** LEDs will indicate the status of the SSPA and its fan respectively.

The **SSPA FAULT** and **FAN FAULT** LEDs continue to indicate a fault until they are reset.

When you switch the transceiver from ON to STANDBY, the **FAULT** LEDs will continue to indicate faults that were present prior to switching to STANDBY.

Table 8-1: LED indications

LED	**Colour**	**Indicates...**
POWER		
STANDBY	Yellow	Transceiver is in standby mode
ON	Green	Transceiver is in operating mode
WARM-UP	Yellow	Transceiver is in warm-up mode (flashes if the reference oscillator override is enabled during warm-up)
SSPA		
SSPA ON	Yellow	SSPA is activated
FAULT		
CONV	Red	Converter has a fault condition
LNB	Red	LNB has a fault condition
SSPA	Red	SSPA has failed to operate after activation
TEMP	Red	SSPA has exceeded the temperature limit: 75°C nominal for 5904/5908/5916 SSPAs 80°C nominal for 5940 SSPA
FAN	Red	SSPA cooling fan has failed to operate (not used in the high power transceiver)

Low noise block converter operation

A +15 V DC supply is available to the LNB whenever the **LNB +15 V** DIP option switch is set to ON and the transceiver is ON.

The current drawn by the LNB is monitored for fault indication and overcurrent protection.

If the current drawn by the LNB exceeds the specified maximum, the supply will automatically switch off, and an LNB fault will be indicated.

To reset the LNB supply overcurrent protection and the resulting fault condition locally:

- ❑ Use a 2.5 mm Allen key to remove the transparent cover on the control panel of the converter.
- ❑ If the **POWER** switch on the converter is set to ON, switch the **POWER** switch on the converter to STANDBY then back to ON.
- ❑ Replace the transparent cover on the control panel of the converter.

When you are replacing the transparent cover, ensure the gasket is in place and that the screws are *not* overtightened.

To reset the LNB supply overcurrent protection and the resulting fault condition via a remote control facility:

- ❑ Either:
  - set the remote serial interface system on command from on to standby, then back to on (see page 8-25, *Set control commands*), or
  - set the remote opto-isolated System On input from on to standby, then back to on

For further information on faults, see Chapter 9, *Maintenance and fault finding*.

Transceiver output level (5940 SSPA only)

The output level of the transceiver is dependent on the input level to the transceiver, the transmit attenuation setting of the converter and the gain setting of the SSPA. The SSPA is supplied with the gain set to –10.0 dB. It is recommended that this setting is maintained, and transceiver gain adjustments made by using the converter transmit attenuation control.

Significant damage to and possible failure of the SSPA may result from driving the SSPA beyond the rated output power.

Peak power levels of a modulated RF input, such as QPSK, will drive the SSPA of the transceiver into saturation when the total output power of the modulated signal approaches the 1 dB compression point. This excessive drive level will initially cause a reduction in the life of the active amplifying devices and eventually result in a total failure of these devices.

To avoid causing damage to the SSPA, a modulated input to the SSPA must never exceed the level required to drive the average output higher than 2 dB below the stated 1 dB compression point. For QPSK modulated input signals, it is recommended that a total OPBO of at least 2 dB be applied. Thus, for a single QPSK carrier the OPBO required is 2 dB, for two QPSK carriers the OPBO would be 5 dB per carrier, and so on for larger numbers of carriers.

For single QPSK or multiple carrier applications, higher OPBO will be needed to meet intermodulation distortion emission requirements.

For a single CW and FM signal, the amplifier may be safely operated continuously at the 1 dB compression point.

Activation control of the solid state power amplifier

To activate the SSPA locally:

- ❑ Use a 2.5 mm Allen key to remove the transparent cover on the control panel of the converter.
- ❑ Switch the **SSPA** switch on the converter to ACTIVATE.
- ❑ Replace the transparent cover on the control panel of the converter.

When you are replacing the transparent cover, ensure the gasket is in place and that the screws are *not* overtightened.

To activate the SSPA via a remote control facility:

- ❑ Either:
  - use the SSPA activation command via the remote serial interface (see page 8-25, *Set control commands*), or
  - set the remote opto-isolated Req SSPA Activate input to on (see page 6-13, *Monitor and control interface*)

  There should be no inhibit control, command or input set to on.

For CE compliance, the SSPA must be activated via the remote serial interface. The **SSPA** switch on the converter must be set to REMOTE and the remote opto-isolated Req SSPA Activate input must be off.

When operating in CE compliant mode (i.e. **SPU1**), an **SPA1** command must be sent to the converter to re-activate the SSPA after power on.

When the SSPA is activated, the **SSPA ON** LED on the converter should be on.

To inhibit the SSPA locally:

- ❑ Use a 2.5 mm Allen key to remove the transparent cover on the control panel of the converter.
- ❑ Switch the **SSPA** switch on the converter to INHIBIT.
- ❑ Replace the transparent cover on the control panel of the converter.

When you are replacing the transparent cover, ensure the gasket is in place and that the screws are *not* overtightened.

To inhibit the SSPA via a remote control facility:

- ❑ Either:
  - use the SSPA inhibit command via the remote serial interface (see page 8-25, *Set control commands*), or
  - set the remote opto-isolated SSPA Inhibit input to on (see page 6-13, *Monitor and control interface*)

The SSPA will be inhibited from activation by either an SSPA fault or a temperature fault.

An SSPA temperature fault condition resets itself and the SSPA module is re-activated automatically when the SSPA has cooled down.

A fan fault does not inhibit activation of the SSPA.

The SSPA must be activated for the transceiver to determine if the SSPA is operating correctly. If an SSPA fault exists after you activate the SSPA, the fault indication will remain until the SSPA fault has been reset.

To reset an SSPA fault condition locally:

- ❑ Use a 2.5 mm Allen key to remove the transparent cover on the control panel of the converter.
- ❑ Either:
  - switch the **SSPA** switch on the converter to INHIBIT then back to REMOTE or ON, or
  - switch the **POWER** switch on the converter to STANDBY then back to ON
- ❑ Replace the transparent cover on the control panel of the converter.

When you are replacing the transparent cover, ensure the gasket is in place and that the screws are *not* overtightened.

To reset an SSPA fault condition via a remote control facility:

- ❑ Do one of the following:
  - set the SSPA inhibit command to on, and then off (see page 8-25, *Set control commands*)
  - set the remote opto-isolated SSPA Inhibit input to on, and then to off (see page 6-13, *Monitor and control interface*)
  - set the remote serial interface system on command from on to standby, and then to on (see page 8-25, *Set control commands*)
  - set the remote opto-isolated System On input from on to standby, then back to on (see page 6-13, *Monitor and control interface*)

If you disconnect the SSPA from the converter, the SSPA and temperature fault conditions are indicated at the converter.

For information on fault conditions in the SSPA, their causes and how to reset the alarms, see the *C-Band and Ku-Band Hub-mount SSPAs 5760/5712H and 5940 Reference Manual*.

Fan operation (5908/5916 SSPAs only)

The fan operates whenever the SSPA is activated. If the SSPA is not activated, the transceiver is unable to determine if the fan has failed.

A fan fault is indicated when the SSPA is activated and the fan is not operating. When a fan fault has been detected, the **FAN FAULT** LED remains on irrespective of whether or not the SSPA module is activated.

The supply voltage to the fan is still present when a fan fault is indicated and the SSPA is activated.

To reset a fan fault condition locally:

- ❑ Use a 2.5 mm Allen key to remove the transparent cover on the control panel of the converter.
- ❑ Either:
  - switch the **SSPA** switch on the converter to INHIBIT then back to REMOTE or ON, or
  - switch the **POWER** switch on the converter to STANDBY then back to ON
- ❑ Replace the transparent cover on the control panel of the converter.

When you are replacing the transparent cover, ensure the gasket is in place and that the screws are *not* overtightened.

To reset a fan fault condition via a remote control facility:

- ❑ Do one of the following:
  - set the SSPA inhibit command to on, and then off (see page 8-25, *Set control commands*)
  - set the remote opto-isolated SSPA Inhibit input to on, and then to off (see page 6-13, *Monitor and control interface*)
  - set the remote serial interface system on command from on to standby, and then to on (see page 8-25, *Set control commands*)
  - set the remote opto-isolated System On input from on to standby, then back to on (see page 6-13, *Monitor and control interface*)

Serial interface monitor and control

To view or change the operating parameters of the transceiver, the transceiver must be connected to one of the following:

- a Hand-Held Controller 5560
- a Remote Controller 5570
- a terminal (such as a dedicated terminal, personal computer, laptop or organiser emulating a terminal)

The remote controller and terminal options provide extensive monitoring capabilities.

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

The Hand-Held Controller 5560 or the Remote Controller 5570 provide the simplest and most convenient way to set the parameters of the transceiver. For details of how to use the hand-held controller or the remote controller, see the user guides for these items of equipment.

For users who do not have one of the controllers mentioned above, see page 8-15, *ASCII protocol* and page 8-20, *Operating commands*. These sections provide the relevant operation details for use with a PC or the terminal connected.

To establish communications between the PC and the transceiver, see page 7-14, *Serial interface control during setup*.

For more advanced remote control applications, see page 8-16, *Packet protocol*.

The transceiver is monitored and controlled using 3-character commands followed by data, if required. These commands are described on page 8-20, *Operating commands*.

The commands described are used exactly as shown when using ASCII protocol. When using packet protocol, the commands are embedded within the packet structure. Note that not all commands are available with packet protocol. For more information on packet protocol, see page 8-16, *Packet protocol*.

Protocol formats

ASCII protocol

ASCII protocol enables you to control and monitor the transceiver from a simple ASCII terminal or a PC emulating a terminal.

When using ASCII protocol, the transceiver sends a prompt when first powered up and then after each command has been processed.

The prompt consists of four components:

(CR) (LF) > (SP) where:

CR = carriage return

LF = line feed character

SP = space character

To send a command:

- ❑ Type the 3-letter command and, if necessary, the command data (see page 8-20, *Operating commands*).

  Use the backspace key to delete characters if required.

- ❑ Press **Enter** or **Return**.

The transceiver ensures that a carriage return character is always followed by a line feed character, whether sent by the terminal or not. This procedure prevents overwriting previous data on the terminal display.

If an invalid command or data item is received by the transceiver, an error response is sent and is immediately followed by a prompt sequence.

Error responses

After the transceiver has received a command, it makes the following checks before the command is performed:

- It checks that the 3-character command received corresponds to a defined command. If the command is not valid, the error message ‘`***No such command!`’ is displayed.
- It checks any extra data associated with the command for validity. If the data is not valid, the error message ‘`***Invalid command data!`’ is displayed.
- For some commands, it checks to ensure the operation is allowed. Some commands are not allowed because of the way the transceiver has been set up. When an error of this type is detected, the error message ‘`***Command not allowed!`’ is displayed.

Packet protocol

This section provides details of the Codan packet protocol. For information on other packet protocol modes, contact your Codan representative.

Packet protocol enables up to 126 devices to be addressed. The transceiver only responds to commands containing its own address or a global address of 127. The address 0 is reserved for the bus controller.

All data transfers on the bus are in the form of predefined packets. Each packet consists of:

- a start character
- a byte count
- an address byte
- a control byte
- command bytes
- data bytes (if applicable)
- a checksum byte
- an end character

Packets must be received by the transceiver in the order listed above. Packets that do not comply with this structure are ignored.

Packets sent from the bus controller to slave devices, such as the transceiver, may request an acknowledgment from the addressed device. The acknowledgment provides the controller with an indication that the command and data (if required) were accepted by the slave device.

The protocol allows for 7 bit or 8 bit characters, with or without parity.

All packets may have a maximum total length of 127 characters/bytes. Packets longer than this length are ignored.

Packet structure

Start character

The start character must be the ASCII STX (Hex 02) character.

Byte count

The byte count character is a binary representation of the total number of characters in the packet. The minimum value is 6 (i.e. no command or data characters) and the maximum value is 127.

Address byte

For controller to slave communications, the address character will be a binary representation of the destination device address as follows:

Bit No.	Function
0	LSB — Device address
1	
2	
3	
4	
5	
6	MSB — Device address
7	Only sent if 8 data bits are selected. It is used to calculate the complete address.

For slave to controller communications, a device address of zero is used.

Control byte

For controller to slave communications, the control byte will have bits 1 to 6 set to 0 (and bit 7 if 8 data bits are selected). Bit 0 will only be set to 1 if the controller requires an acknowledgment from the slave.

For the slave to controller communications, bits 0 to 5 are set to 0 (and bit 7 if 8 data bits are selected) and bit 6 is set to 1.

Command bytes

The command bytes consist of a 3-letter command mnemonic unique to the command being sent.

Data bytes

The data bytes depend on the command being sent. Not all commands require data characters.

Checksum

The checksum is used for error detection within a packet. It is calculated as the modulo 128 sum of packet bytes (before the addition of parity, if selected) from the address byte to the last data byte inclusive. Packets failing the checksum tests are ignored.

End character

The end character is the ASCII ETX (Hex 03) character.

Synchronisation

The start (STX) and end (ETX) characters are used for message synchronisation and help the converter re-acquire lost synchronisation.

The message protocol is structured such that the STX and ETX characters (Hex 02 and 03 respectively) can never appear in any other part of the message apart from in the address and checksum bytes.

If the STX character is received for any byte other than the address or checksum, the converter terminates reception and interpretation of the current message and assumes that a new message has begun. Similarly, if an ETX character is received for any byte other than the address or checksum, the converter terminates reception and interpretation of the current message and begins looking for the STX character again.

If a converter is *not* synchronised, several situations arise:

- The converter may receive a checksum of 02 Hex, which it interprets as a start character. It will then immediately receive 03 Hex, which it will interpret as the byte count. Since the byte count cannot be less than 6, the converter aborts receiving the message and begins looking for the start character (STX, 02) again.
- If the converter interprets an address of 02 Hex as a start character, it will interpret the next byte (the control byte) as the byte count. It will then attempt to interpret the following characters as the remainder of the message. It is unlikely that a valid message will be seen because:
    - the address byte may not match the converter address
    - the actual message ETX character will terminate the message before the correct byte count is reached
    - the byte count will be reached before the ETX character is received
    - even if the byte count and ETX correspond, the checksum probably will not
    - the command and data bytes will probably not represent a valid command
- If the converter interprets either an address or checksum of 03 Hex as an end character, it will cease receiving the message and begin looking for the next start (STX) character. This will correspond to the start of the next valid message and the converter will then be correctly synchronised.

Multiple ETX bytes can be sent by the controller to force an unsynchronised converter to re-synchronise. The converter then begins looking for the STX start character.

If the converter does not receive either the STX or ETX bytes, it discards the message and does not respond.

Commands not available with packet protocol

The following commands cannot be used when using packet protocol:

- Help commands
- View commands
- Logging commands
- the set echo command
- the set packet protocol command
- the set packet address range command
- the output packet address command
- the output packet address range command

If you attempt to use any of the commands listed above with packet protocol, you will receive an error message informing you that the command is not allowed.

The echo and all log status settings are set to off when packet protocol is selected.

Acknowledgment messages

If a valid command is received that requires only an acknowledgment message to be returned, an empty packet (i.e. no command or data bytes) is returned.

If an acknowledgment is requested with the reset command (**RST**), an empty packet is returned to the controller before the command is executed.

The error responses listed in Table 8-2 are sent only if a command error occurred in the last packet, and if an acknowledgment was requested in that packet (as indicated by the appropriate bit in the control byte).

Table 8-2: Error responses

Error	**Means...**
ER1	No such command
ER2	Invalid command data
ER3	Command not allowed

Operating commands

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

The commands consist of a 3-letter mnemonic and, in some cases, command data. When required, command data may be either a single control parameter (0 or 1) or numeric data.

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

The transceiver is insensitive to the case of command text.

The information shown on the example screens is indicative only.

A summary of the commands covered in this chapter can be found in the appendix at the end of this manual.

When the 5900 Converter is operated with a 5940 SSPA, the converter SSPA control mode must be set to Basic using the **SPM1** command. This mode must be used because the 5900 Converter is not able to use serial data to control and monitor the 5940 SSPA.

For this reason, a number of monitoring functions cannot obtain data from the SSPA and their associated commands are made unavailable in Basic mode.

In the command descriptions which follow, it is assumed that for a high power transceiver system, the SSPA control mode has been set to Basic (**SPM1**) and that SSPA fault monitoring has been enabled (**SPE1**).

Help commands

Help commands are not available if you are using packet protocol.

General help

The help commands provide on-screen information for all commands available with ASCII protocol.

To display all the help commands:

- ❑ Enter **HLP**. No data is required.

```
General Help (this Display)       > HLP
Set Control Commands              > HCC
Set Main Parameter Commands       > HPM
Set Auxiliary Parameter Commands  > HPA
Set Log Parameter Commands        > HPL
View Commands                     > HVC
Output Parameter Commands         > HOP
Output Data Commands              > HOD
>
```

Help for control commands

To display the commands and the command data for the major control functions of the transceiver:

- ❑ Enter **HCC**. No data is required.

```
System On              > SSOn  n ==>  0 - Standby   1 - On
SSPA Activate          > SPAn  n ==>  0 - Off       1 - On
SSPA Inhibit           > SPIn  n ==>  0 - Off       1 - On
Reset Change Bits      > RCB
Reset                  > RST
>
```

Help for set main parameter commands

To display the commands and the command data for the main parameters of the transceiver:

- ❑ Enter **HPM**. No data is required.

```
Set Tx Frequency          > STFnnnnn  14000 <=nnnnn<= 14500
Set Rx Frequency          > SRFnnnnn  11700 <=nnnnn<= 12200
Set Tx Attenuation        > STAnn     0 <=nn<= 25
Set Rx Attenuation        > SRAnn     0 <=nn<= 25
>
```

Help for set auxiliary parameter commands

To display the commands and the command data for the auxiliary parameters of the transceiver:

- ❑ Enter **HPA**. No data is required.

```
Set Receive Range       > SRRn n ==> 0 -   950 to 1700MHz
                                     1 - 10950 to 11700MHz
                                     2 - 11700 to 12200MHz
                                     3 - 12250 to 12750MHz
Set SSPA Mode           > SPMn n ==> 0 - Extended ; 1 - Basic
Set Reference Override  > SROn n ==> 0 - Off      ; 1 - On
Set Cable Compensation  > SCCnn      0 <=nn<= 15
Set IF Frequency        > SIFn n ==> 0 - 70       ; 1 - 140
Set Impedance           > SIMn n ==> 0 - 50       ; 1 - 75
Set LNB  Fault Enable   > SLEn n ==> 0 - Disabled ; 1 - Enabled
Set SSPA Fault Enable   > SPEn n ==> 0 - Disabled ; 1 - Enabled
Set O/P  Fault Enable   > STEn n ==> 0 - Disabled ; 1 - Enabled
Set Conv Comp Type      > SCTn n ==> 0 - Standard ; 1 - Custom
Set SSPA Comp Type      > SPTn n ==> 0 - Off      ; 1 - 59XX Std
                                                    2 - Custom
Set SSPA Detector Type  > SPDn n ==> 0 - 59XX Std ; 1 - Custom
Set Output Threshold    > SOTnn      20 <=nn<= 55
Set Echo                > SECn n ==> 0 - Off      ; 1 - On
Set Packet Protocol     > SPPn n ==> 0 - Codan
                                     1-3 - Mode 1-3
Set Address Range       > SARn n ==> 0 -  0 to 31 ; 1 - 32 to 63
                                     2 - 64 to 95 ; 3 - 96 to 127
Set Power Up[a]          > SPUn n ==> 0 - Last State ; 1 - Transmit off
>
```

a. The **SPU** command is only shown in software versions 3.00 or later.

Help for set logging parameter commands

To display the commands and the command data for the logging parameters of the transceiver:

- ❑ Enter **HPL**. No data is required.

```
Set Fault Logging       > SFLn  n ==> 0 - Disabled ; 1 - Enabled
Set Status Logging      > SSLn  n ==> 0 - Disabled ; 1 - Enabled
Set Lock Status Logging > SLLn  n ==> 0 - Disabled ; 1 - Enabled
Set Temperature Logging > STLn  n ==> 0 - Disabled ; 1 - Enabled
Set O/P Power Logging   > SPLn  n ==> 0 - Disabled ; 1 - Enabled
>
```

Help for view commands

To display the commands for viewing the various parameter settings and status information of the transceiver:

- ❑ Enter **HVC**. No data is required.

```
View Faults Status        > VFS
View Parameter Settings   > VPS
View Control Status       > VCS
View System Status        > VSS
View Lock Status          > VLS
View SSPA Faults          > VPF
View Identity Converter   > VID
View Identity SSPA        > VIP
View Table Data           > VTD
View System Temperature   > VST
View Max/Min Temperatures > VMT
>
```

Help for output parameter commands

To display the commands for outputting individual parameter settings and status information of the transceiver:

- ❑ Enter **HOP**. No data is required.

```
Output System On           > OSO  Output SSPA Activate       > OPA
Output Reference Override  > ORO  Output SSPA Inhibit        > OPI
Output Transmit Frequency  > OTF  Output Transmit Attenuator > OTA
Output Receive Frequency   > ORF  Output Receive  Attenuator > ORA
Output SSPA Mode           > OPM  Output Receive Range       > ORR
Output Conv Comp Type      > OCT  Output LNB  Fault Enable   > OLE
Output SSPA Comp Type      > OPT  Output SSPA Fault Enable   > OPE
Output SSPA Detector       > OPD  Output O/P  Fault Enable   > OTE
Output O/P Threshold       > OOT  Output Fault       Logging > OFL
Output Cable Compensation  > OCC  Output Status      Logging > OSL
Output IF Frequency        > OIF  Output Lock Status Logging > OLL
Output Impedance           > OIM  Output Temperature Logging > OTL
Output Packet Protocol     > OPP  Output O/P power   Logging > OPL
Output Address             > OAD  Output Echo                > OEC
Output Address Range       > OAR  Output Configuration Data  > ODP[a]
Output Identity Data       > OTD[a] Output SSPA Band         > OFP[a]
Output Power Up            > OPU[b]
>
```

a. The **OTD**, **ODP** and **OFP** commands are only shown in software versions 2.00 or later.
b. The **OPU** command is only shown in software versions 3.00 or later.

Help for output data commands

To display the commands for outputting data and status information of the transceiver:

- ❑ Enter **HOD**. No data is required.

```
Output Temperature Conv    > OTC  Output Max/Min Conv Temps  > OMC
Output Temperature SSPA    > OTP  Output Max/Min SSPA Temps  > OMP
Output SSPA O/P Power      > OPO  Output Identity Conv       > OID
Output SSPA Compensation   > OPC  Output Identity SSPA       > OIP
Output Fault   Status      > OFS  Output Device Type         > ODT
Output Control Status      > OCS  Output Frequency Data      > OFD
Output System Status       > OSS  Output Comp/Detector Data  > OCD
Output Lock   Status       > OLS  Output Conv Serial no.     > OCN
Output SSPA Faults         > OPF  Output SSPA Serial no.     > OPN
Output Status Poll         > OSP
>
```

Set control commands

The set control commands control the major functions of the transceiver. They are used when control via the serial interface is required.

System on

The system on command switches the transceiver on or to standby mode. For the command to be effective, the corresponding hardware input line must be in standby mode and the **POWER** switch on the control panel of the converter must be set to STANDBY.

To switch the system on or to standby mode:

❑ Enter **SSOn**, where

n = 0 for standby mode, or
1 for on

SSPA activate

The SSPA activate command switches the SSPA on or off. For the command to be effective:

- the corresponding hardware input line must be in the off mode
- the **SSPA** switch on the control panel of the converter must be set to REMOTE
- all inhibit inputs and controls must be off

To switch the SSPA on or off:

❑ Enter **SPAn**, where

n = 0 for off, or
1 for on

If the installation does not require this control, it is recommended that you use the SSPA activate command to switch the SSPA off. This will provide control via the hardware line and switch.

SSPA inhibit

The SSPA inhibit command can inhibit transmission from the SSPA by overriding the activate inputs and controls. When the SSPA inhibit command is set to on, the setting of all other associated hardware input lines and the position of the **SSPA** switch on the control panel of the converter are overridden.

To switch the SSPA inhibit parameter on or off:

- ❑ Enter **SPIn**, where

  n = 0 for off (enable transmission), or
  1 for on (inhibit transmission)

If the installation does not require this control, it is recommended that the SSPA inhibit parameter is set to off to provide control via the associated hardware lines and switches.

Reset change bits

When you have used the output status poll command to display whether or not changes have occurred in the fault, control and status systems of the transceiver, use the reset change bits command to reset the three change bits to ‘0’, i.e. no change.

To reset the change bits:

- ❑ Enter **RCB**. No data is required.

Reset

The reset command resets the controlling functions of the microprocessor in the converter.

To reset the converter:

- ❑ Enter **RST**. No data is required.

Set logging parameter commands

Logging commands are not available if you are using packet protocol.

Set fault logging

With fault logging, fault status changes are displayed as they occur. Fault indications are preceded by ##. The set fault logging command enables or disables fault logging.

To enable or disable fault logging:

- Enter **SFLn**, where

  n = 0 disables fault logging, or
  1 enables fault logging

Set status logging

With status logging, control input or operational status changes are displayed as they occur. The set status logging command enables or disables status logging.

To enable or disable status logging:

- Enter **SSLn**, where

  n = 0 disables status logging, or
  1 enables status logging

Set lock status logging

With lock status logging, converter PLL lock status changes are displayed as they occur. The set lock status logging command enables or disables lock status logging.

To enable or disable lock status logging:

- Enter **SLLn**, where

  n = 0 disables lock status logging, or
  1 enables lock status logging

Set temperature logging

With temperature logging, the temperature of the SSPA and converter are displayed every 5 minutes. If the SSPA fault enable command has been used to disable SSPA fault detection, only the converter temperature is displayed. The temperature logging command enables or disables temperature logging.

When SSPA control mode is set to basic, SSPA temperatures are not available and are displayed as N/A.

To enable or disable temperature logging:

- Enter **STLn**, where

  n = 0 disables temperature logging, or
  1 enables temperature logging

Set output power logging

With output power logging, the output power of the SSPA is displayed every 5 minutes. The output power logging command enables or disables output power logging.

When SSPA control mode is set to Basic, the converter cannot obtain the SSPA output power data and the output power is always shown as N/A. Consequently output power logging should be left off.

To enable or disable output power logging:

- Enter **SPLn**, where

  n = 0 disables output power logging, or
  1 enables output power logging

Set main parameter commands

Set transmit frequency

The set transmit frequency command sets the transmit frequency of the converter. The 5940 SSPA can only be used with 5900 Converters operating over Band 1. The allowable ranges of frequency are shown in Table 8-3.

To set the transmit frequency:

- ❑ Enter **STFnnnnn**, where nnnnn = the transmit frequency in MHz.

Table 8-3: Transmit frequency ranges

Band	Low limit inclusive (MHz)	High limit inclusive (MHz)
1	14000	14500
2	13750	14500

Set receive frequency

The set receive frequency command sets the receive frequency of the converter. The allowable ranges of frequency are dependent on the receive range setting of the converter, as shown in Table 8-4. Use the output receive range command to ascertain the receive range of the converter (see page 8-49, *Output receive range*).

To set the receive frequency:

- ❑ Enter **SRFnnnnn**, where nnnnn = the receive frequency in MHz.

Table 8-4: Receive frequency ranges

Receive range setting	Low limit inclusive (MHz)	High limit inclusive (MHz)
0	950	1700
1	10950	11700
2	11700	12200
3	12250	12750

Set transmit attenuation

The transmit attenuation command sets the transmit attenuation of the converter. The range is 0 to 25 dB in 1 dB steps.

No leading zero is required when you enter a single-digit figure.

To set the transmit attenuation:

- ❑ Enter **STAnn**, where $0 \leq nn \leq 25$.

Set receive attenuation

The receive attenuation command sets the receive attenuation of the converter. The range is 0 to 25 dB in 1 dB steps.

No leading zero is required when you enter a single-digit figure.

To set the receive attenuation:

- ❑ Enter **SRAnn**, where $0 \leq nn \leq 25$.

Set auxiliary parameter commands

Set power up

For CE compliance, the transceiver must be set up so that it does not enter the transmit on state (SSPA on) upon power up. The set power up command controls the SSPA state upon power up by exerting control over the operation of the **SPA** command.

To set the power up mode:

- ❑ Enter **SPUn**, where

  n = 0 to allow the SSPA to return to the state prior to power off, or
  1 to prevent a previous **SPA1** command from switching the SSPA on when the transceiver is powered up

Set receive range

The set receive range command matches the receive range of the down converter with the frequency range of the LNB.

To set the receive range of the down converter:

- ❑ Enter **SRRn**, where

  n = 0 for 950 to 1700 MHz, or
  1 for 10950 to 11700 MHz, or
  2 for 11700 to 12200 MHz, or
  3 for 12250 to 12750 MHz

Set SSPA control mode

The set SSPA control mode command sets the interface mode for the SSPA. The settings are shown in Table 8-5.

Basic mode is used for all vendor HPAs (SSPA or TWTA). This mode provides modified operating logic to interface with other HPAs. Consult your Codan representative if you have special requirements.

For a high power transceiver system the SSPA control mode must be set to Basic (**SPM1**).

To set the SSPA control mode:

- ❑ Enter **SPMn**, where

  n = 0 for extended SSPA control mode, or
  1 for basic SSPA control mode

Table 8-5: SSPA control mode settings

SSPA	SSPA control mode	Setting
5904/5908/5916	Extended	0
5940	Basic	1
Non-Codan SSPA	Basic	1

Set reference override

During the reference oscillator warm-up period, transmission from the converter is inhibited. Use the set reference override command to enable or disable transmission during this period.

To inhibit or enable transmission during the reference oscillator warm-up period:

- ❑ Enter **SROn**, where

  n = 0 to inhibit transmission, or
  1 to enable transmission

Set cable compensation

For converters with a D prefix serial number fitted with software version 3.00 or later, a cable compensation facility is not provided and the **SCC** command has no effect.

The cable compensation command sets the cable compensation of the converter. Setting 0 corresponds to no compensation; 15 corresponds to maximum compensation.

For information on cable compensation and the required setting, see Table 7-12 on page 7-25 for 70 MHz IF, or Table 7-13 on page 7-26 for 140 MHz IF.

No leading zero is required when you enter a single-digit figure.

To set the cable compensation:

- ❑ Enter **SCCnn**, where $0 \leq nn \leq 15$.

Set IF frequency

The set IF frequency command sets the IF frequency of the converter. This command is valid only when the converter is fitted with the narrow bandwidth option. Converters fitted with the wide bandwidth option can only operate at the 140 MHz IF frequency.

To set the IF frequency of the converter:

- ❑ Enter **SIFn**, where

  n = 0 for 70 MHz IF frequency, or
  1 for 140 MHz IF frequency

Set impedance

The set impedance command sets the IF impedance of the converter.

To set the IF impedance of the converter:

- ❑ Enter **SIMn**, where

  n = 0 for 50 Ω IF impedance, or
  1 for 75 Ω IF impedance

Set LNB fault enable

The set LNB fault enable command enables or disables LNB fault detection. Fault detection is normally enabled. When a separate LNB system is installed and fault monitoring via the converter is not required, disable LNB fault detection.

To enable or disable LNB fault detection:

- ❑ Enter **SLEn**, where

  n = 0 to disable LNB fault detection, or
  1 to enable LNB fault detection

Set SSPA fault enable

The set SSPA fault enable command enables or disables the detection of SSPA and associated faults.

If you are using a 5904/5908/5916/5940 SSPA, the normal setting is for fault detection to be enabled.

If you are using an SSPA with incompatible alarm outputs, or have a separate SSPA system installed, disable SSPA fault detection.

If you select the disable setting, this command automatically sets fan fault enable to disable and SSPA temperature compensation type to off.

If SSPA fault detection is disabled, the following functions are also disabled:

- SSPA fault indications
- temperature fault indications
- fan fault indications
- SSPA activation
- gain versus temperature compensation associated with the SSPA
- SSPA temperature indications

For a high power transceiver system the SSPA fault enable must be set to enable (**SPE1**).

To enable or disable SSPA fault detection:

- Enter **SPEn**, where

  n = 0 to disable SSPA fault detection, or
  1 to enable SSPA fault detection

Set output O/P power alarm enable

When SSPA control mode is set to basic, the converter *cannot* obtain the SSPA output power data and the output power alarm facility *cannot* generate output power alarms.

For a transceiver system using a 5904 or 5940 SSPA, the output power alarm mode must be set to disable (**STE0**).

To enable or disable the output power alarm for the SSPA:

- Enter **STEn**, where

  n = 0 for alarm if SSPA is off, or
  1 for alarm if SSPA is off or output power alarm is below the threshold

Set converter temperature compensation type

The set converter temperature compensation type command selects the gain versus temperature compensation data for the converter. If data is loaded, select the custom characteristic.

You cannot select custom unless data is loaded.

To set the converter temperature compensation type:

- Enter **SCTn**, where

  n = 0 for standard temperature compensation, or
  1 for custom temperature compensation

Set SSPA temperature compensation type

The set SSPA temperature compensation type command selects the gain versus temperature compensation data for the SSPA. If data is loaded, select the custom characteristic.

You cannot select custom unless data is loaded.

When SSPA control mode is set to basic, the SSPA temperature compensation type is automatically set to off and the **SPT** command is *not* allowed.

To set the SSPA temperature compensation type:

- ❑ Enter **SPTn**, where

  n = 0 for off, or
  1 for 59XX standard compensation, or
  2 for custom compensation

Set SSPA detector type

The set SSPA detector type command sets the SSPA output power detector characteristic. If data is loaded, select the custom characteristic.

You cannot select custom unless data is loaded.

When SSPA control mode is set to basic, the **SPD** command is *not* allowed.

To set the SSPA detector type:

- ❑ Enter **SPDn**, where

  n = 0 for 59XX standard characteristic, or
  1 for custom characteristic

Set output power alarm threshold

The set output power alarm threshold command sets the output power alarm threshold stored in the converter. When the SSPA RF output power is below the threshold setting, an alarm will sound. The range is 20 to 55 dBm.

When SSPA control mode is set to basic, the converter *cannot* obtain the SSPA output power data and the output power alarm facility *cannot* generate output power alarms. Consequently, the **SOT** command setting is ignored.

To set the output power alarm threshold:

- ❑ Enter **SOTnn**, where 20 < nn < 55.

Set echo

Commands sent to the converter from a terminal can be echoed back to the terminal. The set echo command switches the echo on or off.

This command is not available if you are using packet protocol.

To switch the echo on or off:

- ❑ Enter **SECn**, where

  n = 0 switches the echo off, or
  1 switches the echo on

Set packet protocol

The set packet protocol command enables you to set the packet protocol you want to use. When you have set the packet protocol, the **ASCII/PKT** DIP switch on the control panel of the converter must be set to PKT.

This command is not available if you are using packet protocol.

To set the packet protocol:

- ❑ Enter **SPPn**, where

  n = 0 for Codan mode, or
  1 for packet protocol mode 1, or
  2 for packet protocol mode 2, or
  3 for packet protocol mode 3

Set packet address range

The set packet address range command sets the address range for the packet address of the converter. The remainder of the address is set via the address switches on the control panel of the converter. The complete address may be calculated by adding 0, 32, 64 or 96 as appropriate to the address value set on the control panel switches.

This command is not available if you are using packet protocol.

To set the address range:

- ❑ Enter **SARn**, where

  n = 0 for 0 to 31 address range, or
  1 for 32 to 63 address range, or
  2 for 64 to 95 address range, or
  3 for 96 to 127 address range

View commands

The view commands provide comprehensive information for:

- fault status
- operational status
- control status
- parameter settings
- SSPA and converter temperature
- temperature compensation data

View commands are not available if you are using packet protocol.

View fault status

To display the fault status of the transceiver:

- ❑ Enter **VFS**. No data is required.

```
--------Fault Status--------
Converter   :  OK
LNB         :  OK[a]
SSPA        :  OK[a]
Temperature :  OK[a]
Fan         :  OK[a]
O/P Power   :  OK[a]
----------------------------
>
```

a. Disabled faults are not visible. If SSPA fault detection is disabled then SSPA, temperature, fan and O/P power faults are not displayed, SSPA activation is not possible and compensation for the SSPA is set to zero.

View parameter settings

To display the parameter settings of the transceiver:

- ❑ Enter **VPS**. No data is required.

```
----------------------Parameter Settings----------------------
System Command  : Stand-by     Tx Freq    : 14500   Atten :  0
SSPA Activate   : Off          Rx Freq    : 12200   Atten :  0
SSPA Inhibit    : Off          Cable Comp : 0
Receive Range   : 11700-12200  Impedance  : 50
SSPA Mode       : Extended     IF Freq    : 70
Ref. Override   : Off          Faults     : LNB   : Enable
Conv Comp Type  : Standard                SSPA  : Enable
SSPA Comp Type  : 5908 Std                O/P   : Disable
SSPA Detector   : 5908 Std         O/P Threshold  : 50
Packet protocol : Mode 1           Power Up[a]      : Tx Off
Packet address  : 1 (01H)          Echo           : On
        For actual transceiver status use VSS command
------------------------------------------------------------
>
```

a. The power up parameter is only shown in software versions 3.00 or later.

View control status

To display the status of the switches and control inputs of the transceiver:

- ❑ Enter **VCS**. No data is required.

```
-------Control Status-------
Power Switch      : On
SSPA Switch       : Remote
H/W System On     : Off
H/W SSPA Activate : Off
H/W SSPA Inhibit  : Off
---------------------------
>
```

View system status

To display the system status of the transceiver:

- ❑ Enter **VSS**. No data is required.

```
----------------------System Status-----------------------
System          : On         Reference Osc.    : Warm
Summary SSPA:                Transmit IF       : On
    - Activate  : Off        Logging - Faults  : Off
    - Inhibit   : Off                  Status  : Off
SSPA            : Off                  Lock    : Off
SSPA O/P Power  : U/R dBm[a]           Temp.   : Off
Power   : Off
------------------------------------------------------------
>
```

a. When the detected output power is above or below the detection range of the SSPA (see Chapter 4, *Specifications*), O/R (over range) or U/R (under range) is displayed instead of the power reading. For converters fitted with software versions prior to 1.10, when the detected output power is above or below the detection range of the SSPA, the reading displayed is the upper or lower limit value respectively. Early model 5904 SSPA modules have the output power detector disabled. These SSPAs give a constant U/R output power reading.

View lock status

To display the lock status of the phase locked oscillators within the converter:

- ❑ Enter **VLS**. No data is required.

```
--------Lock Status---------
Rx LO            :   Locked
Tx LO            :   Locked
Rx Synthesiser 1 :   Locked
Rx Synthesiser 2 :   Locked
Tx Synthesiser 1 :   Locked
Tx Synthesiser 2 :   Locked
Tx Synthesiser 3 :   Locked
----------------------------
>
```

View SSPA faults

When SSPA control mode is set to basic, the **VPF** command is *not* allowed.

To display the SSPA faults:

- ❑ Enter **VPF**. No data is required.

```
--------SSPA Faults---------
Neg bias supply     : OK
Overcurrent monitor : OK
Switched supplies   : OK
----------------------------
>
```

View converter identity

To display the identification information of the converter:

- ❑ Enter **VID**. No data is required.

```
-------CODAN (C) - 5900 Ku-Band Converter Module------
Software Part Number : 91-20600-001    Version :  3.00
Date of revision :  17th July 2001
Options : Band 1 / Narrow Bandwidth
-------------------------------------------------------
>
```

View SSPA identity

When SSPA control mode is set to basic, the **VIP** command is *not* allowed.

To display the identification information of the SSPA:

- Enter **VIP**. No data is required.

```
-------CODAN (C) - 5904 Ku-Band SSPA Module-----------
Software Part Number : 91-00124     Version :  1.00
Date of revision :  30th May 1997
Options : Band 1 / No fan
-----------------------------------------------------
>
```

View table data

To display the names of the table data for the transceiver:

- Enter **VTD**. No data is required.

```
Conv Temp Comp Table
--------------------
0   Standard
1   No Data

SSPA Temp Comp Table
--------------------
0   Off
1   5908 Std
2   No Data

SSPA O/P Detector Table
-----------------------
0   5908 Std
1   No Data
>
```

View system temperatures

When SSPA control mode is set to basic, the SSPA temperature is *not* available and is shown as `N/A`.

To display the temperatures of the converter and the SSPA (if the fault system for the SSPA has been enabled):

- ❑ Enter **VST**. No data is required.

```
Converter Temperature : 32  C    SSPA Temperature : 40  C
```

View maximum and minimum temperatures

When SSPA control mode is set to basic, the SSPA temperatures are *not* available and are shown as `N/A`.

To display the maximum and minimum temperatures of the transceiver:

- ❑ Enter **VMT**. No data is required.

```
SSPA Max Temp    : 45  C   Converter Max Temp    : 40  C
SSPA Min Temp    : 22  C   Converter Min Temp    : 19  C
>
```

Output parameter commands

Output system on

To display the system on parameter setting:

- ❑ Enter **OSO**. No data is required.

  The setting is displayed as:

  - 0 if the system on parameter is set to standby, or
  - 1 if the system on parameter is set to on

Output reference override

To display the reference oscillator override parameter setting:

❑ Enter **ORO**. No data is required.

The setting is displayed as:

- 0 if the reference override parameter is set to off (inhibit transmission), or
- 1 if the reference override parameter is set to on (enable transmission)

Output transmit frequency

To display the transmit frequency of the converter:

❑ Enter **OTF**. No data is required.

The transmit frequency of the converter is displayed in MHz with five numeric characters.

Output receive frequency

To display the receive frequency of the converter:

❑ Enter **ORF**. No data is required.

The receive frequency of the converter is displayed in MHz with five numeric characters.

Output SSPA control mode

To display the SSPA control mode setting:

❑ Enter **OPM**. No data is required.

For high power transceiver systems the output will be 1 indicating basic SSPA control mode is selected.

The setting is displayed as:

- 0 if the SSPA control mode is set to extended, or
- 1 if the SSPA control mode is set to basic

Output converter temperature compensation type

To display the converter temperature compensation type setting:

❑ Enter **OCT**. No data is required.

The setting is displayed as:

- 0 if the converter temperature compensation type is set to standard, or
- 1 if the converter temperature compensation type is set to custom

Output SSPA temperature compensation type

To display the SSPA temperature compensation type setting:

❑ Enter **OPT**. No data is required.

For high power transceiver systems the output will be 0 indicating that SSPA compensation is off.

The setting is displayed as:

- 0 if the SSPA temperature compensation type is set to off, or
- 1 if the SSPA temperature compensation type is set to 59XX standard, or
- 2 if the SSPA temperature compensation type is set to custom

Output SSPA detector type

When SSPA control mode is set to basic, the **OPD** command is *not* allowed.

To display the SSPA output power detector type setting:

❑ Enter **OPD**. No data is required.

The setting is displayed as:

- 0 if the SSPA output power detector type is set to 59XX standard, or
- 1 if the SSPA output power detector type is set to custom

Output O/P power alarm threshold

For a transceiver system using a 5904 or 5940 SSPA, the converter cannot obtain the SSPA output power data, the output power alarm facility cannot generate power alarms and this setting is ignored.

To display the output power alarm threshold setting:

- ❑ Enter **OOT**. No data is required.

  The output power alarm threshold is displayed as two numeric characters.

Output cable compensation

For converters with a D prefix serial number fitted with software version 3.00 or later, a cable compensation facility is not provided and the **OCC** command always returns a value of 0.

To display the cable compensation setting of the converter:

- ❑ Enter **OCC**. No data is required.

  The cable compensation is displayed as one or two numeric characters.

Output IF frequency

To display the IF frequency setting of the converter:

- ❑ Enter **OIF**. No data is required.

  The setting is displayed as either:

  - 0 indicating 70 MHz, or
  - 1 indicating 140 MHz

Output impedance

To display the IF impedance setting of the converter:

- ❑ Enter **OIM**. No data is required.

  The setting is displayed as either:

  - 0 indicating 50 Ω, or
  - 1 indicating 75 Ω

Output packet protocol

To display the packet protocol mode setting:

- ❑ Enter **OPP**. No data is required.

  The setting is displayed as:

  - 0 if the packet protocol mode is set to Codan, or
  - 1 if the packet protocol mode is set to packet protocol mode 1, or
  - 2 if the packet protocol mode is set to packet protocol mode 2, or
  - 3 if the packet protocol mode is set to packet protocol mode 3

Output packet address

This command is not available if you are using packet protocol.

To display the packet address setting:

- ❑ Enter **OAD**. No data is required.

  The address is displayed as up to three numeric characters representing the converter's packet address setting. The address is determined by the set packet address range command and the address switches on the control panel of the converter.

Output packet address range

This command is not available if you are using packet protocol.

To display the packet address range setting:

- ❑ Enter **OAR**. No data is required.

  The setting is displayed as:

  - 0 if the packet address range is 0 to 31, or
  - 1 if the packet address range is 32 to 63, or
  - 2 if the packet address range is 64 to 95, or
  - 3 if the packet address range is 96 to 127

Output all identity data

This command is only available with converter software versions 2.00 or later.

To display all the identity data for the transceiver on one line:

- Enter **OTD**. No data is required.

  All the identity data of the transceiver is displayed on one line across the screen. Each parameter is separated by a '|' character (ASCII code 124 decimal, 7C hex). The parameters displayed have the same format and values as specified for the individual commands. The multiline outputs of the **OID** and **OIP** commands are displayed on one line as separate parameters (i.e. each line of data is separated by a '|'). The data is displayed in the following order:

  Output converter identity data (**OID**)
  Output SSPA identity data (**OIP**)
  Output converter serial number (**OCN**)
  Output SSPA serial number (**OPN**)

  Example:

```
5900|91-20600-001|3.00 |17th Jul 2001|      |Narrow
|5904|91-00124|1.00 |30th May 1997|No fan|D0198|C0097
>
```

If the SSPA control mode is set to basic, the **OIP** and **OPN** commands are *not* allowed and the corresponding values displayed in the **OTD** command output are `N/A`.

Output SSPA activate

To display the SSPA activate parameter setting:

- Enter **OPA**. No data is required.

  The setting is displayed as:

  - 0 if the SSPA activate parameter is set to off, or
  - 1 if the SSPA activate parameter is set to on

Output SSPA inhibit

To display the status of the SSPA inhibit parameter setting:

- ❑ Enter **OPI**. No data is required.

  The setting is displayed as:

  - 0 if the SSPA inhibit parameter is set to off, or
  - 1 if the SSPA inhibit parameter is set to on

Output transmit attenuation

To display the transmit attenuation setting of the converter:

- ❑ Enter **OTA**. No data is required.

  The transmit attenuation of the converter is displayed in dB with one or two numeric characters.

Output receive attenuation

To display the receive attenuation setting of the converter:

- ❑ Enter **ORA**. No data is required.

  The receive attenuation of the converter is displayed in dB with one or two numeric characters.

Output power up

This command is only available with converter software versions 3.00 or later.

To display the power up mode setting:

- ❑ Enter **OPU**. No data is required.

  The setting is displayed as:

  - 0 if the power up mode is set to last state, or
  - 1 if the power up mode is set to transmit off

Output receive range

To display the receive range setting of the converter:

❑ Enter **ORR**. No data is required.

The setting is displayed as:

- 0 if the range is 950 to 1700 MHz, or
- 1 if the range is 10950 to 11700 MHz, or
- 2 if the range is 11700 to 12200 MHz, or
- 3 if the range is 12250 to 12750 MHz

Output LNB fault enable

To display the LNB fault enable parameter setting:

❑ Enter **OLE**. No data is required.

The setting is displayed as:

- 0 if the LNB fault enable parameter is set to disabled, or
- 1 if the LNB fault enable parameter is set to enabled

Output SSPA fault enable

To display the SSPA fault enable parameter setting:

❑ Enter **OPE**. No data is required.

For high power transceiver systems the output will be 1 indicating that SSPA fault detection is enabled.

The setting is displayed as:

- 0 if the SSPA fault enable parameter is set to disabled, or
- 1 if the SSPA fault enable parameter is set to enabled

Output O/P power alarm enable

To display the output power alarm enable parameter setting:

❑ Enter **OTE**. No data is required.

The setting is displayed as:

- 0 if the output power alarm enable parameter is set to disabled, or
- 1 if the output power alarm enable parameter is set to enabled

For high power transceiver systems the output will be 0 indicating that the SSPA O/P fault only indicates the on/off status of the SSPA.

Output fault logging

To display the fault logging setting:

❑ Enter **OFL**. No data is required.

The setting is displayed as:

- 0 if fault logging is set to disabled, or
- 1 if fault logging is set to enabled

Output status logging

To display the status logging setting:

❑ Enter **OSL**. No data is required.

The setting is displayed as:

- 0 if status logging is set to disabled, or
- 1 if status logging is set to enabled

Output lock status logging

To display the lock status logging setting:

❑ Enter **OLL**. No data is required.

The setting is displayed as:

- 0 if lock status logging is set to disabled, or
- 1 if lock status logging is set to enabled

Output temperature logging

To display the temperature logging setting:

- ❑ Enter **OTL**. No data is required.

  The setting is displayed as:

  - 0 if temperature logging is set to disabled, or
  - 1 if temperature logging is set to enabled

Output power logging

To display the output power logging setting:

- ❑ Enter **OPL**. No data is required.

  The setting is displayed as:

  - 0 if output power logging is set to disabled, or
  - 1 if output power logging is set to enabled

For high power transceiver systems the output will be 0 indicating that the output power logging is switched off.

Output echo

To display the echo parameter setting:

- ❑ Enter **OEC**. No data is required.

  The setting is displayed as:

  - 0 if the echo parameter is set to off, or
  - 1 if the echo parameter is set to on

Output configuration data

This command is only available with converter software versions 2.00 or later.

To display all the configuration data of the transceiver on one line:

- Enter **ODP**. No data is required.

  The configuration data of the transceiver is displayed on one line across the screen. Each parameter value is separated by a '|' character (ASCII code 124 decimal, 7C hex). The parameters displayed have the same format and values as specified for the individual output commands. The data is displayed in the following order:

  Output cable compensation (**OCC**)
  Output converter temperature compensation type (**OCT**)
  Output SSPA temperature compensation type (**OPT**)
  Output IF frequency (**OIF**)
  Output impedance (**OIM**)
  Output LNB fault enable (**OLE**)
  Output SSPA fault enable (**OPE**)
  Output SSPA control mode (**OPM**)
  Output reference override (**ORO**)
  Output transmit frequency (**OTF**)
  Output transmit attenuation (**OTA**)
  Output receive frequency (**ORF**)
  Output receive attenuation (**ORA**)
  Output system on (**OSO**)
  Output SSPA activate (**OPA**)
  Output SSPA inhibit (**OPI**)
  Output receive range (**ORR**)
  Output SSPA detector (**OPD**)[1]
  Output power alarm threshold (**OOT**)
  Output power alarm enable (**OTE**)
  Output packet protocol (**OPP**)
  Output packet address (**OAD**)
  Output packet address range (**OAR**)
  Output power up (**OPU**)[2]

  Example:

```
0|0|0|0|0|0|1|0|0|14000|0|950|0|0|0|0|0|0|20|0|1|5|0|1
>
```

1. If the SSPA control mode is set to basic, the **OPD** command is not allowed and the value displayed in the **OPD** command output is `N/A`.
2. The **OPU** command is only shown in software versions 3.00 or later.

Output SSPA band

This command is only available with converter software versions 2.00 or later.

When SSPA control mode is set to basic, the **OFP** command is *not* allowed.

To display the operating frequency band setting of the SSPA:

- ❑ Enter **OFP**. No data is required.

  The setting is displayed as:

  - 1 if the SSPA frequency band is set to Band 1, or
  - 2 if the SSPA frequency band is set to Band 2

Output data commands

Output converter temperature

To display the temperature of the converter:

- ❑ Enter **OTC**. No data is required.

  The temperature is displayed in degrees Celsius.

Output SSPA temperature

This command is available only if the SSPA temperature compensation is enabled.

When SSPA control mode is set to basic, the **OTP** command is *not* allowed.

To display the temperature of the SSPA:

- ❑ Enter **OTP**. No data is required.

  The temperature is displayed in degrees Celsius.

Output SSPA output power

When SSPA control mode is set to basic, the **OPO** command is *not* allowed.

To display the output power of the SSPA:

- ❑ Enter **OPO**. No data is required.

  The output power is displayed in dBm.

  When the detected output power is above or below the detection range of the SSPA (see Chapter 4, *Specifications*), a displayed power reading of 0.1 indicates the over range condition while a reading of 0.0 indicates the under range condition.

  For converters fitted with software versions prior to 1.10, when the detected output power is above or below the detection range of the SSPA, the reading displayed is the upper or lower limit value respectively.

  Early model 5904 SSPAs have the output power detector disabled. These SSPAs give a constant under range output power reading.

Output SSPA temperature compensation correction

When SSPA control mode is set to basic, the **OPC** command is *not* allowed.

To display the temperature compensation gain correction required by the SSPA:

- ❑ Enter **OPC**. No data is required.

  The gain correction is displayed in dB.

Output fault status

To display the overall fault status of the transceiver:

- ❑ Enter **OFS**. No data is required.

  The status is displayed as one or two numeric characters representing the overall fault status of the transceiver based on the sum of the following values:

Converter fault	0 = OK	1 = Fault
LNB fault	0 = OK	2 = Fault
SSPA fault	0 = OK	4 = Fault
Temperature fault	0 = OK	8 = Fault
Fan fault	0 = OK	16 = Fault
Output power fault	0 = OK	32 = Fault

Output control status

To display the status of the control panel switch and hardware control input:

- ❑ Enter **OCS**. No data is required.

  The status is displayed as one or two numeric characters representing the control status of the transceiver based on the sum of the following values:

Power switch	0 = Standby	1 = On
SSPA switch	0 = Not activated	2 = Activated
SSPA switch	0 = Not inhibited	4 = Inhibited
H/W system on	0 = Standby	8 = On
H/W SSPA activate	0 = Not activated	16 = Activated
H/W SSPA inhibit	0 = Not inhibited	32 = Inhibited

Output system status

To display the system status of the transceiver:

- ❑ Enter **OSS**. No data is required.

  The status is displayed as one or two numeric characters representing the system status of the transceiver based on the sum of the following values:

System on	0 = Standby	1 = On
SSPA activate	0 = Not activated	2 = Activated
SSPA inhibit	0 = Not inhibited	4 = Inhibited
SSPA on	0 = Off	8 = On
Tx IF	0 = Off	16 = On
Reference oven	0 = Warming up	32 = Warm

Output lock status

To display the synthesiser lock status:

- ❑ Enter **OLS**. No data is required.

  The status is displayed as one or two numeric characters representing the lock status of the PLLs in the converter based on the sum of the following values:

Tx local oscillator	0 = Locked	1 = Unlocked
Rx local oscillator	0 = Locked	2 = Unlocked
Tx synthesiser 1	0 = Locked	4 = Unlocked
Tx synthesiser 2	0 = Locked	8 = Unlocked
Tx synthesiser 3	0 = Locked	16 = Unlocked
Rx synthesiser 1	0 = Locked	32 = Unlocked
Rx synthesiser 2	0 = Locked	64 = Unlocked

Output SSPA faults

When SSPA control mode is set to basic, the **OPF** command is *not* allowed.

To display the status of the SSPA internal faults:

- Enter **OPF**. No data is required.

  The status is displayed as one or two numeric characters representing the internal faults of the SSPA based on the sum of the following values:

Neg Bias Supply	0 = OK	1 = Fault
Overcurrent	0 = OK	2 = Fault
Switched Supplies	0 = OK	4 = Fault

Output status poll

To display whether or not a change has occurred in the fault, control or system status of the transceiver:

- Enter **OSP**. No data is required.

  The status poll is displayed as one numeric character indicating whether or not a change has occurred in the fault, control or system status of the transceiver. This is based on the sum of the following values:

Fault	0 = No change	1 = Change
Control	0 = No change	2 = Change
System	0 = No change	4 = Change

  For example, an output of 0 indicates that no change has occurred; an output of 6 indicates that a change has occurred in the control status and system status.

The functions associated with Fault are:

- Converter fault
- LNB fault
- SSPA fault
- Temp fault
- Fan fault[1]
- O/P power fault[1]

The functions associated with Control are:

- Power switch
- SSPA activate switch
- SSPA inhibit switch
- H/W system on
- H/W SSPA activate
- H/W SSPA inhibit

The functions associated with System are:

- System on
- Summary SSPA activate
- Summary SSPA inhibit
- SSPA on
- Tx IF
- Reference oven

Use the associated **OFS**, **OCS** or **OSS** output commands for more information on the status of the transceiver.

To reset the status poll output to the ‘no change’ state:

- ❑ Enter **RCB** (reset change bits command). No data is required.

1. If the high power transceiver is set up correctly, fan faults and O/P power faults are not reported and will not indicate a change in the fault status of the transceiver.

Output converter maximum and minimum temperatures

To display the maximum and minimum temperatures of the converter:

- ❑ Enter **OMC**. No data is required.

  The temperatures are displayed in degrees Celsius.

```
36
-5
>
```

Output SSPA maximum and minimum temperatures

When SSPA control mode is set to basic, the **OMP** command is *not* allowed.

To display the maximum and minimum temperatures of the SSPA:

- ❑ Enter **OMP**. No data is required.

  The temperatures are displayed in degrees Celsius.

```
39
-3
>
```

Output converter identity data

To display the configuration and identification information of the converter:

- ❑ Enter **OID**. No data is required.

  The following information is displayed separated by line feeds:

  - type number of the converter (e.g. 5900)
  - firmware part number
  - firmware version number
  - firmware release date
  - converter bandwidth

```
5900
91-20600-001
3.00
17th July 2001
Narrow
>
```

Output SSPA identity data

When SSPA control mode is set to basic, the **OIP** command is *not* allowed.

To display the configuration and identification information of the SSPA:

- ❑ Enter **OIP**. No data is required.

  The following information is displayed separated by line feeds:

  - type number of the SSPA (e.g. 5904)
  - firmware part number
  - firmware version number
  - firmware release date
  - fan detail

```
5904
91-00124
1.00
30th May 1997
No fan
>
```

Output device type

To display the converter type number and firmware version:

❑ Enter **ODT**. No data is required.

The 4-digit converter type number is followed by the 3-digit firmware version number to two decimal places, e.g. 300 = 3.00.

```
5900300
>
```

Output frequency data

To display the transmit and receive frequency ranges of the converter and the synthesiser step size:

❑ Enter **OFD**. No data is required.

The following information is displayed separated by line feeds:

- the maximum transmit frequency (MHz)
- the minimum transmit frequency (MHz)
- the maximum receive frequency (MHz)
- the minimum receive frequency (MHz)
- synthesiser step size (MHz)

```
14500
14000
12200
11700
1
>
```

Output compensation/detector data

To display the names of the temperature compensation tables available for the converter and the SSPA, and the names of the power detector characteristics available for the SSPA:

- ❑ Enter **OCD**. No data is required.

  The following information is displayed separated by line feeds.

  Converter compensation table names:

  - converter default compensation table name
  - custom converter compensation table name (‘No data’ if data not loaded)

  SSPA compensation table names:

  - ‘Off’
  - SSPA default compensation table name
  - custom SSPA compensation table name (‘No data’ if data not loaded)

  The SSPA compensation table names are shown as `N/A` when the SSPA control mode is set to Basic.

  SSPA power detector characteristic name:

  - SSPA default detector characteristic name
  - custom SSPA detector characteristic name (‘No data’ if data not loaded)

  The SSPA power detector characteristic names are shown as `N/A` when the SSPA control mode is set to Basic.

```
Standard
No data
Off
5908 Std
No data
5908 Std
No data
>
```

Output converter serial number

To display the serial number of the converter:

- ❑ Enter **OCN**. No data is required.

```
D0198
>
```

Output SSPA serial number

When SSPA control mode is set to basic, the **OPN** command is *not* allowed.

To display the serial number of the SSPA:

- ❑ Enter **OPN**. No data is required.

```
C0097
>
```

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9 Maintenance and fault finding

This chapter covers the following topics:

- precautions that should be taken when servicing the transceiver (9-2)
- details of how to maintain the SSPA fan (9-3)
- procedures on how to check the reference oscillator frequency remotely and locally, and how to adjust it (9-4)
- descriptions of the types of fuse used in the converter and power supply unit and how to replace them (9-7)
- procedures for fault finding (9-9)

Precautions

DC supply

The 48 V DC input supply circuits of the transceiver are completely floating. Consequently, the power supply has separate 0 V input and 0 V output lines.

When servicing, take care not to short the 0 V input and 0 V output lines together, particularly when connecting test equipment.

Connections to power supplies

Many of the intermodule connectors carry DC supplies.

As a general rule, exposed connector pins do not carry DC supply voltages.

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

Non user-serviceable modules

Repair of the Converter Module 5900, 5904/5908/5916/5940 SSPAs and the LNB, require specialised test equipment and tools.

If you find that any of these modules are faulty, return the module to Codan for repair.

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

Maintaining the solid state power amplifier fan

The SSPAs have one or two DC fans to cool the heatsinks. The fans blow air into the heatsink.

The fans should be replaced if they have failed, which is usually indicated by overtemperature warnings or if the bearings become noisy. If a fan needs to be replaced, it can be ordered from Codan.

Check the air passages on the SSPA fan and heatsink regularly for obstructions. This is necessary to ensure that the fan is able to supply adequate cooling to the SSPA.

If necessary, you can remove the fan shroud to clear the air passages or to replace a faulty fan.

A faulty fan may be replaced with the SSPA off or activated. If the SSPA is activated, the fan wires should be unsoldered from the feed-through terminals using a DC isolated soldering iron.

Ensure you do *not* short the feed-through terminals.

If the transceiver attempts to turn the fan on whilst it is disconnected, a fan fault will be indicated, but the transceiver will continue to operate. To reset this fault, see page 8-13, *Fan operation (5908/5916 SSPAs only)*.

Checking the reference oscillator frequency

Check the reference oscillator frequency every 1 to 2 years.

Because of the high frequency accuracy required, the frequency measurement equipment used for adjusting the reference oscillator of the transceiver must have an accuracy and resolution of 1×10^{-8} (e.g. 140 Hz in 14 GHz) or better.

Two techniques may be used to check the reference oscillator frequency indirectly:

- remote measurement
- local measurement

Remote measurement

Remote measurement is the preferred method for checking the reference oscillator frequency.

To check the frequency, transmit a test carrier from your satellite station and have its frequency checked at a major earth station equipped with the appropriate equipment (e.g. a spectrum analyser locked to a high stability frequency reference).

If you use this method, you must know the actual offset frequency of the satellite (it may be measured by the major earth station). You must also be sure that the modulator or signal generator generating the Tx IF input is accurate to within 10 Hz.

To provide voice communication between your station and the major earth station, an orderwire circuit or other communication channel is required.

Local measurement

If you want to use a local measurement method, measure the RF frequency of a test carrier at the Tx RF output of the converter with either:

- a high stability and high sensitivity frequency counter, or
- a spectrum analyser locked to a high stability reference

You must be sure that the modulator or signal generator generating the Tx IF input is accurate to within 10 Hz.

Adjusting the reference oscillator frequency

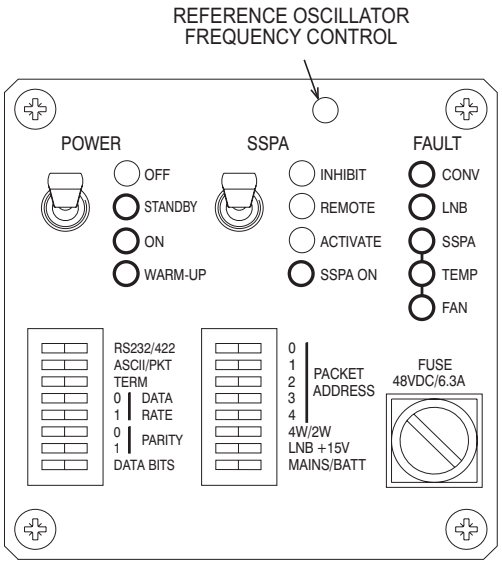
To obtain maximum frequency accuracy, adjust the reference oscillator only when it has been operating continuously for more than 24 hours.

To adjust the reference oscillator frequency:

- ❑ Use a 2.5 mm Allen key to remove the transparent cover on the control panel of the converter.

  The adjustment screw is located at the top of the control panel as shown Figure 9-1.

Figure 9-1: Reference oscillator adjustment



- ❑ If using the local measurement method, connect the frequency counter or the spectrum analyser to the **Tx RF O/P** connector.
- ❑ Measure the carrier frequency.
- ❑ Use a small flat-bladed screwdriver to adjust the frequency control a small amount.

  One turn changes the frequency by approximately 1400 Hz at 14 GHz.

  Due to the use of different reference oscillators, the direction the reference oscillator frequency control must be rotated to increase or decrease the oscillator frequency may vary between converters.
- ❑ Re-measure the frequency and repeat the previous steps until the RF carrier is within ±100 Hz of the required frequency.

- ❑ Replace the transparent cover on the control panel of the converter.

When you are replacing the transparent cover, ensure the gasket is in place and that the screws are *not* overtightened.

Replacing fuses

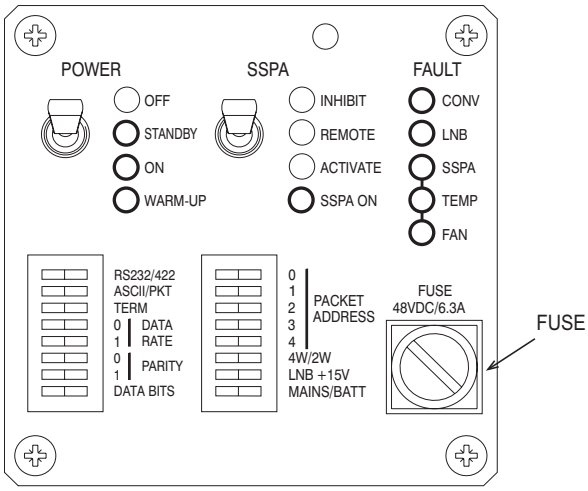
Converter fuse

The converter has one M20 × 5 mm, 6.3 A fast blow fuse in the 48 V DC line. A shunt diode ensures that if reverse polarity is applied to the converter, the fuse will blow.

To replace the fuse:

- ❑ Switch off the 48 V DC supply.
- ❑ Use a 2.5 mm Allen key to remove the transparent cover on the control panel of the converter. The location of the fuse is shown in Figure 9-2.

Figure 9-2: Fuse location



- ❑ Using a flat-bladed screwdriver, depress and rotate the cap of the fuse holder 1/8th of a turn counter-clockwise. Remove the cap and fuse from the fuse holder.
- ❑ Replace the fuse with one of an equivalent rating as specified.
- ❑ Re-insert the fuse and cap into the fuse holder.
- ❑ Using a flat-bladed screwdriver, depress and rotate the cap of the fuse holder 1/8th of a turn clockwise. Ensure the cap is locked into position.
- ❑ Replace the transparent cover on the control panel of the converter.

When you are replacing the transparent cover, ensure the gasket is in place and that the screws are *not* overtightened.

Power supply unit fuse

The PSU has one M20 × 5 mm delay fuse in the AC mains line. The fuse fitted depends on your mains supply (see Table 9-1).

Table 9-1: Power supply fuses

Mains supply	Type
115 V AC	5 A slow blow
230 V AC	2.5 A slow blow

You may damage the PSU if an incorrect voltage selection is made or an incorrect fuse is used.

To replace the fuse:

- ❑ Open the door of the PSU.
- ❑ Turn the AC supply off via the isolation switch or circuit breaker.
- ❑ Using a flat-bladed screwdriver, depress and rotate the cap of the fuse holder 1/8th of a turn counter-clockwise. Remove the cap and fuse from the fuse holder.
- ❑ Replace the fuse with one of an equivalent rating as specified (see Table 9-1).
- ❑ Re-insert the fuse and cap into the fuse holder.
- ❑ Using a flat-bladed screwdriver, depress and rotate the cap of the fuse holder 1/8th of a turn clockwise. Ensure the cap is locked into position.
- ❑ Turn the AC supply on via the isolation switch or circuit breaker.
- ❑ Close the door of the PSU.

Fault finding

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. The fault finding process involves following fault finding diagnostic flow charts, which include simple test procedures.

If technical assistance is required...

If the fault finding procedures do not locate the faulty module or cable, or if further technical assistance is required for any other reason, please contact the Customer Service Engineering staff. For the most rapid response, please call the Codan office that is currently in office hours (see Table 9-2).

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. The contact phone numbers for after hours emergency technical assistance are also listed in Table 9-2.

Table 9-2: Customer service contact numbers

Region	Office hours contact number	After hours contact number	Email address
Asia/Pacific	+61 8 8305 0311	+61 8 8305 0427	asiatech.support@codan.com.au
UK, Europe and Middle East	+44 1252 717 272	+44 1252 741 300	uktech.support@codan.com.au
The Americas	+1 703 361 2721	+1 703 366 3690	ustech.support@codan.com.au

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

Using the fault finding flow charts

To begin the fault finding process, see Figure 9-3: Main fault diagnosis chart, to ascertain which subsequent fault diagnosis chart should be used. Follow the appropriate flow chart, Figures 9-4 to 9-14b, to determine the correct test procedures to follow. The tests indicated in the flow charts can be found at the end of this chapter after the flow charts. When an '*' appears in a flow chart, it indicates that you are to refer to either the relevant test or the relevant text in this chapter.

The flow charts assume that the remote control inputs are not used. To avoid confusion due to multiple control inputs, it is recommended that you do not have any equipment (apart from a terminal when required) connected to the **MONITOR/CONTROL** connector of the converter.

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 converter/SSPA interface. The most effective technique when dealing with complex faults, or if a terminal is not available, is to substitute modules.

During fault finding or performance testing, disconnect the Tx IF signal and/or terminate the SSPA output into a suitable rated dummy load. This will ensure that unwanted signals are not transmitted.

Cable wiring diagrams are included in Chapter 10, *Drawings*, to enable you to check the integrity of interconnecting cables. Internal fault signalling is fail-safe (a fault is indicated if a unit is disconnected).

Power supply unit fault

If you have a power system fault and your system is a DC supply configuration, see Figure 9-4: DC power supply system fault diagnosis chart.

If your system is an AC supply configuration with a Codan supplied power supply, see Figure 9-5: AC power supply (5582B) system fault diagnosis chart.

If your system uses a 5940 SSPA, see Figure 9-6: 5940 SSPA supply system fault diagnosis chart.

Ensure that the **MAINS/BATT** DIP option switch is set correctly.

Low noise block converter fault

If you have an LNB fault, see Figures 9-14a and 9-14b: LNB fault diagnosis chart.

Solid state power amplifier fault

When checking for faults causing no SSPA output power, note that the following events inhibit transmission:

- the warm-up period has not yet expired (when the reference oscillator override is set to disabled)
- the **SSPA** switch on the control panel of the converter is set to INHIBIT
- an external inhibit input is present
- the SSPA inhibit parameter is set to on
- an SSPA fault has been detected
- an SSPA temperature fault has been detected
- a converter fault has been detected in the transmit path

The SSPA and temperature fault diagnosis charts provided in Figures 9-7 and 9-11 are structured for fault finding in an installation using the extended SSPA control mode with a 5904/5908/5916 SSPA.

The SSPA and temperature fault diagnosis charts provided in Figures 9-8 and 9-12 are structured for fault finding in an installation using the basic SSPA control mode with an SSPA other than a 5904/5908/5916 SSPA.

If using the basic SSPA interface mode with a 5940, the interface may be checked using Figure 9-9: 5940 SSPA fault diagnosis chart.

Figure 9-3: Main fault diagnosis chart

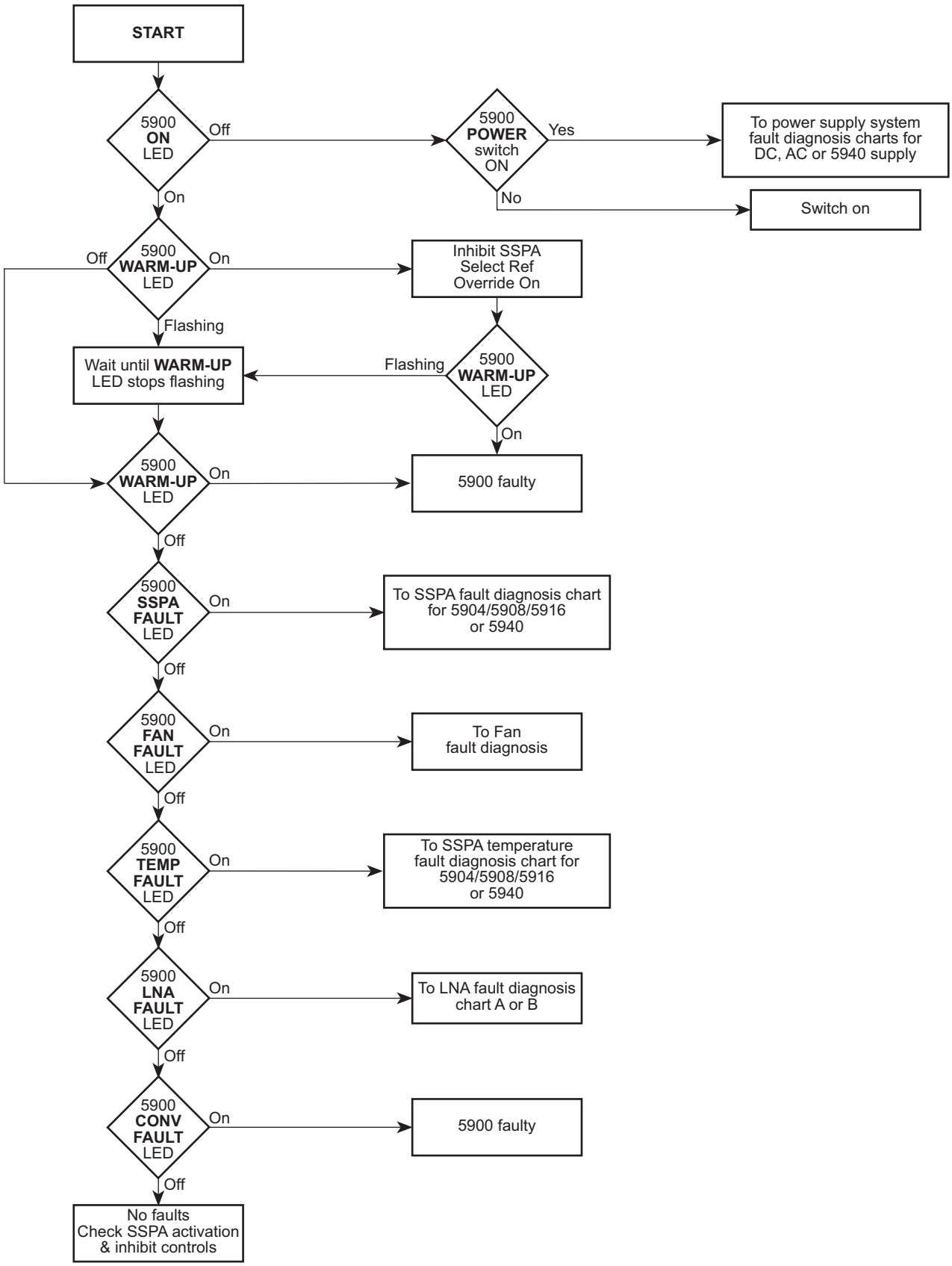


Figure 9-4: DC power supply system fault diagnosis chart

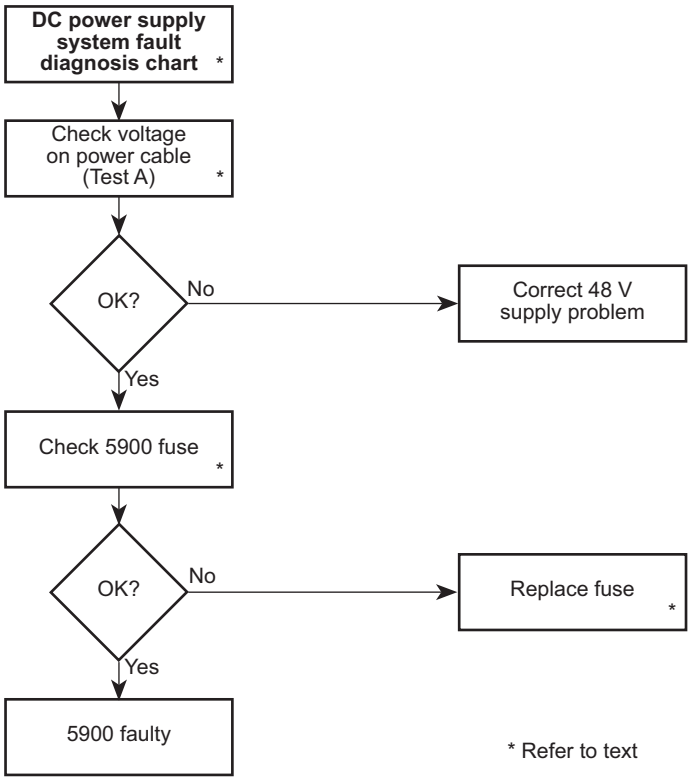


Figure 9-5: AC power supply (5582B) system fault diagnosis chart

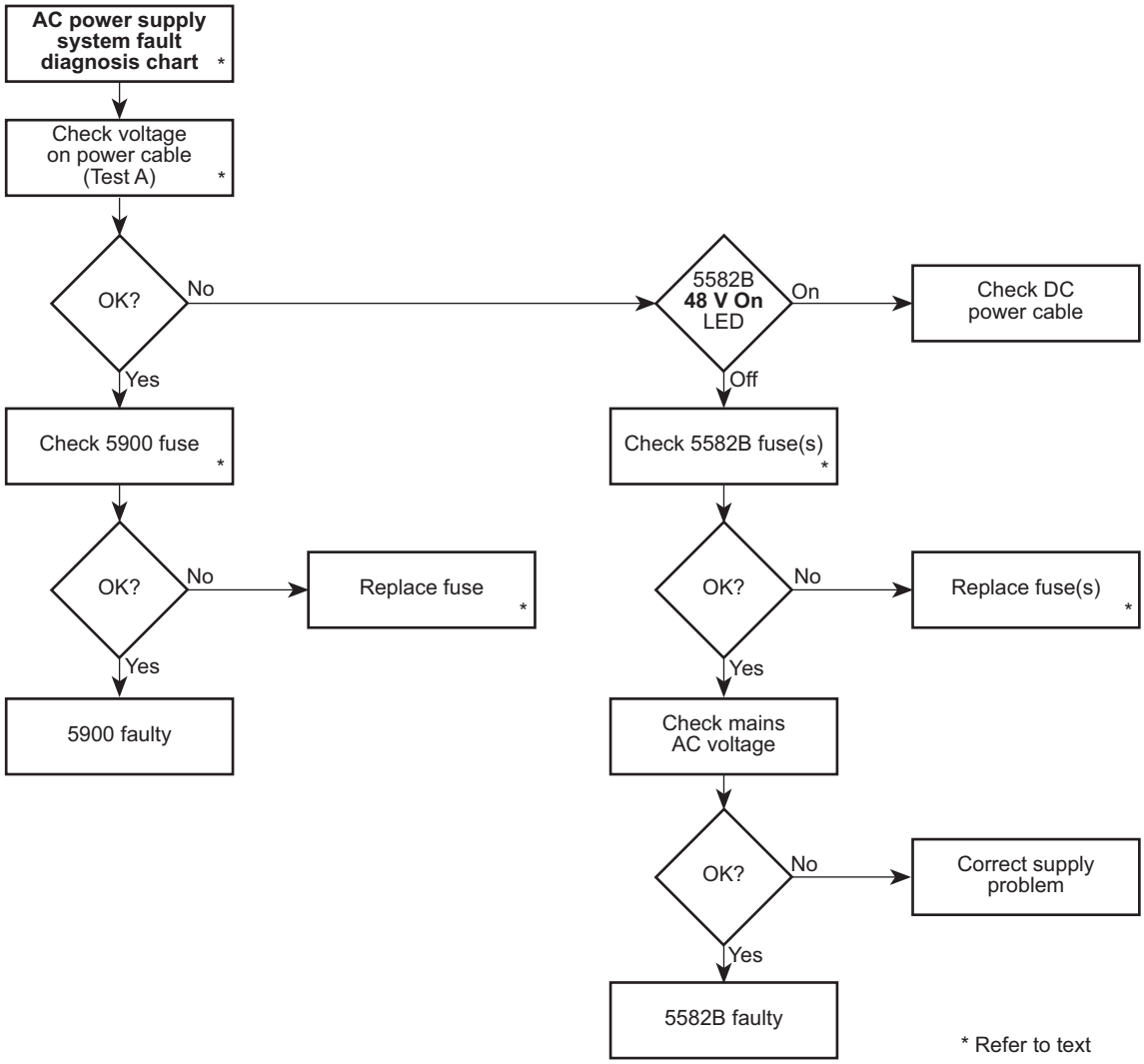


Figure 9-6: 5940 SSPA supply system fault diagnosis chart

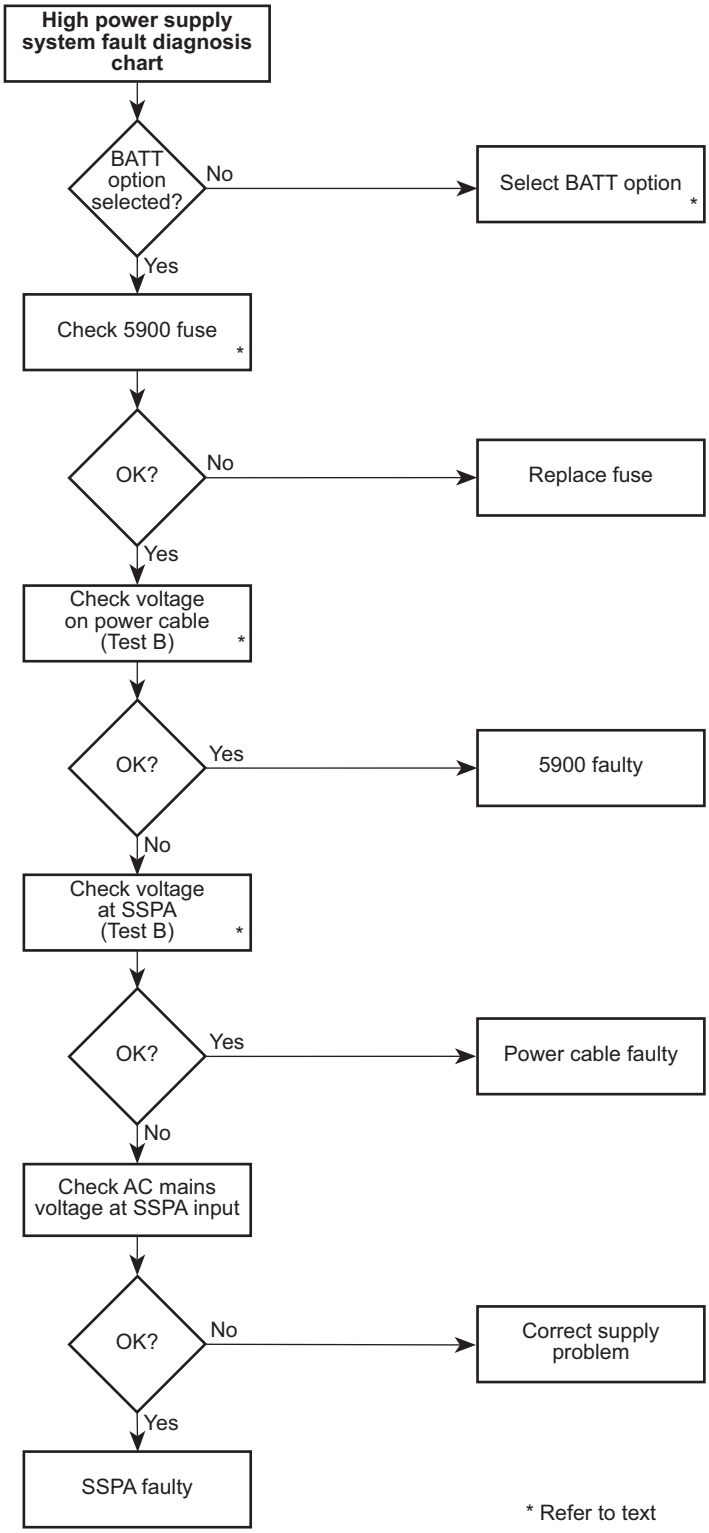


Figure 9-7: 5904/5908/5916 SSPA fault diagnosis chart for an extended interface

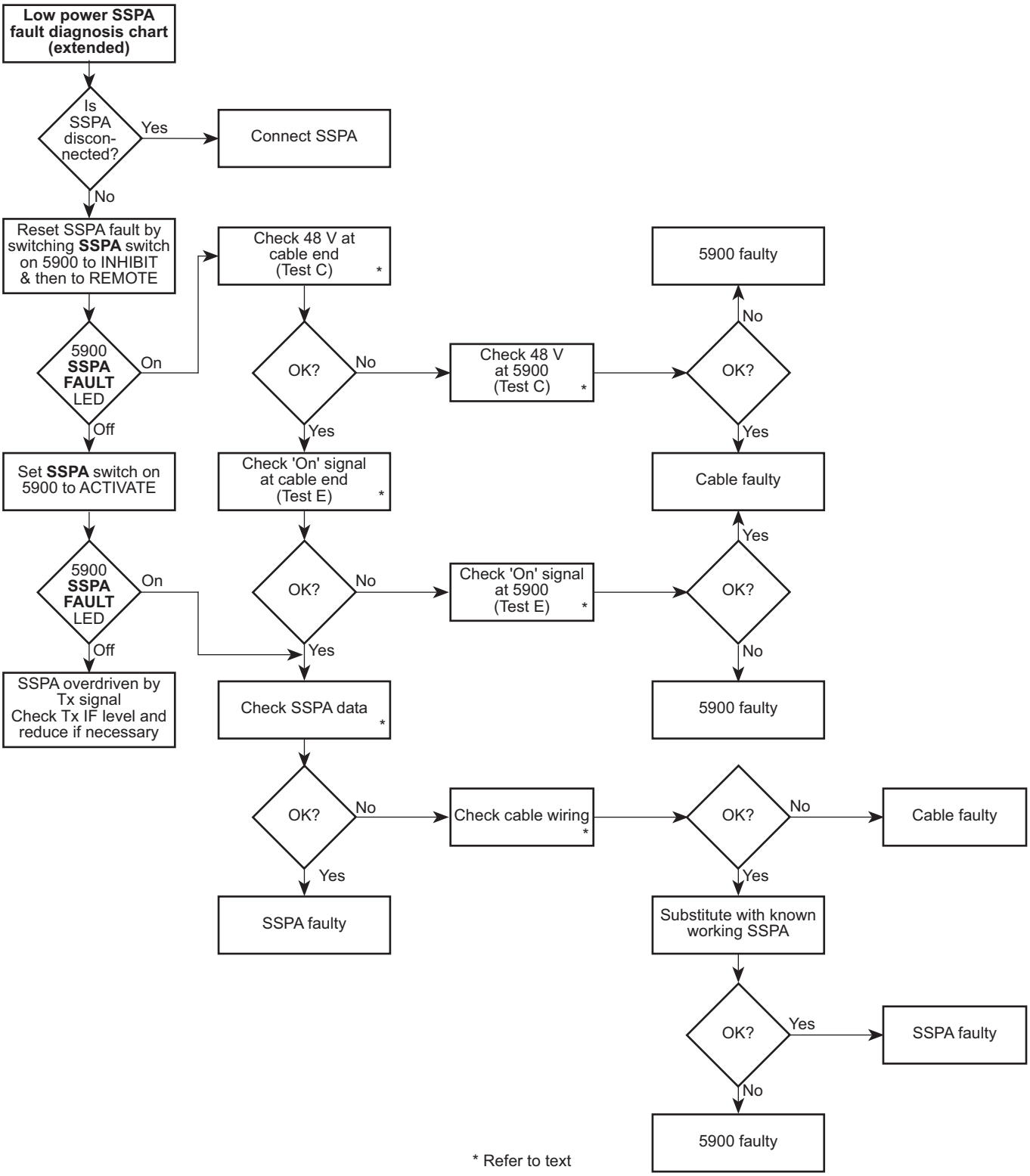


Figure 9-8: Non-Codan SSPA fault diagnosis chart for a basic interface

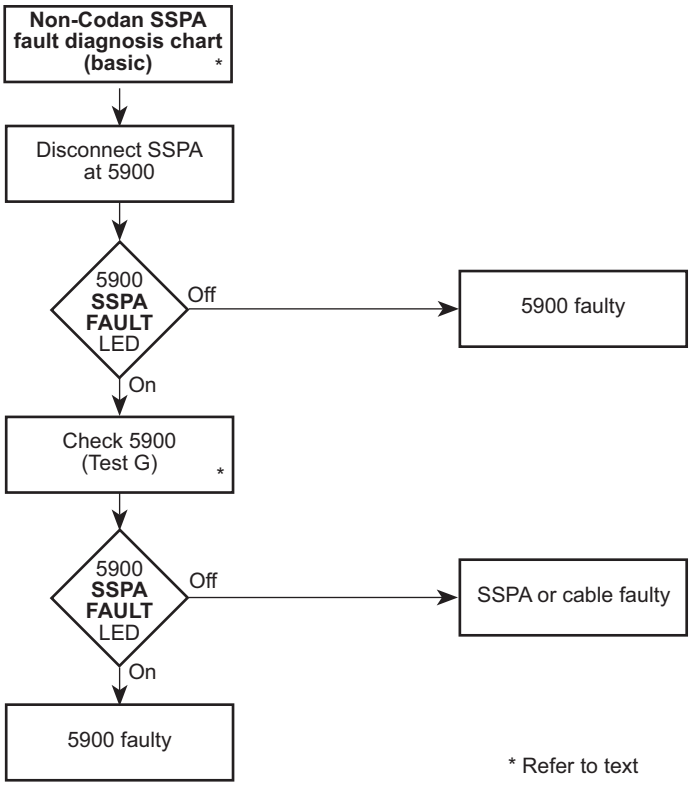


Figure 9-9: 5940 SSPA fault diagnosis chart

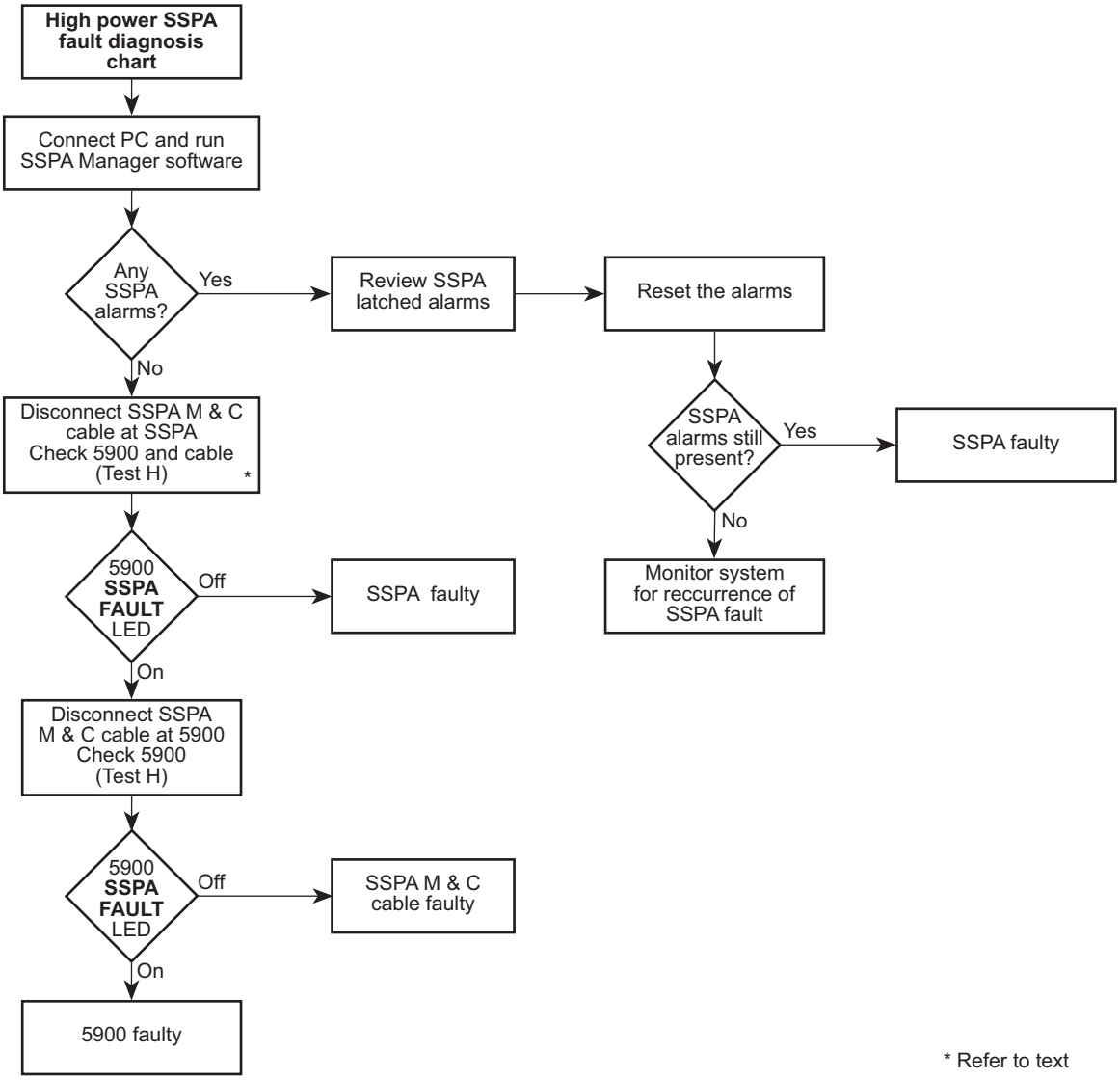


Figure 9-10: 5908/5916 SSPA fan fault diagnosis chart

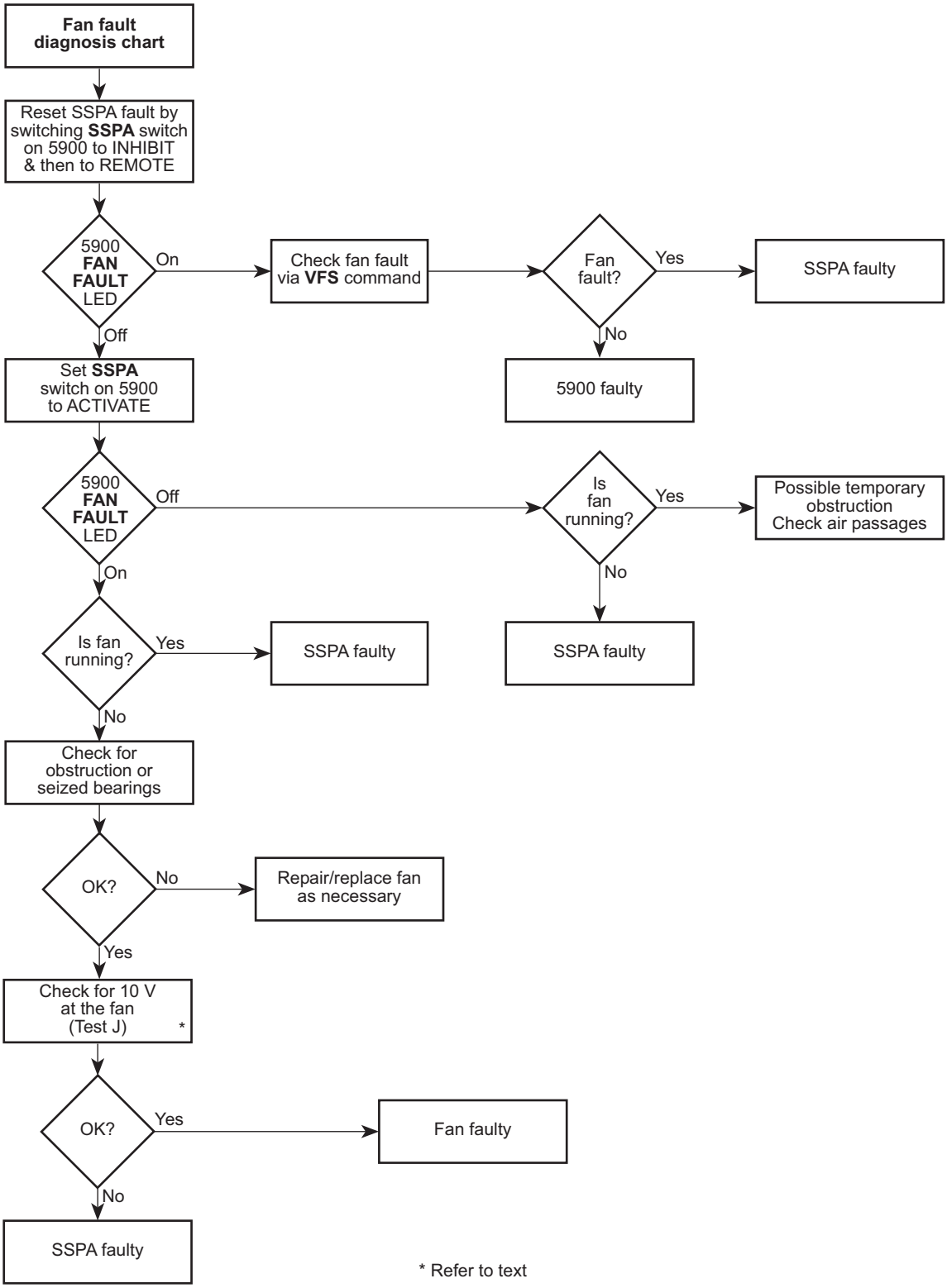


Figure 9-11: Temperature fault diagnosis chart for an extended interface (5904/5908/5916 SSPA)

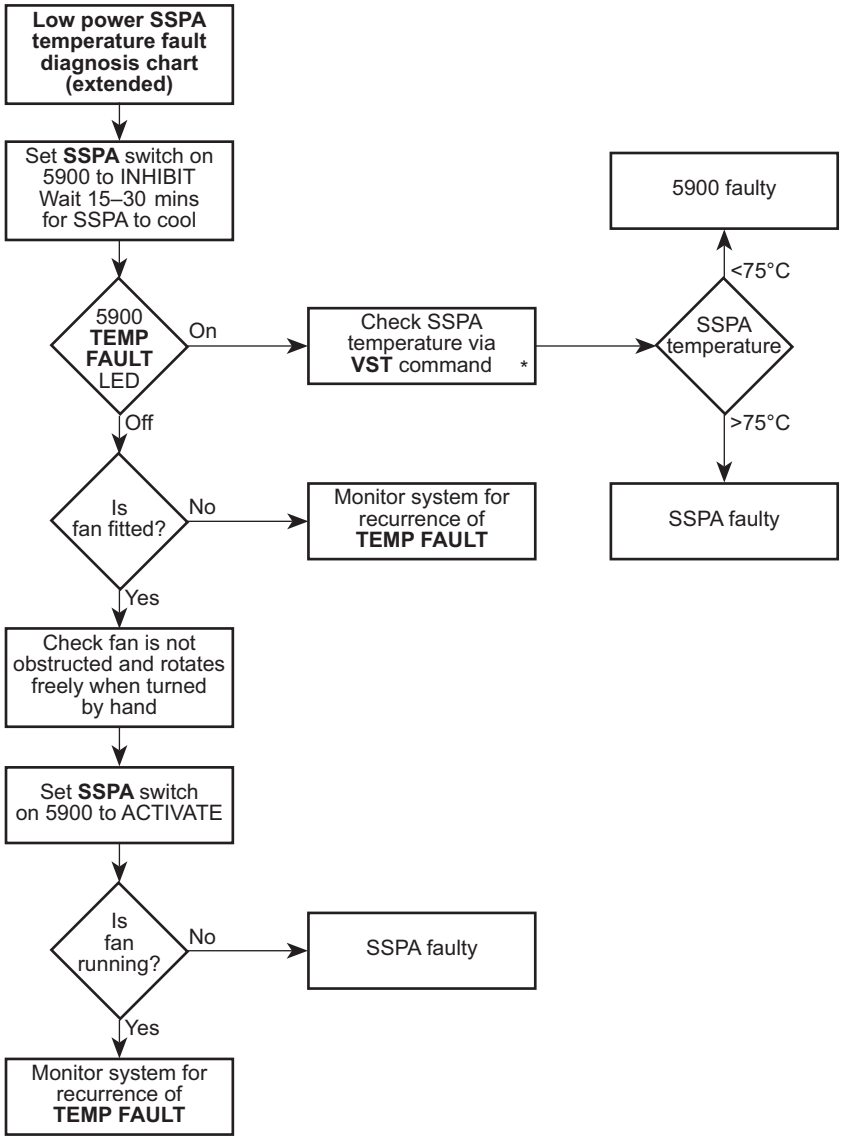


Figure 9-12: Temperature fault diagnosis chart for a basic interface (Non-Codan SSPA)

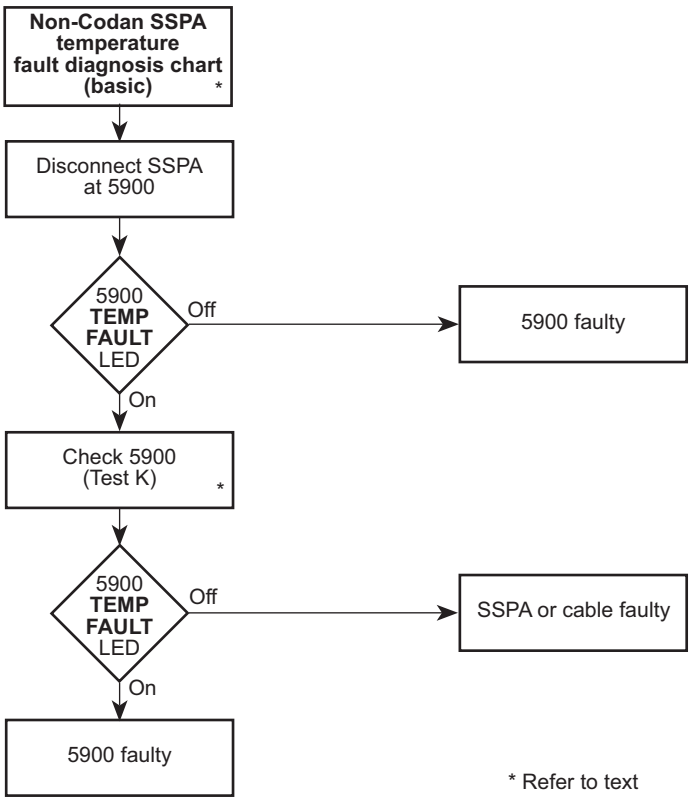


Figure 9-13: Temperature fault diagnosis chart for a basic interface (5940 SSPA)

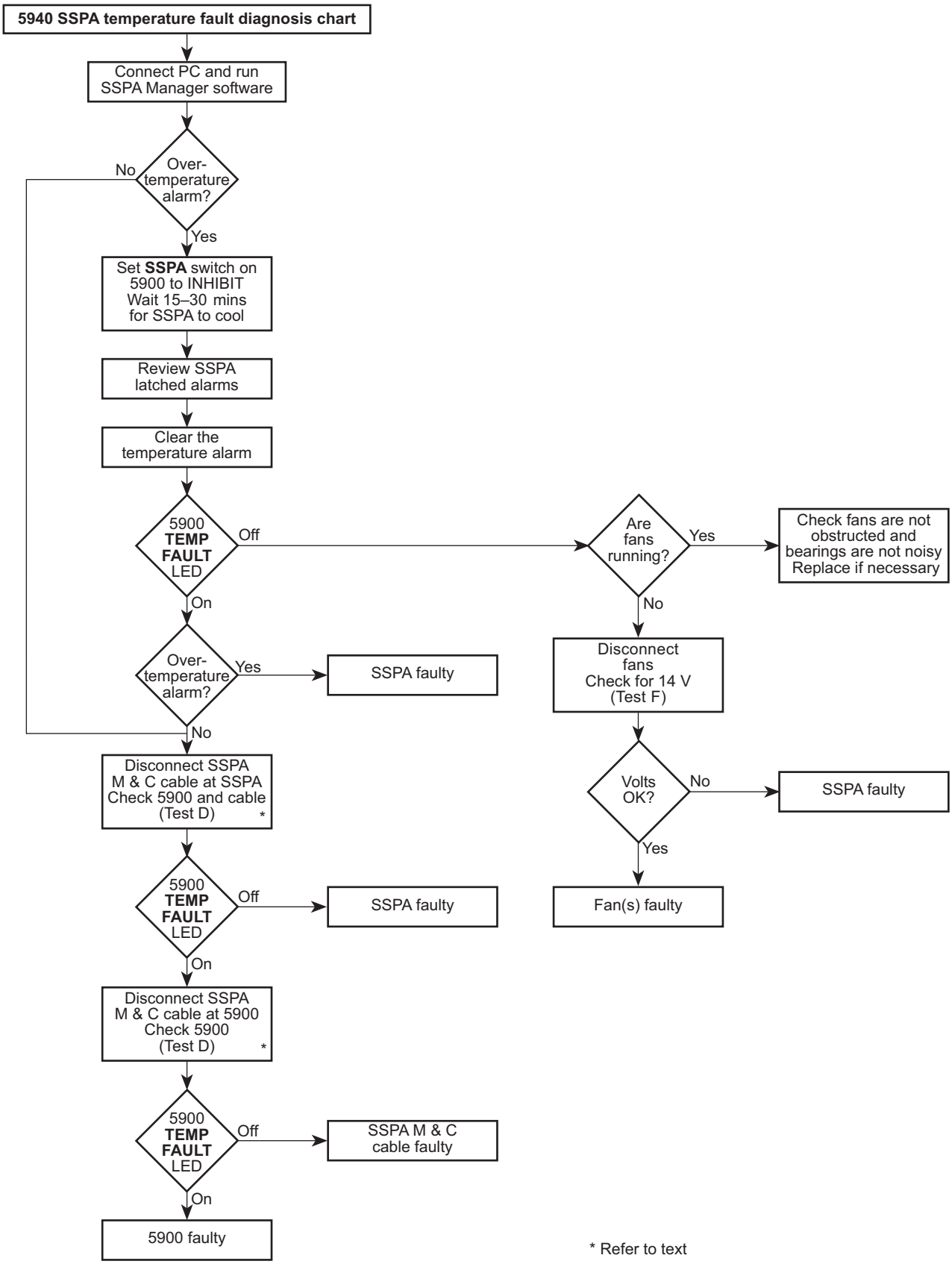


Figure 9-14a: LNB fault diagnosis chart

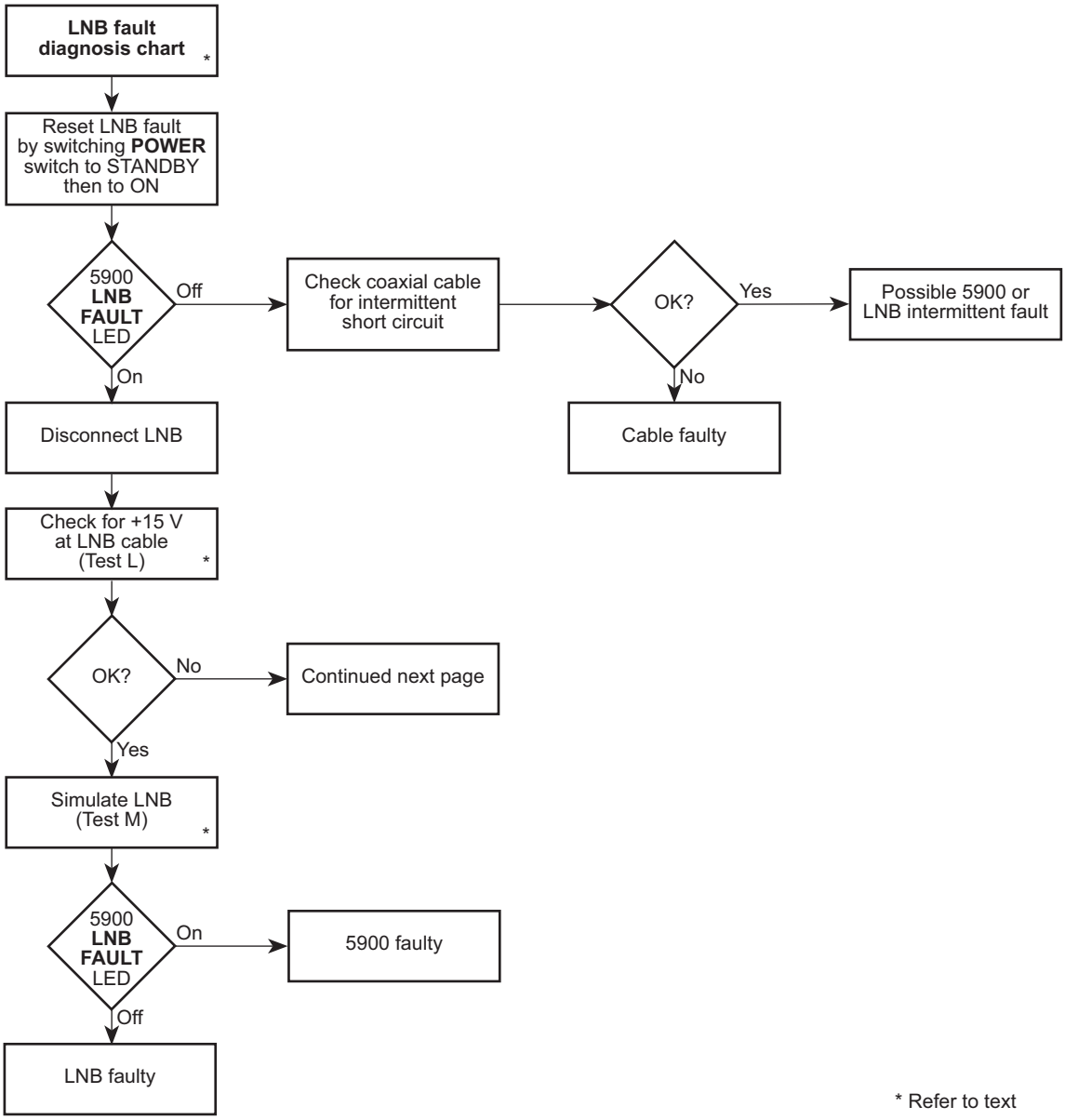
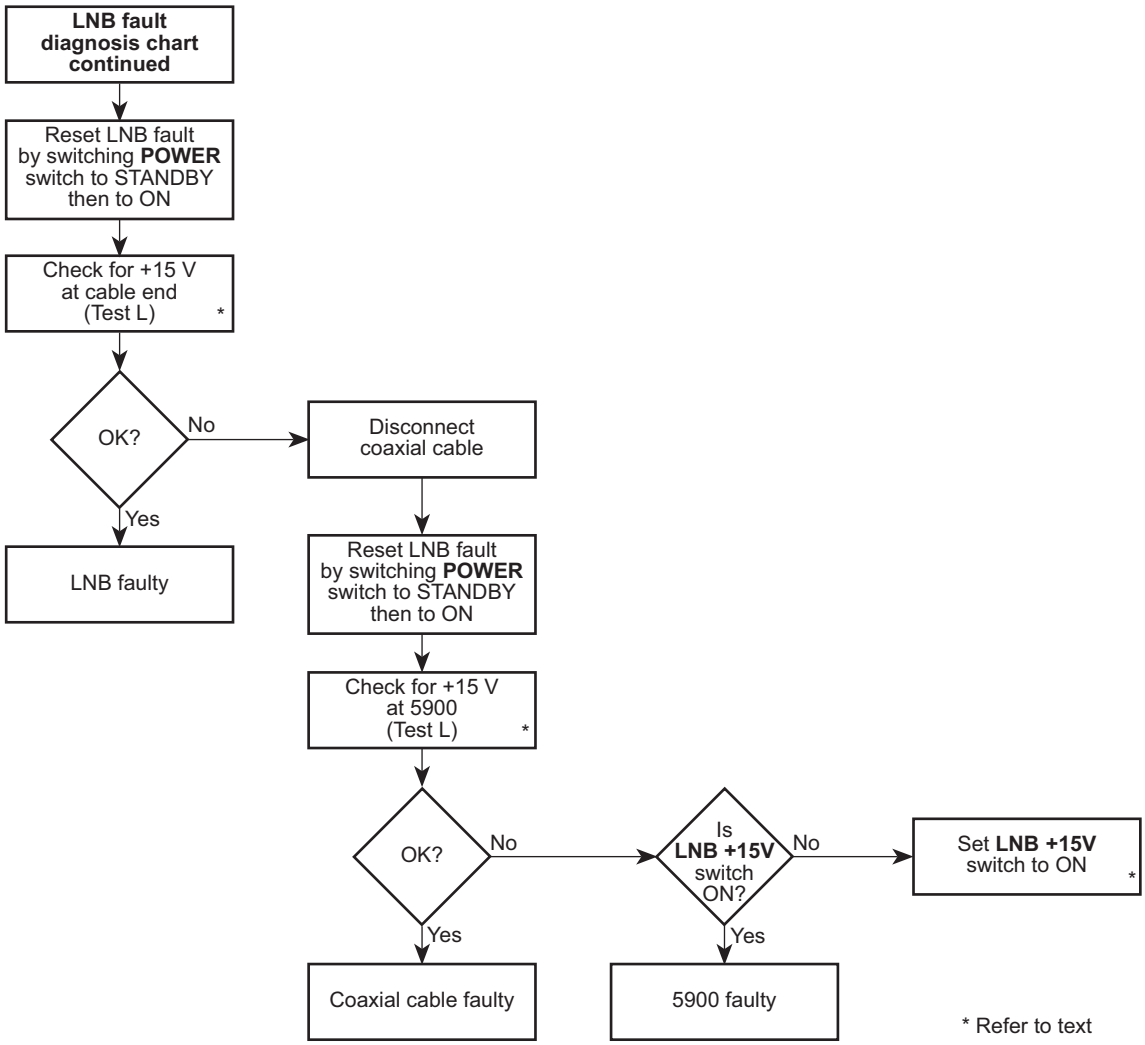


Figure 9-14b: LNB fault diagnosis chart continued



Test procedures

The following tests are to be used in conjunction with the fault finding flow charts.

Table 9-3: Test A

Procedure	Comment
Measure the DC voltage at the **DC POWER** connector end of the 48 V supply cable. Connect positive to pins A and B, negative to pins C and D.	For correct operation, the DC voltage must be within the range 52 to 72 V DC with the **MAINS/BATT** option switch OFF, or within the range 42 to 72 V DC with the **MAINS/BATT** option switch ON.

Table 9-4: Test B

Procedure	Comment
As applicable in the fault diagnosis chart, measure the DC voltage at either: • the converter end of the SSPA to converter power cable, or • the **–48 V DC OUTPUTS** connector of the SSPA Connect positive to pin A or B, negative to pin C or D.	For correct operation, the DC voltage must be within the range 46 to 50 V DC.

Table 9-5: Test C

Procedure	Comment
As applicable in the fault diagnosis chart, measure the DC voltage at either: • the SSPA end of the converter to SSPA cable, or • the **SSPA DC/CONTROL** connector of the 5900 Connect positive to pin H and negative to pin J.	The DC voltage must be within the range 38 to 72 V DC.

Table 9-6: Test D

Procedure	Comment
As applicable in the fault diagnosis chart, either: • connect pins C and D together at the SSPA end of the converter to SSPA M & C cable, or • connect pins A and G together at the **SSPA DC/CONTROL** connector of the 5900	When the transceiver is on, the **TEMP FAULT** LED should be off.

Table 9-7: Test E

Procedure	Comment
As applicable in the fault diagnosis chart, measure the DC voltage at either: • the SSPA end of the converter to SSPA cable, or • the **SSPA DC/CONTROL** connector of the 5900 Connect positive to pin K and negative to pin J.	The DC voltage should be less than 50 mV when STANDBY or ON mode is selected. The voltage is approximately 4.7 V DC when the transceiver is off.

Table 9-8: Test F

Procedure	Comment
Measure the DC voltage at the fan feed-through connections on the SSPA positive and negative as marked.	The DC voltage should be 14.0±0.2 V DC.

Table 9-9: Test G

Procedure	Comment
As applicable in the fault diagnosis chart, connect pins A and D together at either: • the SSPA end of the converter to SSPA cable, or • the **SSPA DC/CONTROL** connector of the 5900	When the transceiver is on, the **SSPA FAULT** LED should be off. When the SSPA is activated, the **SSPA FAULT** LED should remain off.

Table 9-10: Test H

Procedure	Comment
As applicable in the fault diagnosis chart, either: • connect pins B and D together at the SSPA end of the converter to SSPA M & C cable, or • connect pins A and D together at the **SSPA DC/CONTROL** connector of the 5900	When the transceiver is on, the **SSPA FAULT** LED should be off.

Table 9-11: Test J

Procedure	Comment
As applicable in the fault diagnosis chart, measure the DC voltage at the fan feed-through connections on the SSPA, positive and negative as marked.	The DC voltage should be 9.5±0.3 V DC, when the SSPA is activated.

Table 9-12: Test K

Procedure	Comment
As applicable in the fault diagnosis chart, connect pins A and G together at either: • the SSPA end of the converter to SSPA cable, or • the **SSPA DC/CONTROL** connector of the 5900	When the transceiver is on, the **TEMP FAULT** LED should be off.

Table 9-13: Test L

Procedure	Comment
As applicable in the fault diagnosis chart, measure the DC voltage at either: • the LNB end of the converter to LNB coaxial cable, or • the **Rx RF I/P** connector of the 5900 Connect positive to the centre pin and negative to ground (to the screen).	The DC voltage should be 15±0.2 V DC.

Table 9-14: Test M

Procedure	Comment
Connect to the LNB coaxial cable either: • an LNB known to be working, or • a 270 Ω, 2 W resistor between the centre pin and coaxial cable ground	When the transceiver is on, the **LNB FAULT** LED should be off.

10 Drawings

Drawing	Description
03-00993	Power Supply Unit
03-00994	Mounting Details, Power Supply Unit
03-01004	Mounting Details, SSPA 2/4 Watt
03-01006	Mounting Details, SSPA 8/16 Watt
03-01007	RF/IF Level Diagram (Low power transceiver system)
03-01011	Converter module 5900
03-01012	Mounting Details, Converter module
03-01061	RF/IF Level Diagram (High power transceiver system)
08-05301	Cable, Serial to PC (DE-9S)
08-05634	Cable, Power
08-05857	Cable, High Power SSPA to Converter
08-05887	Cable, Converter to SSPA
08-05961	Cable, DC Power, SSPA to Converter (CE)
0969D23	Interface Control Drawing (Ku-Band)
15-40128-001	Fitting Instructions, Supply and Control
15-40196-001	Fitting Instructions, Converter/High Power SSPA
15-42000-001 sheet 1 15-42000-001 sheet 2	Fitting Instructions, Boom Mounting

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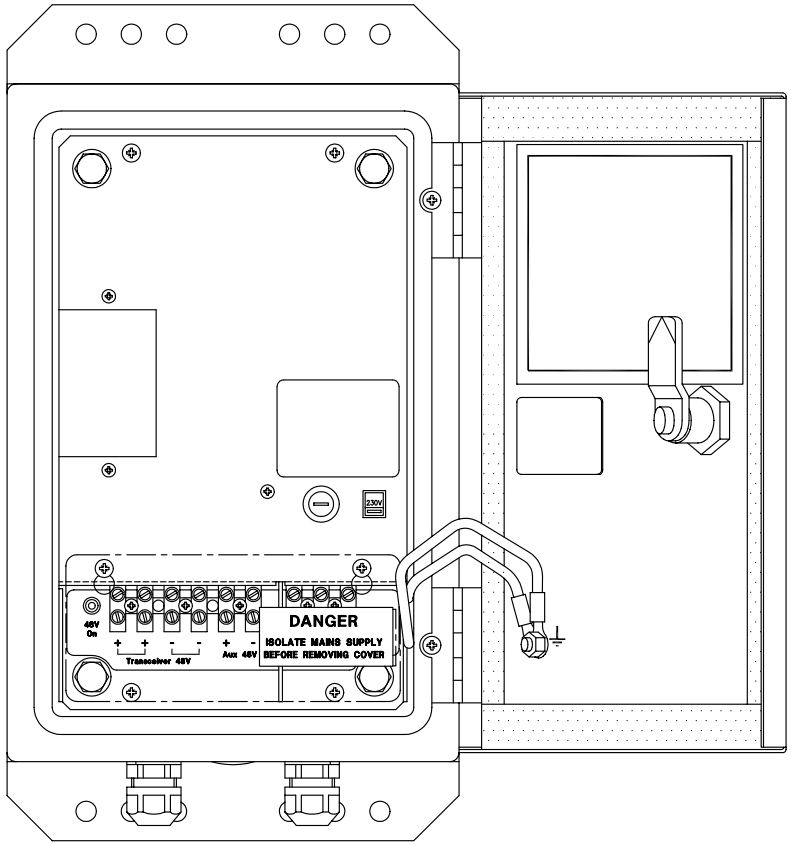
DO NOT SCALE



ISSUE CHANGE
ISSUE 2: SECOND EARTH WIRE ADDED. LABEL ON DOOR WAS SMALLER. C/R 25746 MYL 1-12-98
ISSUE 3 LABEL DETAIL REMOVED. TITLE BLOCK WAS 5580/5581 C/R 26542 02-08-01 GHZ
ISSUE 4 EARTH SYMBOL CHANGED C/R 27075 PMK 13-09-01

FILE No.
03\00993__4.DWG

DIMENSIONS IN mm

CODAN

MATERIAL

FINISH

		SCALE 1:2
DRN	SMC	DATE 24-10-97
CHKD	DB	28-10-97
APPD	DJM	13-2-98

TOLERANCES
UNLESS OTHERWISE STATED

2 PLACES DEC.	±0.25
1 PLACE DEC.	±0.5
0 PLACE DEC.	±1
ANGULAR	±2°

TITLE
POWER SUPPLY UNIT

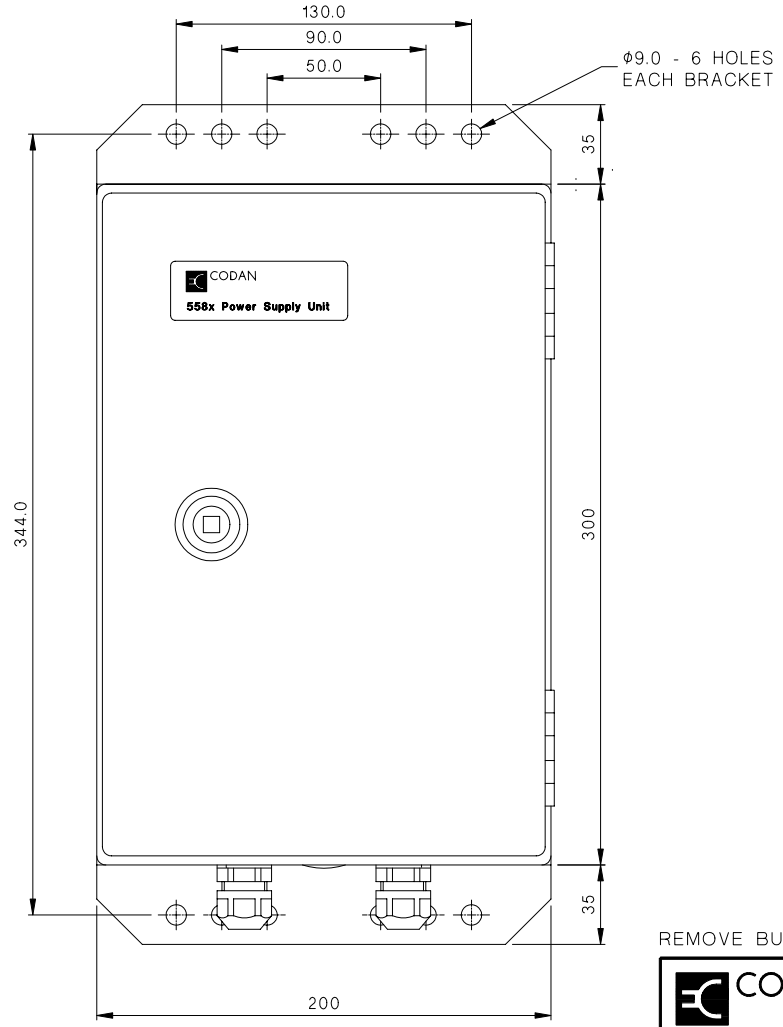
A3

DRAWING/DOC NO.
03-00993

ISS 1 2 3 4

SHT. 1 OF 1

DO NOT SCALE



ISSUE 2
TITLE BLOCK WAS
5580/5581..
C/R 26542
02-08-01 GHZ

REMOVE BURRS & SHARP EDGES

FILE No.
03/00994__2.DWG

DIMENSIONS IN mm

CODAN

MATERIAL

FINISH

SCALE 1:2

DRN	SMC	DATE 23-10-97
CHKD	DB	28-10-97
APPD	DJM	13-2-98

TOLERANCES
UNLESS OTHERWISE STATED

2 PLACES DEC.	±0.25
1 PLACE DEC.	±0.5
0 PLACE DEC.	±1
ANGULAR	±2°

TITLE
POWER SUPPLY UNIT
MOUNTING DETAILS

A3

DRAWING/DOC NO.
03-00994

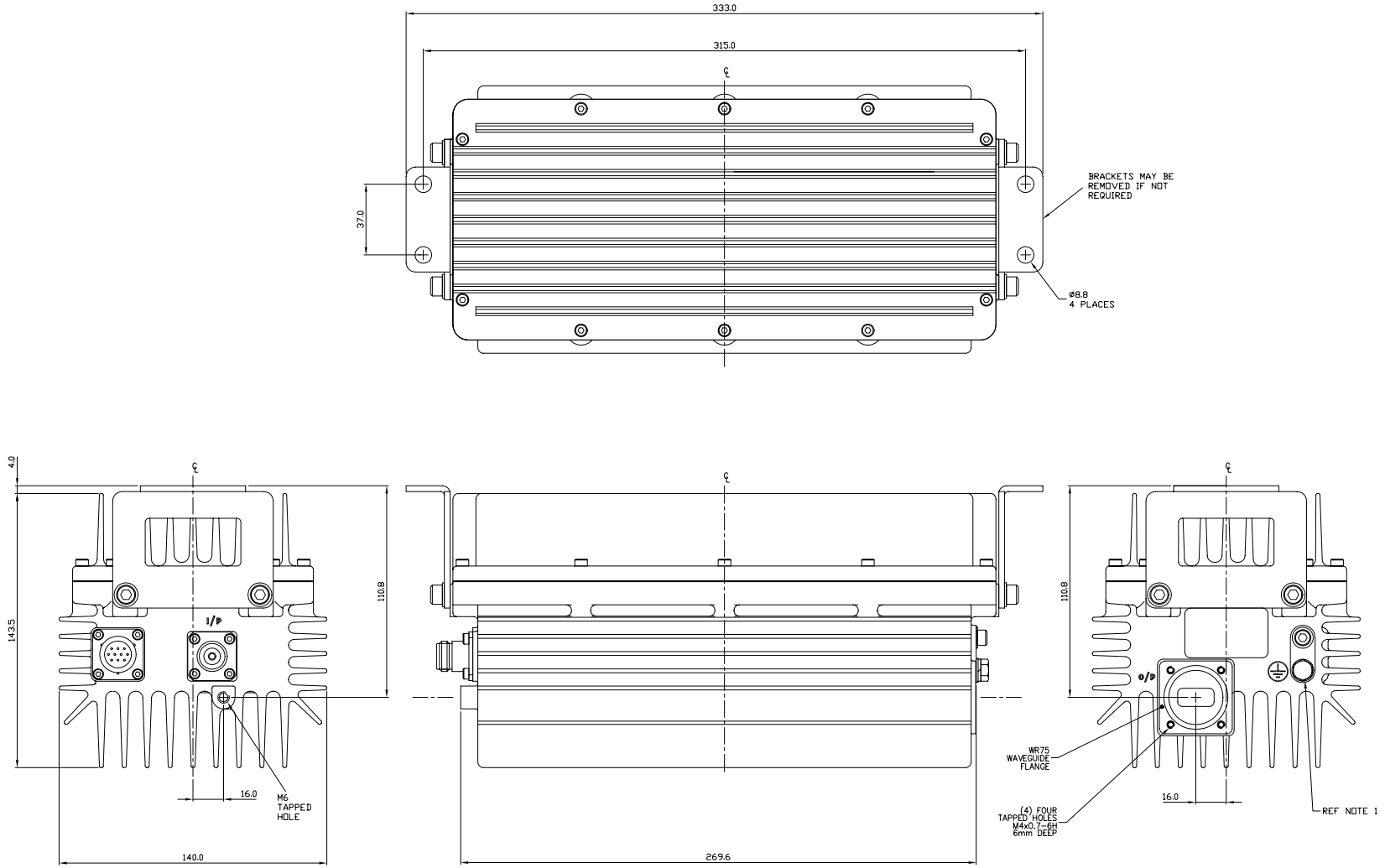
ISS 1 2

SHT. 1
OF 1

DO NOT SCALE

ISSUE B
WAVE GUIDE
DETAIL ADDED
10F
C/R 25665
25-09-98 DJM

ISSUE 2
EARTH SYMBOL
CHANGED. NOTE 1
ADDED
C/R 27075
PMK 13-09-01



NOTE:
1. PROTECTIVE EARTH MUST BE CONNECTED TO GROUND

DIMENSIONS IN mm

FILE No.
03\01004_-_2.DWG

CODAN

MATERIAL

FINISH

SCALE	NTS	
DRN	SMC	DATE 19-12-97
CHKD	DJM	11-2-98
APPD	DJM	25-09-98

TOLERANCES UNLESS OTHERWISE STATED

2 PLACES DEC.	N/A
1 PLACE DEC.	±0.5
0 PLACE DEC.	±1.
ANGULAR	±2°

TITLE
MOUNTING DETAILS
2W/4W Ku BAND SSPA

A1

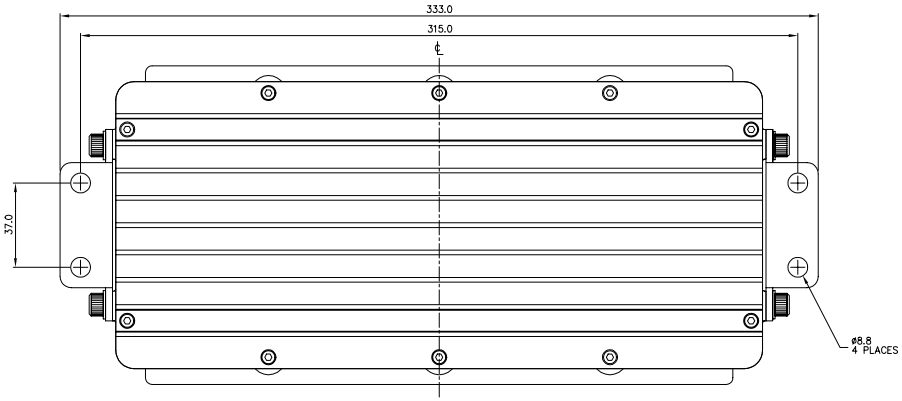
DRAWING/DOC NO.
03-01004

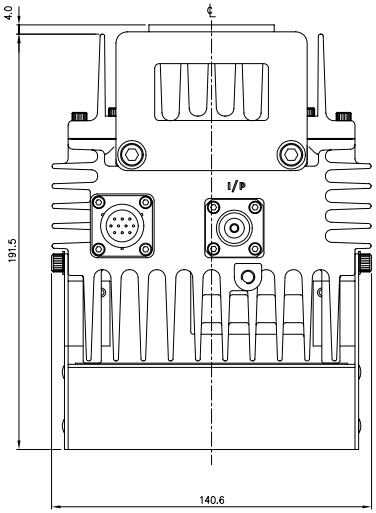
ISS: X B X 2

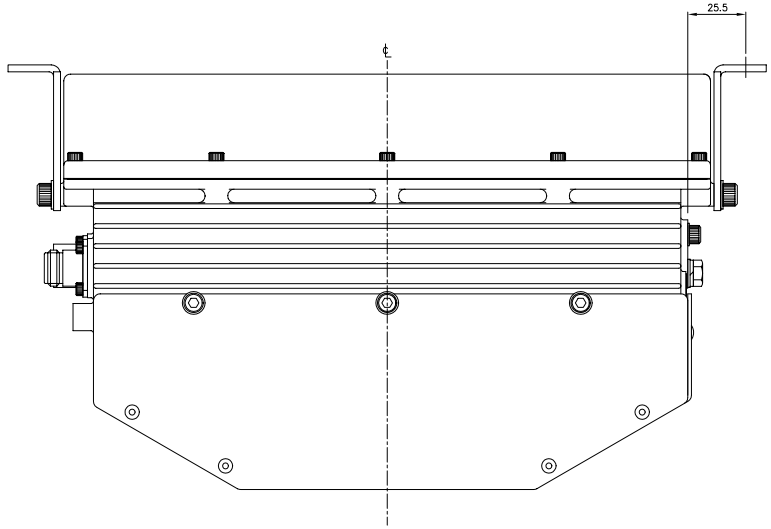
SHT. 1 OF 1

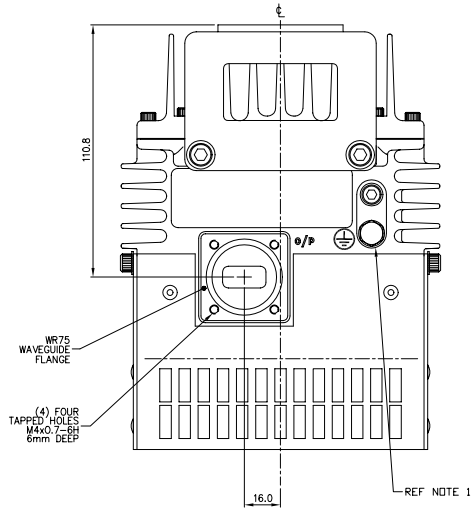
DO NOT SCALE

ISSUE 2
EARTH SYMBOL CHANGED. NOTE 1 ADDED
C/R 27075
PMK 13-09-01









NOTE:
1. PROTECTIVE EARTH MUST BE CONNECTED TO GROUND

DIMENSIONS IN mm

FILE No.
03\01006__2.DWG

CODAN

MATERIAL		SCALE	1:1
	DRN	SMC	DATE 18-8-98
	CHKD	DJM	27-8-98
	APPD	DJM	24-09-98
FINISH	TOLERANCES UNLESS OTHERWISE STATED		
	2 PLACES DEC.		N/A
	1 PLACE DEC.		±0.5
	0 PLACE DEC.		±1

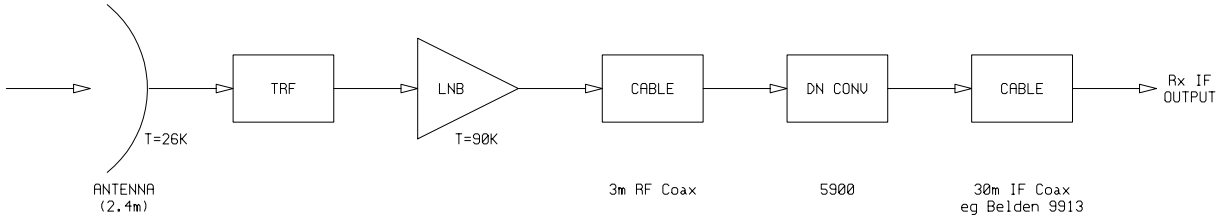
TITLE
MOUNTING DETAILS
8W/16W Ku BAND SSPA

DRAWING/DOC NO.
A1 03-01006

ISS A X 2

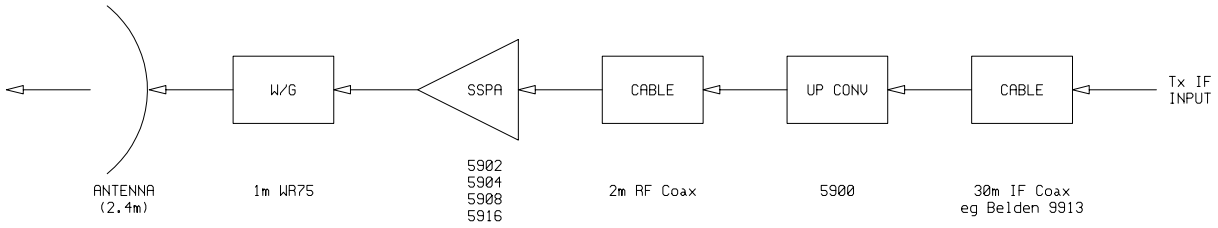
SHT. 1 OF 1

ISSUE CHANGE
ISSUE 2: VARIOUS TEXT CHANGES. C/R 26684 GHZ 28-8-00



GAIN (dB)	+47.6	-0.05		+60.0	-1.4	+35.0 (+35 to +10)	-1.3 (@ 70MHz)
CONV ATTEN. (dB)						0 (0 to 25)	
NOMINAL LEVEL (dBm)	-159.25	-117.25	-117.3	-57.3	-58.7	-23.7	-25.0

Rx Levels shown result in an IF output C/No of
approx. 55dB-Hz due to the LNB & antenna only
(ie excluding uplink and downlink).



GAIN (dB)	+49.4	-0.15		5902 +43.0 5904 +46.0 5908 +50.0 5916 +53.0	-2.0	+15.0 (+20 to -5)	-1.3 (@ 70MHz)
CONV ATTEN. (dB)						5 (0 to 25)	
NOMINAL LEVEL (dBm)	+82.25	+32.85	+33.0	-9.0	-7.0	-22.0	-20.7
NOMINAL LEVEL (dBW)	+52.25	+2.85	+3.0				

Tx levels shown are for single 2W carrier output from 5902 2W SSPA.
Note that the SSPA gain is only 42dB as 2W is the 1dB GCP output.
Multi-carrier operation will require lower levels.

5900 SERIES KU-BAND TRANSCEIVER RF/IF LEVEL DIAGRAM

FILE NAME
03/01007__2

CODAN

MATERIAL

FINISH

			SCALE
DRN	C G	DATE	18-8-98
CHKD	DJM		25-8-98
APPD	DJM		24-09-98

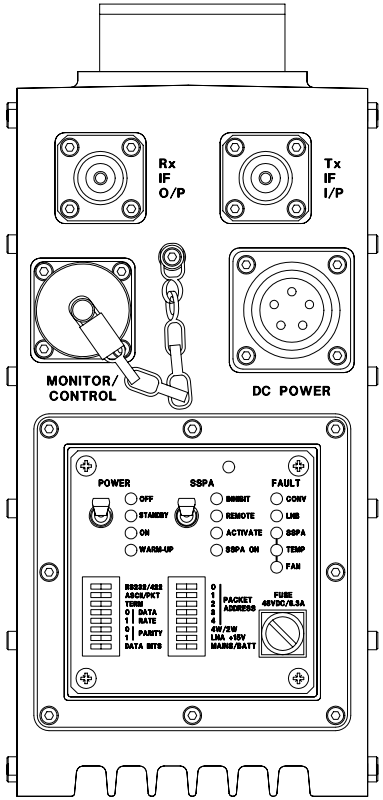
TOLERANCES
UNLESS OTHERWISE STATED
2 PLACES DEC. ±
1 PLACE DEC. ±
ANGULAR ±

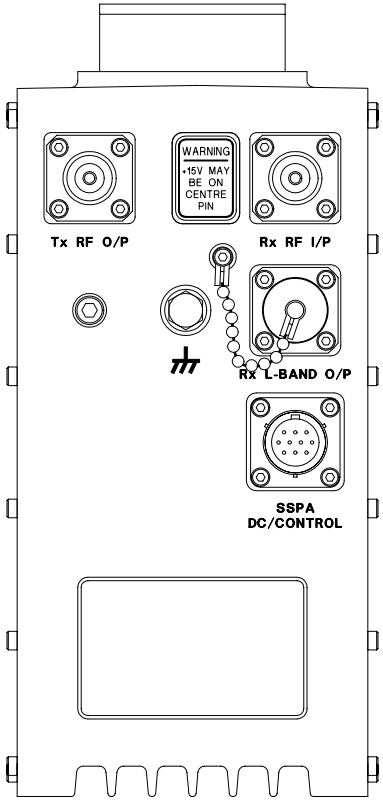
TITLE
RF/IF LEVEL
DIAGRAM

A2 | DRAWING/DOC.NO 03-01007

ISS A 1 2 | SHT 1 OF 1

DO NOT SCALE





ISSUE 2
CAPS ADDED TO M/C & DC/CONTROL.
CASTING UPDATED BY ADDING Rx L-BAND O/P.
"CE" MARK ADDED TO LABEL.
C/R 25996
18-5-99 MYL

ISSUE 3
SERIAL NUMBER DETAIL REMOVED.
C/R 27023
18-07-01 GHZ

FILE No.
03\01011__3.DWG

DIMENSIONS IN mm

CODAN

MATERIAL

FINISH

		SCALE NTS
DRN	DB	DATE 12-8-98
CHKD	DJM	12-8-98
APPD	DJM	24-09-98

TOLERANCES UNLESS OTHERWISE STATED

2 PLACES DEC.	±0.25
1 PLACE DEC.	±0.5
0 PLACE DEC.	±1
ANGULAR	±2°

TITLE
CONVERTER MODULE

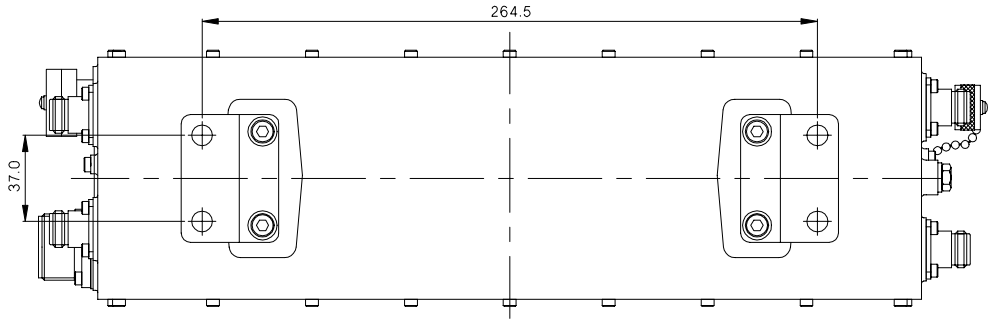
A3

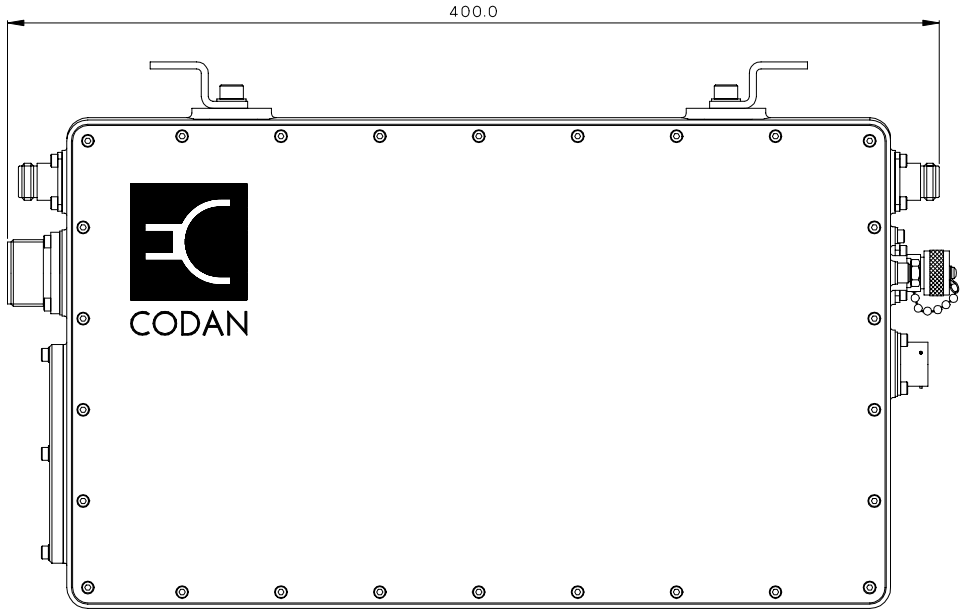
DRAWING/DOC NO.
03-01011

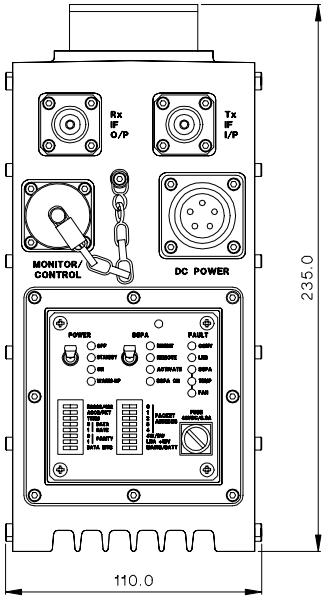
ISS											
A	1	2	3								SHT. 1 OF 1

DO NOT SCALE

ISSUE 2
CAPS ADDED TO M/C & DC/CONTROL.
CASTING UPDATED BY ADDING Rx L-BAND O/P.
C/R 25996
18-5-99 MYL







FILE No.
03\01012__2.DWG

DIMENSIONS IN mm

CODAN		SCALE	NTS
MATERIAL	DRN	DB	DATE 12-8-98
	CHKD	DJM	12-8-98
FINISH	APPD	DJM	24-9-98

TOLERANCES UNLESS OTHERWISE STATED
2 PLACES DEC. ±0.25
1 PLACE DEC. ±0.5
0 PLACE DEC. ±1

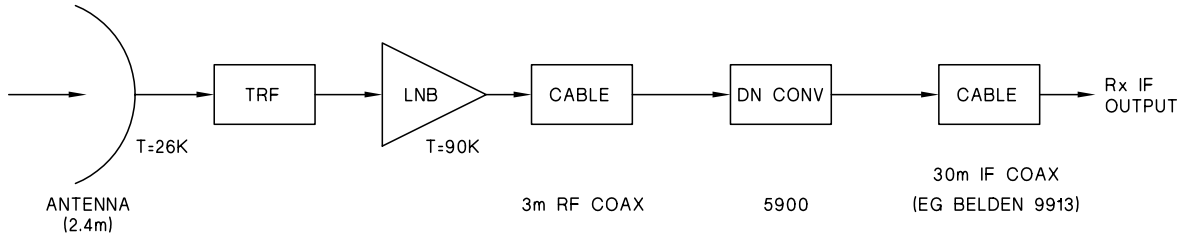
TITLE
CONVERTER MOUNTING DETAILS

DRAWING/DOC NO.
A2 03-01012

ISS 2
SHT. 1 OF 1

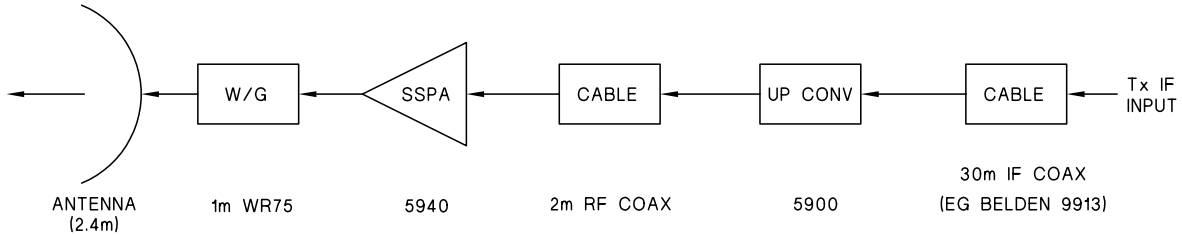
DO NOT SCALE

ISSUE 2:
SOME CHANGES TO Tx
GAIN & LEVEL FIGURES
C/R 26807
GHZ 17/11/00



GAIN (dB)	+47.6	-0.05	+60.0	-1.4	+35 (+35 TO +10)	-1.3 (@ 70MHz)
CONV ATTEN. (dB)					0 (0 TO 25)	
NOMINAL LEVEL (dBm)	-159.25	-117.25	-117.3	-57.3	-58.7	-23.7	-25.0

Rx LEVELS SHOWN RESULT IN AN IF OUTPUT C/No OF
APPROX. 55dB-Hz DUE TO THE LNB & ANTENNA ONLY
(IE EXCLUDING UPLINK AND DOWNLINK)



GAIN (dB)	+49.4	-0.15	+50 (+60 TO +40)	-2.0	+16 (+20 TO -5)	-1.3 (@ 70MHz)
SSPA/CONV. SETTING (dB)			-10 (0 TO -20)		4 (0 TO 25)	
NOMINAL LEVEL (dBm)	+93.25	+43.85	+44.0	-6.0	-4.0	-22.0	-20.7
NOMINAL LEVEL (dBW)	+63.25	+13.85	+14.0				

Tx LEVELS SHOWN ARE FOR A SINGLE CARRIER AT
2 dB OPBO BELOW 40W FROM A 5940 40W SSPA.

5900 SERIES HIGH POWER KU-BAND TRANSCEIVER RF/IF LEVEL DIAGRAM

FILE No.
03\01061__2.DWG

DIMENSIONS IN mm

CODAN

MATERIAL

FINISH

SCALE NTS

		DATE
DRN	SMC	7-8-2000
CHKD	GZ	15-8-2000
APPD	CAH	15-8-2000

TOLERANCES
UNLESS OTHERWISE STATED
2 PLACES DEC. ±0.25
1 PLACE DEC. ±0.5
0 PLACE DEC. ±1

TITLE
RF/IF LEVEL DIAGRAM

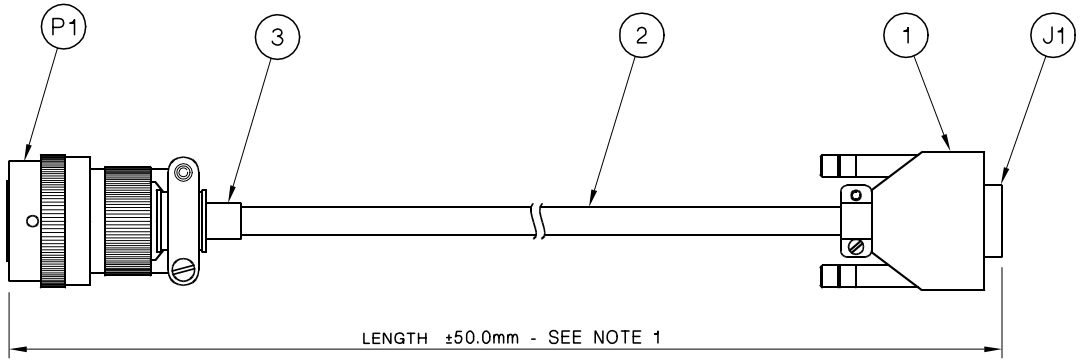
A3

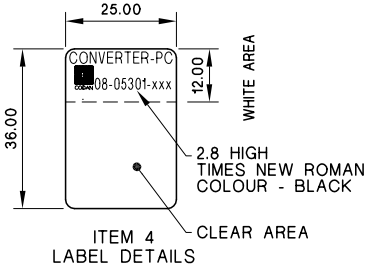
DRAWING/DOC NO.
03-01061

ISS 1 2

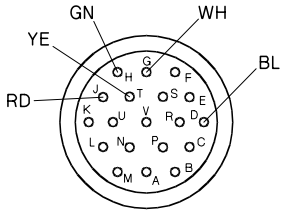
SHT. 1 OF 1

DO NOT SCALE



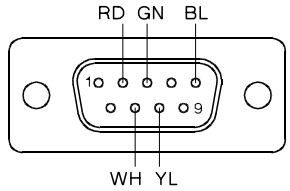


ITEM 4
LABEL DETAILS



P1 REAR VIEW
SCALE 2:1

COLOUR	FROM	TO
RED	P1/J	J1/2
GREEN	H	3
BLUE	D	5
WHITE	G	7
YELLOW	T	8
BLACK	N/C	N/C



J1 REAR VIEW
SCALE 2:1

NOTES:
1. LENGTH IS DEFINED BY SUFFIX OF P/No IN METRES, eg 08-05301-005 IS 5.0m LONG.
2. FOR RS232 COMMUNICATIONS ONLY. PIN CONNECTIONS DO NOT COMPLY WITH RS485 (DE-9S) COMMUNICATIONS STANDARDS.

ITEM	DESCRIPTION	MANUFACTURER	MANUFACTURERS PART No	CODAN PART No	QTY
1	COVER, 9WAY SCREW-LOCK	CEEP INC	CT09	60-00099-091	1
2	CABLE, 6 CORE 16/0.20	A. F. BAMBACK	90153R	67-60604-801	A/R
3	SLEEVE, HELSYN 5x1.0WALLx19	HELLERMANN	H50x19 Bk	71-95010-190	1
4	LABEL	THT-9	JABAC	-	1
P1	PLUG, 19WAY MIL	ITT-CANNON	MS3116F-14-19P	60-00191-090	1
J1	SOCKET, 9WAY 'D'	ITT-CANNON	DE-9S-K83	60-00093-090	1

ISSUE B
P1 UPDATED & ITEM 3 REDUCED FROM 2-OFF TO 1-OFF.
C/R 25031
15-05-97 DJM

ISSUE 2
NOTE 2 ADDED.
C/R 26290
27-09-99 SJH

ISSUE 3
NOTE 2 REF TO USE OF CABLE WITH JIG No 75-80582 DELETED, PARTS LIST ADDED.
C/R 26361
21-12-99 GZ

ISSUE 4:
LABEL (ITEM 4) ADDED
C/R 26603
HKJ 22-6-00

FILE No.
08\05301_4.DWG

CODAN

MATERIAL

FINISH

SCALE 1:1

DRN	DB	DATE 16-8-96
CHKD	DJM	20-8-96
APPD	VS	15-10-98

TOLERANCES UNLESS OTHERWISE STATED
2 PLACES DEC. ±0.25
1 PLACE DEC. ±0.5
0 PLACE DEC. ±1
ANGULAR ±2

TITLE
CABLE, SERIAL
CONVERTER - PC(DE-9S)

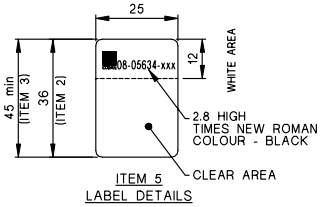
A3

DRAWING/DOC NO.
08-05301

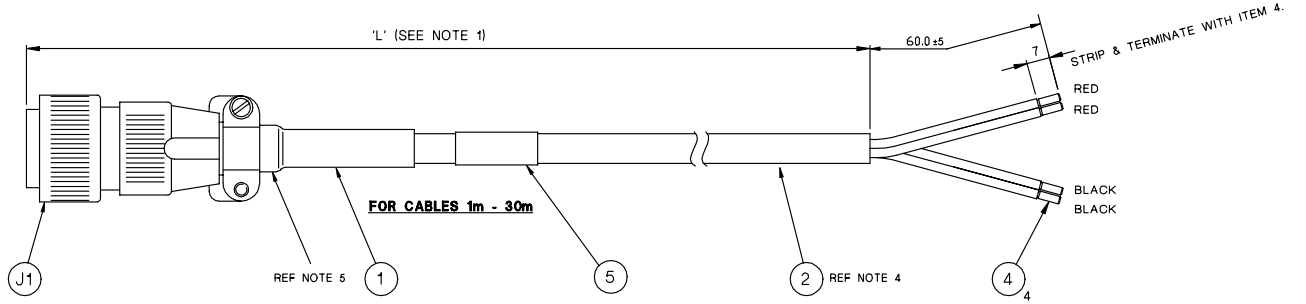
ISS 4

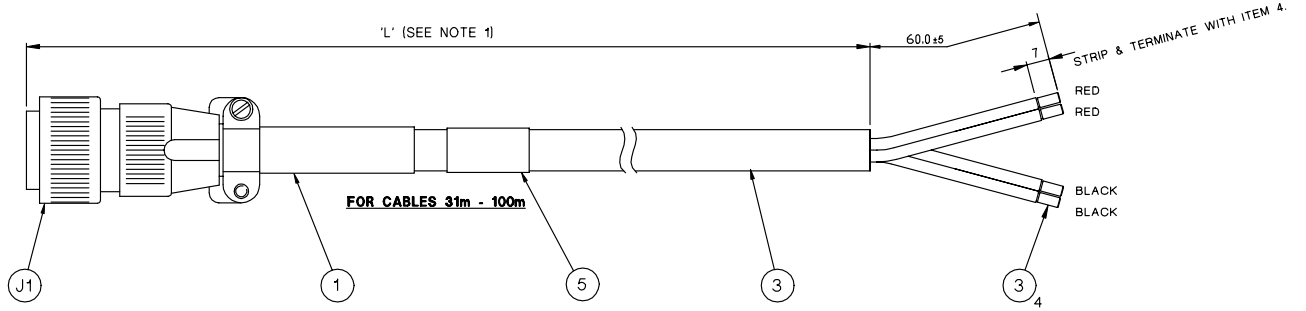
SHT. 1 OF 1

DO NOT SCALE



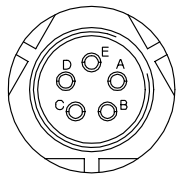
ITEM 5
LABEL DETAILS





TYPICAL ALL CABLES

WIRE	TO
RD	J1/A
RD	/B
BK	/C
BK	/D
N/C	/E



J1 REAR VIEW

VARIANT TABLE		
VARIANT	LENGTH	TOLERANCE
-005	5m	±100mm

NOTES

1. FOR CABLE LENGTH "L" 1m - 30m USE ITEM 2 (ALSO REF NOTE 4).
   FOR CABLE LENGTH "L" 31m - 100m USE ITEM 3.
2. ASSEMBLY No 08-05634-XXX
3. INJECT A SMALL AMOUNT OF SILICON SEALANT INTO THE UNUSED 'E' HOLE IN THE RUBBER GLAND.
4. ALSO INJECT A SMALL AMOUNT OF SILICON SEALANT AROUND THE SOLDERED JOINTS BEFORE CLOSING THE CONNECTOR, TO ENSURE MOISTURE CANNOT CONTACT JOINTS. (THIS IS ONLY NECESSARY WHEN USING ITEM 2)
5. USE SELF-POLYMERISING TAPE &/OR SLEEVES TO INCREASE CABLE DIAMETER, SO CABLE IS FIRMLY SECURED BY J1 CABLE CLAMP.

ITEM	DESCRIPTION	CODAN P/No	MANUFACTURER	MANUFACTURERS PART No	QTY
1	BUSHING, TELESCOPING	60-90509-002	ITT-CANNON	MS3420-8	1
REF NOTE 1 & 4 2✳	CABLE, 4 CORE GREY 30/0.25	——	TYCAB	HMC4CK25A	A/R
REF NOTE 1 3✳	CABLE, 4 CORE GREY 56/0.30	——	TYCAB	FMC4EF30A	A/R
4	BOOT-LACE TERMINAL	——	AMP	0-0926933-1	4
5	LABEL	——	JABAC	THT-9	1
J1	SOCKET, 5WAY	60-00054-091	ITT-CANNON	MS3106E-18-11S	1

✳ USE APPROPRIATE CABLE FOR REQUIRED CABLE LENGTH.

DIMENSIONS IN mm

ISSUE B
STRIPPED WIRE TOLERANCES CHANGED.
C/R 25902
VS 21-01-99

ISSUE 2
ITEM 4 ADDED,
NOTES CHANGED
C/R 26254
14-09-99 GSP

ISSUE 3
ITEM 5 & VARIANT TABLE ADDED.
NOTES 1 & 4 UPDATED.
"L" TOLERANCES MOVED TO VARIANT TABLE.
27-6-2000 HJK

FILE No.
08\05634__3.DWG

CODAN

MATERIAL

FINISH

		SCALE 1:1
DRN	DB	DATE 10-11-98
CHKD	DJM	25-11-98
APPD	VS	21-01-99

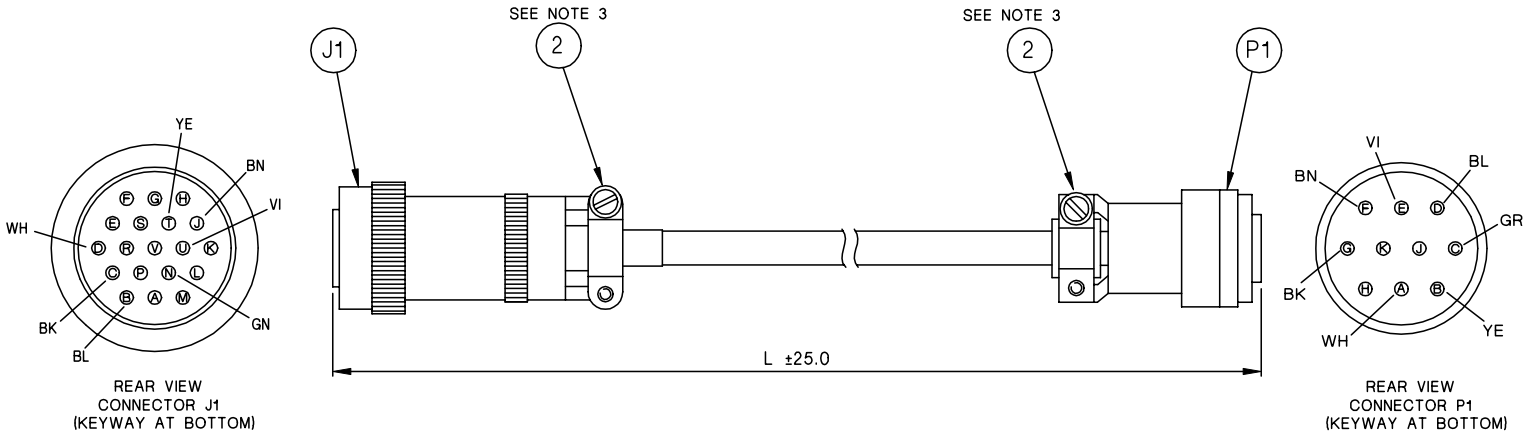
TOLERANCES UNLESS OTHERWISE STATED
2 PLACES DEC. ±0.25
1 PLACE DEC. ±0.5
0 PLACE DEC. ±1

TITLE
CABLE, POWER

DRAWING/DOC NO.
A2 08-05634

ISS B X Z 3 SHT. 1 OF 1

DO NOT SCALE



REAR VIEW
CONNECTOR J1
(KEYWAY AT BOTTOM)

REAR VIEW
CONNECTOR P1
(KEYWAY AT BOTTOM)

WIRE	FROM	TO
WH	J1/D	P1/A
YE	/T	/B
GN	/N	/C
BL	/B	/D
VI	/U	/E
BN	/J	/F
BK	/C	/G
SEE NOTE 4 RD	-	-
SCREEN	SHELL	SHELL

NOTES:

1. LENGTH 'L' IS VARIANT EXTENSION IN 0.1m
   ie 'L'=XX.Xm
   eg 08-05857-030 IS 3.0m LONG.
2. ASSEMBLY No 08-05857-XXX
3. THE SCREEN WIRE (BRAID) SHOULD BE SOLDERED TO SOLDER LUGS ON BOTH ENDS OF THE CABLE. THE SOLDER LUGS ARE TO BE PLACED BETWEEN THE RUBBER GROMMET AND THE CABLE CLAMP OF THE CONNECTOR AND ATTACHED TO THE CONNECTOR SHELL WITH A SCREW.
4. RED WIRE NOT USED, CUT SHORT AT BOTH ENDS.
5. INJECT SOME SILASTIC (ITEM 3) UNDER THE CABLE OUTER SHEATH AT BOTH ENDS TO SEAL THE CABLE.

FILE No.
08\05857__1.DWG

ITEM	DESCRIPTION	QTY	MANUF. PRT No.	MANUF.	CODAN P/No
J1	SOCKET, 19 WAY MIL SOLDER POT	1	MS3116J-14-19S	ITT-CANNON	60-00194-000
P1	PLUG, 10 WAY MIL SOLDER POT	1	MS3116F12-10P	ITT-CANNON	60-00101-581
1	CABLE, 8 CORE 7/0.20 SCR. GREY	SEE NOTE 1	HCE308P GREY	HARTLAND	67-00807-000
2	LUG, SOLDER 3.5mm	2	G410 Code 330	CLIFORD W	61-30200-025
3	ADHESIVE/SEALANT, CLEAR RTV	A/R	5140	LOCTITE	71-30001

DIMENSIONS IN mm

CODAN

MATERIAL

FINISH

SCALE 1:1

		DATE
DRN	SMC	04-09-2000
CHKD	GHZ	07-09-2000
APPD	GHZ	17-09-2001

TOLERANCES
UNLESS OTHERWISE STATED
2 PLACES DEC. ±0.25
1 PLACE DEC. ±0.5
0 PLACE DEC. ±1

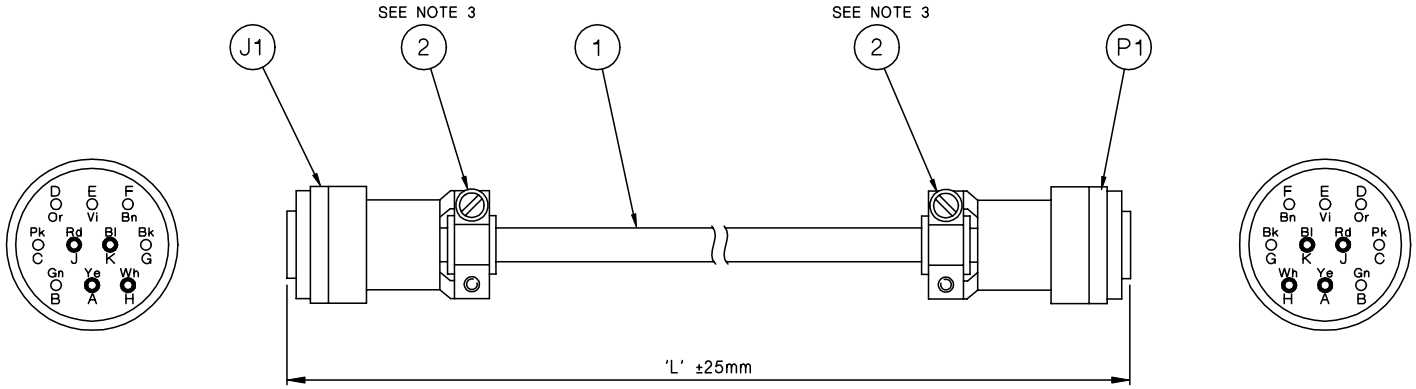
TITLE
CABLE, HP SSPA
TO CONVERTER

DRAWING/DOC NO.
A3 08-05857

ISS 1

SHT. 1
OF 1

DO NOT SCALE



REAR VIEW
CONNECTOR J1
SCALE 2:1
(KEYWAY AT BOTTOM)
WIRE TYPE HC6002 - **BOLD OUTLINE**

REAR VIEW
CONNECTOR P1
SCALE 2:1
(KEYWAY AT BOTTOM)
WIRE TYPE HC6002 - **BOLD OUTLINE**

WIRE	FROM	TO	SIGNAL FORMAT	
			5700	5900
(YE)	J1/A	P1/A	0V	OV
GN	/B	/B	FAN +	SSPA DATA _
PK	/C	/C	SSPA ACT	SSPA ACT
OR	/D	/D	SSPA FAULT	INPUT 1
VI	/E	/E	TEMP SENSOR	SSPA INH
BN	/F	/F	TEMP SENSOR	SSPA DATA +
BK	/G	/G	TEMP FAULT	INPUT 2
(WH)	/H	/H	FUSED PWR +	FUSED PWR +
(RD)	/J	/J	PWR -	PWR -
(BL)	/K	/K	SW	SW
BRAID	SHELL	SHELL	0V	OV

NOTES

1. LENGTH 'L' IS VARIANT EXTENSION IN 0.1m
   ie 'L'=XX.Xm
   eg 08-05618-020 IS 2.0m LONG.
2. ASSEMBLY No 08-05618-XXX
3. THE SCREEN WIRE (BRAID) SHOULD BE SOLDERED TO SOLDER LUGS ON BOTH ENDS OF THE CABLE. THE SOLDER LUGS ARE TO BE PLACED BETWEEN THE RUBBER GROMMET AND THE CABLE CLAMP OF THE CONNECTOR AND ATTACHED TO THE CONNECTOR SHELL WITH A SCREW.
4. INJECT SOME SILASTIC (ITEM 3) UNDER THE CABLE OUTER SHEATH AT BOTH ENDS TO SEAL THE CABLE.

PART No. 08-05887-XXX (REFER NOTE 1)

ITEM	DESCRIPTION	QTY	MANUF. PRT No.	MANUF.
J1	SOCKET, 10 WAY MIL SOLDER POT	1	MS3116F12-10S	ITT-CANNON
P1	PLUG, 10 WAY MIL SOLDER POT	1	MS3116F12-10P	ITT-CANNON
1	CABLE, 6 CORE 16/0.2 &4 CORES HC6002 SCR. GREY	SEE NOTE 1	HCY 685 GREY	HARTLAND
2	LUG, SOLDER 3.5mm	2	G410 Code 330	CLIFORD W
3	ADHESIVE/SEALANT, CLEAR RTV	A/R	5140	LOCTITE

DIMENSIONS IN mm

CODAN

MATERIAL

FINISH

SCALE 1:1

		DATE
DRN	GS	30-05-2001
CHKD	PMK	06-06-2001
APPD	GHZ	17-09-2001

TOLERANCES UNLESS OTHERWISE STATED
2 PLACES DEC. ±0.25
1 PLACE DEC. ±0.5
0 PLACE DEC. ±1

TITLE
CABLE, CONV TO SSPA CONNECTOR

A3

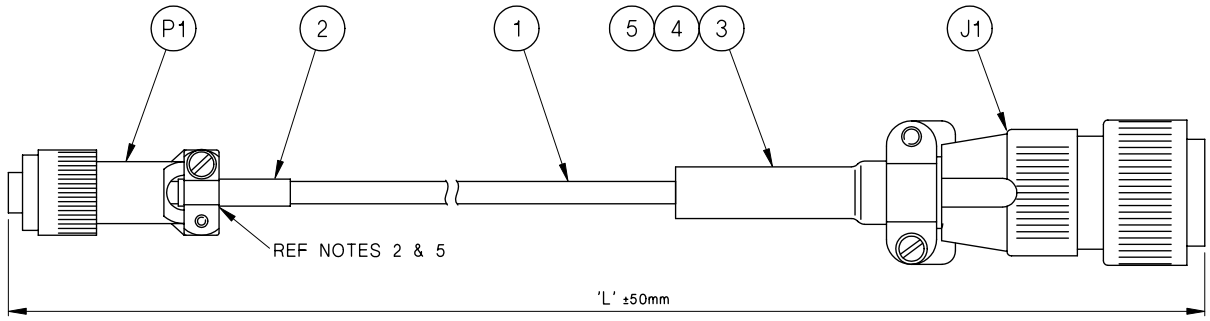
DRAWING/DOC NO.
08-05887

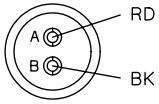
ISS 1

SHT. 1 OF 1

FILE No.
08\05887__1.DWG

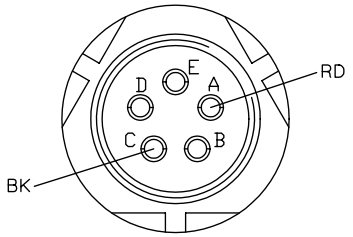
DO NOT SCALE





P1 - REAR VIEW
SCALE 2:1

WIRE	FROM	TO
RD	P1/A	J1/A
BK	/B	/C



J1 - REAR VIEW
SCALE 2:1

ITEM	DESCRIPTION	MANUFACTURER	MANUFACTURERS PART No	QTY
1	CABLE, 2 CORE (16/0.20)	HARTLAND	HC2032	A/R
2	TUBING, HEATSHRINK	3M	FP-301, 1/4"	25mm
3	BUSHING, TELESCOPING	ITT-CANNON	MS3420-4	1
4	BUSHING, TELESCOPING	ITT-CANNON	MS3420-6	1
5	BUSHING, TELESCOPING	ITT-CANNON	MS3420-8	1
J1	SOCKET, 5WAY	ITT-CANNON	MS3106E-18-11S	1
P1	PLUG, 2WAY	ITT-CANNON	MS3116F8-2P	1

NOTES

1. LENGTH 'L' IS VARIANT EXTENSION IN METRES
   ie 'L'= XXXm
   eg 08-05961-003 IS 3m LONG
2. DISCARD GROMMET SUPPLIED WITH CONNECTOR P1.
3. INJECT A SMALL AMOUNT OF SILICON SEALANT AROUND THE SOLDERED JOINTS BEFORE CLOSING THE CONNECTORS TO ENSURE MOISTURE CANNOT CONTACT JOINTS.
4. CAN USE AMP BOOT-LACE TERMINAL (0-0926933-1) IN LIEU OF 'TWIST & TIN'.
5. MAY USE SELF-POLYMERISING TAPE IN LIEU OF TUBING TO INCREASE CABLE DIAMETER SO THAT THE CABLE IS FIRMLY SECURED BY J1 & P1 CABLE CLAMPS.

DIMENSIONS IN mm

FILE No.
08\05961__A.DWG

CODAN

MATERIAL

FINISH

SCALE 1:1

DRN	DB	DATE 23-11-01
CHKD	GZ	28-11-01
APPD		

TOLERANCES UNLESS OTHERWISE STATED
2 PLACES DEC. ±0.25
1 PLACE DEC. ±0.5
0 PLACE DEC. ±1

TITLE
CABLE, DC POWER
SSPA - CONVERTER (CE)

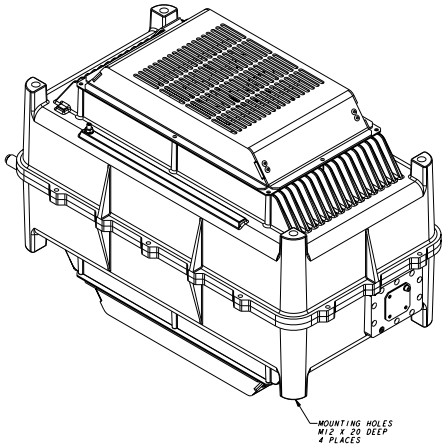
A3

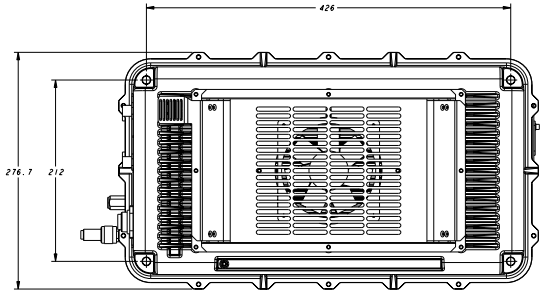
DRAWING/DOC NO.
08-05961

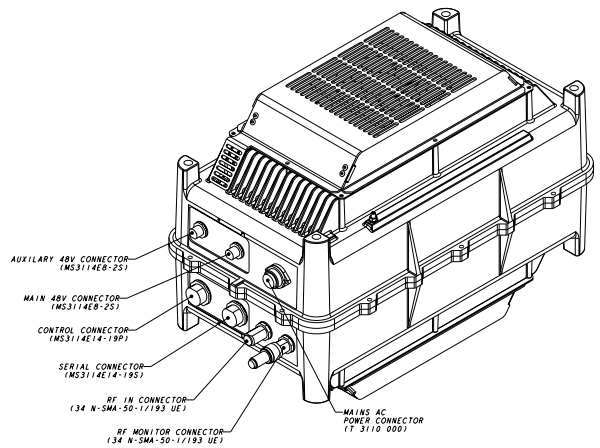
ISS A

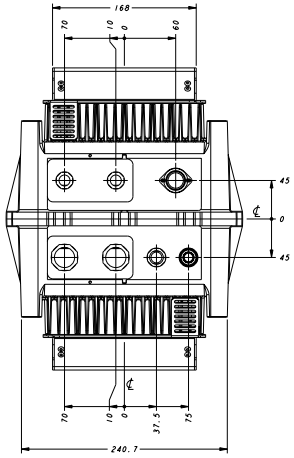
SHT. 1 OF 1

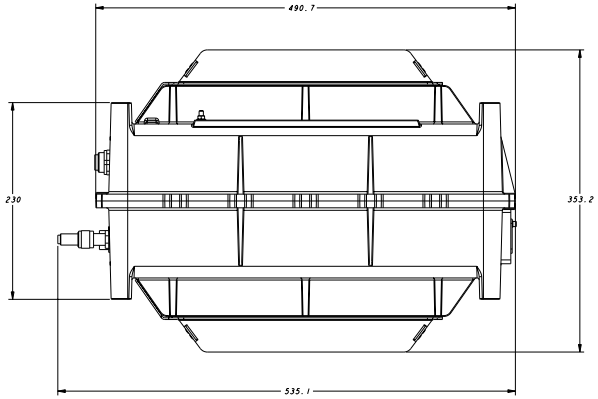
THIS DRAWING WAS PRODUCED USING PRO ENGINEER
REVISIONS WILL ALSO BE MADE WITH PRO ENGINEER

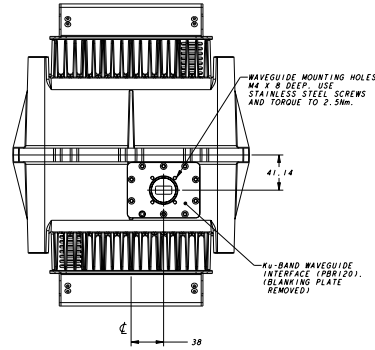












REVISION	DESCRIPTION	APPROVED	DATE
B	DESCRIPTIONS ALTERED C9 AND F12, C1 ADDED E3 PCO 00608	PRM	09-01-02

CODAN

THIRD ANGLE PROJECTION
DIMENSIONS IN MILLIMETRES
FINISH
MATERIAL N/A
TOLERANCE ±0.5 U.O.S.

DRN RH
DATE 01-11-01
CHK AH
APP PRM
SCALE 2:5
SIZE A1

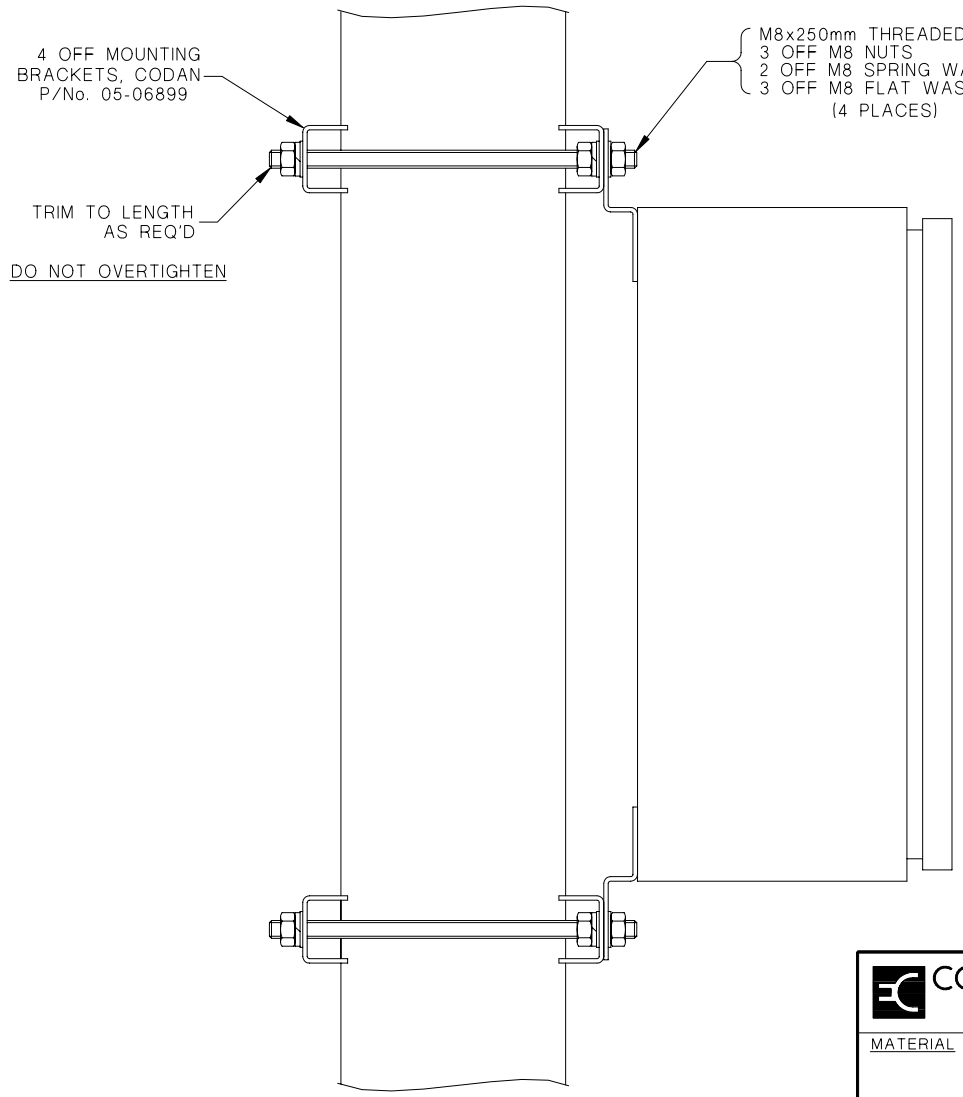
TITLE
INTERFACE CONTROL DRAWING
(Ku-BAND)
P/N 5940
SHIP MOUNT SKEA

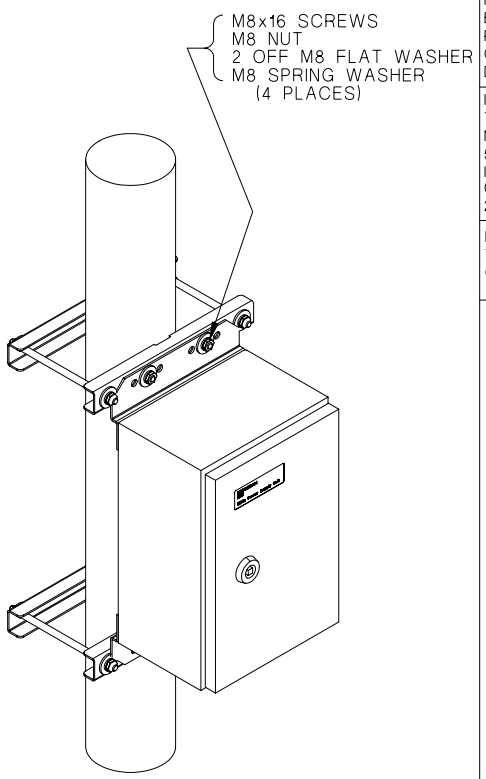
DO NOT SCALE. IF IN DOUBT - ASK

FILE 0969D23B DRG No. 0969D23

SHEET 1 OF 1
REV B

DO NOT SCALE





POWER SUPPLY SHOWN
(SCALE 1:5)

ISSUE 2:
BALLOONS DELETED
PART DESCR ADDED
C/R 24686
DB 08-08-96

ISSUE 3:
TITLE WAS"SUPPLY MODULE/ ETC."
5580/5581 POWER SUPPLY
ISO VIEW ADDED.
C/R 25153
28-10-97 DB

ISSUE 4
TITLES MADE GENERIC
C/R 26542
02-08-01 GHZ

FILE No.
15\40128__4.DWG

DIMENSIONS IN mm

CODAN

MATERIAL

FINISH

		SCALE 1:2 1:5
DRN	DB	DATE 28-06-95
CHKD	DBr	29-06-95
APPD	CM	01-11-95

TOLERANCES UNLESS OTHERWISE STATED

2 PLACES DEC.	±0.25
1 PLACE DEC.	±0.5
0 PLACE DEC.	±1
ANGULAR	±2°

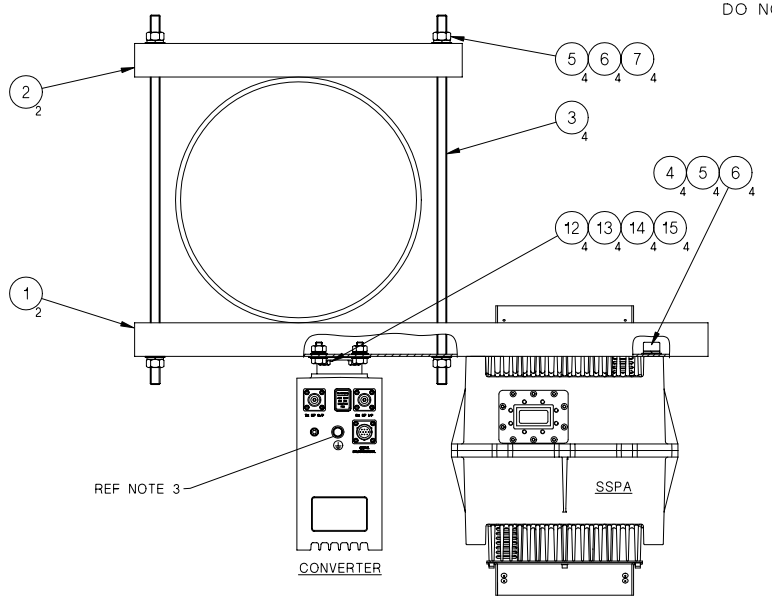
TITLE
POWER SUPPLY/ REDUNDANCY CONTROLLER FITTING INSTRUCTIONS

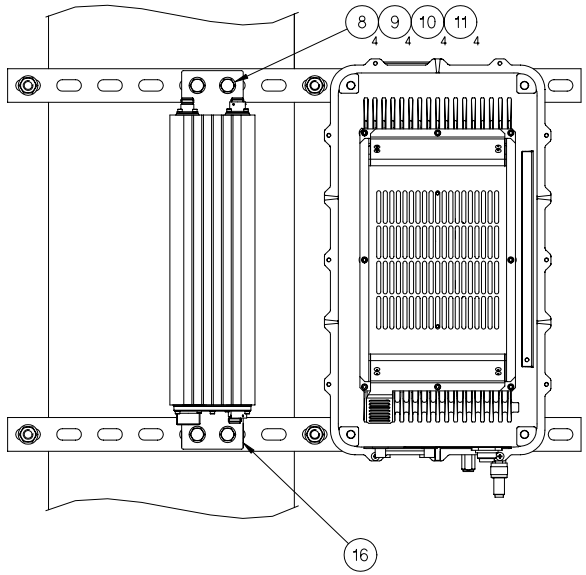
A3

DRAWING/DOC NO.
15-40128-001

ISS	1	2	3	4							SHT. 1 OF 1

DO NOT SCALE





SUGGESTED FITTING INSTRUCTIONS

1. ATTACH UPPER SLOTTED CHANNELS (ITEMS 1&2) TO POLE WITH M12 THREADED ROD (ITEM 3), M12 NUTS, FLAT WASHERS & SPRING WASHERS (ITEMS 5-7).
2. ATTACH SSPA TO 700mm SLOTTED CHANNEL (ITEM 1) AS SHOWN WITH M12 SCREWS, FLAT WASHERS & SPRING WASHERS (ITEMS 4-6).
3. ATTACH LOWER SLOTTED CHANNELS (ITEMS 1&2) TO POLE WITH M12 THREADED ROD (ITEM 3), M12 NUTS, FLAT WASHERS & SPRING WASHERS (ITEMS 5-7). DO NOT OVERTIGHTEN.
4. SLIDE LOWER SLOTTED CHANNEL UNTIL LOWER MOUNTING HOLES ON SSPA ALIGN WITH SLOTTED CHANNEL & FIT SSPA WITH M12 SCREWS, FLAT WASHERS & SPRING WASHERS (ITEMS 4-6).
5. ATTACH WIDE-SPACING BRACKET (ITEM 16) NEXT TO SSPA WITH M10 SCREWS, NUTS, FLAT WASHERS & SPRING WASHERS (ITEMS 8-11).
6. ATTACH CONVERTER TO WIDE-SPACING BRKT (ITEM 16) WITH M8 SCREWS, NUTS, FLAT WASHERS & SPRING WASHERS (ITEMS 12-15).
7. TIGHTEN ALL THREADED RODS & SCREWS.

ITEM	DESCRIPTION	QTY
1	SLOTTED CHANNEL, 700mm	2
2	SLOTTED CHANNEL, 400mm	2
3	M12x500mm THREADED ROD	4
4	M12x25 SKT CAP SCREW	4
5	M12 SPRING WASHER	12
6	M12 FLAT WASHER	12
7	M12 HEX NUT, SELF LOCKING	8
8	M10x40 HEX SCREW	4
9	M10 SPRING WASHER	4
10	M10 FLAT WASHER	8
11	M10 HEX NUT	4
12	M8x20 HEX SCREW	4
13	M8 SPRING WASHER	4
14	M8 FLAT WASHER	8
15	M8 HEX NUT	4
16	WIDE-SPACING BRACKET	1

NOTES:

1. ADDITIONAL ITEMS OF MOUNTING HARDWARE TO THOSE LISTED ABOVE MAY BE SUPPLIED THOUGH NOT NECESSARILY USED IN ASSEMBLY.
2. C-BAND SSPA AND CONVERTER SHOWN. KU-BAND VERSIONS ARE MECHANICALLY IDENTICAL.
3. PROTECTIVE EARTH MUST BE CONNECTED TO GROUND

DIMENSIONS IN mm

FILE No. 15\40196__1.DWG

CODAN

MATERIAL

FINISH

SCALE 1:4

DRN	DB	DATE 20-11-01
CHKD	GZ	27-11-01
APPD	GZ	19-12-01

TOLERANCES UNLESS OTHERWISE STATED
2 PLACES DEC. ±0.25
1 PLACE DEC. ±0.5
0 PLACE DEC. ±1

TITLE
KIT, CONVERTER MTG, HP SSPA's (CE)

DRAWING/DOC NO.
A2 15-40196-001

ISS 1

SHT. 1 OF 1

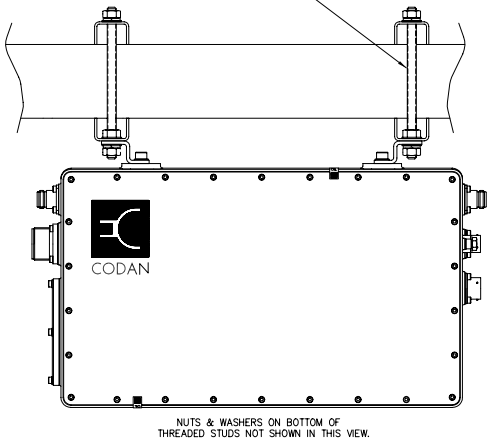
DO NOT SCALE

ISSUE 2
NOTE 2 ADDED,
WAS 3 SHTS.
C/R 25666
08-10-98 DJM

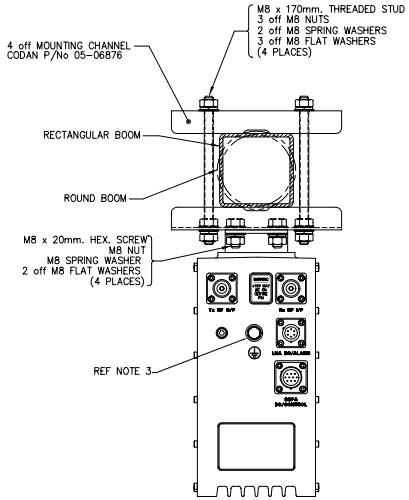
ISSUE 3
SERIAL NUMBER DETAIL
REMOVED.
C/R 27023
18-07-01 GHZ

ISSUE 4
EARTH SYMBOL
CHANGED. NOTE 3
ADDED.
C/R 27075
FMK 13-09-01

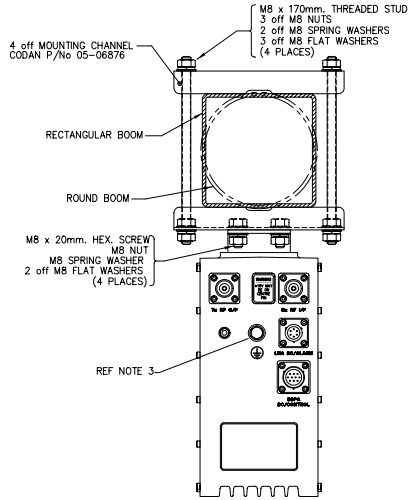
MOUNTING FOR BOOMS UP TO 65mm WIDE/DIA.



NUTS & WASHERS ON BOTTOM OF
THREADED STUDS NOT SHOWN IN THIS VIEW.



MOUNTING FOR BOOMS UP TO 100mm WIDE/DIA.



NOTES:

1. BOOM MOUNTING KIT PART No. 15-42000-000.
2. CONVERTER SHOWN IS C-BAND MODEL 5700.
3. PROTECTIVE EARTH MUST BE CONNECTED TO GROUND

REMOVE BURRS & SHARP EDGES

DIMENSIONS IN mm

FILE No.
15\42000__4

CODAN

MATERIAL

FINISH

SCALE 1:2

DRN	SMC	27-02-97
CHKD	P.F.	30-04-97
APPD	DJM	13-2-98

DATE

TOLERANCES
UNLESS OTHERWISE STATED

2 PLACES DEC.	±0.25
1 PLACE DEC.	±0.5
0 PLACE DEC.	±1
ANGULAR	±2°

TITLE
CONVERTER
FITTING INSTRUCTIONS
BOOM MOUNTING ACCESSORIES

DRAWING/DOC NO.
A1 15-42000-001

ISS 4

SHT. 1 OF 2

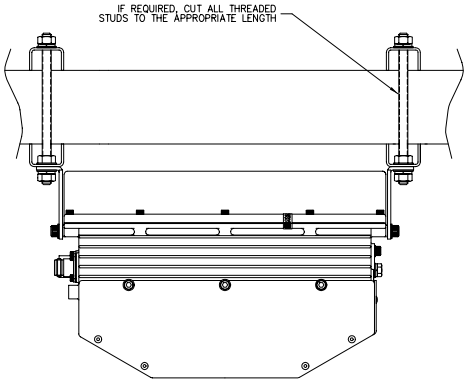
DO NOT SCALE

ISSUE 2
DETAIL UPDATED, WAS 3 SHTS.
C/R 25666
08-10-98 DJM

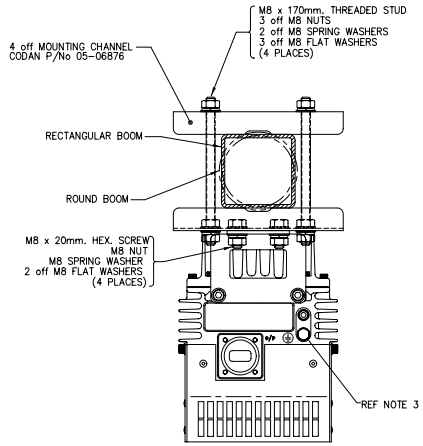
ISSUE 3
SERIAL NUMBER DETAIL REMOVED.
C/R 27023
16-07-01 GHZ

ISSUE 4
EARTH SYMBOL CHANGED. NOTE 3 ADDED.
C/R 27075
PMK 13-09-01

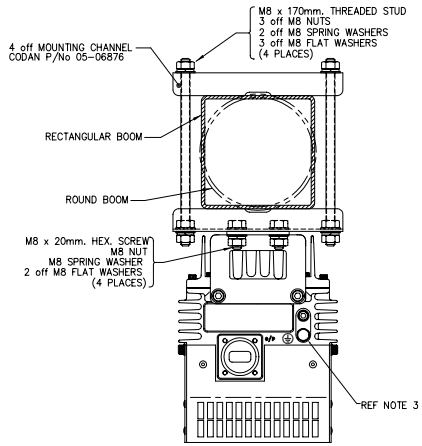
MOUNTING FOR BOOMS UP TO 65mm WIDE/DIA.



NUTS & WASHERS ON BOTTOM OF THREADED STUDS NOT SHOWN IN THIS VIEW.



MOUNTING FOR BOOMS UP TO 100mm WIDE/DIA.



NOTES:
1. BOOM MOUNTING KIT PART No. 15-42000-000.
2. SSPA SHOWN IS Ku-BAND MODEL 5908.
3. PROTECTIVE EARTH MUST BE CONNECTED TO GROUND

REMOVE BURRS & SHARP EDGES

DIMENSIONS IN mm

FILE No. 15\42000_4.DWG

CODAN

MATERIAL

FINISH

SCALE			1:2
DRN	SMC	DATE	27-02-97
CHKD	P.F.		30-04-97
APPD	DJM		13-2-98

TOLERANCES UNLESS OTHERWISE STATED
2 PLACES DEC. ±0.25
1 PLACE DEC. ±0.5
0 PLACE DEC. ±1
ANGULAR ±2°

TITLE
SSPA
FITTING INSTRUCTIONS
BOOM MOUNTING ACCESSORIES

DRAWING/DOC NO.
A1 15-42000-001

ISS 4

SHT. 2 OF 2

Appendix A—Summary of serial interface commands

This appendix summarises the serial interface commands used to view and change the operating parameters and status of the Ku-Band Transceiver 5900 series. The commands are:

Help commands

The Help commands provide on-screen information for all commands available with ASCII protocol.

Help commands are not available if you are using packet protocol.

Table A-1: Help commands

Command	Data required	Displays...
HCC	None	Details of set control commands
HLP	None	Details of help commands
HOD	None	Details of output data commands
HOP	None	Details of output parameter commands
HPA	None	Details of set auxiliary parameter commands
HPL	None	Details of set logging parameter commands
HPM	None	Details of set main parameter commands
HVC	None	Details of view commands

Set control commands

The set control commands control the major functions of the transceiver. They are used when control via the serial interface is required.

Table A-2: Set control commands

Command	Data required	Description
RCB	None	Resets the status poll change bits to ‘0’, i.e. no change
RST	None	Resets the microprocessor in the converter
SPA	0 = off 1 = on	Switches the SSPA off or on
SPI	0 = off 1 = on	Switches the SSPA inhibit parameter off or on
SSO	0 = standby 1 = on	Switches the transceiver to STANDBY mode or ON

Set logging parameter commands

The set logging parameter commands control the display of:

- fault changes
- operational status changes
- lock status changes
- temperatures of the converter and SSPA
- output power of the SSPA

Logging parameter commands are not available if you are using packet protocol.

Table A-3: Set logging parameter commands

Command	Data required	Description
SFL	0 = disabled 1 = enabled	Enables or disables fault logging; if enabled, faults will be logged as they occur
SLL	0 = disabled 1 = enabled	Enables or disables lock status logging; if enabled, the lock status changes will be logged as they occur
SPL	0 = disabled 1 = enabled	Enables or disables SSPA output power logging; if enabled, SSPA output power will be logged every 5 minutes
SSL	0 = disabled 1 = enabled	Enables or disables status logging; if enabled, status changes will be logged as they occur
STL	0 = disabled 1 = enabled	Enables or disables temperature logging for the SSPA and converter; if enabled, the temperatures will be logged every 5 minutes

Set main parameter commands

The set main parameter commands enable you to set the main operating parameters of the transceiver.

Table A-4: Set main parameter commands

Command	Data required	Description
SRA	n where $0 \leq n \leq 25$	Sets the receive attenuation of the converter
SRF	Receive frequency in MHz	Sets the receive frequency of the converter
STA	n where $0 \leq n \leq 25$	Sets the transmit attenuation of the converter
STF	Transmit frequency in MHz	Sets the transmit frequency of the converter

Set auxiliary parameter commands

The set auxiliary parameter commands enable you to set the auxiliary parameters of the transceiver.

Table A-5: Set auxiliary parameter commands

Command	Data required	Description
SAR	0 = 0 to 31 1 = 32 to 63 2 = 64 to 95 3 = 96 to 127	Sets the address range for the packet address of the converter Command not available if using packet protocol
SCC	n, where $0 \leq n \leq 15$	Sets the cable compensation of the transmit section of the converter
SCT	0 = standard 1 = custom	Sets the gain versus temperature compensation data used in the converter
SEC	0 = off 1 = on	Switches the echo of commands off or on Command not available if using packet protocol
SIF	0 = 70 MHz 1 = 140 MHz	Sets the IF frequency of the converter
SIM	0 = 50 Ω 1 = 75 Ω	Sets the IF impedance of the converter
SLE	0 = disabled 1 = enabled	Disables or enables the detection of LNB faults
SOT	nn, where 20 < nn < 55	Sets the output power alarm threshold stored in the converter, which activates an alarm when the SSPA RF output power is below the threshold setting
SPD	0 = 59XX std 1 = custom	Sets the SSPA output power detector type Command not allowed when SSPA control mode is set to basic
SPE	0 = disabled 1 = enabled	Disables or enables the detection of SSPA faults

Table A-5: Set auxiliary parameter commands (cont.)

Command	Data required	Description
SPM	0 = extended 1 = basic	Sets the mode used to interface with the SSPA
SPP	0 = Codan mode 1 = packet protocol mode 1 2 = packet protocol mode 2 3 = packet protocol mode 3	Sets the packet protocol mode Command not available if using packet protocol
SPT	0 = off 1 = 59XX std 2 = custom	Sets the gain versus temperature compensation data used in the SSPA Command not allowed when SSPA control mode is set to basic
SPU	0 = last state 1 = transmit off	Sets the SSPA state on power up
SRO	0 = off 1 = on	Inhibits or enables transmission from the converter during the warm-up period
SRR	0 = 950 to 1700 MHz 1 = 10950 to 11700 MHz 2 = 11700 to 12200 MHz 3 = 12250 to 12750 MHz	Sets the receive range control setting of the down converter to match the frequency range of the LNB
STE	0 = disabled 1 = enabled	Sets the output power alarm mode for the SSPA

View commands

The View commands provide comprehensive information for:

- fault status
- operational status
- control status
- parameter settings
- temperature of the SSPA and converter
- temperature compensation data

View commands are not available if you are using packet protocol.

Table A-6: View commands

Command	Data required	Displays...
VCS	None	Current status of the switches and control input lines of the transceiver
VFS	None	Current fault status of the transceiver
VID	None	Software version of the converter and the options fitted
VIP	None	Software version of the SSPA and the options fitted Command not allowed when SSPA control mode is set to basic
VLS	None	Current PLL lock status of the converter
VMT	None	Maximum and minimum temperatures of the transceiver
VPF	None	Current fault status of the SSPA Command not allowed when SSPA control mode is set to basic
VPS	None	Current settings of the operating parameters
VSS	None	Current system status of the transceiver
VST	None	Current temperatures of the converter and SSPA
VTD	None	Compensation data installed in the converter

Output parameter commands

The output parameter commands are used to display the parameter settings stored in the transceiver.

Table A-7: Output parameter commands

Command	Output	Displays...
OAD	0–127	Packet address setting Command not available if using packet protocol
OAR	0 = 0 to 31 1 = 32 to 63 2 = 64 to 95 3 = 96 to 127	Packet address range setting Command not available if using packet protocol
OCC	Cable compensation setting displayed as one or two numeric characters	Cable compensation setting
OCT	0 = standard 1 = custom	Converter temperature compensation type
ODP	See page 8-52, *Output configuration data*	All the transceiver configuration data
OEC	0 = off 1 = on	Echo setting
OFL	0 = off 1 = on	Fault logging setting
OFP	1 = Band 1 2 = Band 2	SSPA operating frequency band
OIF	0 = 70 MHz 1 = 140 MHz	IF frequency setting of the converter
OIM	0 = 50 Ω 1 = 75 Ω	IF impedance setting of the converter
OLE	0 = disabled 1 = enabled	LNB fault detection setting

Table A-7: Output parameter commands (cont.)

Command	Output	Displays...
OLL	0 = off 1 = on	Lock status logging setting
OOT	Output power alarm threshold displayed as two numeric characters	SSPA output power alarm threshold
OPA	0 = off 1 = on	SSPA activate setting
OPD	0 = 59XX std 1 = custom	SSPA output power detector type Command not allowed when SSPA control mode is set to basic
OPE	0 = disabled 1 = enabled	SSPA fault detection setting
OPI	0 = off 1 = on	SSPA inhibit setting
OPL	0 = off 1 = on	Output power logging setting
OPM	0 = extended 1 = basic	SSPA control mode
OPP	0 = Codan 1 = packet protocol mode 1 2 = packet protocol mode 2 3 = packet protocol mode 3	Packet protocol mode
OPT	0 = off 1 = 59XX std 2 = custom	SSPA compensation type
OPU	0 = last state 1 = transmit off	SSPA state on power up

Table A-7: Output parameter commands (cont.)

Command	Output	Displays...
ORA	Receive attenuation displayed in dB	Receive attenuation setting
ORF	Receive frequency in MHz	Receive frequency
ORO	0 = off 1 = on	Reference oscillator override setting
ORR	0 = 950 to 1700 MHz 1 = 10950 to 11700 MHz 2 = 11700 to 12200 MHz 3 = 12250 to 12750 MHz	Receive range of the converter
OSL	0 = off 1 = on	Status logging setting
OSO	0 = standby 1 = on	System on setting
OTA	Transmit attenuation displayed in dB	Transmit attenuation setting
OTD	See page 8-47, *Output all identity data*	All the transceiver identity data
OTE	0 = disabled 1 = enabled	Output power alarm setting
OTF	Transmit frequency in MHz	Transmit frequency
OTL	0 = off 1 = on	Temperature logging setting

Output data commands

The output data commands are used to display operating conditions and information about the transceiver.

Table A-8: Output data commands

Command	Output	Displays...
OCD	Converter default compensation table name Custom converter compensation table name Off SSPA default compensation table name Custom SSPA compensation table name SSPA default detector characteristic name Custom SSPA detector characteristic name	Names of temperature compensation tables available for the converter and SSPA, and the names of the power detector characteristics for the SSPA
OCN	5-character serial number	Serial number of the converter

Table A-8: Output data commands (cont.)

Command	Output	Displays...
OCS	Power switch: 0 = standby 1 = on SSPA switch: 0 = not activated 2 = activated SSPA switch: 0 = not inhibited 4 = inhibited H/W system on: 0 = standby 8 = on H/W SSPA activate: 0 = not activated 16 = activated H/W SSPA inhibit: 0 = not inhibited 32 = inhibited	Current control status of transceiver as one or two numeric characters, which is the sum of the values in the Output column
ODT	4-digit type number followed by 3-digit firmware version to two decimal places	Converter type and firmware version
OFD	Max transmit frequency Min transmit frequency Max receive frequency Min receive frequency Synthesiser step size	Transmit and receive frequency of the converter and the synthesiser step size

Table A-8: Output data commands (cont.)

Command	Output	Displays...
OFS	Converter fault: 0 = OK 1 = fault LNB fault: 0 = OK 2 = fault SSPA fault: 0 = OK 4 = fault Temp fault: 0 = OK 8 = fault Fan fault: 0 = OK 16 = fault Output power fault: 0 = OK 32 = fault	Current fault status of transceiver as one or two numeric characters, which is the sum of the values in the Output column
OID	Type number Firmware part number Firmware version number Firmware release date Converter bandwidth	Identification information of the converter
OIP	Type number Firmware part number Firmware version number Firmware release date Fan detail	Identification information of the SSPA Command not allowed when SSPA control mode is set to basic

Table A-8: Output data commands (cont.)

Command	Output	Displays...
OLS	Tx local oscillator: 0 = locked 1 = unlocked Rx local oscillator: 0 = locked 2 = unlocked Tx synthesiser 1: 0 = locked 4 = unlocked Tx synthesiser 2: 0 = locked 8 = unlocked Tx synthesiser 3: 0 = locked 16 = unlocked Rx synthesiser 1: 0 = locked 32 = unlocked Rx synthesiser 2: 0 = locked 64 = unlocked	Current PLL lock status of converter as one or two numeric characters, which is the sum of the values in the Output column
OMC	Temperatures in degrees Celsius	Maximum and minimum temperatures of the converter
OMP	Temperatures in degrees Celsius	Maximum and minimum temperatures of the SSPA Command not allowed when SSPA control mode is set to basic
OPC	Temperature compensation gain correction in dB	Temperature compensation gain correction Command not allowed when SSPA control mode is set to basic

Table A-8: Output data commands (cont.)

Command	Output	Displays...
OPF	Bias Supply: 0 = OK 1 = fault Overcurrent: 0 = OK 2 = fault Switched Supplies: 0 = OK 4 = fault	Status of SSPA internal faults as one or two numeric characters, which is the sum of the values in the Output column Command not allowed when SSPA control mode is set to basic
OPN	5-character serial number	Serial number of the SSPA Command not allowed when SSPA control mode is set to basic
OPO	Output power in dBm	SSPA output power Command not allowed when SSPA control mode is set to basic
OSP	Fault: 0 = no change 1 = change Control: 0 = no change 2 = change System: 0 = no change 4 = change	Changes that have occurred in the fault, control or system status of the transceiver as one or two numeric characters, which is the sum of the values in the Output column

Table A-8: Output data commands (cont.)

Command	Output	Displays...
OSS	System on: 0 = standby 1 = on SSPA activate: 0 = not activated 2 = activated SSPA inhibit: 0 = not inhibited 4 = inhibited SSPA on: 0 = off 8 = on Tx IF: 0 = off 16 = on Reference oven: 0 = warming up 32 = warm	Current system status of transceiver as one or two numeric characters, which is the sum of the values in the Output column
OTC	Temperature in degrees Celsius	Current converter temperature
OTP	Temperature in degrees Celsius	Current SSPA temperature Command not allowed when SSPA control mode is set to basic

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