Installation and Operating Handbook

P7035 Converters

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ISO 9001

IMPORTANT NOTE: THE INFORMATION AND SPECIFICATIONS CONTAINED IN THESE DOCUMENTS SUPERSEDE ALL PREVIOUSLY PUBLISHED INFORMATION CONCERNING THESE PRODUCTS

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CUSTOMER CARE

Contact the Peak Communications support department for:

- Product operation, application support or training requests
- Information for returning or upgrading a product
- Comments or suggestions on any supplied literature

Contact Information

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Attention: Support Department
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Fax +44 (0) 1484 723666
E-mail support@peakcom.co.uk

You can also contact us via our website at www.peakcom.co.uk

To return a Peak Communications product for repair:

1. Contact the Peak Communications support department and request a Return Material Authorisation (RMA) number.
2. You will be required to provide to our support representative the model number, serial number and a detailed description of the problem.
3. To prevent any damage to the product during shipment we recommend that the unit is returned in its original packaging or if this is not available the packaging used must be of an equal standard.
4. Return the product back to Peak Communications and advise shipment details to support representative for tracking purposes. (Any shipping charges should be prepaid)

For information regarding our warranty policy see Appendix 1 Terms and conditions of sale.

PRODUCT COMPLIANCE

Safety

To ensure safety of operator the P7035 series of converters have been designed to comply with the following safety standard;

EN 60950: Safety of information technology equipment, including electrical business machines.

Operation of the equipment in a non standard manner will invalidate compliance to this standard.

The equipment MUST BE OPERATED WITH ITS LID ON AT ALL TIMES. If it is necessary to remove the lid for any purpose then it is essential that the lid is fitted back correctly before normal operation.

DANGEROUS VOLTAGES ARE PRESENT AROUND THE POWER SUPPLY AND PRECAUTIONS MUST BE TAKEN.

EMC

The P7035 Series of converters have been designed to comply with the following standards;

Emissions: EN 55022 Class B; Limits and methods of measurement of radio interference characteristics of Information Technology Equipment.

Immunity EN 50082 Part 1; Generic immunity standard, part 1: Domestic, commercial and light industrial environment.

Damage to the keyboard membrane or mechanical damage to the chassis will also invalidate compliance; please contact the factory under these circumstances for advice on continued operation.

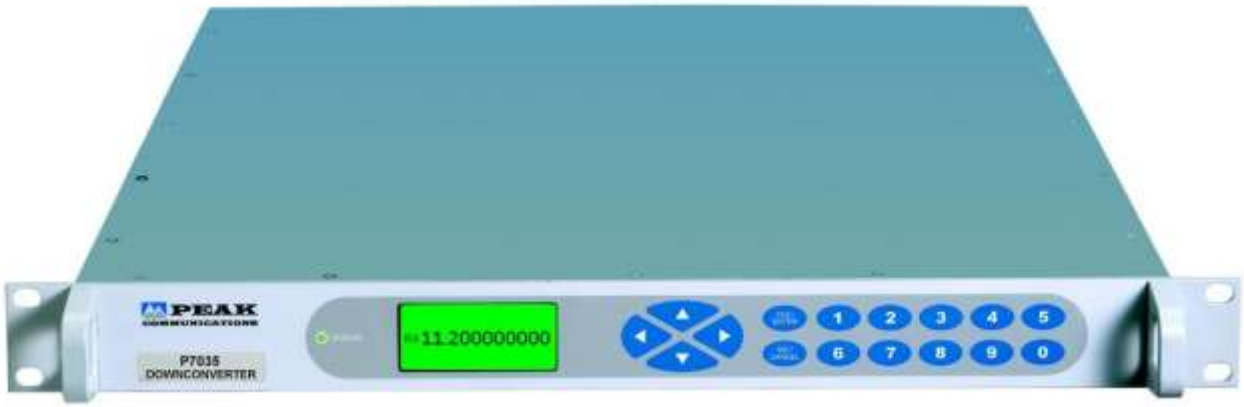
Interfaces to the P7035 Series of converters must be made with suitably screened connectors and double screened coaxial cable. Data cables must be double screened.

All 'D' type connectors must have grounding fingers on the plug shell to guarantee continuous shielding. The back-shells must comply to the requirements of VDE 0871 and FCC 20708, providing at least 40 dB of attenuation from 30 MHz to 1 GHz.

Installations which do not comply with this requirement will invalidate the EMC specifications.

1. INTRODUCTION

1.1 General product overview



P7035 KU-band DownConverter

This Manual covers the installation and operation of the P7035 frequency converters. A specification for the P7035 downconverter is incorporated in this manual but is not guaranteed to be the latest specification so please visit our website www.peakcom.co.uk for up to date specifications.

All P7035 series converters are housed in a 1U high 19" rack mount chassis and are designed to connect between a LNA, and provide an L band interface as required. The P7035 units are especially suitable for systems requiring an IBS and Eutelsat SMS compliant high stability low phase noise frequency converter for both data and analogue TV signals.

The P7035 units are under constant development and new features may not be included in this manual.

The P7035 series of converters will interface with the Peak CANBUS redundancy units for 1:1, 1:2 and 1:N systems (see RT1000 RT2000 and RCU1800 data sheets)

1.2 Functional description

The P7035 will down convert a Ku Band receive 10.95-12.75GHz signal to a frequency of 70MHz ± 18 MHz (or optionally 140MHz ± 36 MHz). The receive path features three stage frequency conversion and can be set to a frequency resolution of 1 Hz. The unit features a large graphic LCD display, membrane keyboard and menu driven software for control and configuration of the unit. The units have built in 1:1 and 1:2 redundancy control and can be remotely controlled via a RS232/485 port.

The P7035 is fully software controlled; there are no links or switches used to configure the unit. This enables all control and configuration to be programmed either locally or by remote control. All the configuration parameters are stored in non-volatile memory that will retain data for a minimum of 5 years with no power applied.

1.3 P7035 Specifications

This specification is provided to show typical values and explain the parameters involved. The specification may change so please refer to our website www.peakcom.co.uk for the latest up to date specifications.

1.3.1 Downconverter

Input	10.95-12.75GHz
Output	70 ± 18 MHz or option 140 ± 36MHz
Frequency resolution	1 Hz
Phase noise (dBc/Hz)	-73 @ 100 Hz; -76 @ 1 kHz; -85 @ 10 kHz; -93 @ 100 kHz; -110 @ 1 MHz
Group delay	Linear 0.025nS, Parabolic 0.015nS/MHz^2 , Ripple 1nS p-p.
Conversion gain	30 to 60dB step size 0.1dB
Gain flatness	± 1.5 dB full band, ± 0.5 dB, across any 36MHz in band
1 dB comp. point	Output +10 dBm, Input -30 dBm
Output spurious	<-60 dBm(in band non carrier related), <-60 dBc in band (in band carrier related)
L band output monitor	10dBc ±3dB
Noise Figure	20dB nominal @ maximum gain

1.3.2 General

Reference frequency	Internal 10 MHz frequency trimmed by software
External reference input	Selectable 5 or 10MHz
Stability	1 second <5 x 10^{-11}, ageing <7.5 x 10^{-8} per yr, 5 x 10^{-10} per 12 hrs
Mechanical	1U stainless steel chassis - 534mm deep, weight approx 8kg dependant on options
Environmental	Operating temperature range -10 to 50^0C
Compliance	EMC to EN 55022 part B and EN 50082-1, safety to EN 60950

Power supply	Autoswitching 100 to 120VAC and 200 to 240VAC
Remote Control	RS 232/ RS 485 port
Redundancy features	In-built 1:1 and 1:2 redundancy controller and CANBUS® for 1:N system

1.4 Review of P7035 Specification parameters

1.4.3 Downconverter Output

70 ± 18 MHz or option 140 ± 36MHz
As above for an upconverter output, if the converter is set to input a frequency of 1200MHz then the centre frequency at 1200MHz will convert exactly to 70MHz (or 140MHz). If you input a frequency not exactly at the input frequency then the output will be similarly lower or higher by the same amount

1.4.4 Downconverter Input

10.95 – 12.75 GHz
Range of limit of input

1.4.5 Frequency resolution

1 Hz
Output frequency step size. On the LCD screen this is 0.000001MHz if the L-Band frequency is viewed or 0.000000001GHz if the SHF LO addition feature is switched on.

1.4.6 Phase noise (dBc/Hz)

-73 @ 100 Hz; -76 @ 1 kHz; -85 @ 10 kHz; -93 @ 100 kHz; -110 @ 1 MHz
At 100Hz away from the carrier the average relative intensity of the carrier in CW mode at that point is 73dB lower than the centre frequency

1.4.7 Group delay

Linear 0.025nS, Parabolic 0.015nS/MHz^2 , Ripple 1nS p-p.
The relative timing distortion imposed on a signal passing through the converter within the ± 18MHz band at 70MHz. This is due mainly to the internal filters. The group delay profile is described mathematically as follows
The linear function describes the straight line slope across the 36Mhz range. At 0.025nS over 36MHz the slope across the pass band calculates to 0.025x36=0.9nS. The parabolic function is a quadratic function and can be converted at any point to a linear function by multiplying the specification parameter by the square of the frequency offset. For example for a Parabolic specification of 0.015nS/MHz^2 at a frequency of 60MHz the offset is 10MHz (70-60). This can be expressed in the form of an actual delay by calculating (70-60) squared times 0.015nanoseconds which is 100x0.015=1.5nS. This figure is always positive and the corresponding frequency at 80MHz calculates in this example to the same figure of 1.5nS. Note that the group delay is defined for a 70MHz IF and the group delay for a 140MHz is considerably improved especially the parabolic function.

The ripple parameter defines the limits of the balance of the group delay distortion after the linear and parabolic functions have been subtracted. This distortion is not necessarily a sinusoidal waveform and is important when considering high symbol rates

1.4.9 Downconverter Conversion Gain

30 to 60dB ± 2dB min stepped 0.1dB
The gain of the converter can be set to have no gain at 0dB or a gain of 30dB. The finite gain set is specified to be within 2dB of the setting and the step size is 0.1dB. The tolerance of the step size is not specified but should not exceed 0.05dB per step.

1.4.10 Gain flatness

± 1.5 dB full band, ± 0.5 dB, across any 36 MHz in band
The slope and variation of power across L-Band should be within 2dB top to bottom but 1dB across any 36MHz

1.4.11 1 dB comp. point

Output +10 dBm, Input -30 dBm
The 1dB compression point is a finite point in the power scale where a 1dB input only gives 0.5dB increase in power. At full gain of +20dB the output stage of the unit will compress before the input stage and conversely at gains of less than 20dB the input stage will compress before the output stage. Note also the values specified are for total composite power and not single carrier.

1.4.13 Invert Spectrum

In a conversion process if the Local oscillator used is of higher frequency than the Input frequency then the output will be spectrum inverted. This means that the High Frequency side of an FM signal will come out at the Low Frequency side of the centre frequency. To decode a signal the decoder must know whether the signal is inverted and somewhere in the system there must be a mechanism to re-invert the signal.
A classical example is the 5.15GHz oscillator used in a C-Band LNB. To convert the 3.4 to 4.2GHz band to 950MHz to 1750MHz a 2.45GHz LO is the calculated frequency. Unfortunately this 2.45GHz LO gives a problem due to twice the LO mixing with the input to give an interfering signal (4.9-3.4=1.5). A 5.15GHz LO is therefore used to avoid this problem and consequently the L-Band to 70MHz converter (P7001) has to have INVERT enabled to preserve the spectrum. It is not normal to transmit inverted.

1.4.16 L band output/input monitor

Provides monitoring of the L-Band signal at 10dBc.
Cannot be used as an input.
3 band spectrum is available

1.4.17 Reference frequency

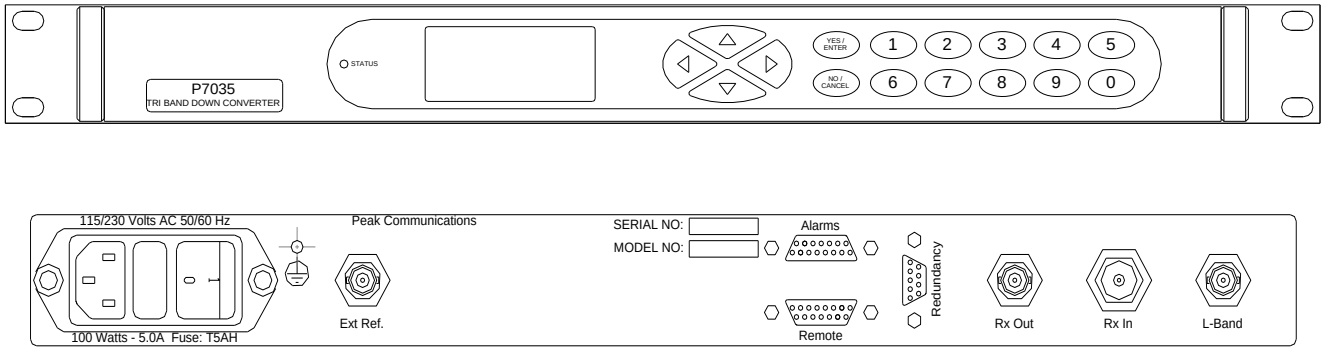
Internal 10 MHz frequency, trimmed by software.
Uses a high grade OCXO at 10MHz.
External reference input: Will accept either 5 or 10MHz.
Stability <5 x 10^{-11} per second, ageing <7.5 x 10^{-8} per yr, 5 x 10^{-10} per 12 hrs

1.5 Mechanical description

The P7035 Series of converters are housed in a 19 inch 1U high chassis, suitable for rack mounting. It is 534 mm deep and may be fitted with rack slides if required. Figure 2 shows views of the front and rear panels of the P7035 series Ku-Band Down converters.

At the front of the unit is the keyboard, LCD display and LED indicators. The operator is prompted by messages displayed on the LCD to enter data via the keyboard. In this way the P7035 may be configured for use, and the set up changed, if necessary. The LEDs provide a quick visual indication of the operational status of the unit.

FIG 1. Front and rear panel views



1.6 Front panel description

Keyboard

The keyboard is of the membrane type and is an integral part of the front panel assembly. The front panel overlay and is completely sealed against penetration of liquids but caution should be taken especially with solvents which may damage the front screen.
There are 16 keys in total - number keys in the range 0 to 9, YES/ENTER and NO/CANCEL and a 4 way arrow block of keys

LCD display

The backlit display is a graphic display and characters are scaled to incorporate as much information as possible on the screen. It provides detailed information about the status and configuration of the unit, and when appropriate, prompts the user to enter data via the keypad.

LED Indicator

Only one tricolour LED is present marked STATUS. This shows GREEN when the unit is OK, RED when an internal fault is present and AMBER when in STANDBY (Redundancy operation)

1.7 Rear panel description

All of the connectors necessary for the user to interface the P7035 series to other equipment are located at the rear of the unit. Depending on the model the connection may include some of the following

Receive IF	Marked RX Out for the downconverter and is always a BNC connector
Ku Band interfaces	Marked RX In for the downconverter and are always an N connector
L-Band monitor	Marked L-Band monitor and is always a BNC connector
External Reference	Marked Ext Ref and is always a BNC connector

Alarms, Remote Control, Redundancy All ‘D’ type connections

EC mains power connector/switch/fuse

The P7035 series of converters are designed to operate from a mains AC supply from 100 - 230 V AC. The Input connector incorporates a mains switch and 2 input fuses. Access to the fuses is also provided under the removable cover. ALWAYS REPLACE THE FUSE WITH ONE OF THE SAME TYPE AND RATING.

1.7.1 Chassis Earth stud

To provide the correct level of safety to the operator this must be connected to a suitable safety earth provided in the rack installation. See the Safety and EMC comments in section 1.

1.7.3 Rx In

On a Downconverter this is a 50 ohm N-type female connector. The input frequency should be in the range 10.95 to 1275GHz

1.7.5 Rx Out

This connector is a 50ohm BNC female connector. The output frequency should be within the range of 50 to 90 MHz (or 100 to 180MHz with the 140MHz option).

1.7.6 L-Band Monitor

The connector next to the RX IN is the 10dBc L-Band input monitor.

1.7.7 Ext Ref.

On the P7035 series of converters this is the input for the 10MHz station clock input. The internal reference is locked to this external reference.

1.7.8 Alarms connector

This is a 15 pin male 'D' type connector, which provides access to the various form 'C' relay contacts which indicate alarm conditions.

1.7.9 RS232/RS485 Remote Control connector

This is a 15 pin female 'D' type connector. The P7035 provides both an RS232 port for remote control, and an RS485 port for 'multi-drop' applications.

1.7.10 Redundancy

This is a 9 pin male 'D' type connector. The P7035 has a built-in 1:1 and 1:2 redundancy controller. A pair of P7035 units is required for correct operation plus R1000/2000 unit.

1.8 Fault philosophy

Fault conditions are divided into two categories;

a) MAIN UNIT COMMON FAULTS; Faults with internal items on a P7035 (Main power supply assembly etc).
b) DEVICE SPECIFIC FAULTS; Faults that are specific to the DownConverter assembly. These can include external fault inputs.

Most faults as shown below activate the summary ALARM on the unit, this will force a change-over if used in a normal redundant system.
The only fault that does not cause the unit to go into ALARM is the ‘External Mute’.
All faults shown below are reported on the front panel LCD and turn the tri-colour fault LED to red.

Green – No faults
Amber – Unit in standby
Red – Fault condition

The MUTED column shows if the output is muted when the ALARM is active.

MAIN UNIT COMMON FAULTS:

Fault Name	**MUTED**	**SUMMARY ALARM**
5 VDC Power Supply	Yes	Yes
+15 VDC Power Supply	Yes	Yes

-15 VDC Power Supply	Yes	Yes
+36 VDC Power Supply	Yes	Yes
Over/Under Temperature	Yes	Yes
Over Humidity	Yes	Yes
General Fault	Yes	Yes
100MHz Fault	Yes	Yes
Redundancy Coax Switch	Yes	Yes

DEVICE SPECIFIC FAULTS;
For the P7035 there are 1 set of device faults

DOWNCONVERTER;

Fault Name	**MUTED**	**SUMMARY ALARM**
Block Fault	No	Yes
+3 VDC Power Supply	No	Yes
DC Feed Power Supply	No	Yes
+5 VDC Power Supply	No	Yes
1st LO Fault	Yes	Yes
2nd LO Fault	Yes	Yes
Internal Block Fault	No	Yes
External Fault	No	Yes
Internal SHF Fault	Yes	Yes
External Mute	Yes	No

2. INSTALLATION

2.1 Care of Your Product

2.1.1 Handling

Single products, when fully packaged for transport can weigh in excess of 12kg's. When multiple Converters are to be delivered at the same time, to the same customer, occasionally two Converters are packaged in the same outer carton, the overall weight can then exceed 20kg's. Care must be taken when attempting to lift or carry these packages.
The shipping carton is qualified for transit of these products and has been used successfully for many years. It will protect against shock and vibration encountered during normal carrier transportation.
PLEASE RETAIN ALL PACKING MATERIALS, including the foam insets. Should the unit need to be returned, return to the address on the front of the manual USING THE ORIGINAL PACKING CARTON, unless it has been seriously damaged.
Avoid subjecting the packaged or unpackaged product to severe shocks.

2.1.2 Unpacking and Inspection

When the product is first received, the outer pack should be inspected for signs of damage. If damage to the outer pack is evident, contact the Carrier immediately and submit a damage report. The equipment should then be removed and inspected for signs of damage, retaining all packing materials. Any visible signs of damage to the equipment should be reported immediately to Peak Communications (electronic photo's of the pack and equipment can help with any subsequent insurance claims). If the equipment appears undamaged, it should be tested for correct operation and again any abnormalities reported to Peak Communications.
When first removing the product from its transit pack, take care to retain all documentation and associated hardware. These products are typically provided with the following items;

- P7xxx series product.
- Operation Manual.
- Test Results.
- Mains Lead (suitable for use in country of operation).
- Spares Kit.

If you suspect that any item is missing, please contact Peak Communications immediately.

2.1.3 Storage

Store the product in the normal horizontal orientation, in its outer carton until it is required for use. Do not use the products to support the weight of other items whilst in storage.

Storage temperature range is typically from -40°C to +80°C, avoid exceeding these extremes otherwise damage may result.

Avoid exposing the packaged or unpackaged product to extremes of humidity or moisture (including condensation). In the event that this does occur, the product

should be left at room temperature for in excess of 5 hours to dry naturally before application of prime power.

2.1.4 Cleaning & Maintenance

The product is designed to be installed and operated in a clean air environment. Apart from occasional cleaning of the front panel, no regular cleaning &/or maintenance is necessary.

Always ensure that the product is off-air and that the mains supply is isolated before attempting to clean the front panel. Cleaning of the front panel can be accomplished with a damp cloth. Do not use excessive amounts of water & do not use detergents or other cleaning agents without first consulting Peak Communications.

2.2 Mechanical Installation Considerations

2.2.1 Mounting

This product has been designed to mount in a standard IEC 19 inch racking system, but can also be used free standing or mounted in a standard IEC flight case.

The product is of standard 1U height (1.75 inch) and depth of 534mm (21 inches). Standard connector mating parts with cable bend radii, plus space to uncouple connectors, can add a further 80mm (3.15Inches) to this depth & should be considered when designing the installation.

The product is provided with standard 19 inch rack front panel fixing points, however these should not be solely relied upon to support the entire weight of the unit. Four (two on each side) additional M3 mounting points are provided along the sides of the unit, These can be used to support the unit from rack slide rails or other side support mechanisms, alternatively shelving brackets can be used to provide rest support for the units.

Cooling slots are provided on the sides of the unit, care should be taken to avoid blocking these when designing the installation (see Cooling section below).

When several products are to be mounted on top of one another in a rack system, they should not be stacked without individual support. Stacking of units without adequate mechanical support and isolation can degrade microphonic performance of the overall system and hamper maintenance activities.

2.2.2 Cooling

These products dissipate <100W internally and contain an internal forced air cooling system. Air intake and exhaust apertures are provided on the side panels of the chassis, care should be taken to avoid blocking these when designing the installation

Although these products have been designed to operate with a full rack packing density in an ambient of 50°C, for operational reasons it may be necessary to allow extra space if the unit is sandwiched between two longer chassis, or if the rack ambient increases above 50 degrees C. This will be necessary if adjacent equipments

transfer significant heat to the Converter surfaces, through either conduction or convection.

A thermal sensor is fitted to the unit which provides an over temperature alarm

2.3 Prime Power Supply & Connection

The safety notes provided in the product compliance section of this handbook should be read before connecting this product to the mains supply.

This product can be operated from mains supplies of 100-132Va.c. or 200-230V a.c. (50/60Hz), the appropriate voltage range is automatically selected by the unit and requires no user intervention. The IEC standard mains inlet on the rear of the unit includes a double pole switch.

The typical power requirement of these units is <100W.

The equipment is classified in EN 60950 as ‘pluggable equipment, class A’ for connection to the mains supply, as such it is provided with a mains inlet cord suitable for use in the country of operation. In normal circumstances this will be of an adequate length for installation in the rack. If the mains cord proves to be too short, then any replacement must have a similar fuse type (if fitted) and be manufactured to similar specifications: check for HAR, BASEC or HOXXX-X ratings on the cable. The connector ends should be marked with one of the following : BS1636A (UK free plug 13 amp); BSI, VDE, NF-USE, UL, CSA, OVE, CEBEC, NEMKO, DEMKO, SETI, IMQ, SEV and KEMA-KEUR for the IEC 6 amp free socket. Schuko and North American free plugs must have similar markings.

The installation of the equipment and the connection to the mains supply must be made in compliance to local or national wiring regulations for a category II impulse over voltage installation. The positioning of the equipment must be such that the mains supply socket outlet for the equipment should be near the equipment and easily accessible or that there should be another suitable means of disconnection from the mains supply.

2.3.1 Fuses

The equipment is provided with short circuit fuse protection of both the Live and Neutral conductors, both fuses must be functional before the unit will operate.
The fuses are accessible from the rear of the unit and are fitted into the IEC mains inlet. To check or replace a fuse, switch off and isolate the mains supply before removing the fuse cover. If a replacement fuse is required, then an equivalent type and rating must be used. The fuse size is 5 x 20 mm, rated at 5A anti-surge (T5A).

2.3.2 Earthing

The equipment is designed to operate from a TN type power supply system as specified in EN 60950. This is a system that has separate earth, line and neutral conductors. The equipment is not designed to operate with an IT power system which has no direct connection to earth.
An external protective earth, providing protection against RF and transient currents, should be connected between the rear panel earth stud (adjacent to the prime power inlet point and fitted with an M4 nut) and a local system earth point.

2.4 Other Interface Connections

2.4.1 Ku-band Connections

These are provided on the rear panel and have the following characteristics;

Converter Type	Connection Type	Panel Label	Impedance
DownConverter	N-type (F)	Rx In	50Ω

The use of high quality cables and connectors for input signals is strongly recommended. Cables and connectors should be rated for operation up to 12.75GHz. Care should be taken when handling these cables, avoiding stress to connections, tight bend radii and damage from sharp objects, all of which can degrade system performance.

2.4.2 L-band Monitor Output Connections

These are provided on the rear panel and have the following characteristics;

Converter Type	Connection Type	Panel Label	Impedance	Notes.
DownConverter	BNC (F)	L-Band	50Ω	Monitors L-band Input from conversion stage.

Monitor signal levels are typically 10dBc ±3dB.

2.4.3 IF Connections

These are provided on the rear panel and have the following characteristics;

Converter Type	Connection Type	Panel Label	Impedance	Notes.
DownConverter	N-type (F)	Rx Out	50Ω	Optional 75Ω impedance.

The IF input frequency should be within the range 50 to 90 MHz (100 to 180MHz with the 140MHz option).

2.4.4 External Reference Input Connections

These are provided on the rear panel and have the following characteristics;

Converter Type	Connection Type	Panel Label	Impedance	Notes.
All	BNC (F)	Ext Ref.	50Ω	Accepts 5 or 10MHz.

2.4.5 Alarms Interface Connection

This is provided on the rear panel and is a standard ‘D’ type 15-pin (M). The connections provide access to the various form 'C' relay contacts which indicate alarm conditions.

For P7035 the 2 independent relays are controlled together

A pin configuration is given below;

Unit fault (1) COM	1	9	Unit fault (1) N/O
Unit fault (1) N/C	2	10	Ext. Alarm (2)
Ext. Mute (1)	3	11	Ext. Alarm (1)
Unit fault (2) COM	4	12	Unit fault (2) N/O
Unit fault (2) N/C	5	13	Not used
Ext. Mute (2)	6	14	Not used
Not used	7	15	GROUND
Not used	8		

Note : N/O indicates 'normally open' in the non fail state, with STATUS LED Green.

2.4.6 Remote Serial Communications Interface (RS-232/RS-485)

This is provided on the rear panel and is a standard 'D' type 15-pin (F). The units provide both an RS232 port for simple two way remote control, and an RS485 port for asynchronous, 'multi-drop' remote control applications.

A pin configuration is given below;

RS485 Rx +	1	9	RS485 Rx -
RS485 Tx +	2	10	RS485 Tx -
Not used	3	11	Not used
Not used	4	12	Not used
Not used	5	13	Not used
Not used	6	14	GROUND
RS232 Rx In	7	15	RS232 Tx Out
Not used	8		

When using this product with the serial communications interface, a 120Ω bus termination should be fitted externally between the Rx + (pin 1) and Rx – (pin 9) connections of the 15-way ‘remote’ connector. If used in conjunction with other equipment on a multi-drop system, the bus termination is only required on one equipment, typically the furthest from the master device.

A screened cable, terminated to the back-shell of the ‘remote’ connector should be used to prevent RF interference from adversely affecting operation. When connecting the cable screen to the back-shell, ideally a full 360° contact should be made.

For short cable runs (up to 10m), a cable containing a twin twisted pair conductor arrangement is ideal. Typical conductor characteristics would be size 24 AWG, screened with an overall tinned copper braid. For cable runs above 10m, an insulated signal return connection should also be made.

2.4.7 Redundancy Interface Connector

This is provided on the rear panel and is a standard 'D' type 9-pin (M).

The redundancy interface is a standard feature of these units and can be easily configured so that the converters communicate with each other for 1:1 and 1:2 redundancy systems or with the Peak redundancy controller for 1:n redundancy systems. The units communicate using the CANBUS® interface system.

A pin configuration is given below;

Not used	1	6	GND
CANBUS® Low	2	7	CANBUS® High
GND	3	8	Tellback A
Power A	4	9	Tellback B
Power B	5		

3. EQUIPMENT OPERATION

The P7035, are L-Band based and have additional switched LO conversion stage for integration with Ku-band systems.

3.1 Menu structure overview

All facilities are accessed from the front panel, via the menu system. The remote control can interrogate the unit whilst the menu is in use.

The keyboard consists of 16 keys. The block of 4 arrowed keys are used for jumping to associated menus and moving along character strings.

The YES/ENTER is the general confirmation button and the NO/CANCEL is the general abort/step back button.

The 0 to 9 keys are used to set values or to select a menu option. Only one push of the number button is required to select an item

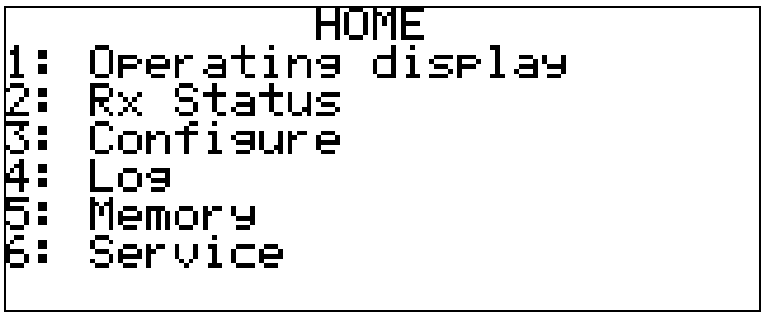
You can change the contrast on the screen by holding in the YES button and pressing arrow UP or arrow DOWN

A short audible beep designates a valid key and a short buzz an invalid key

3.1.1 LCD display contrast

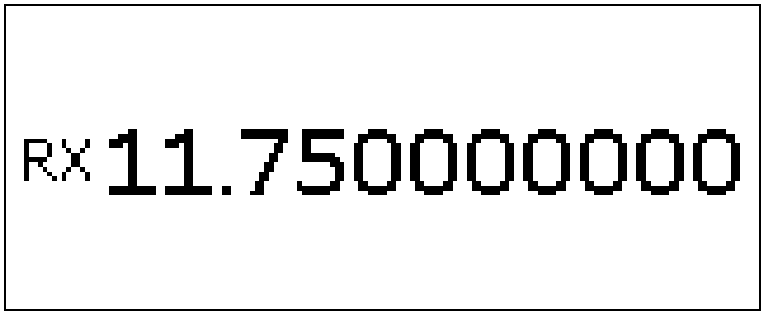
The contrast of the LCD can be changed via the front panel.
To change the contrast press and hold the YES/ENTER key, while holding down this key either press the UP arrow (to lighten the screen) or the down arrow (to darken the screen).

3.2 Home Menu



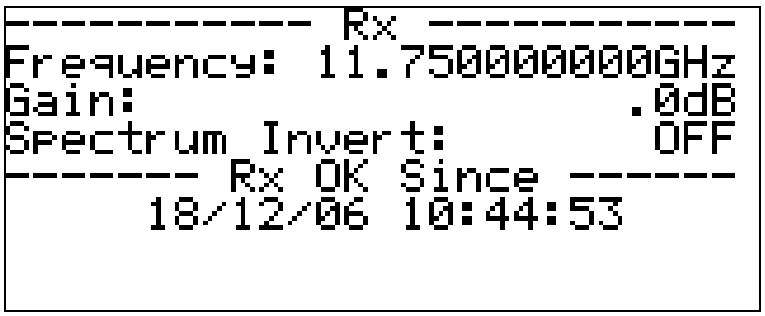
The HOME menu is the base menu from which to perform any function. For this manual to cover all models the following describes the basic operation of a P7035 and this is typical of all the equipment in the P7000 range. The HOME menu displays items which are particular to the converter being used .
There is also a ‘hidden’ SETUP menu that can be accessed by pressing key ‘9’ from this menu.

3.2.1 Operating display



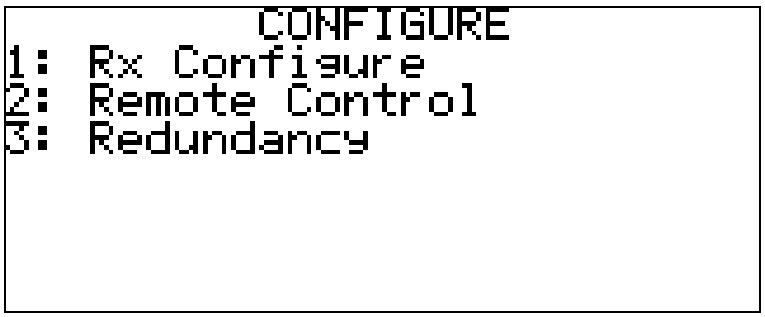
Displays the frequency of operation.

3.2.2 RX status



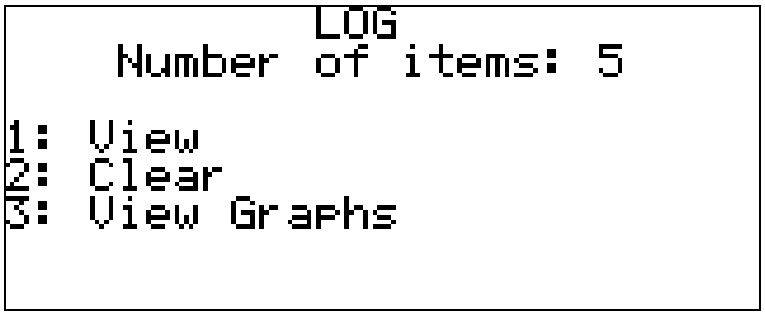
Displays frequency, Gain, Spectrum Invert, By using the left and right arrow keys when on the RX Status screen, the ‘general’ Unit status screen can be displayed. This gives an overview of the Software version, unit type, serial number, the presence of the summary alarm and external reference input, the local/remote RS232/RS485 setup details and redundancy settings, as shown below:

3.2.3 Configure



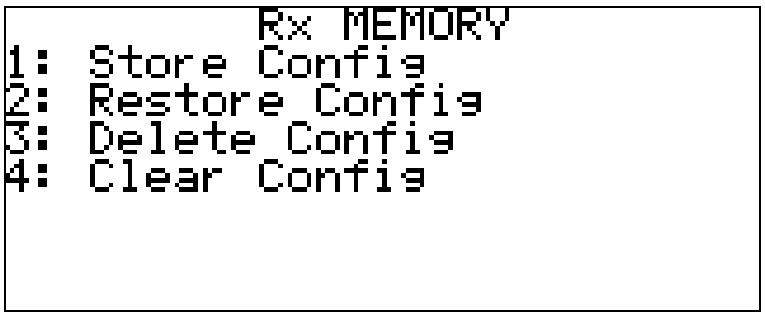
Select this option to change the set-up of the unit, especially frequency and gain.

3.2.4 Log



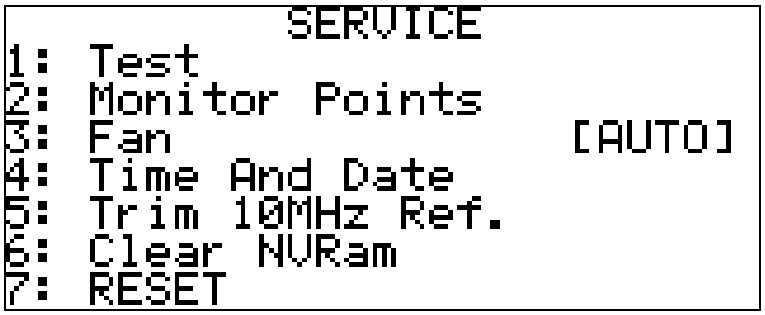
Event log of any errors or problems that have arisen.

3.2.5 Memory



Gives access to the stored user setups and gives ability to store the current setup

3.2.6 Service

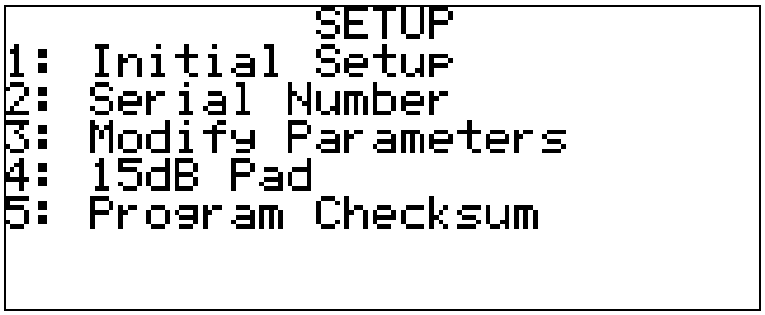


This menu is for maintenance personnel only and allows setting of the date and time, LOs inside the unit can be manually changed, fans switched on and off and the 10MHz internal reference frequency can be trimmed. This menu is factory set and it is not recommended that the user changes parameters within this menu without consulting the factory.

Fan:

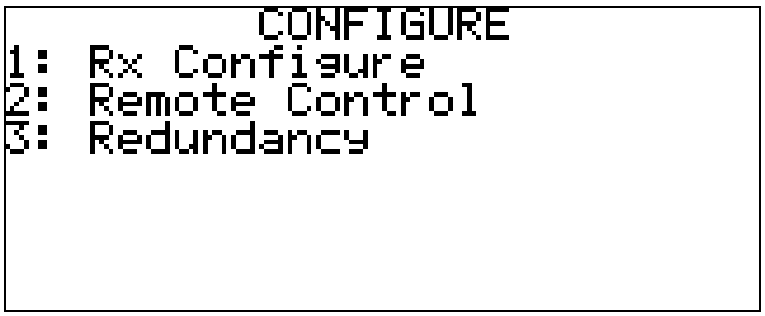
The P7035 series of converters are fitted with two fans. One fan operates all the time the prime power is applied the second fan can be set to [ON] [OFF] or [AUTO]. In auto mode the fan will operate when the unit internal temperature rises above the set point.

3.2.7 Setup



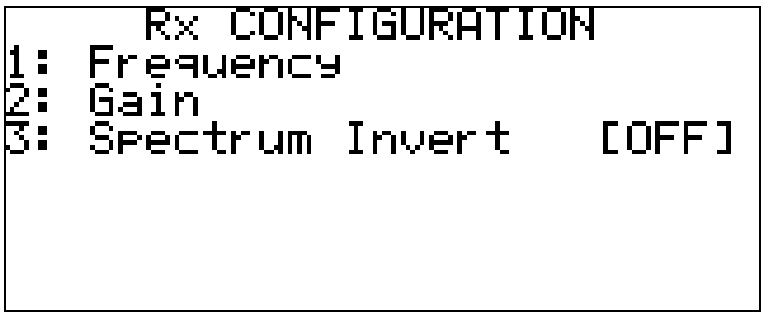
This menu is ‘hidden’ and is intended for maintenance personnel only. It allows setting of the unit type, serial number, modification of parameters & factory setup of the internal operation. This menu is factory set and it is not recommended that the user changes parameters within this menu without consulting the factory.

3.3 Configuration menu

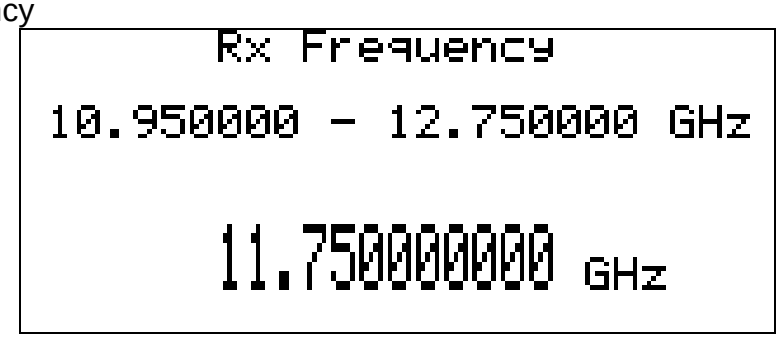


Selecting Configure from the HOME menu displays a new screen. On the configuration menu the following can be set up
RX configuration
Remote control
Redundancy

3.3.2 RX configuration

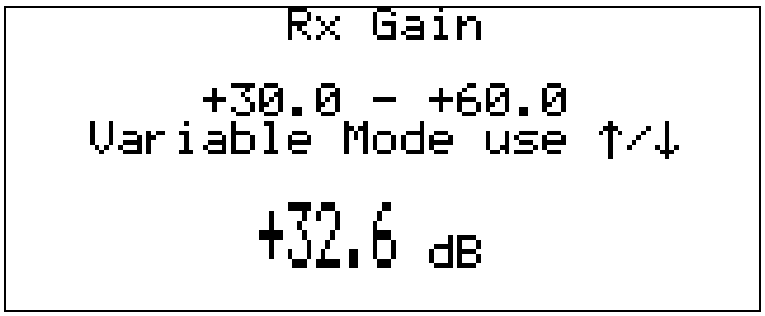


3.3.2.1 Frequency



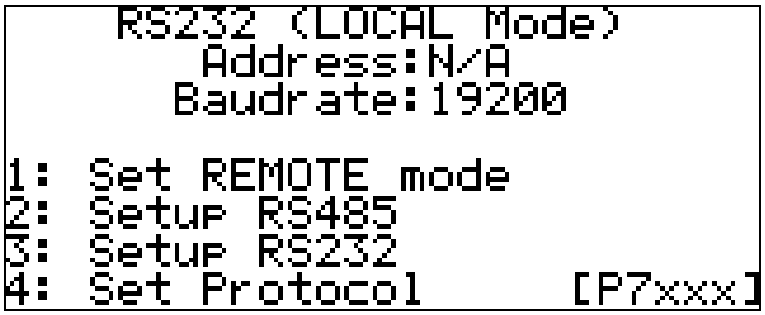
Pressing 1 takes you to a screen which shows the full allowable range and gives you a flashing cursor over the frequency. If the current number is invalid an out of range message is shown. Press YES/ENTER to change. You can press YES/ENTER at any time in input to leave remaining numbers unchanged.

3.3.2.2 Gain



Pressing 2 takes you to a screen showing current gain. You can enter a number on the keypad directly but if you press UP or DOWN you are in variable mode which increments or decrements the shown value by 0.1dB. The RIGHT and LEFT arrows allows you to highlight the +/- character and UP and DOWN will change the sign. The gain change is instant.

3.3.3 Remote Control

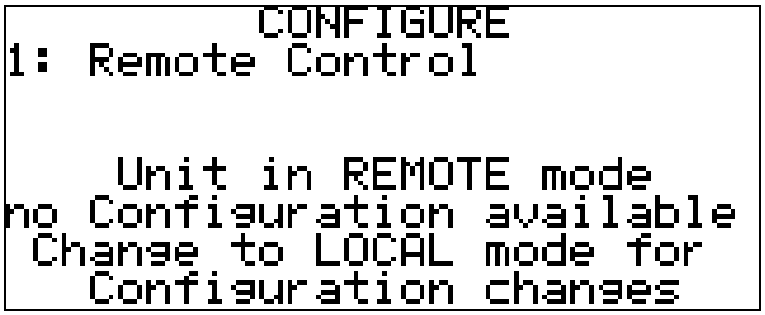


This screen provides access to all setup parameters for the remote interface.

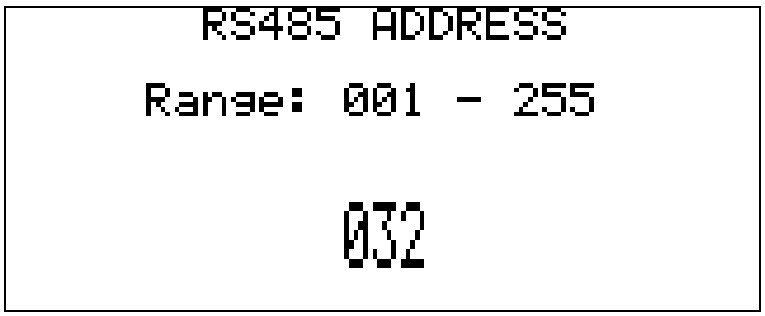
3.3.3.1 Set remote mode

Pressing 1 will toggle the unit into either local or remote mode.

Note: In remote mode only the redundancy option is available to be configured from the configuration menu via the front panel, if you try to access the configuration menu while in remote the screen shown below will be displayed.

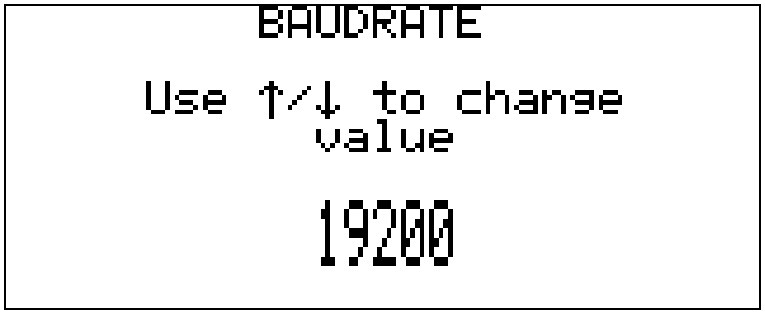


3.3.3.2 Setup RS485



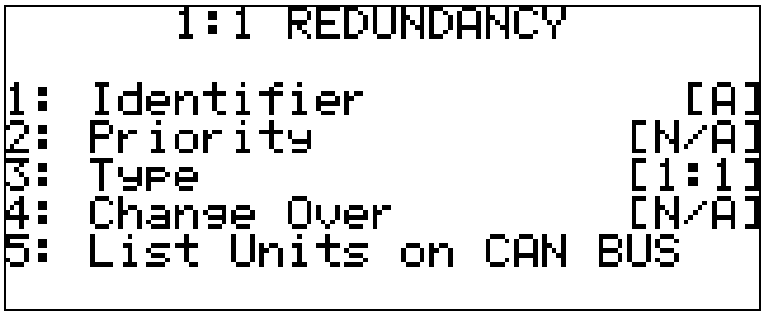
The RS485 bus address can be set by entering in the number using the numeric keypad.

3.3.3.3 Setup RS232



The baud rate of the serial communication can be set by scrolling up or down using the up and down arrows.

3.3.4 Redundancy



3.3.4.1 Indentifier

The identifier for each converter can be either [A] or [B] in a 1:1 redundant system or [A], [B] or [STANDBY] in a 1:2 system.

3.3.4.2 Priority

The priority of an individual converter in a redundancy system can be set via this option. The converter with the higher priority will command the standby if it alarms.

Note: Priority is not applicable [N/A] in a 1:1 redundancy system.

3.3.4.3 Type

The type of redundancy system that the converter is part of, is set by pressing 3 and scrolling through 1:1, 1:2 or 1:N

3.3.4.4 Change Over

This sets the converter to be either an online unit or offline (standby) unit.

3.3.4.5 Mode

Not available on current units.

3.3.4.6 List of units on CANBUS

This lists the converters that are connected to the CANBUS.

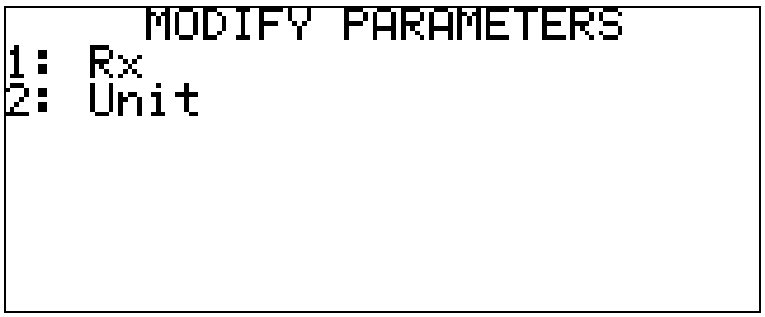
3.3.4.7 CANBUS for Passive Redundancy Systems

If a simple 1:1 ‘passive’ redundant system is required, the converter units can still be connected via the CANBUS interface. This will result in the units monitoring each other and the off-line unit un-muting if the on-line unit fails.

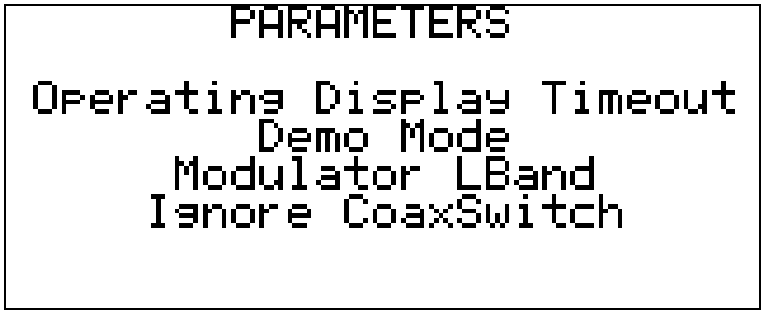
As a passive system has no tellback facility (from relay contacts), this normal feature has to be disabled to allow the passive redundant system to function correctly, this is done as follows;

From the HOME menu, press ‘9’ to access the ‘hidden’ SETUP menu.
Note; This menu and all sub-menus are factory set and it is not recommended that the user changes other parameters within this menu without consulting the factory.

From the SETUP menu, select the MODIFY PARAMETERS screen.



From the MODIFY PARAMETERS screen, select UNIT and a PARAMETERS screen will be shown.



Select IGNORE COAXIALSWITCH.

4. REAR PANEL CONNECTOR PINOUTS

4.1 Alarms

15 Way D type male with connections as follows

There are 2 independent relays controlled together designated (1) and (2) as follows. Important note : N/O means 'normally open' in the non fail state with STATUS LED Green

Unit (1) = Tx, Unit (2) = Rx for a P7035 unit

Unit fault (1) COM	1	9	Unit fault (1) N/O
Unit fault (1) N/C	2	10	Ext. Alarm (2)
Ext Mute (1)	3	11	Ext Alarm (1)
Unit fault (2) COM	4	12	Unit fault (2) N/O
Unit fault (2) N/C	5	13	Not used
Ext Mute (2)	6	14	Not used
Not used	7	15	GROUND
Not used	8		

4.2 Remote

15 Way D type Female with connections as follows

RS485 Rx +	1	9	RS485 Rx -
RS485 Tx +	2	10	RS485 Tx -
Not used	3	11	Not used
Not used	4	12	Not used
Not used	5	13	Not used
Not used	6	14	GROUND
RS232 Rx In	7	15	RS232 Tx Out
Not used	8		

5. REDUNDANCY

The P7035 series of frequency converters interface with the Peak CANBUS redundancy system for 1:1, 1:2 and 1:N redundancy systems.

5.1 1 for 1 Redundancy (switched & passive)

For 1:1 switched redundant operation a pair of P7xxx units is required along with an R1000 for receive applications and for Transmit applications a T1000 is required, for full P7035 transmit and receive applications a RT1000 is available.

In use, the redundancy type on the configure / redundancy menu is set to 1:1 and one unit is set to identifier “A” and the other to identifier “B”. The R/T1000 is connected to the rear panel 9 way connector with the supplied cables and the units will self detect and set one unit to online and the other will be set to standby. A changeover will be caused by an alarm detected in the online unit or changeover (keypad 4) being selected, this will result in the configuration of the online unit being taken over by the standby and then the standby will take over the RF path, making itself the online unit.

If a simple 1:1 ‘passive’ redundant system is required, the converter units can still be connected via the CANBUS interface. This will result in the units monitoring each other and the off-line unit un-muting if the on-line unit fails.

As a passive system has no tellback facility (from relay contacts), this normal feature has to be disabled to allow the passive redundant system to function correctly. To perform this task please refer to ‘redundancy’ in the ‘equipment operation’ section.

5.2 1 for 2 Redundancy

For 1:2 switched redundant operation a Trio of P7xxx units is required along with an R2000 for receive applications and for Transmit applications a T2000 is required, for full P7035 transmit and receive applications a RT2000 is available.

In use, the redundancy type on the configure / redundancy menu is set to 1:2 and one unit is set to identifier “A” and the other to identifier “B” and the third set to “Standby” the R/T2000 is connected to the rear panel 9 way connector with the supplied cables and the units will self detect. A changeover will be caused by an alarm detected in an online unit or changeover (keypad 4) being selected, this will result in the configuration of the online unit being taken over by the standby and then the standby will take over the RF path, making itself the online unit. Priority can be set on paths A and B, so that if there is a second failure and this unit is set to a higher priority it will take control of the standby path, if both units are set to priority 1 then this function will be ignored.

5.3 1 for N Redundancy

For 1:3 to1:8 switched redundant operation the RCU1000 series of redundancy units are available, see data sheets for specifications.

9 Way D type Male with connections as follows

Not used	1	6	GND
CAN® Low	2	7	CAN® High
GND	3	8	Tellback A
Power A	4	9	Tellback B
Power B	5		

6. REMOTE CONTROL

The unit transmits and receives data serially in an asynchronous format using the standard ASCII character set. The serial data consists of message frames composed of the following message characters: STX, BYTE COUNT, DEVICE ADDRESS, INSTRUCTION, BODY, CHECKSUM, ETX. All characters are compulsory except for the message body. The presence of a message body is determined by the message type (INSTRUCTION). The total number of message characters in a message frame may range from a minimum of 6 to a maximum of 255.

The remote control follows the following protocol: (in byte form)

[STX] start of message character #02.

[B] char defining how many characters are in the message including the STX & ETX parts.

[A] **Address of unit**. Address ranges from ASCII character 001 to 255.

[I] **Instruction number.**
See List below

[MESSAGE]

Numerous characters from length 0 upwards.

[CHKSUM]

The checksum is used to verify the accuracy of the message frame. The checksum is defined as the summation of all the bytes in the message, ***beginning*** with the 3rd byte (DEVICE ADDRESS) and extending through the body of the message, ***ending*** with the last byte before the checksum. The total of the bytes is then ANDed with 255 so that the checksum is truncated to a single byte.

[ETX] End of transmission character #03

All message to and from the unit follow the above protocol with a character format of 8 data bits, one stop bit, no parity, baud rate 19200, 9600, 4800, 2400, 1200 or 300. Note that all numeric values are shown as decimal.

Instruction Number List: (in decimal)

To P7XXX unit	From P7XXX unit	Description
20		Requests Rx/Tx Status
	21	Responds with Rx/Tx Status
22		Requests Rx/Tx setting changes
24		Set Remote/Local Mode request
30		Requests the number of unread alarm log entries
	31	Responds with number of unread alarm log entries
32		Requests alarm log entry
	33	Responds with alarm log
34		Requests alarm log clear
36		Requests next unread alarm log entry
	37	Responds with next unread alarm log entry
40		Asks for the main Unit settings
	41	Replies with the Unit Settings
45		Requests redundancy status
	46	Responds with redundancy status
47		Requests redundancy changes

Instruction 20 (Rx/Tx Status Request):

Message Byte No.	Set Value / (example)	Length (bytes)	Description
1	02	1	STX
2	?	1	No of bytes in message
3	?	1	Address
4	20	1	Message instruction
5	(‘R’)	1	Device we are asking the information on: ‘R’ = Receive ‘T’ = Transmit ‘A’ / ‘B’ in a dual up/down converter.
6	?	1	Checksum
7	03	1	ETX

Instruction 21 (Rx/Tx Status Request Reply):

This message is based on a standard P7xxx message and as such some of the parameters are set as 'X's.

Message Byte No.	Set Value / (example)	Length (bytes)	Rx	Description
1	02	1	✓	STX
2	?	1	✓	No of bytes in message
3	?	1	✓	Address
4	21	1	✓	Message instruction
5	('R')	1	✓	Device we are asking the information on: 'R' = Receive 'T' = Transmit 'A' / 'B' in a dual up/down converter.
6	('10123456789' = 10.123456789 Ghz)	11	✓	Frequency in Hz The Frequency of the unit.
17	(' +0123' = 12.3 dB)	5	✓	Gain in 0.1dB steps Lband gain of the converter
22	('1')	1	✓	Spectrum Invert ON/OFF '0' = OFF '1' = ON
23	('X')	1		NOT USED
24	('X')	1		NOT USED
25	('X')	1		NOT USED
26	('X')	1		NOT USED
27	('XXXXXXXXXXX')	11		NOT USED
38	('X')	1		NOT USED
39	('X')	1		NOT USED
40	('XXXX')	4		NOT USED
44	('XXXX')	4		NOT USED
48	('0')	1	✓	Block fault '0' = OK '1' = FAULT
49	('0')	1	✓	3V voltage out of range fault '0' = OK '1' = FAULT
50	('0')	1	✓	DC Feed voltage out of range fault '0' = OK '1' = FAULT
51	('0')	1	✓	5V voltage out of range fault '0' = OK '1' = FAULT
52	('0')	1	✓	Fault 1: Rx : 1ST LO Fault
53	('0')	1	✓	Fault 2: Rx: '0' Fault not used yet '0' = OK '1' = FAULT
54	('0')	1	✓	Fault 3: Rx: 2ND LO Fault '0' = OK '1' = FAULT
55	('0')	1	✓	Block current Fault '0' = OK '1' = FAULT
56	('0')	1	✓	External Alarm Fault '0' = OK '1' = FAULT
57	('0')	1	✓	SHF Fault
58	('0')	1	✓	External Mute '0' = OK '1' = MUTED
59	('0')	1	✓	Internal PLO1 Fault '0' = OK '1' = FAULT
60	('0')	1	✓	Internal PLO2 Fault '0' = OK '1' = FAULT
61	('0')	1	✓	Internal PLO3 Fault '0' = OK '1' = FAULT
62	('0')	1	✓	Internal Coax Switch1 Fault '0' = OK '1' = FAULT
63	('0')	1	✓	Internal Coax Switch1 Fault '0' = OK '1' = FAULT
64	('23/12/02 12:34:56')	17	✓	OK Since time/date string, if there is a fault with this down/up part of

				the converter then the string is blank.
81	?	1	✓	Checksum
82	03	1	✓	ETX

Instruction 22 (Rx/Tx Reconfiguration Request):

The message body for this message is a truncated form of the Rx/Tx Status Request Reply (instruction 21)
i.e. no information after the SHF Gain I/P power parameter is sent.

Not all parameters have to be set, if the user doesn't wish to change a particular parameter then a number of 'x''s can be sent in the parameters place. Sending such data will make the unit ignore that particular parameter.
'x''s should also be sent in place of parameters that are not used by that particular unit type.

The unit MUST be in remote mode to allow reconfiguration of parameters via the remote control. Setting the unit in Remote mode can be done either by the front panel or remotely using the following command:

Instruction 24 (Set Remote/Local Mode):

Message Byte No.	Set Value / (example)	Length (bytes)	Description
1	02	1	STX
2	?	1	No of bytes in message
3	?	1	Address
4	20	1	Message instruction
5	('R')	1	'R' = Remote Mode 'L' = Local Mode
6	?	1	Checksum
7	03	1	ETX

Alarm Log message routines & Remote Interrogation of the Alarms log.
The unit will remember the number of new LOG entries that have been added since the user last requested LOG entry status.

If instruction 30 is sent, it will respond with the number of new LOG items since the last request.
Instruction 36 can be sent to get the list of currently unread LOG items, when there are no more unread LOG items the unit will respond with *!END!*.

Alternatively the user can ask for LOG item [n] using instruction 32.

Instruction 30 (Alarm Log Entry Status Request):

Message Byte No.	Set Value / (example)	Length (bytes)	Description
1	02	1	STX
2	?	1	No of bytes in message
3	?	1	Address
4	30	1	Message instruction
5	?	1	Checksum
6	03	1	ETX

Instruction 31 (Alarm Log Entry Status Response):

Message Byte No.	Set Value / (example)	Length (bytes)	Description
1	02	1	STX
2	?	1	No of bytes in message
3	?	1	Address
4	31	1	Message instruction
5	(‘010’)	3	No. of Log entries
8	(‘001’)	3	No of Log entries that are NEW since the last Log Entry Status Request.
11	?	1	Checksum
12	03	1	ETX

Instruction 32 (Alarm Log Entry Request):

Message Byte No.	Set Value / (example)	Length (bytes)	Description
1	02	1	STX
2	?	1	No of bytes in message
3	?	1	Address
4	32	1	Message instruction
5	(‘002’ = ask for log entry 2)	3	No. of the LOG entry to be returned
8	?	1	Checksum
9	03	1	ETX

Instruction 33 (Alarm Log Entry Response):

Message Byte No.	Set Value / (example)	Length (bytes)	Description
1	02	1	STX
2	?	1	No of bytes in message
3	?	1	Address
4	33	1	Message instruction
5	(“LOG Entry 001 of 124*Unit: +36V Fault*31.6V*23/12/04 12:23:45*”)	?	Details of the LOG message Should be the same as what is displayed on screen, each line is ended with a *. LOG entry number x of n* Unit: Fault type* Extra Fault details* Date and Time*
?	?	1	Checksum
?	03	1	ETX

Instruction 34 (Clear Alarm Log Request):

Message Byte No.	Set Value / (example)	Length (bytes)	Description
1	02	1	STX
2	?	1	No of bytes in message
3	?	1	Address
4	34	1	Message instruction
5	?	1	Checksum
6	03	1	ETX

Instruction 36 (Next Unread Alarm Log Item Request):

Message Byte No.	Set Value / (example)	Length (bytes)	Description
1	02	1	STX
2	?	1	No of bytes in message
3	?	1	Address
4	36	1	Message instruction
5	?	1	Checksum
6	03	1	ETX

Instruction 37 (Next Unread Alarm Log Item Response):

Message Byte No.	Set Value / (example)	Length (bytes)	Description
1	02	1	STX
2	?	1	No of bytes in message
3	?	1	Address
4	37	1	Message instruction
5	(“LOG Entry 001 of 124*Unit: +36V Fault*31.6V*23/12/04 12:23:45*”)	?	Details of the NEXT previously unread LOG message. Should be the same as what is displayed on screen, each line is ended with a *. LOG entry number x of n* Unit: Fault type* Extra Fault details* Date and Time* If no more unread LOG message the text sent back is “*!END*”
?	?	1	Checksum
?	03	1	ETX

Instruction 40 (Unit Status Request):

Message Byte No.	Set Value / (example)	Length (bytes)	Description
1	02	1	STX
2	?	1	No of bytes in message
3	?	1	Address
4	40	1	Message instruction
5	?	1	Checksum
7	03	1	ETX

Instruction 41 (Unit Status Request Reply):

Message Byte No.	Set Value / (example)	Length (bytes)	Description
1	02	1	STX
2	?	1	No of bytes in message
3	?	1	Address
4	41	1	Message instruction
5	(‘P7035 ’)	27	Type of unit this is: P7035, P7001 etc
32	(‘01234’ = Serial No 01234)	5	Serial Number
37	(’01.1234’)	7	Software Version Number
44	(‘0’ = OK)	1	Summary Alarm OK/FAULT ‘0’ = OK ‘1’ = FAULT
45	(‘0’)	1	+5V voltage out of range fault ‘0’ = OK ‘1’ = FAULT
46	(‘0’)	1	+15V voltage out of range fault ‘0’ = OK ‘1’ = FAULT
47	(‘0’)	1	-15V voltage out of range fault ‘0’ = OK ‘1’ = FAULT
48	(‘0’)	1	+36V voltage out of range fault ‘0’ = OK ‘1’ = FAULT
49	(‘0’)	1	Temperature out of range fault ‘0’ = OK ‘1’ = FAULT
50	(‘0’)	1	Humidity out of range fault ‘0’ = OK ‘1’ = FAULT
51	(‘0’)	1	External Reference fault ‘0’ = OK ‘1’ = FAULT
52	(‘0’)	1	100MHz fault ‘0’ = OK ‘1’ = FAULT
53	(‘0’)	1	Coax Switch Fault ‘0’ = OK ‘1’ = FAULT
54	(‘23/12/02 12:34:56’)	17	OK Since time/date string, if there is a fault with this down/up part of the converter then the string is blank.
71	(‘0’)	1	1:1 Status ‘0’ = Offline ‘1’ = Online
72	(‘0’)	1	Remote mode ‘0’ = Local ‘1’ = Remote
73	(‘0’)	1	External Reference ‘0’ = Off ‘1’ = On
74	?	1	Checksum
75	03	1	ETX

Instruction 45 (Redundancy Status Request):

Message Byte No.	Set Value / (example)	Length (bytes)	Description
1	02	1	STX
2	?	1	No of bytes in message
3	?	1	Address
4	45	1	Message instruction
5	?	1	Checksum
7	03	1	ETX

Instruction 46 (Redundancy Status Request Reply):

Message	Set Value /	Length	Description

Byte No.	(example)	(bytes)	
1	02	1	STX
2	?	1	No of bytes in message
3	?	1	Address
4	46	1	Message instruction
5	(‘1’)	1	Redundancy Type Configuration ‘1’ = 1 for 1 ‘2’ = 1 for 2 ‘N’ = 1 for N
6	(‘M’)	1	Redundancy Manual Mode ‘M’ = Manual ‘A’ = Auto ‘X’ = Units setup as 1 for 1 type
7	(‘0’)	1	Online Status ‘0’ = Offline ‘1’ = Online
8	(‘A’)	1	Unit Identifier ‘A’ or ‘B’ when in 1 or 1 configuration ‘A’ or ‘B’ or ‘S’ when in 1 or 2 configuration
9	(‘1’)	1	Unit Priority ‘X’ when in 1 for 1 configuration or if units are selected as standby ‘1’ or ‘2’ when in 1 for 2 configuration
10	(‘A’)	1	Unit Online ‘A’ or ‘B’ when in 1 for 1 configuration. ‘A’ or ‘B’ or ‘S’ when in 1 for 2 configuration and the unit selected as standby otherwise ‘X’ ‘@’ means no redundant controller attached, unit online not known.
11	(‘1’)	1	Coax Switch Position ‘1’ or ‘2’ ‘@’ means no redundant controller attached , position not known
12	?	1	Checksum
13	03	1	ETX

Instruction 47 (Redundancy Change Request):

When a unit is in a 1 for 1 configuration only the “Unit To Go Online” parameter in the message below can be manipulated on either unit in the configuration.

When a unit is in a 1 for 2 configuration if the unit is selected as standby then all the parameters can be modified apart from the unit priority. However, if the unit is selected as either A or B, then only the priority can be changed for that particular unit.

Message Byte No.	Set Value / (example)	Length (bytes)	Description
1	02	1	STX
2	?	1	No of bytes in message
3	?	1	Address
4	47	1	Message instruction
5	(‘M’)	1	Redundancy Manual Mode ‘M’ = Manual ‘A’ = Auto
6	(‘S’)	1	Unit To Go Online ‘A’ or ‘B’ when in 1 for 1 configuration. ‘A’ or ‘B’ or ‘S’ when in 1 for 2 configuration and the unit selected as standby
7	(‘1’)	1	Unit Priority ‘1’ or ‘2’ when in 1 for 2 configuration ‘1’ .. ‘8’ when in 1 for n configuration
8	?	1	Checksum
9	03	1	ETX

APPENDIX 1 Terms and conditions of sale

Peak Communications Ltd

Terms and Conditions of Sale

1 Application of Terms and Conditions

The following terms and conditions shall constitute the entire agreement between Peak Communications Limited ("the Seller") and the purchaser of any goods or services ("the Customer) from the Seller. No contract shall be formed between the Seller and the Customer until the dispatch by the Seller to the Customer of the Seller's written acknowledgment of order. Unless otherwise expressly agreed in writing by the Seller, these conditions shall apply to all quotations and invoices given, orders received and accepted and contracts undertaken by the Seller. All prices quoted by the Seller are based upon these Conditions of Sale and reflect the limitations upon the Seller's liability which they contain. No modifications of these terms and conditions shall have effect unless agreed in writing by the Seller and shall not be affected by any documentation or communication from the Customer purporting to give effect to different terms and/or conditions.

2 Invoicing and Payment Terms

a) Unless otherwise expressly agreed in writing between the Customer and the Seller, the Seller shall be entitled to invoice the Customer for the price of goods on delivery of the goods, unless the goods are to be collected by the Customer (or their agent) or the Customer wrongfully fails to take delivery of the goods, in which event the Seller shall be entitled to invoice the Customer for the price at any time after the Seller has notified the Customer that the goods are ready for collection or (as the case may be) the Seller has tendered delivery of the goods.

b) Charges for services will be invoiced on completion of the services.

c) Where credit terms are allowed by the Seller to the Customer, the terms of payment of all invoices issued by the Seller to the Customer are, unless otherwise decreed in writing, to be paid net at the Seller's registered office within 30 days from the date of the invoice unless otherwise stated on the invoice and subject to condition (d) below. Where credit terms are not given by the Seller, a pro-forma invoice will be issued by the Seller and goods will be dispatched on payment.

d) Notwithstanding condition ©, the Seller shall without prejudice to its other rights, have the right by notice in writing to the Customer to demand immediate payment of all monies due from the Customer to the Seller for goods delivered at whatever time. The Seller also reserves the right to ask for a payment of a deposit before acceptance of an order.

e) The Seller reserves the right to charge interest on all or any sums not paid within 30 days from the date of invoice at the rate of 2% of the total invoiced amount for every period of 30 days (and pro rata for any part of a period of 30 days whether before or after judgment) from the due date of payment until the date of actual receipt of payment in full by the Seller.

f) The Customer shall indemnify the Seller against any loss or expense sustained or incurred by the Seller as a result of any change in currency exchange rates or in exchange control or other governmental regulations by reason of or in connection with any failure on the part of the Customer to pay any sum payable hereunder within 30 days of the date of the invoice,

g) The Seller shall have the right to invoice the Customer for part delivery or provision of goods or services to the Customer notwithstanding the fact that other goods or services are to be delivered or provided to the Customer under the contract.

h) The Seller's rights under this paragraph (2) shall be exercisable in addition to all and any other rights the Seller may have under these Terms and Conditions of Sale.

i) All sums owing to the Seller to the Customer shall be paid in full without any objection, set off or counterclaim, save in respect of mutual debts and set off which cannot be excluded by reason of statute

3 Prices

a) The price of goods shall be the price ruling at the date of delivery unless otherwise stated on the quotation invoice, or previously agreed in writing by the seller. The prices are based on the costs of packing, documentation, insurance and any other costs incurred by the Seller, prior to dispatch from the Sellers works, but excludes all customs duties levies and freight charges.

b) All prices quoted in writing or by fax by the Seller to the Customer shall have a validity of 30 days unless otherwise expressly stated on the specific quotation. Thereafter the price must be revalidated in writing or by fax by the Seller to the Customer at the Customer's request.

c) The Seller reserves the right to alter its prices, its published terms of trade and its catalogue and other published material at any time and without prior notice.

d) The Seller reserves the right to alter its quoted prices during the course of a contract for the supply of goods or services in that contract to reflect changes in;
(i) VAT, Duty and other levies brought about by changes in governmental legislation.
(ii) Costs brought about by exchange rate fluctuations or changes in manufacturers' list price.
4 Specification
a) Goods are manufactured to the specifications as published within the Sellers documentation. Particular specifications not mentioned in the documentation will be quoted prior to order acceptance at the request of the Customer. Any specifications not agreed at acceptance of order will not form part of any contract or warranty claim.
b) If the goods are to be manufactured or any process is to be applied to the goods by the Seller in accordance with a specification submitted by the Customer, the Customer shall indemnify the Seller against all loss, damages, costs and expenses arising out of or in connection with or paid or agreed to be paid by the Seller in settlement of any claim or infringement of any patent, copyright, design, trade mark or other industrial or intellectual property rights of any other person which results from the Seller's use of the Customer's specification.
c) The Customer shall be responsible for stipulating the specifications of goods to be supplied by the Seller and the Seller accepts no responsibility where the Customer has incorrectly stipulated required specifications, where the specification stipulated is not suitable for the Customer's actual requirements. The Seller will however on request provide advice in relation to the suitability of different specifications of goods for the purposes identified by the Customer, although any such advice is provided for guidance only and the Customer accepts ultimate responsibility for the suitability for the Customer's actual requirements on the specification of the goods stipulated by the Customer. The Customer shall also have responsibility for ensuring that the capacity and performance of the goods are specified in its order and are sufficient and suitable for its purpose
d) The Seller reserves the right to make any changes in the specification of the goods which are required to conform with any applicable statutory or EC regulatory requirements or, where the goods are to be supplied to the Seller's specification, which do not materially affect their quality or performance.
e) The Seller reserves the right, if extra expense or nay increase in costs or overheads are incurred by the Seller as a result of modifications made at the Customer's request, the Customer's special requirements or instructions, or the failure of the Customer to supply drawings, plans, specifications or any other information whatsoever to enable to the Seller to proceed with the Contract, to increase the price by giving notice in writing of the amount of such increase to the Customer
f) Goods are manufactured and dispatched to comply with Customer's Order as interpreted by the Seller. Any costs for changes arising, due to interpretation of the order, are at the Customers expense.
g) At the time of acceptance of the specification submitted by the Customer the Seller will give an estimate of the risk involved in achieving the Customer Specification. If any deviation from the customers Specification is found during development and manufacture, the Customer will be informed within 7 days.
5 Title and Risk
a) Risk in the goods shall pass to the Customer when delivery is made to the customer or its agents, subcontractors or carriers except that, where the goods are to be delivered at the Seller's premises, risk in the goods shall pass at the time when the Seller notifies the Customer that the goods are ready for collection.
b) All the goods shall remain the sole and absolute property of the Seller until such a time as the Customer shall have paid to the Seller the agreed price together with the full price of any other goods the subject of any other contract with the Seller.
c) The Customer acknowledges that the Customer is in possession of goods solely as bailee for the Seller until such time as the full price thereof is paid to the Seller together with the full price of any other goods the subject of any other contract with the Seller.
d) The Customer's right to possession of the goods shall cease if-.
(i) The Seller serves notice requiring that the goods be returned; or
(ii) In the case of an individual, he commits an available act of bankruptcy or proposes to enter into a voluntary arrangement with his creditors; or
(iii) In the case of a company:-
It is unable to pay its debtors for the purposes of S 123 of the Insolvency Act 1986; or a Receiver or Administrative Receiver is appointed; or a Petition for an Administration Order is presented or an Administrator appointed; or
The Customer proposes an informal arrangement with its creditors or a formal corporate voluntary arrangement; or
The Customer takes any step to enter into a voluntary liquidation, or if a Liquidator is appointed, or if a Petition for the winding up of the Customer is presented; or In the event that the Customer is not a

company incorporated in England, any event analogous to those specified above shall occur in relation to the Customer. Until such time as the Customer becomes the owner of the goods, the Customer will store them on his premises separately from the Customer's own goods or those of any other person and in a manner which makes them readily identifiable as the goods of the Seller.

e) If any of the events listed at d(ii) and (iii) above occur in relation to the Customer (or any parent of the Customer),or in the event that the Customer is not a company incorporated in England, any events analogous to those specified in d(ii) or (iii) occur, and then and in any such events or such events or sums due or becoming due by the Customer to the Seller shall forthwith and without notice immediately become due and payable in full. In addition, the Seller shall have the right at its discretion to decline to perform any contract in whole or in part then not performed by the Seller in whole or in part without prejudice to all and any of the rights it may have under the terms and conditions of sale.

6 Cancellation of Order

a) If the Customer shall fail to pay to the Seller on the due date any sum payable hereunder or shall exceed its credit limit or breach the terms upon which such credit has been offered or shall suffer any of the events listed in Condition 5d)(ii) (being an individual) or 5d)(iii) (being a company) the Seller may, without prejudice to its other rights, and without prejudice to the generality of Condition 2(d) demand immediate payment by the Customer of all unpaid accounts and, in addition, and suspend or cancel further deliveries and cancel this and any other contract between the Seller and the Customer without any liability attaching to the Seller in respect of such suspension or cancellation and debit the Customer with any loss sustained thereby.

b) The Seller will only accept a cancellation or postponement of any order by or on behalf of the Customer or any refusal to accept delivery if the Customer pays the amount specified by the Seller as representing its losses incurred thereby. Without prejudice to the generality of the foregoing the Seller will not accept cancellations of, and the Customer will be obliged at all times to purchase, materials which have already been manufactured or which have been modified or specifically purchased to meet the Customer's requirements. Any amount owing by the Seller to the Customer as a result of any properly cancelled order will be satisfied by the Seller issuing credit notes to the Customer to a value equal to the amount owing.

7 Insurance of Goods in Transit

a) The Seller will insure the goods for a total invoice price to the Customer if transport is agreement to be effected by the Seller or its agent. Where the Seller insures goods the liability of the Seller shall be absolutely limited to the amount if any received by the Seller under such insurance from its insurers from which a reasonable deduction may be made for administrative expenses.

b) If the Customer arranges transport either directly or indirectly through its agents the Customer must insure the goods against loss or damage on any account whatsoever.

c) The Seller shall not in any event be liable for any loss or damage to the goods whilst in transit or where the goods are transported by an outside freight carrier.

8 Delivery

a) Any time or date for the dispatch or delivery of goods for the completion of work whether specified in the Seller's quotation or otherwise given by the Seller shall be taken as an estimate made by the Seller in good faith but shall not be binding upon the Seller either as a term of the contract or otherwise. In no circumstances shall the Seller be liable for any loss or damage sustained by the Customer in consequence of failure to deliver within such time or by such date or in consequence of any other delay in delivery however caused.

b) Unless otherwise agreed in writing delivery shall be made in the case of sales within the United Kingdom at the premises specified by the Customer and, in the case of export sales, at the United Kingdom port of shipment specified by the Customer. Subject to Condition e) below the risk in the goods shall pass to the Customer upon delivery or, in the case of export sales, upon the goods leaving the Seller's premises.

c) The Seller may deliver the goods in instalments and invoice the Customer as if each instalment comprised a separate contract upon the terms of these Conditions of Sale.

d) The Seller does not accept any responsibility for failure to deliver or a delay in delivery where such failure or delay is caused by other suppliers or contractors upon whom the Seller is reliant to ensure a timely delivery.

e) If delivery of the goods is delayed or prevented by any act or omission of the Customer, the Seller may put the goods into storage at the Customer's risk and expense. Any redeliveries will be at an extra cost as specified by the Seller, and the Customer will indemnify the Seller in relation to any losses, claims, expenses or liabilities which the Seller suffers or incurs as a result of such delay or prevention (including in particular but without limitation liabilities to any third party suppliers).

9 Acceptance

a) Acceptance of delivery of the equipment by the Customer or its agent shall be conclusive evidence that the equipment was delivered in good operating condition and in all respects in accordance with the contract under which it was supplied and that it was fit for any purpose for which it may be required by the Customer.
b) Shortage claims or claims that goods are defective or otherwise not in accordance with the contract, will only be considered if the Seller receives written notification thereof within seven days of delivery failing which no liability will be accepted.

10 Warranty

a) Subject to the conditions set out below the Seller warrants that the goods will correspond with their specification at the time of delivery and will be free from defects in material and workmanship:
b) The Seller shall be under no liability in respect of any defect in the goods arising from any drawing, design or specification supplied by the Customer.
c) The Seller shall be under no liability in respect of any defect arising from fair wear and tear, willful damage, negligence, abnormal working conditions, failure to follow the Seller's instructions (whether oral or in writing), misuse or alteration or repair of the goods without the Seller's approval,
d) Notwithstanding the terms of sub-clauses (a) and (b) above, the Seller's liability in respect of all goods supplied by it but manufactured by third parties shall be limited to such warranty as shall be provided by the manufacturer to the Seller and the Seller shall have no further or larger responsibility whatsoever.
e) Where goods are returned by the Customer to the Seller or the Seller's agent for warranty or other repair or calibration the Customer shall be responsible for all costs (including freight, duties and insurance) of delivering the goods to the Seller or the Seller's agent and/or at the Seller's option the manufacturer and the return of the goods thereafter to the Customer.
f) All goods returned must have full documentation as to the reason for the return. The Seller reserves the right to charge for time checking equipment which has no faults.
g) All other warranties or representations in respect of the goods expressed or implied by or under statute or custom or trade usage are hereby expressly excluded.
h) The Seller's entire liability in respect of any claim for loss or damage arising from the supply of goods or services (including the proper use of goods by the Customer) shall be limited to sum's recovered under the Seller's liability insurance. Without prejudice to the foregoing, the Seller shall not be liable for any consequential loss or damage (including, without limitation, loss of profits and goodwill).

11 Provision of Services

a) Where the Seller provides personnel to the Customer, the Customer shall not, without the prior written consent of the Seller use such personnel to undertake any work which, in the Seller's opinion, is inappropriate to their qualifications and experience, or which is not directly connected with the services If services are to be provided for an indeterminate period, then they will continue until terminated by either party giving to the other (thirty days') prior written notice.
b) The Customer shall be deemed to have been granted a licence to use any program or material supplied by the Seller in performing services for the period during which the services are performed only. This licence shall not entitle the Customer to grant any sub-licence or to provide these programs or materials for use or copying by any third party.
c) The Seller warrants that all services will be performed with reasonable skill and care. The Seller will not be liable for breach of this warranty unless the Customer reports the breach to the Seller within 1 month of completion of the services.
d) The Customer agrees that during a period of 6 months after completion or termination of any service provided by the Seller, it will not solicit the employment or services of any employee of the Seller who has been working in connection with the provision of services to the Customer

12 Lien

The Seller shall have a general lien in respect of all sums due from the Customer upon all goods to be supplied to such Customer or upon which work has been done on the Customer's behalf and, upon 14 days' written notice to the Customer, may sell such goods and apply the proceeds towards the satisfaction of the sums due to the Seller.

13 Force Majeure

The Seller shall not be liable for any delay or failure in the performance of any of its obligation hereunder if the delay or failure is due to causes outside its reasonable control and the Seller shall have the right at its option (a) to suspend further performance of the Contract until such time as the cause of the delay shall be no longer present; or (b) to be discharged from further performance of liability under the Contract and if the Seller exercises such right, the Customer shall thereupon pay the Contract Price less a reasonable allowance for what has not been performed by the Seller.

14 Descriptive Leaflets, Catalogues and Illustrations

All descriptive leaflets, catalogues, illustrations, specifications, drawings and other particulars issued by the Seller are approximate only and shall not form part of any contract between the Seller and the Customer unless specifically stated in writing by the Seller.

15 Representation by Seller's Employees

The Seller's employees or agents are not authorised to make any representations concerning the goods or services provided under the contract unless confirmed by the Seller in writing. In entering into the contract the Customer acknowledges that it does not rely on any such representations which are not so confirmed.

16 Copyright

Copyright in all drawings, specifications, designs, descriptions and documents issued by the Seller to the Customer or other third parties shall be and remain the property of the Seller and no copies shall be taken without the prior written consent of the Seller.

17 Licence Grant

The Seller hereby grants to the Customer a non-exclusive, non-transferable licence to use any programs supplied by the Seller for internal purposes only for the duration of the services provided by the Seller and on the equipment identified by the Seller. Any other use is prohibited. Such programs may not be used to provide a service to a third party without the prior written agreement of the Seller and subject to such extended use charges as the Seller may require.

18 Severance

a) While the restrictions and exclusions of the Customer's rights whether express or implied by common law, statute, custom of the trade, course of dealing or otherwise, are considered to be fair and reasonable having regard to the circumstances known to and in the contemplation of the parties at the date hereof, it is recognised that certain of the restrictions and exclusions may become unfair and unreasonable due to unforeseen circumstances and accordingly it is hereby agreed that if any of such restrictions and exclusions shall be adjudged to be void but would be valid if part of the wording thereof were deleted the said restriction or exclusion shall apply with such modifications as may be necessary to make it valid and effective.

b) If any condition herein shall be deemed void for any reason whatsoever, but would be valid if part of the wording thereof were deleted the said condition shall apply with such modifications as may be necessary to make it valid and effective.

19 General

a) Any notice required or permitted to be given by either party to the other under these Terms and Conditions of Sale shall be in writing addressed to that other party at its registered office or principal place of business or such other address as may at the relevant time have been notified pursuant to this provision to the party giving the notice.

b) No waiver by the Seller of any breach of the contract by the Customer shall be considered as a waiver of any subsequent breach of the same or any other provision.

c) If any of the provisions of these Terms and Conditions of Sale is held by any competent authority to be invalid or unenforceable in whole or in part the validity of the other provisions of these Terms and Conditions of Sale and the remainder of the provision in question shall not be affected.

d) These Terms and Conditions of Sale shall be governed and construed in all respects in accordance with the Laws of England. The Customer hereby submits to the non-exclusive jurisdiction of the English Courts in relation to these Terms and Conditions of Sale and all matters falling to be determined hereunder or in connection herewith.