Installation and Operating handbook

P700 L Band Up/ Downconverter

(Covering P701 Downconverter and P702 Upconverter options)

Handbook Issue 3.1, Wednesday 27th November, 2001
Covering software versions V2.02 or later

CE 2001

EN 55022 CLASS B
EN 50082-1
EN 60950

PEAK COMMUNICATIONS Ltd.
Kirklees House, 22 West Park Street
Brighouse, West Yorkshire
HD6 1DU, England

Phone +44 (0)1484 714200
Fax +44 (0)1484 723666

IMPORTANT NOTE: THE INFORMATION AND SPECIFICATIONS CONTAINED IN THIS DOCUMENT SUPERSEDE ALL PREVIOUSLY PUBLISHED INFORMATION CONCERNING THIS PRODUCT

Table of Contents

1 INTRODUCTION

The P700 is a fully synthesised L Band frequency Upconverter and Downconverter. It is housed in a 1'U' high 19" rack mount chassis and is designed to connect between a Modem IF, and provide an L Band interface for an external, antenna mounted, L to SHF Block Up/Downconverter. The P700 is 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 P700 is available in three options; the P700, a full Up and Downconverter, the P701, a Downconverter only and the P702, an Upconverter only.

The P700 L Band Up/Downconverter can upconvert 70 MHz signals to the range 925 to 1525 MHz and downconverts L Band signals in the range 950 to 1750 MHz, to 70 MHz.

The frequency converter provides a high stability 10 MHz reference signal and a 16.5 V DC signal for both the transmit and receive paths to power the external Block Up and Downconverter. The P700 also includes an integral 1 for 1 redundancy controller and a full remote control capability via a selectable RS232/485 port. The P700 has a non volatile memory which allows the operator to store up to 10 transmit and 10 receive configurations.

This handbook covers the operation and installation of a P700 L Band Up/Downconverter. Users of the P701 Downconverter and the P702 Upconverter should read the appropriate sections relating to their equipment only. Note : The menu structures for the P701 and P702 will differ from the P700 as various sections of the transmit or receive menus will not be included.

2 DESCRIPTION

2.1 FUNCTION

The P700 will upconvert a 70 ± 20 MHz signal to a frequency within the band 925 to 1525 MHz and will downconvert signals within the range of 950 to 1750 MHz to 70 ± 20 MHz. Both transmit and receive paths feature two stage frequency conversion and can be set to a frequency resolution of 125 kHz. The unit features a large multi-character LCD display, membrane keyboard and menu driven software for control and configuration of the unit. The unit has a built in 1 for 1 redundancy controller and can be remotely controlled via a RS232/485 port. Figure 1 shows an overall block diagram of the P700.

The P700 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 3 years with no power applied.

2.2 MECHANICAL DESCRIPTION

The P700 is housed in a 19 inch 1'U' 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 P700.

At the front of the unit is the keyboard, LCD display, LED indicators, and a monitor port. The operator is prompted by messages displayed on the LCD to enter data via the keyboard. In this way the P700 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. The monitor port permits connection of a PC or serial printer to obtain a listing of the internal traffic log, or the unit's configuration.

2.3 EMC AND SAFETY

2.3.1 EMC

The P700 L Band Up/Downconverter has 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.

Operation of the equipment in a non standard manner will invalidate compliancy to these standards.

The equipment **MUST BE OPERATED WITH ITS LID ON AT ALL TIMES**. If it is necessary to remove the lid for routine servicing or fault finding then it is essential that the lid is fitted back correctly before normal operation.

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

Interfaces to the P700 at IF or L Band must be made with suitably screened connectors and double screened coaxial cable. Data cables must be double screened.

For the Alarm, 1 for 1 and Remote Control data interfaces 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 to this requirement will invalidate the EMC specifications.

2.3.2 Safety; Standards

To ensure safety of operator the P700 L Band Up/Downconverter has been designed to comply with the following safety standard;

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

Before operation the user must ensure that the installation complies with the information given in the environmental and installation section.

2.3.3 Safety; Environmental and Installation

Environmental

The equipment is designed to operate in a static 19 inch rack system conforming to IEC 297-2. Operation of the equipment in transportable vehicles equipped with the means of providing a stable environment is permissible. Operation of the equipment on board vehicles, ships or aircraft without means of environmental conditioning will invalidate the safety compliancy; please contact the factory for further advice. Operation of the equipment in an environment other than that stated in the specifications will also invalidate the safety compliancy. The equipment must not be operated above 2000 metre altitude, extremes of temperature; excessive dust, moisture or vibration; flammable gases; corrosive or explosive atmospheres.

Installation

The equipment is classified in EN 60950 as a 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 type fuse (if fitted) and be manufactured to similar specification: 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.

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.

Fig 1 Block diagram P700

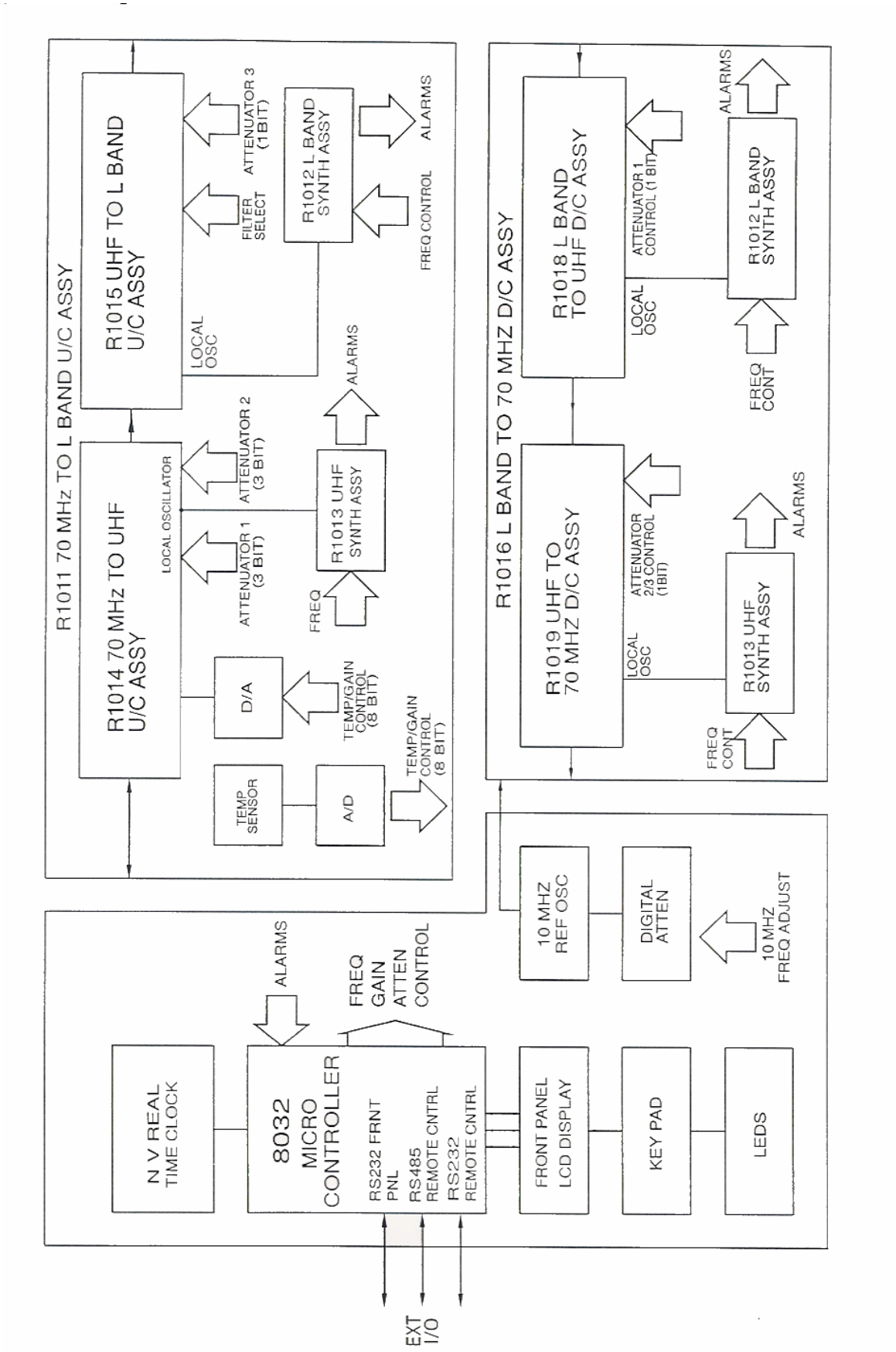
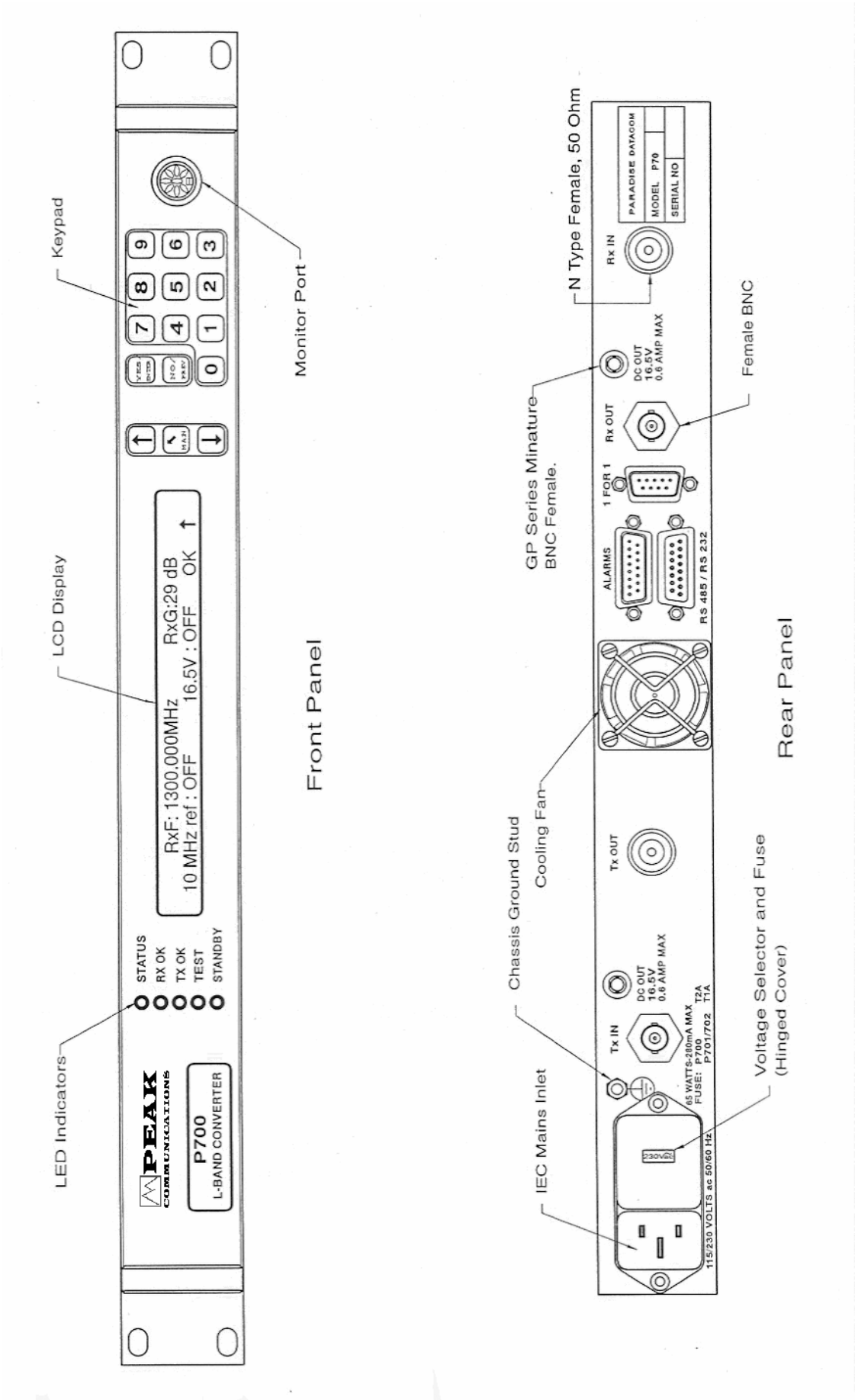


Fig 2 Front and rear panel views of P700



2.4 FRONT PANEL DESCRIPTION

Keyboard
The keyboard is of the membrane type (an integral part of the front panel), and is completely sealed against penetration of liquids. The keys provide audible feedback - the internal microprocessor recognises that the key has been pressed, and makes an audible 'beep'.

There are 15 keys in total - number keys in the range 0 to 9, an up arrow key (↑), down arrow key (↓), **MAIN** key, **YES/ENTER** key, and **NO/PREV** key.

LCD display
The backlit display provides 2 lines of 40 characters each which are extremely visible even in conditions of high ambient light. It provides detailed information about the status and configuration of the unit, and when appropriate, prompts the user to enter data via the keypad.

Monitor port
This 8 pin DIN connector permits access to the traffic log via a serial printer. Details are found in Appendix A.

LED Indicators
See section 2.6 (Fault Philosophy) for a definition of LED functions.

2.5 REAR PANEL DESCRIPTION

All of the connectors necessary for the user to interface the P700 to other equipment; Transmit and Receive IF and L Band interfaces to and from external SHF Blockconverters, Alarms, Remote Control, external 10 MHz and AC power are located at the rear of the unit.

From left to right, the rear panel connectors are:

IEC mains power connector/voltage selector/fuse
The P700 is designed to operate from a mains AC supply of either 115 V AC or 230 V AC. The IEC connector incorporates the voltage selector switch, and the setting is clearly visible on the body of the connector. Access to the fuse is also provided under this cover. **ALWAYS REPLACE THE FUSE WITH ONE OF THE SAME TYPE AND RATING.**

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.

Transmit DC Out
The 16.5 V DC output to the external SHF block upconverter is supplied from this miniature BNC female connector. Alternatively the 16.5 V DC supply may be output from the Tx output N type connector (see Appendix A for details).

Tx input
This connector is a 50 Ω BNC female connector. The input frequency should be within the range of 50 to 90 MHz and the input level range is -10 to -30 dBm.

Tx output
This connector is a 50 Ω N type female connector. The output frequency is within the range of 925 to 1525 MHz and the output level range is 0 to -20 dBm. This connector may also output a 10 MHz reference signal at a nominal 0 dBm and 16.5 V DC to drive the external SHF Block Upconverter.

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. Full details are provided in Appendix A and section 2.5.

RS232/RS485 Remote Control connector
This is a 15 pin female 'D' type connector. The P700 provides both an RS232 port for remote control, and an RS485 port for 'multi-drop' applications. Full details are provided in Appendix A.

1:1 Redundancy connector

This is a 9 pin male 'D' type connector. The P700 has a built-in 1 for 1 redundancy controller. A pair of P700 units is required for correct operation. Details of connections and switching philosophy are given in section 7.

Rx output
This is a 50 Ω BNC female connector. The output frequency will be within the range of 50 to 90 MHz and the output level range is -50 to -30 dBm.

Receive DC Out
The 16.5 V DC output to the external SHF block downconverter is supplied from this miniature BNC female connector. Alternatively the 16.5 V DC supply may be output from the Rx input N type connector.

Rx input
This connector is a 50 Ω N type female connector. The input frequency is within the range of 950 to 1750 MHz and the maximum composite input level is -20 dBm. This connector may also have a 10 MHz reference signal at a nominal 0 dBm and 16.5 V DC to drive the external SHF Block Down converter (see Appendix A for details).

2.6 FAULT PHILOSOPHY

Faults are split into two categories:

a) **UNIT FAULTS**: Equipment failures (such as a synthesiser lock failure).
b) **EXTERNAL UNIT FAULTS**: Failures in external equipment (such as SHF block converter).

A full description of every detected fault, its category (unit or external), and the corresponding action taken is provided in Appendix C - Fault/Action Table. In general unit faults will cause an alarm to be raised, and dependent on the severity of the fault, will either mute the unit or, if in a 1 for 1 pair, will cause a changeover to take place and the failed unit muted and placed in standby. External faults will be reported by the LCD and LED indicators but will not cause the relays to change over. LED indicators and fault relays respond to the varying fault conditions as follows:

LED INDICATORS (front panel)
Five LEDs on the front panel provide summary fault information, so that even when the LCD is unavailable for status display (such as when the operator is reconfiguring the unit, and a menu is

displayed), the current status can always be assessed. The Tx and Rx OK LEDs will only be operative if the unit is equipped with a transmit or receive path, otherwise they will remain unlit under all circumstances.

STATUS (red/green)	Green:	There are **no unit faults**
	Red:	A Tx or Rx **unit fault** exists.
RX OK (green/flashing/off)	Green:	Rx path is **OK** (there are no Rx faults).
	Flashing Green:	An external Rx **fault exists** External alarms, such as a faulty external Block Up/Downconverter are reported by the unit AND ARE TREATED AS A UNIT FAULT, THE Rx ALARM RELAY CHANGES OVER.
	Off:	A Rx path **fault** exists.
TX OK (green/flashing/off)	Green:	Tx path is **OK** (there are no Tx path faults).
	Flashing Green:	An external Tx **fault exists** External alarms, such as a faulty external Block Up/Downconverter are reported by the unit AND ARE TREATED AS A UNIT FAULT, THE Tx ALARM RELAY CHANGES OVER.
	Off:	A Tx path **fault exists**.
TEST (amber)	Amber:	Unit is in one of several test modes
STANDBY (amber)	Amber:	Unit is in standby (off-line) mode in a 1:1 pair

FAULT RELAYS (rear panel)
Three independent `form c` contacts indicate the units status to external equipment.

Rx unit fault:	A Rx path fault exists.
Tx unit fault(1):	A Tx path fault exists.
Tx unit fault(2):	A Tx path fault exists.

A further external Tx mute TTL input is available to allow external equipment to mute the TX path if required.

Full pin out details are provided in Appendix A.

3 SUMMARY OF SPECIFICATIONS

3.1 UPCONVERTER SPECIFICATION

Input frequency range	50 - 90 MHz
Input impedance/return loss	50 Ω, better than 18 dB
Input Connector type	BNC, 50 Ω, female
Output frequency range	925 - 1525 MHz
Output impedance/return loss	50 Ω, better than 14 dB
Group delay response	fc ± 5 MHz : 2 nS fc ± 10 MHz : 3 nS fc ± 15 MHz : 5.5 nS fc ± 20 MHz : 7.5 nS This ensures the unit is compliant with IESS 309 and IESS 306
Output connector type	'N' type female
Conversion gain	0 dB ± 1 dB min 29 dB ± 1 dB min Front panel selectable -0,3,6,9,10,13,16,19,20,23,26 or 29 dB
Gain stability	± 0.5 dB from 0 to 40^{0}C ± 0.1 dB per week, constant temp
Gain flatness	± 1 dB, 925 - 1525 MHz ± 0.5 dB, across any 40 MHz band within output frequency.
Recommended input levels	-10 dBm, absolute max -30 dBm, min
Recommended maximum output level	0 dBm
Recommended minimum output level	-20 dBm
Input 1 dB compression point	0 dBm
Output harmonics	better than -50 dBc
Output spurious	better than -55 dBc/4kHz (925 - 1525 MHz)
LO leakage at TX port	-35 dBc,(always out of band)
Frequency resolution	125 kHz

Output phase noise (when driven by a signal with phase noise 10 dB better than these figures)	-70 dBC/Hz @ 100 Hz -72 dBC/Hz @ 1 kHz -78 dBC/Hz @ 10 kHz -90 dBC/Hz @ 100 kHz -108 dBC/Hz @ 1 MHz
Internal reference frequency	10 MHz, ovenised crystal oscillator
Output frequency stability	± 5 x 10^{-8} from 0 to 40^{0}C (after 10 minute warm up period)
Reference aging	better than ± 1 x 10^{-7} per year
Reference phase noise	-90 dBC/Hz @ 1 Hz -120 dBC/Hz @ 10 Hz -135 dBC/Hz @ 100 Hz -145 dBC/Hz @ 1 kHz -145 dBC/Hz @ 10 kHz
10 MHz Reference output level (can be disabled via front panel)	0 dBm, nominal
Reference offset feature	Permits user to offset 10 MHz frequency ± 1.0 ppm via the front panel, in steps of 2 x 10^{-8} (corresponds to approx ± 2 kHz at L-Band)
Alarms	1st LO lock fail 2nd LO lock fail Power supply voltages out of limits
External Alarms monitor	TTL input, will monitor an external contact closure, or TTL level
External Tx mute	TTL input, will mute Tx path from external contact closure or TTL input
Fail relay	TX summary fail, Form C dry contact closure, 2 off.
Auxiliary DC output (for SHF converter can be disabled from front panel)	16.5 volts @ 0.6 amps, regulated (Fed through N type, or out of separate connector - GP Series - miniature BNC, female)

3.2 DOWNCONVERTER SPECIFICATION

Input frequency range	950 - 1750 MHz
Input impedance/return loss	50 Ω, better than 14 dB
Input connector type	'N' type female
Output frequency range	50 - 90 MHz
Output impedance/return loss	50 Ω, better than 18 dB
Group delay response	fc ± 5 MHz : 2 nS fc ± 10 MHz : 3 nS fc ± 15 MHz : 5.5 nS fc ± 20 MHz : 7.5 nS This ensures that the unit is compliant to IESS 309 and 306
Output Connector type	BNC, 50 Ω, female
Conversion gain	0 dB ± 2 dB min 29 dB ± 2 dB min Front panel selectable - 0,3,6,9,10,13,16,19,20,23,26 or 29 dB
Gain stability w.r.t temperature	± 1 dB from 0 to 40°C
Gain variation w.r.t frequency	± 1.5 dB, input in the range 950 -1750 MHz
Gain flatness	± 0.5 dB, across any 40 MHz band within input frequency range.
Noise Figure	24 db max (dependent on internal attenuator settings typically 16 to 20 dB).
Recommended composite input level	-20 dBm, absolute max
Recommended output level per carrier	-50 dBm max (matches P200/P230 requirement)
Input 1 dB compression point	-10 dBm
Frequency resolution	125 kHz
Output phase noise (when driven by a signal with phase noise 10 dB better than these figures)	-70 dBc/Hz @ 100 Hz -72 dBc/Hz @ 1 kHz -78 dBc/Hz @ 10 kHz -90 dBc/Hz @ 100 kHz -108 dBc/Hz @ 1 MHz
Internal reference frequency	10 MHz, ovenised crystal oscillator (see Up Converter specifications for details pertaining to the frequency reference)

10MHz Reference output level, Rx port (can be disabled via front panel)	0 dBm, nominal
Alarms	1st LO lock fail 2nd LO lock fail Power supply voltages out of limits
External Rx Alarm	TTL input, will monitor an external contact closure, or TTL level signal.
Fail relay	Rx summary fail, Form C dry contact closure
Auxiliary DC output (for SHF Converter can be disabled from Front panel)	16.5 volts @ 0.6 amps, regulated (Fed through N type, or out of separate connector - GP Series - miniature BNC, female)

3.3 COMMON SPECIFICATION

Mechanical	1U chassis - 534mm deep Membrane keyboard LCD display, 2 lines x 40 characters, backlit
Weight	P700 - 8.2 kgs (18 lbs) P701, P702 - 6.9 kgs (15 lbs)
Environmental	Operating temperature range 0 to 40^{o}C
EMC	Compliant to EN 55022 part B and EN 50082-1
Safety	Compliant to EN 60950 safety requirements
Power supply	115 volts ac ± 10 % 230 volts ac ± 10 % (switch selectable) 65 watts max (P700) 55 watts max (P701) 55 watts max (P702)
Cooling	Forced air - 1U high fan at rear - 60,000 hours MTBF on fan
Microcontroller	80537 - provides all monitor and control functions, including full event logging
Remote Control	For direct-to-PC applications, RS 232 port For multi-drop application, RS 485 port (Both supplied)
Redundancy features	1:1 redundancy controller built in

4 UNPACKING AND INSTALLATION

4.1 UNPACKING

Prior to unpacking, inspect the exterior of the shipping container for evidence of damage during transit. If damage is evident, contact the Carrier immediately and submit a damage report. Carefully unpack all items, taking care not to discard packing materials, particularly the moulded foam inserts. 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. This is the only approved shipping container for insurance purposes.

4.2 VISUAL INSPECTION OF EQUIPMENT

Once unpacked, visually inspect the unit for damage. The shipping carton in which the P700 is shipped has been used to ship products worldwide for a number of years. It has been shown, through experience, that it can withstand very rough handling. Therefore, if the equipment you receive is damaged, there can be no doubt that it has been subjected to abnormal or abusive treatment - please file a claim with the Carrier *immediately* and then contact the address shown on the front of the manual. Assuming, however, that the equipment has reached you in perfect condition, proceed with the installation of the equipment.

4.3 RACK INSTALLATION

The P700 is designed to be fitted in a standard IEC 19 inch rack. The unit must be provided with support in the rack from standard right angle chassis supports. It must ***not*** be fitted into the rack using only the front fixings for support.
The P700 is equipped with sufficient ventilation to operate at a 1 U packing density in an ambient of 40 °C. For operational reasons it may be necessary to allow 1 U extra space if the unit is sandwiched between two longer chassis or if the rack ambient increases above 40 °C. This will allow the operator space to the rear of the unit for maintenance and sufficient cooling of the unit.

4.4 SELECTING PRIMARY VOLTAGE

Please read the detailed requirements for the power supply type in the Safety and EMC section of the introduction. The P700 will operate on either 230 V or 115 V ac ± 10 %, 50/60Hz. The mains voltage must be selected first before mains is applied to the unit. NB This task is easier to perform before the unit is installed in the rack. To set the mains voltage ensure that the IEC mains lead is removed and open the fuse holder-voltage selector on the IEC mains inlet fitted at the rear of the unit. Remove the voltage selector and rotate until the correct voltage will be seen through the window in the holder. Replace the fuse holder-voltage selector.

4.5 FUSES

The P700 is equipped with both primary and secondary short circuit protection.
The primary circuit fuses are available from the rear of the unit and are fitted into the IEC mains inlet. Access to them is as described in the previous section. Note the P700 has fuses in both the live and neutral lines, both fuses must be functional before the unit will operate. The fuse size is 5 x 20 mm and the rating and type is 2 A anti-surge (2TA).
The secondary fuses are available only from inside the unit. If you suspect that one of these has blown the unit will have to removed from the rack. Once out of the rack, place on a suitable work bench and remove the 14 black cross head screws from the lid of the unit. Pull the lid free from the unit and place the lid and the screws in a safe place. The fuses can then be inspected to find which if any have blown. It will be necessary to remove the covers from the fuse holders for inspection. The faulty fuse must then be replaced with the correct value and type of fuse. All the internal fuses are of the TR5 European subminiature type. The fuses are mounted on two separate PCBs; fuses F1 to F4 on Q700 are 3.15 amp antisurge; fuse F1 on

Q703/Q703a is 1.0 amp antisurge.

4.6 POWER UP

At power up the unit performs an initialisation procedure which lasts approximately 3 seconds, it is normal for the unit to beep 3 times during this process. During the power-up phase the unit will display the equipment identification, the unit Serial Number and the software version fitted will be displayed. If the unit was previously operational, it will enter operating mode. If the unit was previously non-operational or the NV RAM has been cleared, then the main menu will be displayed but the unit will force the operator to enter the SETUP mode before any changes can be made. After SETUP has been run the user is strongly advised to select the change menu and set up further features such as remote control etc. **On initial power up the unit will report an external Tx / Rx fault (flashing green Tx / Rx LED). If external faults are not to be monitored use the supplied Alarm connector to inhibit this alarm**.

4.7 AUXILIARY L BAND OUTPUT

Optionally all P701 units can be fitted with an 'AUXILIARY L BAND OUTPUT' and is available at the BNC marked at the rear of the unit. The auxiliary L-Band signal output level is taken from a splitter located just after the P700 L Band input filter. The signal is 5 to 7 dB down on the signal received at the L Band input. When not in use a 50Ω BNC terminator should be fitted.

Also optionally all P702 units may be fitted with an 'AUXILIARY L BAND OUTPUT' and is available at the BNC marked at the rear of the unit. The auxiliary L-Band signal output level is taken from a splitter located just after the P700 L Band output filter. The signal is at the same level as the signal output at the L Band output. When not in use a 50Ω BNC terminator should be fitted.

5 EQUIPMENT OPERATION

5.1 MENU STRUCTURE

All facilities are accessed from the front panel, via the menu system. However, to configure the unit you do not need to know the menu structure, as selecting one option (explained later) will make the unit prompt for all needed parameters. The structure of the Menu tree is shown in Figure 3 on the next page.

The menus are provided as an operator guide. Once familiar with the unit, you do not have to wait for the menu to be displayed, it is possible to type ahead, there is a 25 key buffer.

The main menu can be accessed from any display with the **MAIN** key. It is from this main menu that all functions are selected.

Select: 1=Operate 2=Change 3=Setup
4=1:1 5=Log 6=Info 7=Memory

Main Menu

Whenever the `↓` or '↑' symbol appears it indicates that further information is available by pressing the **UP** or **DOWN** key.

The **NO** key functions as a back step key, both when entering numeric data, and when moving down the menus. The **YES** key doubles as an enter key.

When selecting a configuration parameter, the last setting is displayed in brackets. To select the same option again, just press the **YES** Key.

5.2 INITIAL EQUIPMENT CONFIGURATION

When a unit is shipped it will have a default configuration loaded in non-volatile memory. Unlike other equipment the P700 does not expect the user to be able to remember all the parameters that need setting, and provides a facility that prompts the user for all required parameters. ***SETUP*** takes the user through all the relevant configuration questions in turn.

Only when ***SETUP*** has been completed in full at least once will the unit allow the selection of ***OPERATE*** mode. ***SETUP*** is available by selecting ***SETUP (3)*** from the main menu.

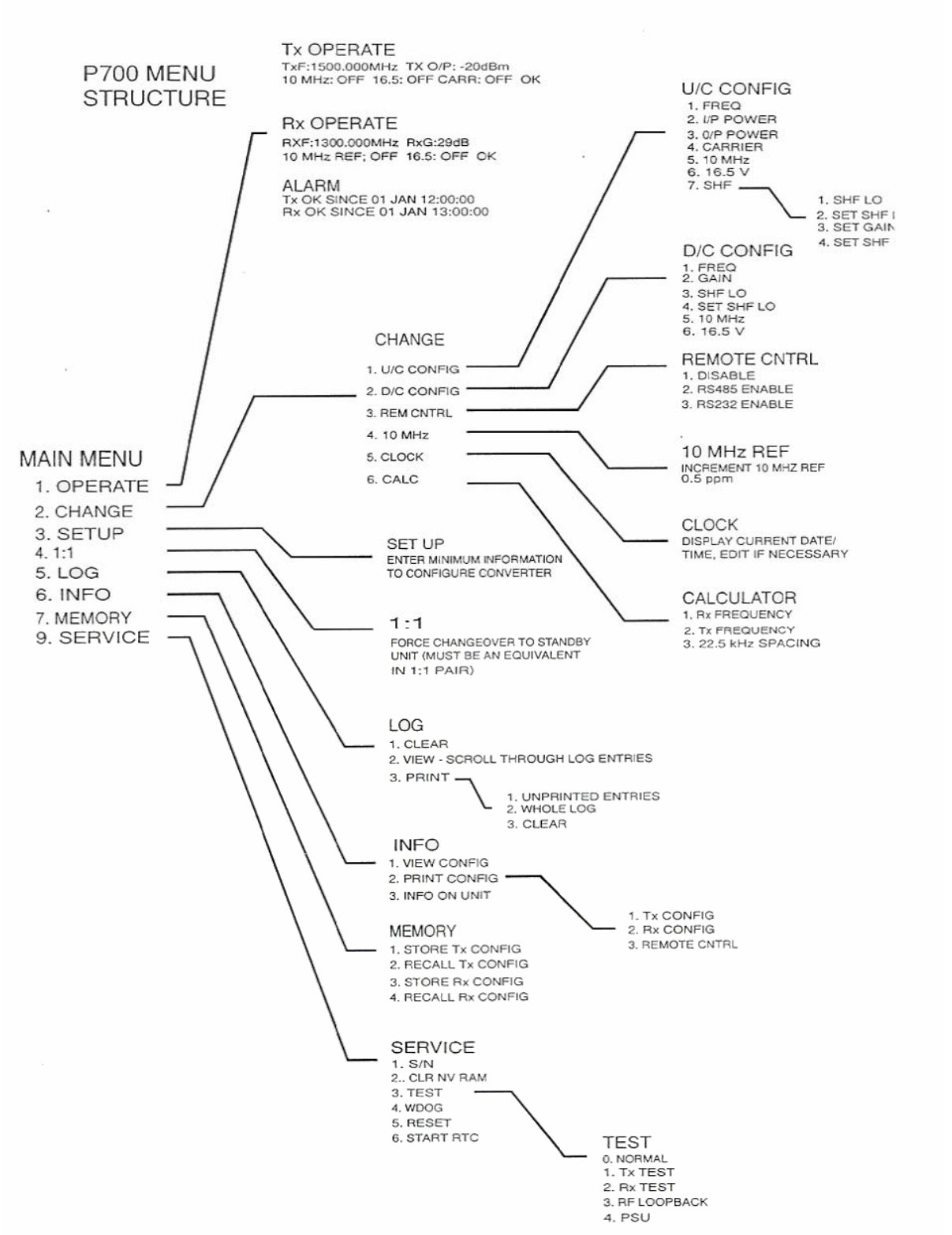
SETUP forces the user to set the following parameters (details will be shown in section 5.3 ***OPERATE***);

Upconverter	**Downconverter**
Transmit Frequency	Receive frequency
Transmit input power	Receive Gain
Transmit output power	10 MHz ON/OFF
Carrier ON/OFF	16.5 V ON/OFF
10 MHz ON/OFF	
16.5 V ON/OFF	

The final part of ***SETUP*** asks the operator how the LCD display is to be configured. There are two options : Option 1 gives the Alarm screen first and the Operate screen second. Option 2 gives the Operate screen first and the Alarm screen second. The second option provides the standard configuration for normal use, THE DISPLAY SELECTION IS ONLY AVAILABLE IN THE ***SETUP*** menu.

After ***SETUP*** has been performed once, minor changes to the configuration may be made with the ***CHANGE*** option from the main menu. ***CHANGE*** allows parameters such as remote control, SHF LO selection and other miscellaneous parameters to be set without going through the entire ***SETUP*** process.

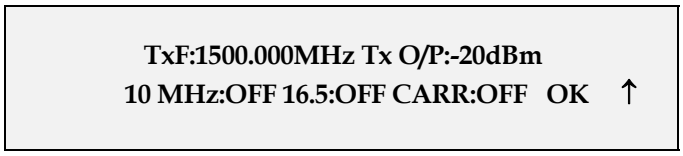
Fig 3 P700 menu structure



5.3 OPERATION

Selecting ***OPERATE*** from the main menu will display the following screens for the transmit and receive paths (unless a fault exists):

Transmit Operate screen

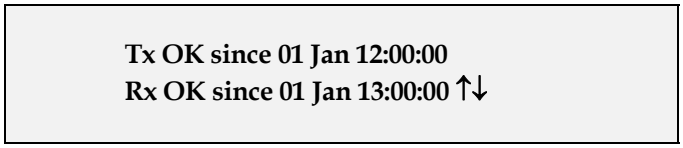


Tx Operate Screen

The top line of the transmit operate screen shows the output frequency and power. These are selectable from the ***CHANGE - U/C CONFIG*** menu and are self evident. The bottom line shows the status of the 10 MHz reference, the external 16.5 V DC, carrier status and the overall transmit path status. The options for these are also all selectable via the ***CHANGE - U/C CONFIG*** menu and are detailed below;

10 MHz reference status:	**ON**		10 MHz reference is ON and output via N type.
	:	**OFF**	10 MHz reference is OFF.
16.5 V DC status:	**ON**		16.5 V DC is ON and output to either the mini BNC or the N type.
	:	**OFF**	16.5 V DC OFF.
Carrier status	:	**ON**	Carrier is ON.
	:	**OFF**	Carrier is OFF.
Unit Status		**OK**	Upconverter path is OK
	:	**FLT**	Upconverter path has a fault
	:	**ExtFlt**	External Transmit path fault from SHF Block Upconverter etc.
	:	**REMOTE**	P700 unit is in Remote mode, unit is not configurable from front panel.

The ↑ arrow shown in the bottom right hand of the display indicates that another screen is available from the operate screen by pressing the ↑ on the keyboard. This will take you to the Alarm Screen. A typical screen is shown below;



Alarms Screen

This shows that the transmit and receive paths are OK since the date stated. NOTE this is not a current date. It will not be updated until the unit has a fault which is subsequently cleared.

Receive Operate screen

Rx Operate Screen

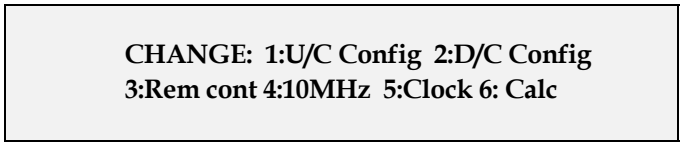
The top line of the receive operate screen shows the output frequency and gain, these are selectable from the ***CHANGE - D/C CONFIG*** menu and are self evident. The bottom line shows the status of the 10 MHz reference, the external 16.5 V DC and the overall receive path status. The options for these are also all selectable via the ***CHANGE - D/C CONFIG*** menu and are detailed below;

10 MHz reference status:	**ON**		10 MHz reference is ON and output via N type.
	:	**OFF**	10 MHz reference is OFF.
16.5 V DC status	**ON**		16.5 V DC is ON and output to either the mini BNC or the N type (factory selection option).
	:	**OFF**	16.5 V DC OFF.
Unit Status	:	**OK**	Downconverter path is OK
	:	**FLT**	Downconverter path has a fault
	:	**ExtFlt**	External Receive path fault from SHF Block Downconverter etc.
	:	**REMOTE**	P700 unit is in Remote mode, unit is not configurable from front panel.

The receive operate screen will also allow the user to switch to the alarms display in a similar fashion to the transmit operate screen.

5.4 CHANGING THE CONFIGURATION

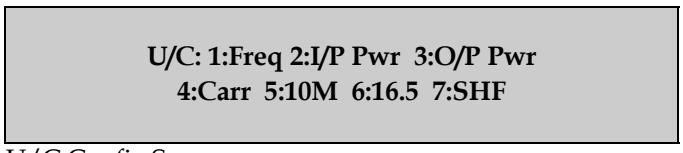
Once the unit has been through the ***SETUP*** and the unit is in ***OPERATE*** mode then the user can modify any of the P700 options through the ***CHANGE*** menu. The top level ***CHANGE*** menu is shown below, each option on the menu is then described in further detail on the following pages.



Change Screen

5.4.1 U/C Configuration

Selecting ***(1) U/C Config*** from the ***CHANGE*** menu displays the following screen:



U/C Config Screen

The following parameters can be changed:

Freq(1) The user will be prompted to enter the desired transmit frequency. At L Band this must be within the range of 925 to 1525 with a frequency step size of 125 kHz. Entering frequencies outside the band or outside the 125 kHz step size will cause the software to prompt the user to enter the correct frequency again. Once the correct frequency is entered pressing the **YES** key returns the display to the ***CHANGE*** menu. Mistakes can be corrected during the entry process by using the **NO/PREV** key.

If SHF LO is switched ON then the frequency input allowable is at the SHF frequency determined by the addition of the SHF LO frequency and the L band frequency. For example if an LO is set at 13.05 GHz the allowable input range will be 13.975 to 14.575 GHz

I/P Pwr(2)
O/P Pwr (3)

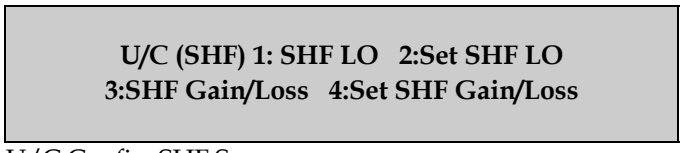
In both cases the user is prompted to enter a power level for the input and output levels of the upconverter path. Rather than setting the gain directly, this allows the Upconverter to internally set the optimum power levels within the unit which ensures that the unit will remain in specification. **Having set the input power level, overdriving the input by more than 2 to 3 dB will cause the unit to go out of specification**. The input to the converter will normally be from a data Modem or similar product and will have been set to a known output power level. The user is required to know this before setting the converter. The input and output power levels are set by using the ↑ and ↓ keyboard entry keys followed by the **YES** key,the software will then return to the ***CHANGE*** menu.

Carr(4) This prompts the user to switch the upconverted signal ON (2) or OFF (1) by pressing 1 or 2 on the keypad. The software then returns to the ***CHANGE*** menu.

10MHz(5) This prompts the user to switch the 10 MHz reference ON (2) or OFF (1) by entry of 1 or 2 on the keypad. The software then returns to the ***CHANGE*** menu.

16.5(6) This prompts the user to switch the 16.5 V DC to the external SHF Block Upconverter ON (2) or OFF (1) by pressing 1 or 2 on the keypad. The software then returns to the ***CHANGE*** menu.

SHF(7) Selection of this displays a further screen shown below;



U/C Config, SHF Screen

Use of the features on the SHF Config screen allows the user to manipulate the P700 LCD display to show the **overall SYSTEM frequency and output power levels**. This is achieved by selecting both the Local Oscillator frequencies of the external SHF Block Upconverter and the Gain/Loss between Upconverter output to antenna. The SHF LO frequency and Gain/Loss are added - subtracted to the L Band output frequency (not if SHF is ON) and power to obtain the System output frequency and power level. A modified ***OPERATE*** screen is shown at the end of this section showing the differences between the normal and modified display.

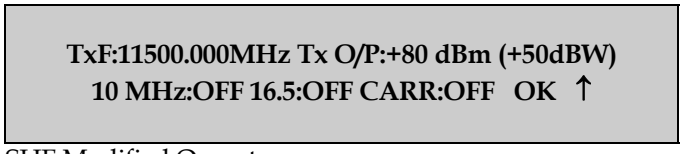
SHF LO (1) This allows the operator to select a SHF LO frequency (of the external SHF Block Upconverter), or by selection of User entry, a SHF LO frequency between 1.75 to 13.3 GHz. Entry is made by either selection of the fixed SHF LO frequencies (1 or 2) and the entering **YES**, or by selection of ***User (3)*** and then manual entry of the SHF LO followed by **YES**.

Set SHF LO(2) Having selected the correct external SHF block upconverter LO frequency selection of a 1 will switch the feature ON, and 0 cause the display to revert to L Band.

Gain/Loss(3) The user is prompted to enter the overall system Gain/Loss from the upconverter output to the antenna output. The display shows the final output power in dBm and dBW (EIRP) so the antenna gain may also be entered to obtain the system EIRP in dBW. The ***Gain/Loss*** is entered by first using the ⇖ key to toggle between Gain and Loss (a minus sign appears in loss mode) and then entering the value in dB followed by **YES**. The software then returns you to the ***SHF Config*** screen.

Set Gain/loss In a similar fashion to setting the SHF LO this switches the feature ON/OFF. Selecting a 1 switches the ***Gain/Loss*** ON, and 0 causes the display to revert back to normal.

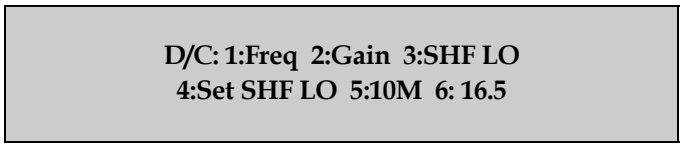
Selection of the ***SHF LO*** and ***Gain/Loss*** will cause the ***OPERATE*** display to be modified to show the System Frequency and Output power as shown below;



SHF Modified Operate screen

5.4.2 D/C Configuration

Selecting (2) on the ***CHANGE*** menu will cause the following screen to be displayed:



D/C Config change screen

The following parameters can be modified:

Freq(1) The user is prompted to enter the receive input frequency. At L band this must be within the range of 950 to 1750 MHz with a frequency step size of 125 kHz. Entering frequencies outside the band, or outside the 125 kHz step size, will cause the software to prompt the user to enter the correct frequency again. Once the correct frequency is entered pressing the **YES** key returns the display to the ***CHANGE*** menu. Mistakes can be corrected during the entry process by using the **NO/PREV** key.
If SHF LO is switched ON then the frequency input allowable is at the SHF frequency determined by the addition of the SHF LO frequency and the L band frequency. For example if an LO is set at 10.00 GHz the allowable input range will be 10.950 to 11.750 GHz. Note at C Band there is automatic frequency inversion for an LO of 5.15 GHz

Gain(2) Selecting the ***Gain*** function causes the software to prompt the user for a Gain value between 0 and 29 dB. The step size is set in software and is controlled using the ↑ and ↓ function keys on the keypad. The ***Gain*** display will roll over from 0 to 29 and vice versa allowing the user faster entry. Once the correct gain setting is chosen pressing **YES** will enter the number and cause the display to revert back to the ***D/C Change*** screen.

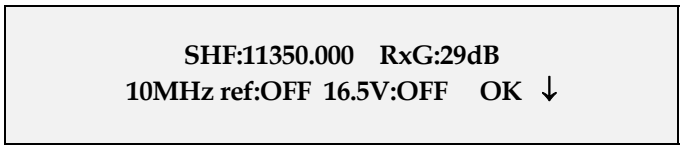
SHF LO(3) Use of the ***SHF LO*** feature allows the operator to manipulate the P700 LCD display to show the **overall SYSTEM Frequency**. It also allows the operator to select a **frequency inversion** which is necessary for C Band operation. This is achieved by selecting one of the available SHF Local Oscillator frequencies (of the external SHF Block Upconverter) and adding - subtracting from the L Band input to show the actual SHF Input frequency. A modified ***OPERATE*** screen is presented at the end of this section showing the differences between the normal and modified display.
On selection of ***SHF LO*** the user will be prompted to either select from one of three fixed Block Downconverter SHF LO frequencies or via ***User(4)*** to select a SHF LO frequency between 1.75 to 13.3 GHz. Entry is made by either selection of the fixed SHF LO frequencies (1, 2 or 3) and then entering **YES** or by selection of ***User (4)*** and then manual entry of the SHF LO followed by **YES**. If the user selects the 5.15 GHz option (3) the output frequency is inverted to compensate for the inversion generated in the external LNB. This can be easily checked upon in the system, increasing the L Band input frequency DECREASES the 70 MHz IF output frequency in this mode.

Set LO(4) Having chosen the correct external SHF Block Downconverter LO frequency, selecting 1 will switch the feature ON, and 0 cause the display to revert to L Band.

10MHz(5) Selection of this prompts the user to switch the 10 MHz reference ON (2) or OFF (1) by entry of 1 or 2 on the keypad. The software then returns to the ***CHANGE*** menu.

16.5(6) Selection of this prompts the user to switch the 16.5 V DC to the external SHF Block

Downconverter ON (2) or OFF (1) by pressing 1 or 2 on the keypad. The software then returns to the ***CHANGE*** menu.



D/C SHF modified operate screen

5.4.3 Remote Control

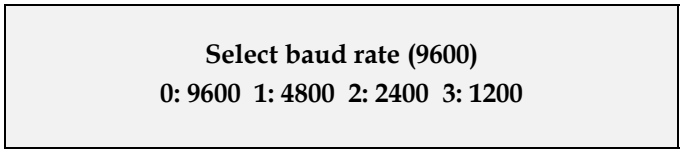
Selecting ***Remote Control (3)*** from the ***CHANGE*** menu displays the following screen:

Remote Control Configuration screen

The P700 has one remote control port which is software selectable between RS485 (for multi-drop systems) and RS232, for direct connection to a PC. This port cannot be set to both RS485 and RS232 simultaneously, and so the user is prompted to either enable RS485 or RS232, or to disable remote control entirely.

If the RS485 option is selected, the user will be further prompted to enter a unit address (in the range 1 to 255), so that each unit in a multi-drop application can be uniquely identified (if 0 is selected the RS485 is disabled). For further information, please see Appendix B.

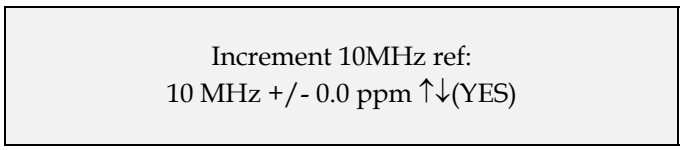
If either RS485 of RS232 remote control is selected then the user is prompted to select the Baud rate for the remote operation as follows:



Remote Control Baud Rate Selection

5.4.4 10 MHz reference

Selecting ***10MHz(4)*** from the ***CHANGE*** menu displays the following screen:

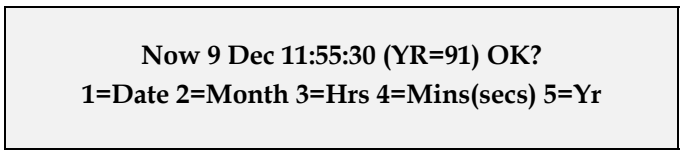


Change 10 MHz screen

The P700 allows the user to adjust the absolute frequency of the 10 MHz reference, and therefore the frequency of both the L Band Up and 70 MHz IF Downconverted signals. This allows the long term aging of the 10 MHz reference to be adjusted from the software. Control is made by pressing the ↑ or ↓ keypad buttons until the required adjustment has been made and then entering **YES**. The software will then return to the ***CHANGE*** menu.

5.4.5 Clock

Selecting ***Clock (5)*** from the ***CHANGE*** menu displays the following screen:

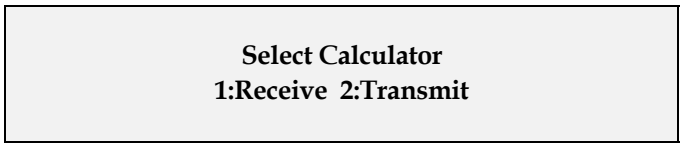


Real-time Clock screen

The P700 includes a real-time clock, so that events entered into the traffic log may be time-stamped. The clock is set using this menu. If the time displayed is OK, press the **YES** key.
If the time is incorrect, edit the appropriate parameters (1 to 5) until the display is OK, then press **YES**.

5.4.6 Calculator

Selecting ***Calculator(6)*** from the ***CHANGE*** screen displays the following screen:



Calculator screen

The calculator mode allows the operator to quickly check the final frequency **relative to the L Band input or output**. NOTE; the calculator option will not work unless the ***SHF LO*** has been selected and switched **ON**. If the user inputs a frequency outside of the current fc ± 20 MHz converter bandwidth the calculator screen will show an out of range message requesting an input within range.

Receive(1) On selection the user is prompted to enter the system SHF input frequency. This is entered by selecting the correct frequency via the keypad (remembering that **NO** will correct errors) and then entering **YES**. The software will then display the required SHF input signal, the L Band Input centre frequency and the resultant IF frequency.
As an example if the L Band input is set to 1075.000 MHz and the SHF LO selected is 10 GHz then for an SHF input frequency of 11075.000 the resultant IF will be centred at 70 MHz.

Transmit(2) Selecting transmit will cause the software to display a further screen requiring the operator to select either ***Tx frequencies(1)*** or ***Tx 22.5 kHz spacing(2).*** Selecting ***Tx frequencies(1)*** prompts the user to enter the input IF frequency and then provides the upconverted L Band and SHF frequency. As an example if the Upconverter is set to 1300 MHz, SHF LO set at 13050 MHz and the IF is set at 70 MHz then the resultant SHF signal will be at 14375.000 MHz.

Selecting ***Tx 22.5 kHz spacing(2)*** gives the user a means of setting the Upconverter (125 kHz step size) and Modem (22.5 kHz step size) frequencies together to meet the Intelsat IBS and Eutelsat SMS frequency planning requirements. For further details see Appendix D Intelsat and Eutelsat frequency assignments. On entry the display will prompt the user for the exact SHF frequency required. This is entered by using the keyboard, followed by **YES**. The display then shows the Modem IF, L Band Upconverter frequency and the resultant SHF frequency using the two previous values. This will be within 500 Hz of the required frequency.

5.5 TEST MODES

The Test menu is entered from the ***MAIN*** menu using a hidden Service menu. To obtain the service menu press 09 at the ***MAIN*** menu prompt and the display will change to the following screen:

SERVICE: 1:S/N 2:Clr NV RAM 3:Test
4:Wdog 5:Reset 6:Start RTC

Hidden Service screen

These features are used in servicing and testing the P700 and with the exception of Test(3) will not be explained in detail.

S/N(1) This is used to enter the serial number of the unit.

Clear NV RAM (2) The contents of the NV RAM with the P700 configuration are held in NV RAM. This allows the user to clear the contents with the exception of the clock.

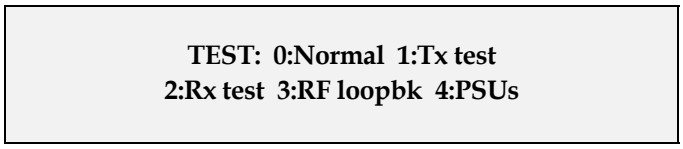
WDog(4) This tests the Watch Dog timer on the processor board. Operation of this will cause the unit to halt operation for a fixed time (approx 30 seconds) and then perform a reset.

Reset(5) This performs a software reset (a hardware reset may be executed by pressing SW1 on Q700 processor board).

Start RTC(6) After setting the real time clock in the ***CHANGE*** menu it may occasionally fail to start. This feature kicks the real time clock into action.

The Test mode of the P700 contains several features which will be of use to the operator for fault finding in the field, or testing the integrity of the unit. The test mode allows the user to modify local oscillator frequencies and gain stages separately, set up a RF loopback from IF to IF and finally to monitor the units internal power supplies.

Test(3) The menu displays the following screen on entering the ***TEST*** menu:



Test screen

The operation of each of these modes are described in sections 5.5.1 to 5.5.4.

5.5.1 Tx test

Entering ***Tx test(1)*** displays a further screen which prompts the user to select one of the following options;

ON ENTERING TEST MODE THE P700 CONFIGURATION IS STORED IN NV RAM. LEAVING TEST WILL FORCE THE P700 BACK TO ITS ORIGINAL CONDITION.

Normal(0) ***O***n entering certain test functions it is possible to modify frequency or gain. To ensure that the operator is aware of this fact, the amber TEST LED will be lit on the front panel. Selecting Normal(0) from the test screen resets the P700 back to its condition before entering ***TEST*** and switches the amber LED off.

1st LO(1) This allows the user to adjust the frequency of the 1st Local Oscillator without modifying any other parameters. The 1st LO is normally within the range of 688 to 692 in 125 kHz steps. Entry of the required frequency is made by using the keyboard (remembering that **NO** will correct errors), followed by **YES** to enter the number.NOTE: There are no frequency validation checks on the data input; make certain the LO is not set outside the limits shown.

2nd LO(2) This allows the user to adjust the frequency of the 2nd Local Oscillator without modifying any other parameters. The 2nd local oscillator is normally within the range of 1520 to 2120 MHz in 4 MHz steps. Entry of the required frequency is made by using the keyboard (remembering that **NO** will correct errors) followed by **YES** to enter the number. NOTE: There are no frequency validation checks on the data input; make certain the LO is not set outside the limits shown.

Att 1(3) The user can modify the value of the 1st attenuator (pre mixer), by using the ↑ and ↓ keyboard functions and then entering **YES**. NOTE : ADJUSTMENT FROM THE OPTIMUM SETTING WILL AFFECT THE SPURIOUS LEVELS FROM THE UPCONVERTER.

Att 2/3(4) This allows the operator to change the combined value of the 2nd and 3rd attenuator (post mixer), By using the ↑ and ↓ keyboard functions and then entering YES.
NOTE : ADJUSTMENT FROM THE OPTIMUM SETTING WILL AFFECT THE SPURIOUS LEVELS FROM THE UPCONVERTER.

Disp Att/ temp(5) The gain of the transmit chain of the P700 is temperature compensated using an external sensor, the input of which is linked to one of the A/D inputs of the processor. The microprocessor controls a PIN attenuator connected to one of its A/D outputs to close the loop and provide the necessary gain/temperature compensation. By selecting this function it is possible to show the internal temperature of the unit and the value of the attenuation at the PIN attenuator.

Log Att/ temp(6) Selecting this option modifies the operation of the log function, forcing it to log the temperature of the unit over a 24 hour cycle, noting the temperature every 15 minutes. The feature is switched off when the unit is taken out of test mode.

5.5.2 Rx test

Entering ***Rx test(2)*** displays a further screen which prompts the user to select one of the following options;

ON ENTERING TEST MODE THE P700 CONFIGURATION IS STORED IN NV RAM. LEAVING TEST WILL FORCE THE P700 BACK TO ITS ORIGINAL CONDITION.

Normal(0) On entering certain test functions it is possible to modify frequency or gain. To ensure that the operator is aware of this fact the amber TEST LED will be lit on the front panel. Selecting ***Normal(0)*** from the test screen resets the P700 back to its original condition before entering ***TEST*** and switches the amber LED off.

1st LO(1) This allows the user to adjust the frequency of the 1st Local Oscillator without modifying any other parameters. The 1st local oscillator is normally within the range of 1532 to 2312 MHz in 4 MHz steps. Entry of the required frequency is made using the keyboard (remembering that **NO** will correct errors), followed by **YES** to enter the number. NOTE: There are no frequency validation checks on the data input; make certain the LO is not set outside of the limits shown.

2nd LO(2) This allows the user to adjust the frequency of the 2nd Local Oscillator without modifying any other parameters. The 2nd LO is normally within the range 650 to 654 MHz in 125 kHz steps. Entry of the required frequency is made using the keyboard (remembering that **NO** will correct errors), followed by **YES** to enter the number. NOTE: There are no frequency validation checks on the data input; make certain that the LO is not set outside of the limits shown.

Att 1(3) The user can modify the value of the 1st attenuator which is a switchable 10 db attenuator. The user selects 1 or 0 to switch the attenuator in or out. NOTE : ADJUSTMENT FROM THE OPTIMUM VALUE WILL AFFECT THE UNIT 1 dB COMPRESSION POINT. EXCESSIVE INPUT SIGNAL LEVELS WITH NO INPUT ATTENUATION MAY DAMAGE THE UNIT. TAKE CARE WHEN SELECTING 0 dB ATTENUATION.

Att 2(4) This allows the operator to change the value of the 2nd attenuator (post mixer). By using the ↑ and ↓ keyboard functions it is possible to cycle through all available values. NOTE : ADJUSTMENT FROM THE OPTIMUM VALUE WILL AFFECT THE 1 dB COMPRESSION

POINT OF THE DOWNCONVERTER PATH.

5.5.3 RF Loopback

RF loopback is a self validation function. With the addition of a L Band loopback cable and 30 dB attenuator between the Tx output and Rx input operation of the complete chain can be checked.

RF loopbk
(3) Selecting this feature prompts the user to connect the Tx output to the Rx input with a 30 dB attenuator in the path. Entering **YES** then sets both the transmit and receive path frequencies to 1400 MHz, the transmit gain to -10 dB and the receive gains to 0 dB. Assuming the Tx input is at maximum (-10 dBm) the output will be at -20 dBm, after the 30 dB attenuator the Rx input will be -50 dBm which is a sensible value for the input. The output of the Rx path will be at maximum giving an output of -21 dBm. The user may then check the operation of the P700 from 70 MHz IF input to output.

5.5.4 PSUs

The PSU's function allows the user to monitor the status of the internal power supplies on the P700. This is shown as a percentage value, the permissible limits are 94% to 106%. Values outside these limits will cause a unit alarm to be generated.

Selecting the ***PSUs(4)*** function changes the display to show three numbers relating to the three main PCB assemblies, Q700(1), Q703(2) and Q703a(3). Q700 is the microprocessor and main power supply board, Q703 the transmit path motherboard and Q703a the transmit path motherboard.

5.6 1 FOR 1 OPERATION

For more detailed information please see section 7.

If ***1:1(4)*** is selected from the main menu, the following screen is displayed:

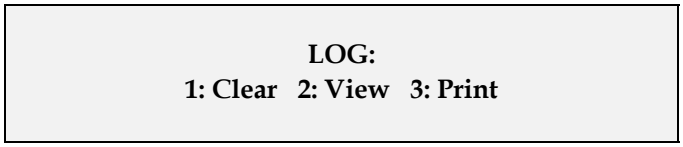
If in 1:1 pair, YES to force changeover to standby unit. NO to continue

1:1 Menu

The P700 has an in built 1:1 redundancy controller. If a pair of P700s are being operated in a 1:1 pair, then operation is normally automatic. However, if the user wishes to force a switch over to the off-line (standby) unit, then this menu will allow this, assuming that the off line unit is not in a fail state.

5.7 LOG

If ***Log (5)*** is selected from the main menu, the following screen is displayed:

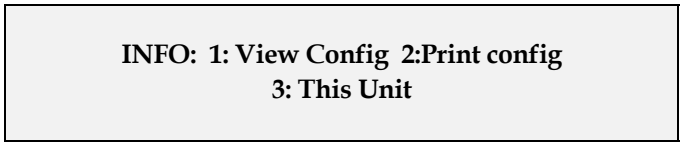


Log Menu

See Section 6 for more details.

5.8 INFORMATION

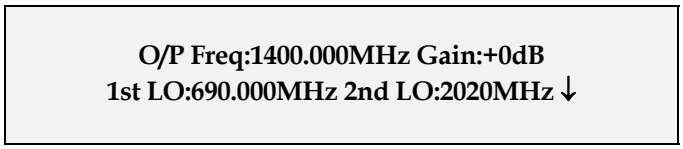
If ***INFO (6)*** is selected from the main menu, the following menu is displayed:



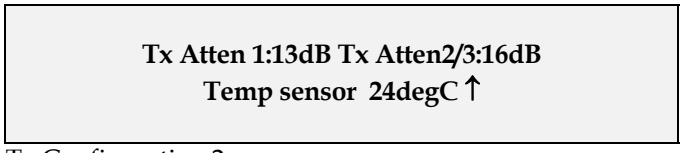
Information Screen

Selecting ***View Config (1)*** will produce a further menu, prompting the user to enter ***Tx Config (1)***, ***Rx Config (2)*** or ***Remote Cntrl(3)***. Selecting one of the three options will display the screens shown overpage:

Tx Config(1)



Tx Configuration 1 screen

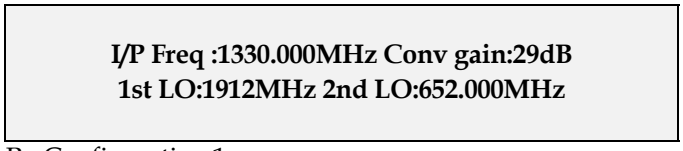


Tx Configuration 2 screen

This shows the configuration of the Upconverter path. The top line provides output frequency and power whilst the rest of the information on the screen and on the other screen shows the units internal parameters.

Note: This is for information purposes only. The user cannot change any of the parameters. This screen is useful to show the user a complete system configuration without having to look in several places.

Rx Config(2)



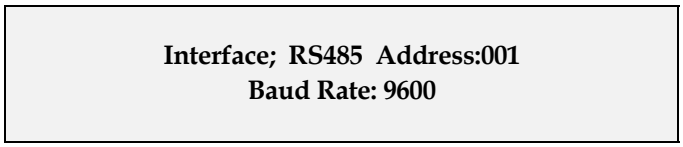
Rx Configuration 1 screen

Rx Configuration 2 screen

This shows the configuration of the Downconverter path. The top line provides output frequency and power whilst the rest of the information on the screen and on the other screen shows the units internal parameters.

Note: This is for information purposes only. The user cannot change any of the parameters. This screen is useful to show the user a complete system configuration without having to look in several places.

Remote Control
Config(3)



Remote control configuration screen

This shows the Remote Control configuration for the RS485 option. The RS232 option will display a similar screen without the address information.

5.9 MEMORY

The ***MEMORY*** function allows the user to store unit configurations and reconfigure from memory. This allows the user to store ten complete configurations for specific satellite transponders and quickly change between them. Selecting ***MEMORY(7)*** prompts the user to select either ***Transmit(1)*** or ***Receive(2)*** memory. Selection of either of these options will change the display and prompt the user to either store the configuration or reconfigure the unit from a previously stored configuration.

Store config(1) This prompts the user to select a memory location from 0 to 9. The unit will then store the current configuration in the selected memory location. NOTE; The unit will overwrite memory locations. Make certain that the location the current configuration is being stored to does not contain valid data or it will be lost.

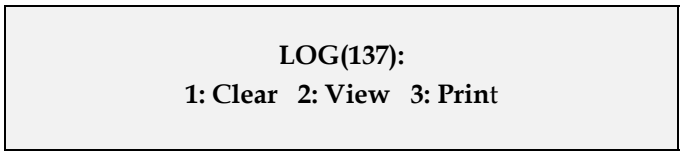
Reconfig(2) This will prompt the user to select a previously stored configuration in memory locations 0 to 9. On selection the current configuration will be lost and the stored configuration will become the current set-up.

6 LOG

6.1 GENERAL

The traffic log records the last 255 events which affect the transmit or receive traffic. The time and date of each event is also recorded. The log can either be viewed on the LCD, or printed on a serial printer attached to the front panel port.

From the front panel the following `Log' menu is available. It is accessed through ***MAIN (6)***



Log Menu

The number in parentheses on the top line is the event count. It indicates the current number of events stored in the log. When this number reaches 255 further events are still added to the log by overwriting the oldest event, so that the log stores the latest 255 events. If a record of all traffic events is required, then a hard copy of the log should be made before the event count reaches 255.

6.2 HARD COPY

There are several methods to make a hard copy, all of which require a serial printer to be attached to the front panel port of the equipment. Serial data is at 9600 Baud, RS232 levels, 8 data bits, no parity, one stop bit. There are no options. The printer carriage is also assumed to be 80 columns wide.

1. Selecting ***PRINT (3)*** from the above menu forces the following question to be asked:

Print: 1=Unprinted entries (37 items)
2=Whole Log (132 items) 3=Cancel

Print Log Menu

The unit keeps a record of the last log printout, and can therefore print all the events in the log, or only events added since the last hard copy. This provides a simple mechanism to make a hard copy of all events, without having to clear the log manually at the end of each printout. As soon as option 1 or 2 is selected printing begins, to terminate printing access this menu again and select ***CANCEL (3)***.

2. The front panel port of the P700 allows the printing of the log to be started by grounding one of two pins on this front panel connector. The P1390 lead (see later) available from Peak Communications has two toggle switches connected to these pins allowing a log printout to be initiated without operating the front panel of the equipment (that can be locked). The two switches provide the following functions:

Print Log This is functionally equivalent to selecting ***Log, Print unprinted entries*** as described under 1) above. This seemingly trivial alternative method of printing the log has the advantage that a printer may be plugged sequentially into many units in turn, and a daily/weekly hard copy of all log events made.

Live Print This enables printing of events as they are added to the log, and is only of any use while a printer is attached to the front panel port. It is useful during initial circuit operation, providing an immediate hard copy of any events that occur. It also guarantees that ALL events will be printed if more than 255 events occur at any one time, as no logged event is overwritten before it can be printed.

6.3 PRINTER CONNECTION

The P1390 lead, available from Peak Communications, allows the P700 to be connected to the serial port of a Personal Computer. The PC should be set up to emulate a dumb terminal (or a printer). The PC can then capture the log printout onto disk as a permanent record, or act as an interface between the serial port and a parallel printer.

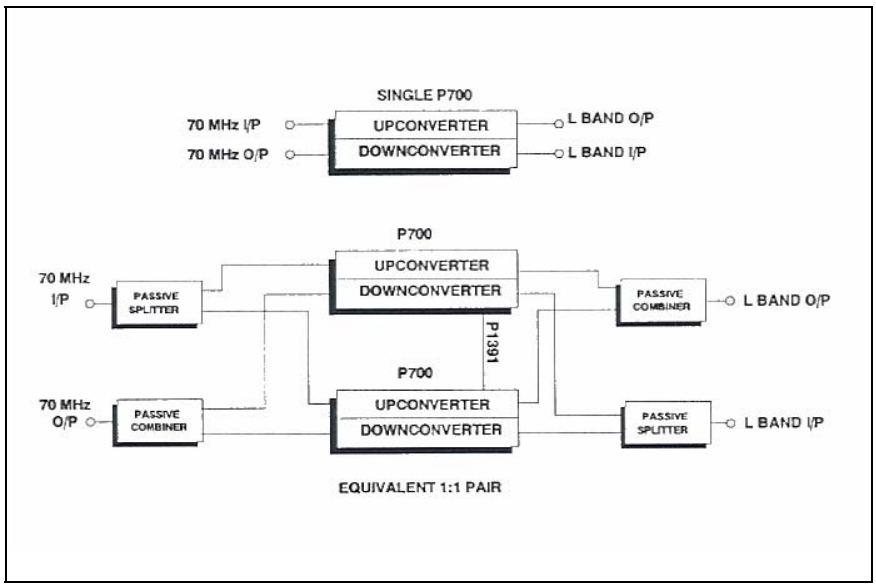
7 1 FOR 1 OPERATION

7.1 THEORY

Any two P700s will operate as a 1 FOR 1 redundant pair, with no other equipment except for a single interconnecting lead, two power splitter/combiners and cables to parallel up the units.

Both P700s operate continuously, performing their function on the incoming IF and L Band signals, but only one P700 enables its output, and drives the signals to and from the Modem and external Block Up and Downconverters.

The diagram on the right illustrates the equivalence of a standard P700 and a 1-FOR-1 redundant pair. The pair of units, with suitable cables may be used as a direct replacement for a single unit, with all connectors and pin assignments remaining the same. One unit of the pair may be replaced without interrupting traffic.



In the event of a catastrophic failure, such as a power supply etc, the switching circuitry (which is distributed between the two units) will switch over to the operational unit.

7.2 SWITCHING PHILOSOPHY

Both P700's operate continuously, with each providing a regularly updated status to their half of the 1 FOR 1 control logic. There is no pre-assigned master and slave unit.

Changeovers are minimised, i.e. a unit taken off line due to a reported failure, will remain off line even if it returns to the OK state. If it does return to the OK state then it will act as the standby unit. The software provides the necessary delays of status to the control logic, to prevent unnecessary switching. There is no delay in the case of catastrophic failures, when the hardware performs the switching regardless of the software, and its associated built in delays.
The 1 FOR 1 system has no `memory', i.e. a unit taken off line because of an indicated failure, will be put on line again if it now indicates OK. This will only occur if the on-line unit subsequently failed, otherwise it would be an unnecessary changeover.

Detected failure

A failure is defined as either a detected failure of the unit, or a catastrophic (power) failure. The P700s will change over if one fails, and if the other unit indicates that it is still operational. If both units fail simultaneously (which is likely to be caused by external circumstances), then no changeover takes place.

A 'detected failure' is defined as a UNIT FAULT. On this release of software an external fault will now cause a switch over. This previously was a deliberate design feature to inhibit this feature. External faults will also cause the status LED to change from green to flashing green and an alarm report to be displayed.

Manual changeovers

The P700 is able to `give away' operation to the other unit of the pair, if instructed to do so from the front panel, as described earlier. The switch over will only occur if the other unit indicates that it is OK, and is performed by momentarily simulating a failure in the on-line equipment.

7.3 PRACTICAL 1 FOR 1 IMPLEMENTATION

To implement 1 FOR 1 switching between any two P700s, the following steps need to be performed:

1. Check that both P700s have the same software issue and have identical configuration.

2. Connect a 1:1 redundancy cable between the two 9 pin 1 FOR 1 connectors on the P700s to be used, refer to Appendix A for details of the connector, as well as the lead required.

3. Connect the two transmit IF inputs to a suitable power splitter, of the correct impedance (50 Ω) and the appropriate frequency range. The input to the splitter is fed from the 70 MHz Modem equipment. Repeat this for the L Band output using an L Band combiner. Note: only one output is active at a time, and because of the loss of most splitter/combiners the power level at the input and output of the upconverter needs to be compensated for (typical splitter / combiner losses approximately 3.5 dB).

4. Connect the two receive L Band inputs together using a suitable power splitter of the correct impedance (50 Ω) and the appropriate frequency range. The output from the SHF Block Downconverter then feeds the input of the splitter, so that both Downconverters are fed with an identical signal. Repeat this for the 70 MHz IF outputs using a suitable power combiner feeding the resultant output to the Modem.

8 APPENDIX A : P700 CONNECTOR PINOUTS

8.1 ALARMS CONNECTOR

Connector type : 15 way 'D' type male

Important note : N/O means 'normally open' in the non fail state

Pinout:	N/O	Comm	N/C
Rx unit fault	1	9	2
Tx unit fault (1)	10	3	11
Tx unit fault (2)	4	12	5

Ext Tx Mute	Pin 6 active low
Ext Tx Alarm	Pin 14 active low
Ext Rx Alarm	Pin 7 active low
Gnd	Pin 15

Note: To inhibit the Transmit signal externally, either apply a TTL/CMOS 'low' signal to pin 8, or short pin 8 to ground (for example with an external relay closure).

The external Tx and Rx alarms need to be inhibited, if they are not in use, to stop false external alarms being generated. To inhibit external alarms, connect pins 15 and 14 to ground. If the external alarms are required they can be driven either by applying a TTL/CMOS 'low' signal or by a connection to ground via an external relay.

8.2 REMOTE CONTROL INTERFACE

Connector type : 15 way 'D' type female

Connections	Pinout	
	A	B
RS485 Tx	2	10
RS485 Rx	1	9
GND	14	
RS232 OUT	15	
RS232 IN	7	
GND	14	

Note: Remember the RS232 and RS485 ports cannot be active simultaneously. The selection of the active port is made via the software.

8.3 1 FOR 1 INTERFACE

Connector type: 9 way 'D' male

Connections

Circuit Ground	Pin 1
Line in	Pin 2
Line out	Pin 3
Fail in	Pin 6
Fail out	Pin 7

A suitable eight way lead (7 + Screen) is as follows:

Unit 1	Unit 2	
Pin 1 ...Screen...	Pin 1	(circuit ground)
Pin 2	Pin 3	(On-Line signal 2-1)
Pin 3	Pin 2	(On-Line signal 1-2)
Pin 6	Pin 7	(Fail signal 2-1)
Pin 7	Pin 6	(Fail signal 1-2)

Keep this lead as short as practical, and ensure it is screened to prevent spurious changeovers by noise induced in these high impedance signal leads.

Refer to the earlier section on 1 FOR 1 switching for details of 1 FOR 1 operation.

A standard 1 FOR 1 lead is available from Peak Communications, part number P1391. The lead is 10 cm long, and is designed for use when two P700s are mounted vertically adjacent to each other in the rack.

8.4 EXTERNAL DC

The P700 can supply 16.5 volts DC @ 0.6 amps for powering external Block Up and Downconverters on both the transmit and receive paths. The external DC can be supplied on either the mini BNC connector OR directly on the Rx input - Tx output via the N type connector.

The connection on both coaxial connectors is; + 16.5V DC on the centre pin and 0 V on the chassis.

The P700 will be supplied from the factory with the DC connected to the mini BNC connector. If the DC is required to be fed directly on the N type output the unit may be modified by the following procedure;

1. Ensure that mains cable to the unit is removed and remove the 16 black cross head screws from the lid of the P700. Pull lid clear and store carefully.

2. Identify the black and red twisted pair cable connected to the rear of the mini BNC connector, remove the Molex 2 pin connector from the motherboard and cut the cable close to the BNC end. Strip the ends of the cable and tin them.

3. Identify the filtered feed-through connector on the machined box (R1018 for Rx, R1015 for Tx) which is in the top left hand corner for the R1018 and centre rear for R1015. Solder the red lead to the centre pin and the black lead onto the solder tag. BE CAREFUL, THE PIN ON THE FILTERED FEED-THROUGH CONNECTOR IS VERY FRAGILE.

4. Replace the Molex lead onto the motherboard and check the solder connection.

5. Switch the P700 back ON and select the 16.5 V DC ON via the CHANGE menu and the appropriate path. Monitor the N type and ensure that the DC is available on this output.

6. Switch unit off and replace lid.

WARNING: DC IS NOW ON THE OUTPUT AND INPUT TO THE P700. MAKE CERTAIN THAT THE UNITS CONNECTED TO THE P700 CAN WITHSTAND A DC VOLTAGE ON THEIR INPUT/OUTPUT.

8.5 FRONT PANEL CONNECTOR

This connector provides a serial printer port for the LOG feature which may be accessed from the front of the equipment on a semi-regular basis.

Connector type : 8 Pin `DIN' latching female (Audio `DIN' type)

Connection numbering from front : Clockwise from the top - 2,5,3,7,6,1,4, centre 8

Connections:

Serial printer out:	Pin 4 (RS232)
Serial In:	Pin 5 (RS232)
Trigger printout of unprinted log entries:	Pin 6
Enable printout of new log entries (Live):	Pin 7
Ground	Pin 2 (and chassis)

The Serial printer port is at 9600 Baud, RS232 levels, 8 data bits, no parity, one stop bit. There are no options.

Note : There is no handshaking on the printer port, not even XON/XOFF, and the printer carriage is assumed to be 80 columns wide.

By grounding pin 6 on the connector, it instructs the P700 to print the traffic log of events added since last printed. By grounding pin 7 it instructs the P700 to print traffic events as they are added to the traffic log.

PC Connection

To connect the serial printer port (DIN plug) to a standard PC serial port (D type female), the following connections are required. (DIN pin 4 to `D' pin 3), (DIN pin 5 to `D' pin 2), and (DIN pin 2 to `D' pin 7).

A standard test/printer lead is available from Peak Communications, part number P1390. This lead provides the required connections to a 25 pin D type for the serial printer.

9 APPENDIX B : REMOTE CONTROL

The P700 may be monitored and controlled remotely either via a five wire RS485 multidrop bus consisting of Data in (A and B lines), Data out (A and B lines) and signal ground, or a three wire RS232 interface consisting of Data in, Data out and signal ground. The interface is selectable via the front panel LCD and keypad. The RS232 interface is designed for a single unit to be attached directly to the serial port of a Personal Computer. The RS485 is a multi-drop interface designed for connecting up to 32 modems simultaneously on a common bus. The controlling computer therefore needs to be fitted with an RS485 interface.

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.

Message frame format: The message frame is described below:

Byte 1:	STX
Byte 2:	BYTE COUNT
Byte 3:	DEVICE ADDRESS
Byte 4:	INSTRUCTION
Bytes 5 to n-2:	BODY
Byte n-1:	CHECKSUM
Byte n:	ETX

Note that the same frame format is used in *both* directions.

Character format: 8 data bits, one stop bit, no parity. The baud rate can be selected via the front panel, and can take the value 2400, 4800 or 9600 baud.

The details of the protocol and message formats can be found in " Remote Control Specification, P700 L Band Up/Downconverter". Customers may request a free copy of this document from the address shown on the front of the manual.

10 ALARM FAULT ACTION TABLE

The fault table for the P700 is listed overpage. The table shows the effect of each fault, actions are shown as stars in the respective sections of the table. As an example a Tx synthesiser failure ,fault number 12, will cause the output to be muted and be shown in the Log and LCD display as a Tx synthesiser fault.

Definitions for each of the entries on the chart are given below:

Flt No Each fault is assigned a number, faults are reported in order of precedence. If two faults exist at the same time the fault with the lowest fault number will be reported on the LCD display but both faults will be reported in the Log.

Description The details of the faults are shown in this section. The faults can be grouped into three main areas and two categories. The three areas are; 1) Q700, the microprocessor and power supply board. 2) Q703, the transmit path assembly and 3) Q703a, the receive path assembly. The two categories of faults are; Internal, relating to modules and boards failed within the unit and External, which are faults reported from external equipment.

Rxlog Flt This shows when an external Rx alarm will be reported and the action the software takes.

Txlog Flt This shows when an external Tx alarm will be reported and the action the software takes.

Mute Carr This shows the faults which will cause the carrier to be muted.

Unit Flt
Tx Flt
Rx Flt These three columns show how the faults will be reported, i.e a Rx 10 MHz failure is reported as a Tx fault but a failure of both Tx and Rx 10 MHz reference will cause a unit fault with an alarm report of "10 MHz failure".

1:1 Stat This shows the faults which will cause a changeover if the unit is in a 1:1 pair.

10.1 Alarm table

Flt No	Fault Description	Rx log Flt (32)	Tx log Flt (16)	Mute Carr (8)	Unit Flt (4)	Tx Flt (2)	Rx Flt (1)	1:1 Stat
1	PSU - 5.0 V Q700			*	*			BAD
2	PSU + 5.0 V Q700			*	*			BAD
3	PSU + 12.0 V Q700			*	*			BAD
4	PSU - 5.0 V Q703(TV1)			*		*		BAD
5	PSU + 5.0 V Q703(TV2)			*		*		BAD
6	PSU + 15.0 V Q703(TV3)			*		*		BAD
7	PSU - 5.0 V Q703A(RV1)						*	BAD
8	PSU + 5.0 V Q703A(RV2)						*	BAD
9	PSU + 15.0 V Q703A(RV3)						*	BAD
10	Tx 10 MHz FAILURE(10TX)			*		*		BAD
11	Rx 10 MHz FAILURE(10RX)						*	BAD
12	10 MHz REFERENCE FAILURE			*	*			BAD
13	Tx L BAND SYNTH OUT OF LOCK(2SLD)			*		*		BAD
14	Tx UHF SYNTH OUT OF LOCK(*1SLD)			*		*		BAD
15	Rx UHF SYNTH OUT OF LOCK(*2LSD)						*	BAD
16	Rx L BAND SYNTH OUT OF LOCK(1LSD)						*	BAD
17	TX TEMP OUT OF RANGE(TXTEMP)					*		BAD
18	EXT Tx ALARM(EXTTX)		*			*		*GOOD
19	EXT Rx ALARM(EXTRX)	*					*	*GOOD

*Note Optionally the External alarm can be made to switch the 1 for 1

11 INTELSAT AND EUTELSAT FREQUENCY ASSIGNMENTS

Introduction

This Section is included to show that it is possible to achieve Intelsat and Eutelsat RF frequency assignments using a Modem with an IF synthesiser step size of 22.5 kHz and an Up/Downconverter with a step of 1 MHz. Following the procedure outlined below to set the frequency of the Modem and Up/Downconverter then :

1) Any IBS frequency assignment can be met *exactly*.

2) Any SMS frequency assignment can be met with a maximum of 500 Hz error (at Ku-band). However, this error would still be present, *even if 2.5 kHz steps were available.*

Calculating the Converter frequency - a worked example on SMS

To quote from Eutelsat BS 7-40, Rev. 2E, Vol III, page 11, the RF frequency, at Ku-band, is given by:

F_{RF} = 14003.417 + (m x 0.0225) MHz

where m is an integer between 0 and 10707

For an Up-Converter:

We have derived two formulae, which, given F_{RF}, permit the user to determine what frequency to set the conversion equipment to, and what IF frequency to set the Modem to.

These formulae assume that if (for example) the up-converter has a setting of 14.2000 GHz, then an IF input at exactly 70 MHz will produce an RF output at exactly 14.2000 GHz.

All frequencies are in MHz

Formula A: $F_{Conv} = 14000 + 9 \times integer\ [((F_{RF}-14000)/9) +0.5]$

Formula B: $F_{IF} = 0.0225 \times integer\ [((F_{RF}-F_{Conv}+70)/0.0225) +1]$

To use a real example:

Suppose F_{RF} is given as 14220.4070 MHz (which is a 'real' Eutelsat channel assignment), then:

using Formula A, F_{conv} = 14216.0 MHz,
using Formula B, F_{IF} = 74.4075 MHz.

This combination yields an F_{RF} of 14220.4075 MHz, which is 500 Hz high.

Using these formulae, F_{IF} is always constrained to lie between 65.5200 and 74.4975 MHz for all output frequencies.

Incidentally, 'correct' solutions also lie at ± 9 MHz away from the RF converter frequency derived above, giving even greater freedom of choice.

An identical approach can be used for calculating the down-converter frequency.

A Common Problem

A problem arises when the user wishes to set the Up/Downconverter to the nearest 1 MHz at Ku-band, and then obtain the correct frequency by tuning the modem IF by ± 500 kHz about an exact centre frequency of 70 MHz. In this case, a step size of 2.5 kHz ***is*** required. In practice, however, this is a totally artificial constraint given that the modem can tune over ± 18 MHz.

Intelsat Frequency Assignments

The situation for Intelsat is more complex, due to the large number of C-band and Ku-band transponders carrying IBS traffic, and the diversity of frequency plans used on each. *However, every case* has been analysed, and there is always an RF converter frequency which will permit the exact RF channel to be obtained. Please call Peak Communications if you require further information.

Document Issue History

Issue 1.0 30/08/1995
Initial Issue

Issue 1.1 19/09/1995
Preliminary comment removed. Software issue updated.
New address and phone number added.

Issue 1.2 2/10/1995
Minor changes to external fault alarm reporting corrected.

Issue 1.3 24/10/1995
Changes to text on rear panel drawing for safety approval.

Issue 1.4 7/12/1995
Drawings incorporated as EPS files.
CE marking added to front cover.

Issue 2.0 17/5/1996
C band inversion added
SHF D/C operate screen
Fuse information added
Installation information added

Issue 3.0 16/4/1998 Peak Communications
Error corrections
Aux L band output
SHF frequency input
External Alarm with 1 for 1

Issue 3.1 28/11/2001 Peak Communications
Corrections made.