Installation and Operating handbook

RCU1000 Series Redundancy Units
(Covers RCU1800, RCU1600, RCU1400 and RCU1300)

Covers Software version 2.02 and above

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CE 1997

EN 55022 CLASS B
EN 50082-1
EN 60950

PEAK COMMUNICATIONS Ltd.
Unit 1, The Woodvale Centre, Woodvale Road,
Brighouse, West Yorkshire
HD6 4AB, England

Phone 01484 714200
Fax 01484 723666

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

PEAK COMMUNICATIONS Ltd maintains a continuing programme of product improvement and therefore reserves the right to change specifications without notice

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INTRODUCTION

The RCU1000 series units are redundancy control units for P7000 series converters. Numerous configurations are available, the differences in these configurations vary how many switched paths are available. A maximum of two switch banks; each fitted with four RF and four IF transfer switches, the switch banks can be configured for transmit or receive paths is possible.
The RCU1000 series units are housed in 19 inch 4'U' high chassis, suitable for rack mounting. It is 400 mm deep.

EMC AND SAFETY

EMC

The RCU1000 series redundancy control units 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.

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.

For the Alarm 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 with the requirements of VDE 0871 and FCC 20708, providing at least 40 dB of attenuation from 30 MHz to 1 GHz.
Connecting cables must be of the shielded type.

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

Safety

To ensure safety of the operator the RCU1000 series control units 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.

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

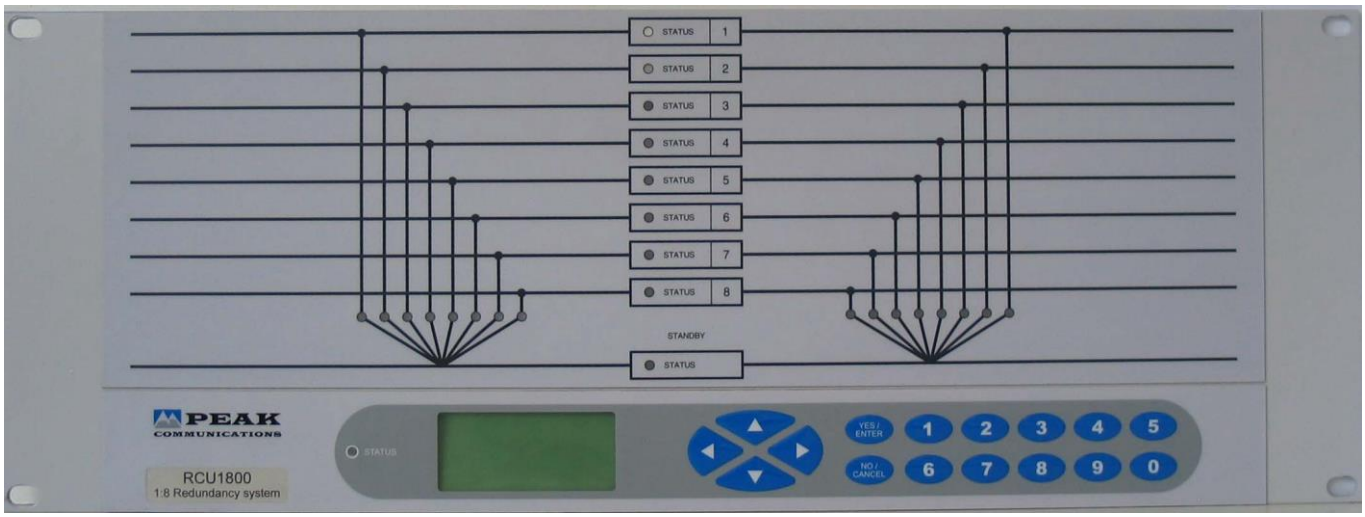
The equipment is classified in EN 60950 as a pluggable equipment class A for connection to the mains supply, as such it is provided with mains inlet cords suitable for use in the country of operation. In normal circumstances they will be of an adequate length for installation in the rack. If a mains 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.

UNIT DESCRIPTION

Front panel



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 P7000 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.

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.

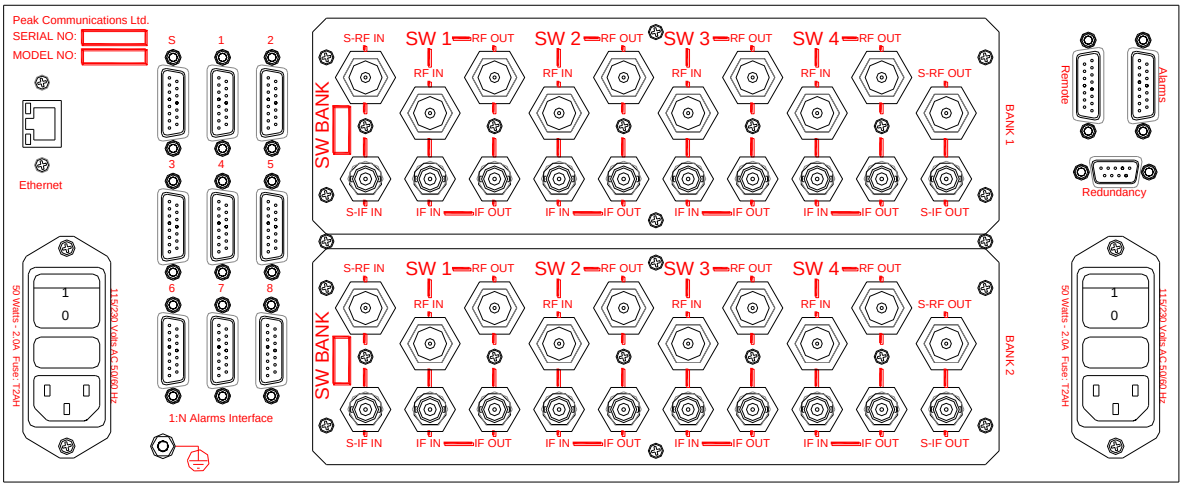
LED Status Indicator

One tricolour LED is present marked STATUS. This shows GREEN when the unit is OK, RED when an internal fault is present.
LED Path indication

A 3U overlay gives the user immediate information on signal path through the available converters. The centre indicators give a mimic of the individual converters front panel status LED’s. The indicators Left and right of centre give an indication of

the current path of the RF signal through the P7000 units and display routing of the standby unit, these LED's will be normally lit Green, however they can be used to indicate internal switch failure or switch bank missing.

Rear panel description (fully populated RCU1800 unit)



All of the connectors necessary for the user to interface the RCU1000 series unit to the P7000 equipment are located at the rear of the unit.

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.

The unit contains a redundant switch mode power supply arrangement. The unit is designed to work off one or both of 2 feeds and whichever one is present then it is automatically selected. The phases of the supplies can be phase unrelated but caution should be taken when both feeds are brought close together because a very high mains voltage can be generated.

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.

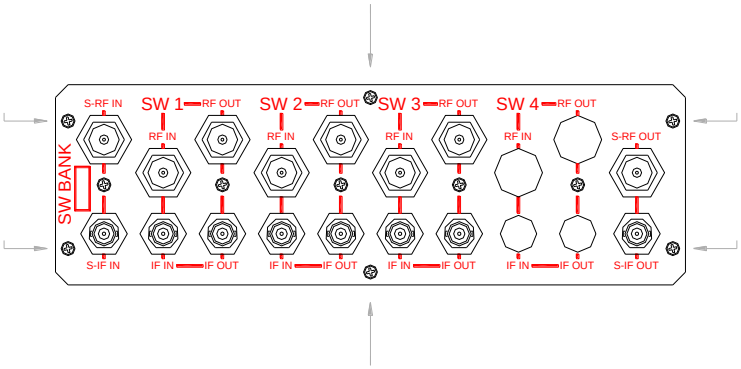
The typical power requirement of these units is <50Wand 2 amp fuses must be fitted.

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.

Switch Banks

The RCU1800 is fitted with 2 switch banks, which provide the necessary IF and RF switching, they are identical in function. The way in which they are cabled determines use for receive or transmit function. Switch banks are slide in trays and can be easily removed for upgrade/repair purposes by removing the 6 pozidrive screws on the outer edge of the tray and gently easing the tray out. As mentioned earlier, different RCU1000 series units have different arrangements and numbers of banks/paths.



1:N alarms interface

These are a standard 'D' type 15-pin (M) Labelled 1 to 8 and S (9 off). This is the interface to the connected P7000 units that carries the dry contact relay information back to the RCU1800, having both a hardware and software connection to the P7000 units enables a faster switchover time in case of detected failure.

A pin configuration is given below;

GROUND	1	9	NOT USED
Unit fault (1)	2	10	GROUND
NOT USED	3	11	GROUND
GROUND	4	12	NOT USED
Unit fault (2)	5	13	NOT USED
GROUND	6	14	NOT USED
NOT USED	7	15	NOT USED
NOT USED	8		

Alarms Connector

This is a standard ‘D’ type 15-pin (M). The connections provide access to the 2 form 'C' relay contacts which indicate alarm conditions.

The 2 independent relays are controlled as follows. An internal critical RCU1800 alarm will cause relay (1) and relay (2) changeover. A connected P7000 failure will cause a relay (2) changeover.

A pin configuration is given below:

Unit fault (1) COM	1	9	Unit fault (1) N/O
Unit fault (1) N/C	2	10	Not used
Not used	3	11	Not used
Unit fault (2) COM	4	12	Unit fault (2) N/O
Unit fault (2) N/C	5	13	Not used
Not used	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.

RS232/RS485 Remote Control connector

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 piece of 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.

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 the RCU1000 series units. 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	Not used
Not used	4	9	Not used
Not used	5		

When the CANBUS cable is used in a passive redundant configuration a 120Ω resistor must be connected between pin 2 and pin 7. If the unit has been ordered with a cable set then the resistors will already be fitted inside the cable shells.

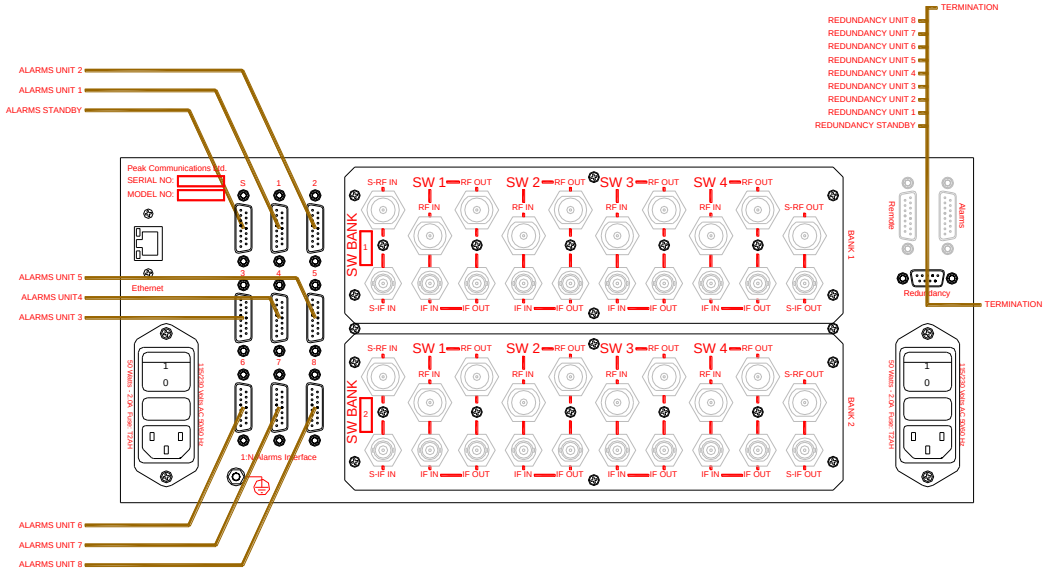
Ethernet

The Ethernet is only fitted when the option has been ordered from the factory. This is provided on the rear panel and is a standard RJ45 8P8C connector

TX +	1
TX -	2
RX +	3
Not used	4
Not used	5
RX -	6
Not used	7
Not used	8

SYSTEM WIRING INFORMATION

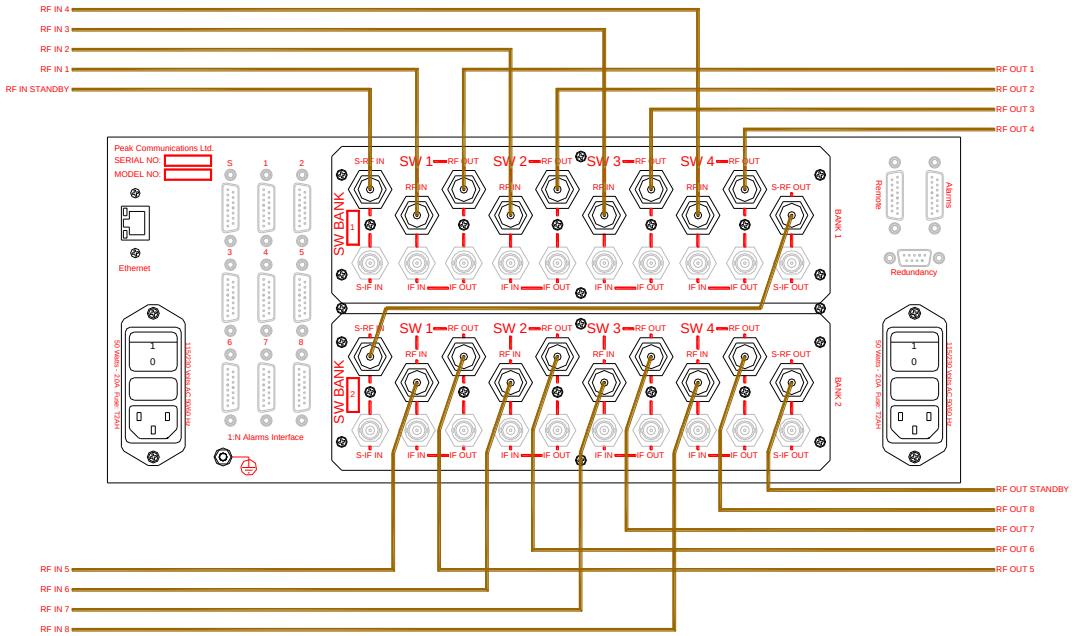
Below is a diagram to show connections of the CANBUS® Control cables and the ALARMS interface cables required for full functionality of a RCU1800 system, different RCU1000 series units may have less paths and hence less units attached.



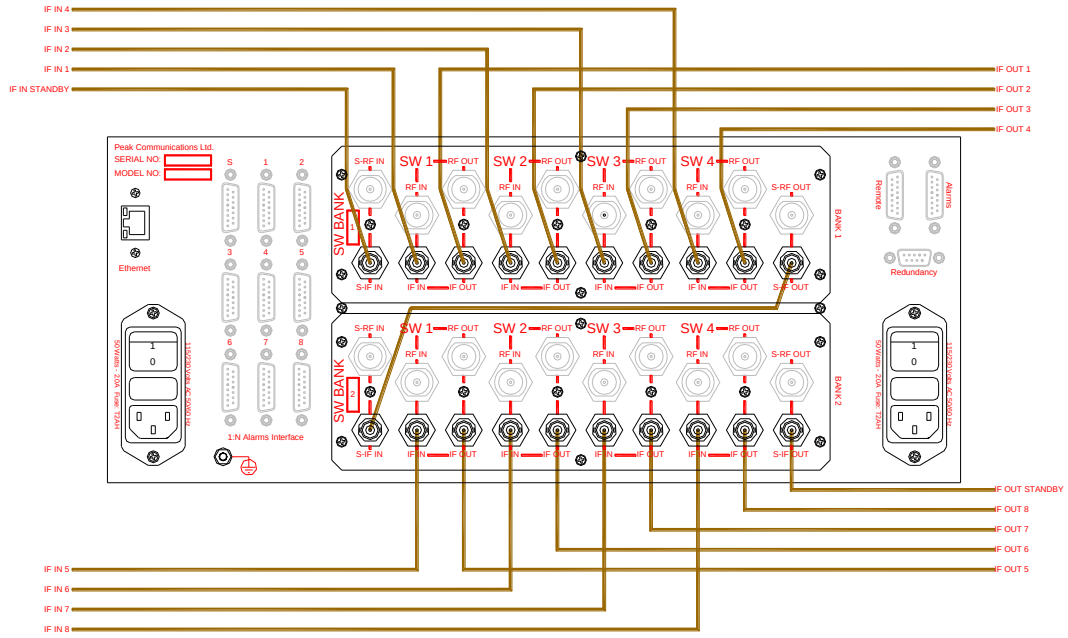
Cable pinout for the 1:N to converter units

15 Way D Female (RCU end)	15 Way D Female (P7xxx end)	Description
1, 4, 6, 10, 11	1, 3, 4, 6, 10, 11	GND
2	2	Unit Fault(1)
5	5	Unit Fault(2)

Below is a diagram showing the RF connections for a fully populated RCU1800.

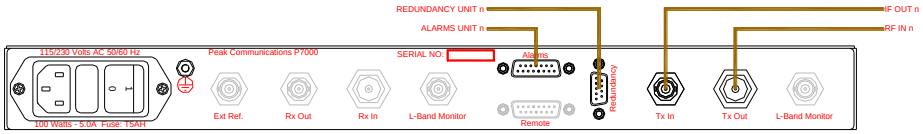


Below is a diagram showing the IF connections for a fully populated RCU1800.

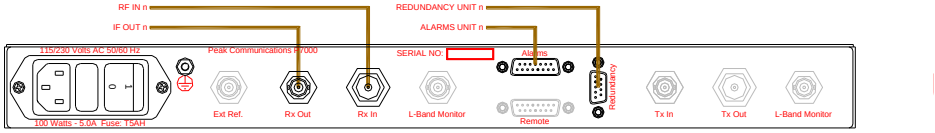


The RCU1000 series units can be used with either Tx or Rx P7000 family units, below are a couple of diagrams showing the connections required for both these types of units:

Transmit wiring:



Receive wiring:

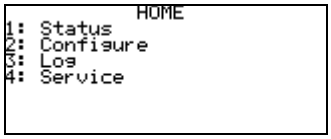


MENU STRUCTURE OVERVIEW

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
A short audible beep designates a valid key and a short buzz an invalid key.
LCD display contrast

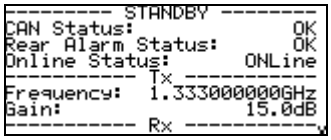
The contrast of the LCD can be changed via the front panel.
To change the contrast press and hold the YES/ENTER key, while holding down this key either press the UP arrow (to lighten the screen) or the down arrow (to darken the screen).

Home Menu

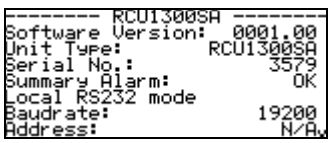


The HOME menu is the base menu from which to perform any function.
There is also a ‘hidden’ SETUP menu that can be accessed by pressing key ‘9’ from this menu.

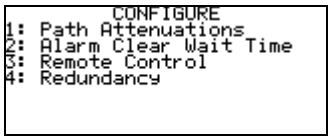
Status



Displays status of the standby unit; CAN status, Rear alarm status, Online status, TX Frequency and Gain, RX Frequency and Gain, full data can be shown be scrolling the display with the up and down arrows. Depressing the left and right arrows will show similar screens for units 1 to 3 with extra information available for Priority and TX/RX path Attenuation status, status of the RCU1800 unit is also available, showing an overview of the Software version, unit type, serial number, the presence of the summary alarm and the local/remote RS232/RS485 setup details as shown below;

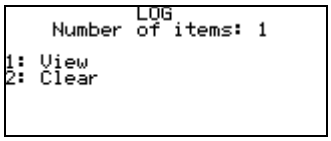


Configure



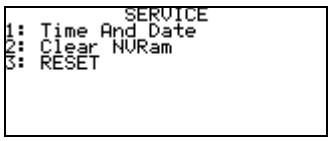
Select this option to change the set-up of the unit, such as path attenuation and remote control.

Log



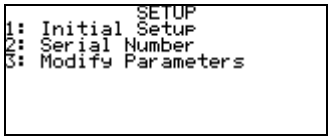
Event log of any errors or problems that have arisen.

Service



This menu is for maintenance personnel only and allows setting of the date and time. This menu is factory set and it is not recommended that the user changes parameters within this menu without consulting the factory.

Setup



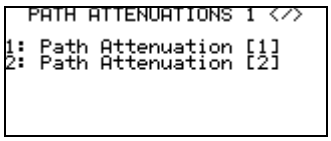
This menu is ‘hidden’ and is intended for maintenance personnel only. It allows setting of the unit type, serial number, modification of parameters & factory setup of the internal operation. This menu is factory set and it is not recommended that the user changes parameters within this menu without consulting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

Configuration menu

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

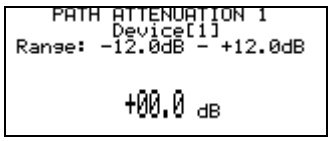
Path Attenuations
Alarm Clear Wait time
Remote Control
Redundancy

Path Attenuations



Selecting this menu will display a new screen, with 2 sub menu's and the ability to select path attenuations for the attached units using the left and right arrows. Pressing 1 will display the Path attenuation [1] screen pressing 2 will display the Path attenuation [2] screen.

Path attenuation [1]

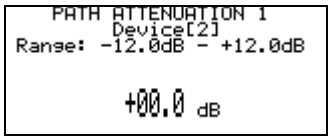


This screen allows a value for the attenuations introduced by the IF and RF signal path through the RCU1000 series switch banks to be inputted. This will allow the standby converter to compensate for these losses and therefore minimize the difference in levels when the standby is switched into an online transmit path. A positive value will compensate for insertion loss, a negative value will compensate for a standby unit with higher gain at a given point.

The values can be set either by referring to the unit test results or empirically when the system is on site using a power meter / spectrum analyser, by recording the level change when the standby path is manually switched in. Please be aware the test results are a maximum signal loss, which is normally at the highest measured frequency. A system measurement setup will always give much better results. Standby unit offsets can be set to within 0.1dB in use.

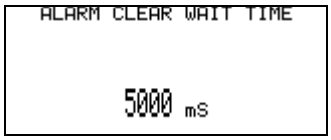
This is path attenuation [1] as it changes the path attenuation for the first device in the attached P7000 series converter. For an attached P7000 converter this would change the path attenuation for the up converter, for a P7001D it would change the attenuation path for down converter A. For single device converters such as the P7001, P7002, P7013, & P7018 this is the only path attenuation that is used.

Path attenuation [2]



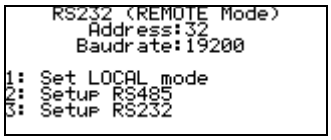
This screen works in the same way as for the Path Attenuation[1] screen, however this time the screen changes the path attenuation for the second device in the connected P7000 series of units. So for instance, in a P7001D this would change the attenuation path for down converter B, for a P7000 it would be for the down converter. For single device converters such as the P7001, P7002, P7013, & P7018 this path attenuation is not used.

Alarm Clear Wait time



This screen allows a value for a time period to be input before the RCU unit will revert from the Standby unit back to a "green status" converter. A converter that is about to be reintroduced into the system will show a green flashing LED on the front panel, as this time period is passing. This allows a warm up period for a reintroduced converter, which limits the effect of frequency drift to the system. Please allow an out off system warm up time for units that are cold starting or have been out of the system for some time of around 30 minutes. A suggested value for the alarm clear wait time is 5000ms. The value can be adjusted by the use of the up and down arrows.

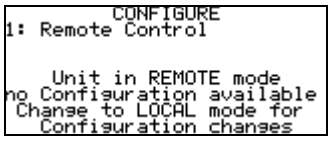
Remote Control



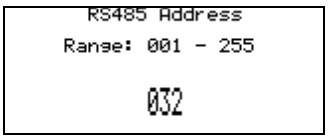
This screen provides access to all setup parameters for the remote interface.

Set remote mode

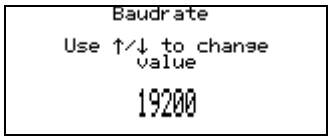
Pressing 1 will toggle the unit into either local or remote mode.
Note: In remote mode if you try to access the configuration menu while in remote the screen shown below will be displayed.



Setup RS485



The RS485 bus address can be set by entering in the number using the numeric keypad.
After entering the unit address, the baudrate to be used is entered.



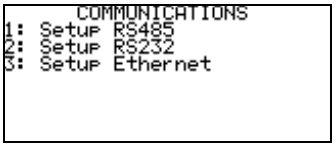
Setup RS232

The procedure for setting up the RS232 is the same as shown above for the RS485.

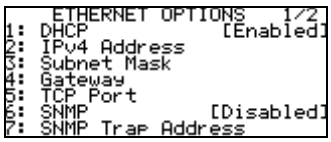
Ethernet Option

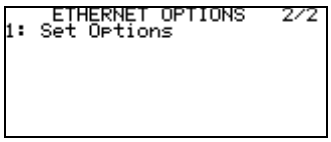
If the unit has been fitted with the ethernet option, the remote control menus are slightly different:

To set communications between RS232/RS485 or Ethernet, menu option 2 must be chosen.



The Setup RS485 and Setup RS232 menu options are the same as described previously. Setup Ethernet shows the following menu screens, this allows the Ethernet port to be used rather than the RS232/RS485 for remote control.





The menu choices (1-4) shown in the figures above allow the user to change the relevant Ethernet settings of the unit.

5 TCP Port – Sets the TCP port number used that allows serial comms messages to be sent, via TCP, to the unit (fixed address 32).

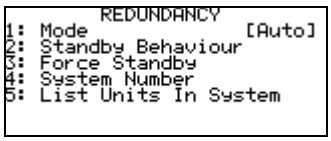
6 SNMP – Allows the SNMP protocol to be Disabled/Enabled.

7 SNMP Trap Address – Sets the IP address of the device that will receive any SNMP trap error messages from the unit.

Set Options is used to set the Ethernet data all at once on the device, this must be used when trying to change the Ethernet settings.

Redundancy

This screen allows the user to select the function of the RCU1800. The screen display will be different depending on the whether the unit is in automatic or manual mode. If AUTO mode is selected then the screen below will be shown.



Mode

The mode will be displayed to the right of the screen. AUTO will cause the RCU1000 series unit to monitor both the CAN bus information and the rear alarms interface. If a fault is found with a converter then the RCU1000 will route the faulty converters IF and RF signals through to the Standby converter and reconfigure the Standby converter to entirely match the last known settings of the faulty converter. If a unit with a higher priority setting also fails then the RCU1000 will reroute and reconfigure the standby to this unit. Care should be taken to determine which paths must have higher traffic priority, a unit with priority 3 set on the P7000 will have the highest priority, and a unit set to priority 2 will have a higher priority over a P7000 set to priority 1. The time taken for full switch over will be around 500ms from fault detection.

Standby Behaviour

This allows the behaviour of the standby unit to be changed, either to latching or non-latching.

Latching refers to the fact that if the standby has been switched into a unit's position, if that unit becomes good again, the standby WILL NOT go back into its standby position, non latching means that it will. This can have undesirable side effects whereby the standby unit could oscillate in and out of its standby position. If while switched in to a unit if a higher priority unit fails, the standby will still move to replace the higher priority unit no matter what the behaviour.

Force Standby

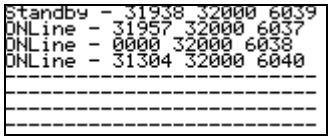
In latching behaviour, as mentioned above the standby unit will not go back into its standby position if a previously failed unit becomes good. This menu option forces the standby into its standby position.

System Number

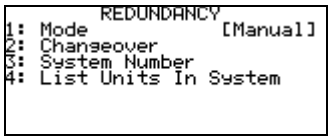
This allows the changing of the system number, only units on the same system number will be seen by the redundancy unit.

List units in System

This will display a new screen which will list the units connected to the redundancy CAN bus, but only those that have the same system number. Data shown will be unit standby and online status, serial numbers and timing codes.



If MANUAL mode is selected then the screen below will be shown.

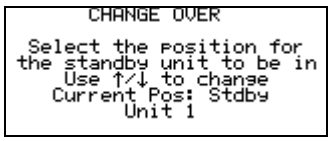


Mode

The mode will be displayed to the right of the screen. MANUAL will route the standby path to a user-defined path selected in the changeover menu. This mode may be used for service and maintenance. If a fault is found with a converter then the RCU1000 will not change the path. Care must be taken in setting the unit back to automatic when the user has finished manual path selection.

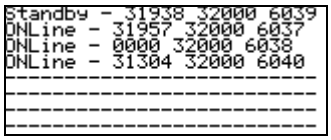
Changeover

This will display a new screen, which allows the user to immediately reconfigure which path the standby unit will adopt. The screen will display the current position and the required position is displayed on the lowest line of the screen, depressing the up and down keys will scroll through the available paths. The RCU1000 will reconfigure once the Yes/Enter button is depressed, to leave the screen without a change then depress the No/Cancel button.



List units in System

This will display a new screen which will list the units connected to the redundancy CAN bus, but only those that have the same system number. Data shown will be unit standby and online status, serial numbers and timing codes.



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 RCU1000 unit	From RCU1000 unit	Description
20		Requests attached unit status
	21	Replies with attached unit status
24		Set Remote/Local Mode request
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

When the user requires the status of any attached unit to the RCU system the following message can be sent:

Instruction 20 (Request Attached Unit Status):

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	(‘1’)	1	Attached unit the status of which is required. ‘S’ = Standby ‘1’ – ‘8’ = units 1 to 8 ‘A’ – ‘H’ = units A to H
6	?	1	Checksum
7	03	1	ETX

Instruction 21 (Attached Unit Status 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	20	1	Message instruction
5	(‘1’)	1	Attached unit, the status of which is here. ‘S’ = Standby ‘1’ – ‘8’ = units 1 to 8 ‘A’ – ‘H’ = units A to H This is the same as what was sent in instruction 20
6	(‘1’)	1	Is this unit number valid? ‘0’ = Not Valid ‘1’ = Valid In a RCU1400 system for instance the unit ‘5’ will return not valid.
7	(‘1’)	1	Unit Online ‘0’ = Offline ‘1’ = Online
8	(‘1’)	1	Rear alarm pin from unit to RCU ‘0’ = OK ‘1’ = Alarm
9	(‘1’)	1	Unit missing on the CAN bus? ‘0’ = OK ‘1’ = Missing
10	?	1	Checksum
11	03	1	ETX

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	24	1	Message instruction
5	(‘R’)	1	‘R’ = Remote Mode ‘L’ = Local Mode
6	?	1	Checksum
7	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	(‘RCU1800 ’)	27	Type of unit this is: RCU1800
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	Temperature out of range fault ‘0’ = OK ‘1’ = FAULT
49	(‘0’)	1	PSU(1) RHS fault ‘0’ = OK ‘1’ = FAULT
50	(‘0’)	1	PSU(2) LHS fault ‘0’ = OK ‘1’ = FAULT
51	(‘0’)	1	Ethernet module fault ‘0’ = OK ‘1’ = FAULT
52	(‘0’)	1	Coax switch fault ‘0’ = OK ‘1’ = FAULT
53	(‘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.
70	(‘0’)	1	Remote mode ‘0’ = Local ‘1’ = Remote
71	?	1	Checksum
72	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 Byte No.	Set Value / (example)	Length (bytes)	Description
1	02	1	STX
2	?	1	No of bytes in message
3	?	1	Address
4	46	1	Message instruction
5	(‘M’)	1	Redundancy Mode ‘M’ = Manual ‘A’ = Auto
6	(‘1’)	1	Standby position ‘S’ In standby position ‘1’ – ‘8’ means standby switched into position 1 – 8 (8 being the maximum for a RCU1800 unit) ‘?’ – position not known
7	(‘01’)	2	System number ‘00’ to ‘10’
9	(‘L’)	1	Standby behaviour ‘L’ – Latching ‘N’ – Non-Latching
10	?	1	Checksum
11	03	1	ETX

Instruction 47 (Redundancy Change 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	47	1	Message instruction
5	(‘M’)	1	Redundancy Mode ‘M’ = Manual ‘A’ = Auto
6	(‘1’)	1	Standby position ‘S’ In standby position ‘1’ – ‘8’ means standby switched into position 1 – 8. (When the redundancy mode is Auto, the standby unit can be forced into standby position by using this parameter, otherwise it is ignored)
7	(‘01’)	2	System number ‘00’ to ‘10’
9	(‘L’)	1	Standby behaviour ‘L’ – Latching ‘N’ – Non-Latching
10	?	1	Checksum
11	03	1	ETX

ETHERNET REMOTE CONTROL (OPTION)

The Ethernet option for the RCU1000 series products adds the ability to control the unit by Ethernet as well as by the existing standard RS232 or RS485, this is achieved via a separate module within the unit.

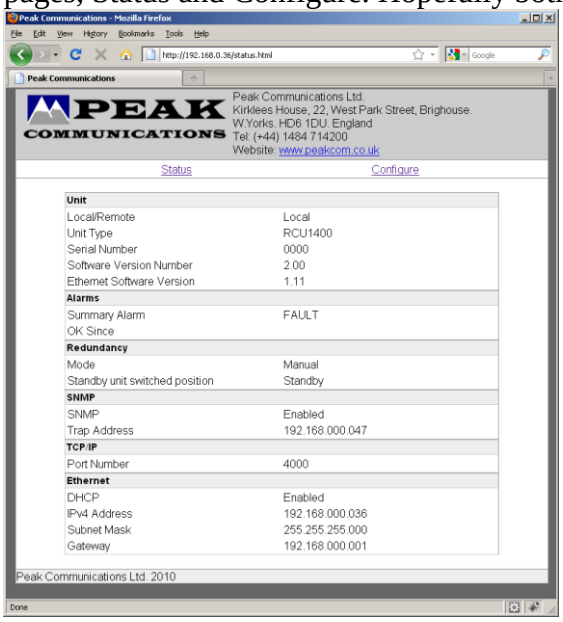
The unit can be controlled through the Ethernet port using three different approaches.

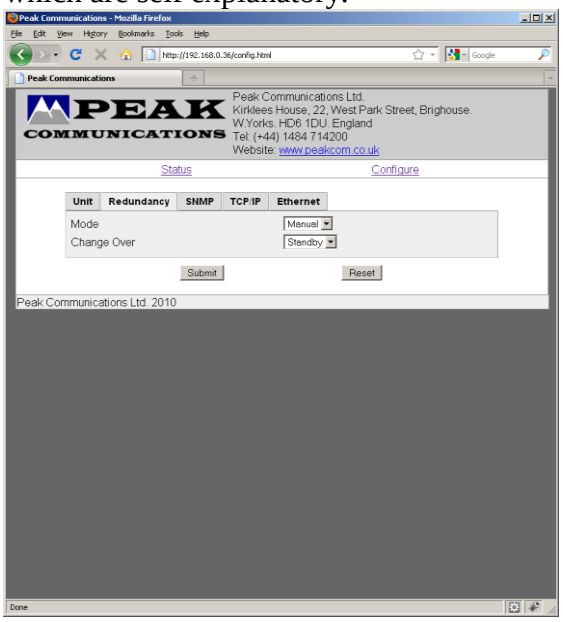
TCP Port

The unit can be controlled using the serial remote control messages as described earlier sent through the TCP port set in the Ethernet menu option. The address is fixed at 32.

Webpage

The unit can be controlled via the in-build web server's web page. There are two pages, Status and Configure. Hopefully both of which are self explanatory.





SNMP

The RCU1000 series units fitted with Ethernet, have built-in SNMP (Simple Network Management Protocol) agent software.

It supports SNMP Trap, RFC1155, 1157, 1212, 1213, 1901 & 1906, as well as the Peak MIBS.

The Peak SNMPv2 MIB files are supplied by Peak Communications Ltd, below is a quick overview of them.

The Peak Enterprises node is essentially split into three main areas (relevant to this unit):

Converters - In this node there are numerous nodes:

PeakRCU1XXXModule – contains information on the current redundancy switch position and mode (auto/manual).

Unit – This node allows the unit status to be checked as well as the Ethernet settings.

PeakFaultsModule – This node contains the unit summary alarm as well as a table showing all the faults currently on the unit.

Version history:

1.0	18/10/10	Created
1.1	20/10/10	General tidy up and made more universal
1.2	27/5/11	Added the new automatic standby behaviour parts.

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.