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VORTEX
Communications Ltd

TimeLord-Net
Master Clock

Operations Manual

Revision 2.0

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In the interests of improving design, operational function, and/or reliability, we reserves the right to make changes to the products described in this document without notice.

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Customer Support

For assistance with installation, configuration or operation of your TimeLord system, please contact us or your vendor's representative.

For further technical information and support for your TimeLord or any other Vortex product, please visit the Vortex Communications Web site:

`http://www.vtx.co.uk`

Statutory Notices

Warning - To prevent fire or shock hazard, do not expose the unit to rain or moisture.

Some TimeLord-Lite and TimeLord-MTG Versions Only

This equipment has a built-in rechargeable Nickel Metal Hydride (NiMh) battery, which should only be replaced by qualified personnel.

Nickel Metal Hydride battery, dispose of properly.

You can return your unwanted Nickel Metal Hydride batteries to the manufacturer or their agent.

Note: In some areas disposal of Nickel Metal Hydride batteries in household or business trash may be prohibited.

Caution: Do not handle damaged or leaking Nickel Metal Hydride batteries.

All other TimeLord versions

This equipment has a built-in Lithium battery which in normal operation should have a service life greater than 10 years. The Lithium battery should only be changed by a suitably qualified engineer.

CAUTION

Danger of explosion if battery is incorrectly replaced.

Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

You can return your unwanted Lithium batteries to the manufacturer or their agent.

Note: In some areas disposal of Lithium batteries in household or business trash may be prohibited.

Caution: Do not handle damaged or leaking Lithium batteries.

For Customers in Europe

Electromagnetic Compatibility & Safety

The TimeLord Master Clock, when used in accordance with our recommendations, complies with the European Community Electromagnetic Compatibility Directive 89/336/EEC and Low Voltage Directive 73/23/EEC and conforms to the following standards:

- **EN 50081-1** 55022 class B
- **EN 50082-1** IEC 801-2 level 3
  IEC 801-3 level 3
  IEC 801-4 level 3
- **EN 60950**

For Customers in the USA

The equipment has been tested and certified to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. The equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try and correct the interference by one or more of the following measures:

- Reorientate or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

You are cautioned that any changes or modifications not expressly approved in this manual could void your authority to operate this equipment.

Warranty

The TimeLord Master Clock is fully guaranteed, on a return to works basis, against failure due to faulty parts or workmanship for one year from date of purchase. In the event of failure, either within or outside the warranty period, please pack the unit with care and return to the manufacturer, or their agent, for examination and repair.

In no event shall the manufacturer, or their agent, be liable for any direct, incidental or consequential damages of any nature, or losses or expenses resulting from any defective product or the use of any product, irrespective of whether the manufacturer, or their agent, has advance notice of the possibility of such damages.

Manual revision

This manual version 2.0 applies to VA software version 05.01 and later, unless otherwise specified.

Contents

1 - Introduction

TimeLord series Master Clocks provides an ideal time synchronisation solution for complete systems of equipment, including computer networks, CCTV security, voice recording, industrial process control and CCC applications. Available as standard with MSF, DCF and GPS input synchronisation options, optionally the TimeLord can be supplied to synchronise from an NTP time source or from IRIG-B time code. This flexibility allows the TimeLord to be used as a universal solution for providing time synchronisation to many different devices.

Features

- **Operational**

  High visibility 6 digit display.

  Display and timecode output messages can be referenced to UTC or 'Local' time.
  'Set Once' local time zone setup, automatically calculating future time zone changes for local time zone.
  256 Year Calendar, 4 digit year setting. (Range 2000-2255)
  Easy to install, 'setup and forget' operation.

- **Timing accuracy**

  Integrated TCXO module standard on TimeLord versions.

  Unsynchronised: 0.1sec/day @ 0-45ºC (20-25 ºC on TimeLord-Lite)
  Locked to MSF or DCF: within 30mS of UTC
  Locked to GPS: within 50uS of UTC (100uS on TimeLord-Lite)

- **Network Timing Accuracy (TimeLord-Net)**

  Clients typically synchronised within 1-10 milliseconds of TimeLord-Net timebase depending on network delay and jitter. (NTP)

- **RS232 and RS485/422 interface**

  One, two (.S2 versions only) or four (.S4 versions only) RS232 and RS485 serial outputs.
  71 preset data formats for specific CCTV and embedded equipment. Output interval programmable for every second, every minute, 5 minutes, every hour, every day or on request.
  User selection of 1200, 2400, 4800, 9600 or 19200 baud, 7 or 8 data bits and odd, even or no parity on nonspecific message formats

- **Relay**

  30v dc. @ 500mA rated change-over contacts
  0.1 second programmable contact change-over to occur; every 5 seconds; every minute; every hour; once per day at a user programmable time; on power failure; whilst locked to an external time reference and during an error state.

- **w482 digital time/date code interface**

  Supports up to 50x V-400A series digital clocks and time zone displays.
  'Set Once' time zone setup, automatically calculating future seasonal time changes for 15 time zones.

The TimeLord-Net Master Clock is supplied fitted with a 10Base-T Ethernet interface to allow it to act as a time server on a TCP/IP network. The TimeLord-Net interface supports the following protocols:

- **NTP and SNTP**

  Network Time Protocol (NTP) v2, v3 and v4 clients are supported. (RFC1305 & RFC1119)

  Simple Network Time Protocol (SNTP) v3 and v4 clients are supported. (RFC2030 & RFC1769)

- **TIME Protocol**

  TIME protocol (RFC868) is supported in UDP mode.

Additional optional output - IRIG timecode interface (IRIG-OUT)

- **IRIG interface**

  1KHz amplitude modulated 3v p-p, 600Ω transformer coupled output.
  RS485 level output. (RS485 interface can either be used for serial or IRIG data)

  Output formats: IRIG-B (B123), Afnor NFS 87-500, NENA 911, IEEE 1344, MIC20

Additional optional output - EBU Timecode Interface (EBU-OUT)

- **EBU interface**

  EBU longitudinal timecode (LTC) output, 2000 bps with 25 complete messages every second.

  Balanced 600 ohm and low impedance (TimeLord-Net)
  Balanced 600 ohm only (TimeLord-Lite).

Additional optitional dual intelligent impulse outputs (-02)

- **Impulse outputs - for analogue clocks (with hands)**

  Dual 24V alternate polarity impulse outputs rated at 200mA per channel.

  Each output programmable for one second, half minute or one minute alternate polarity impulses.

  Fully protected output drive circuitry detects power failure and short circuit line conditions which are automatically corrected for on fault removal.

Environment

Power supply: *Rackmount TimeLords* - 110-240V AC 50/60Hz
Desktop version- 12v DC via supplied external 110v or 230v AC PSU (specifiy required PSU at time of order)

Power consumption: < 0.4A @ 230V AC

Battery Backup: *TimeLord-Net* >1 Year.
TimeLord-Lite and -MTG > 50 hours
(The battery backup maintains the internal time count during periods of mains failure - figures for fully-charged battery)

Enclosure: *Rackmount TimeLords* - 1u high 19" rack mount
483mm wide x 185mm deep x 44mm high (19" x 7.3" x 1.75")
Weight: 2.8Kg
-T Dekstop - Table top case
173mm wide x 178mm deep x 49mm high (6.8" x 7" x 2")
Weight: 0.5Kg

Operating temperature: 0-50ºC

Relative Humidity: 0% to 90% (non-condensing.)

Altitude: 0 to 3,000m

MTBF: > 50,000 hours

Package Contents

The product package should contain the following items:

1 TimeLord Master Clock.

2 IEC Mains lead (Rackmount TimeLords) or AC power adapter (-T Desktop). (Either UK, EU, US or AU style depending on order code)

3 9-pin RS-232 serial cable.

4 This manual.

5 TimeLord software CD-ROM (available on request).

6 RJ45 patch lead (TimeLord-Net versions only)

For systems supplied with GPS receiver V-488C.00:

6 GPS antenna / receiver module.

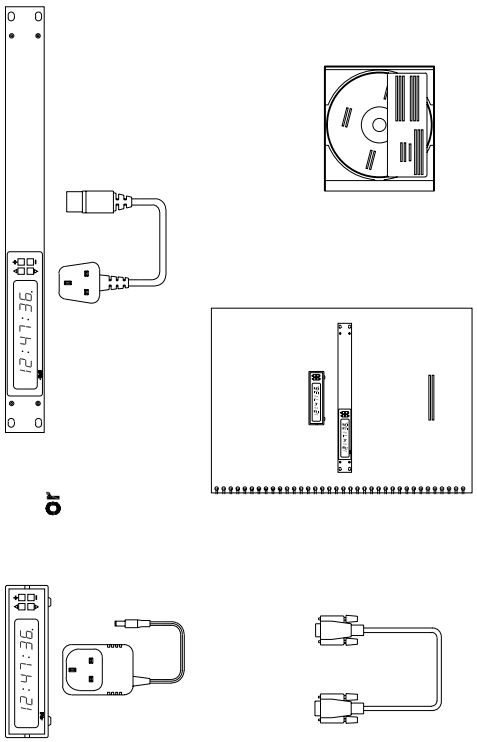
7 25 metres of 4 core cable

or systems suppled with MSF or DCF radio receiver.

6 V-484.02 / V-484.06 MSF or V-484.03 / V-484.07 DCF radio receiver with 5 metres of cable.

2 - Quick Start, FAQ and TimeLord Programming

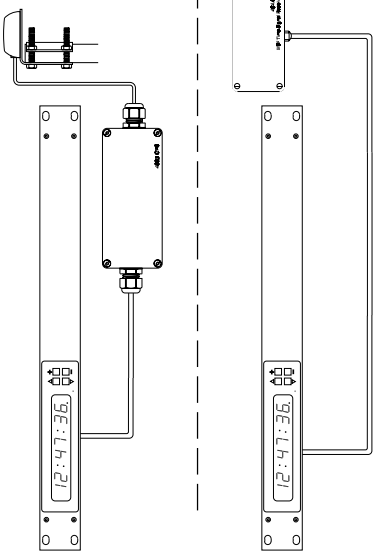
1 - Unpack the TimeLord and check contents matches list on page 1-1.



2 - Connecting V-488B, V-488C GPS and V-484 series radio receivers

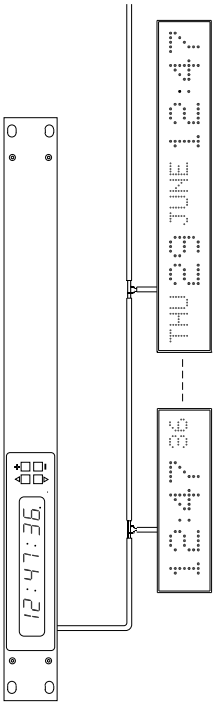
For V-488C & V-488B GPS synchronisation see pages 5-1 and 5-2.

For radio synchronisation (V-484)see pages 5-1 & 5-3.



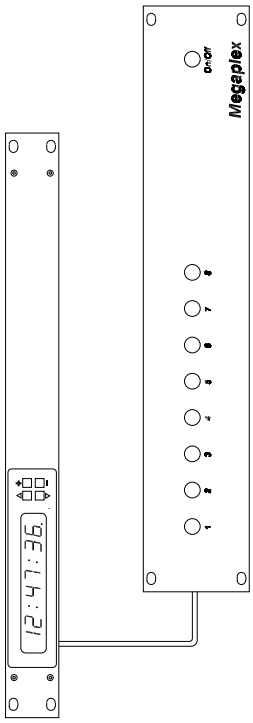
3 - Connecting V-400A and V-470/474A slave displays

For details on synchronising V-400A series clocks and time-zone displays see pages 6-1 and 6-2.

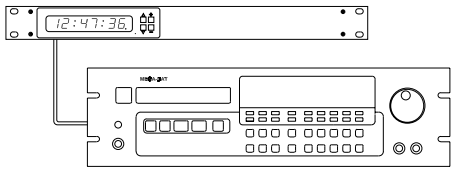


4 - Connecting third-party equipment using RS232 or RS422/485

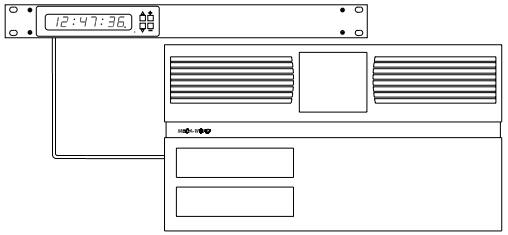
See sections 7 and appendix A of manual and application notes on TimeLord CD for further information.



5 - Connecting third-party equipment using EBU and IRIG.



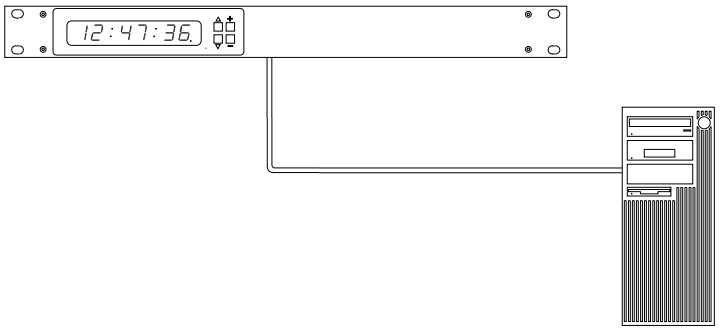
For further information on connecting a TimeLord with EBU-OUT to other equipment using EBU timecode see pages 11-1 and 11-2.



For further information on connecting a TimeLord with IRIG-OUT option to equipment using IRIG timecode see page 10-1.

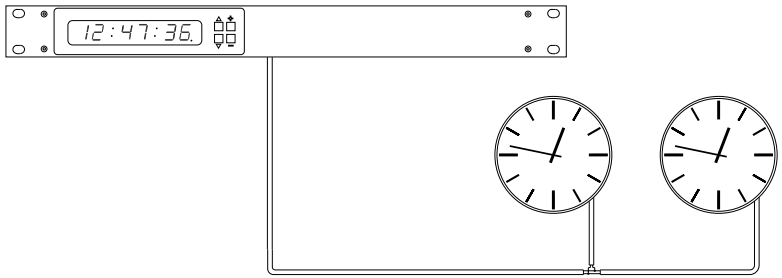
6 - Connecting the TimeLord-Net to an Ethernet network.

For further information on connecting a TimeLord-Net Clock to an Ethernet network see chapter 9.



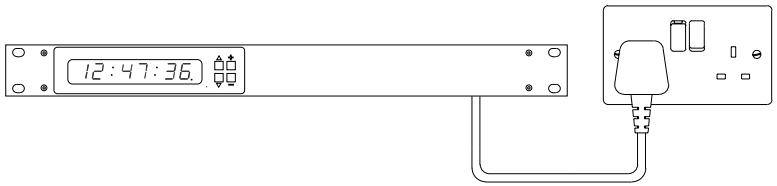
7 - Connecting Impulse slave clocks.

For further information on connecting a TimeLord with -02 interface to Impulse slave clocks see chapter 12.



8 - Apply power and set time on TimeLord.

See page 3-1 for information on connecting the Master clock to the mains power system. See pages 2-4, 2-5 and 2-6 for information on programming the time.



Frequently Asked Questions

Will the V-488C / V-488B GPS receiver system work indoors?

Both the V-488C and the V-488B GPS receiver systems are designed for external mounting. We would recommend positioning the post-mounting V-488C GPS system on the roof of the building with a clear view of at least 75% of the sky.

The post mounting antenna supplied with the V-488B GPS system should be mounted in a similar position. The decoder box supplied with the V-488B GPS system should be mounted within 5 metres of this (either indoors or outdoors).

Please refer to chapter 5 for further information.

Can I extend the cable supplied with the V-488C GPS receiver system?

The system is supplied with 25 metres of four-core screened cable for connection between the V-488C GPS system and the TimeLord master clock. This cable length may be increased up to a maximum of 50 metres using a similar type of cable or up to a maximum of 200 metres using a heavier gauge cable.

Please refer to chapter 5 and appendix A for further information.

Can I extend the cables supplied with the V-488B GPS receiver system?

The V-488B GPS receiver system is supplied with a 5 metre fixed length of cable for connection between the post-mount antenna and the decoder box. This cable length cannot be adjusted.

The system is also supplied with 25 metres of four-core screened cable for connection between the decoder box and the TimeLord master clock. This cable length may be increased up to a maximum of 50 metres using a similar type of cable or up to a maximum of 200 metres using a heavier gauge cable.

Please refer to chapter 5 and appendix A for further information.

Why will the TimeLord master clock not synchronise to the MSF or DCF radio time code signal?

Under normal circumstances the MSF signal provides reliable operation at distances of up to 1000km from Rugby in the United Kingdom. The DCF signal is normally usable up to 1500km from Frankfurt in Germany.

In good conditions the TimeLord master clock, when used with a V-484 series radio time code receiver should synchronise to MSF or DCF within 3 minutes. During this period, the 'code' LED should flash once per second.

However, MSF and DCF suffer greatly from electromagnetic interference which can cause the TimeLord master clock not to synchronise. In this instance, the 'code' LED on the front panel of the TimeLord may flash erratically. To minimise interference problems, we would recommend mounting the V-484 series radio time code receiver away from any computer or electronic equipment, fluorescent lighting, lift equipment, metal girders, reinforced concrete walls or any other sources of electrical noise.

MSF is off-air for a maintenance period of two weeks during the summer, and the first Tuesday of every January, April, July and October. Please refer to page 5-3 for further information.

Will the V-484 series radio time code receiver work indoors?

The V-484.02 MSF and 484.03 DCF radio time code receivers are suitable for either indoor or protected outdoor mounting. For reliable operation, we would recommend mounting these units externally if possible though they normally work indoors also.

The V-484.06 MSF and V-484.07 DCF radio time code receivers are suitable for indoor use only.

Please refer to page 5-3 for further information.

Can I extend the cable to my V-484 series radio time code receiver?

The cable connection to a V-484 series radio time code receiver may be extended up to a maximum of 10m using a similar specification cable. This connection may be extended up to a maximum of 200 metres using a screened twisted pair cable as specified in appendix A.

How can I tell if the TimeLord master clock has synchronised to my chosen synchronisation time source?

When the TimeLord master clock is synchronised, the 'Lock' LED will illuminate.

Why does the master clock not show the correct time, even though the 'lock' LED is illuminated?

Check that the location is set correctly. Please refer to chapter 4 for further details.

How do I synchronise / time-stamp a CCTV device from the TimeLord master clock?

Appendix C lists the supported devices and any relevant application note. The application notes detail how to connect the TimeLord master clock to your chosen device and may be found on the CD-ROM supplied.

How do I connect analogue impulse clocks to the TimeLord master clock equipped with the -02 O/P option?

Please refer to chapter 12 for details on impulse output setup.

TimeLord Progamming

The TimeLord Master Clock has a user friendly interface based on the use of four buttons.

The buttons are located to the right hand side of the display and are labelled △ ▽ + and □.

The △ and ▽ buttons are used to step between and save mode settings whereas the + and □ buttons are used to alter the values of settings.

On pressing the △ button the function mode is entered. By pressing the + and □ buttons the user can scroll through all the available modes for set up of the TimeLord .

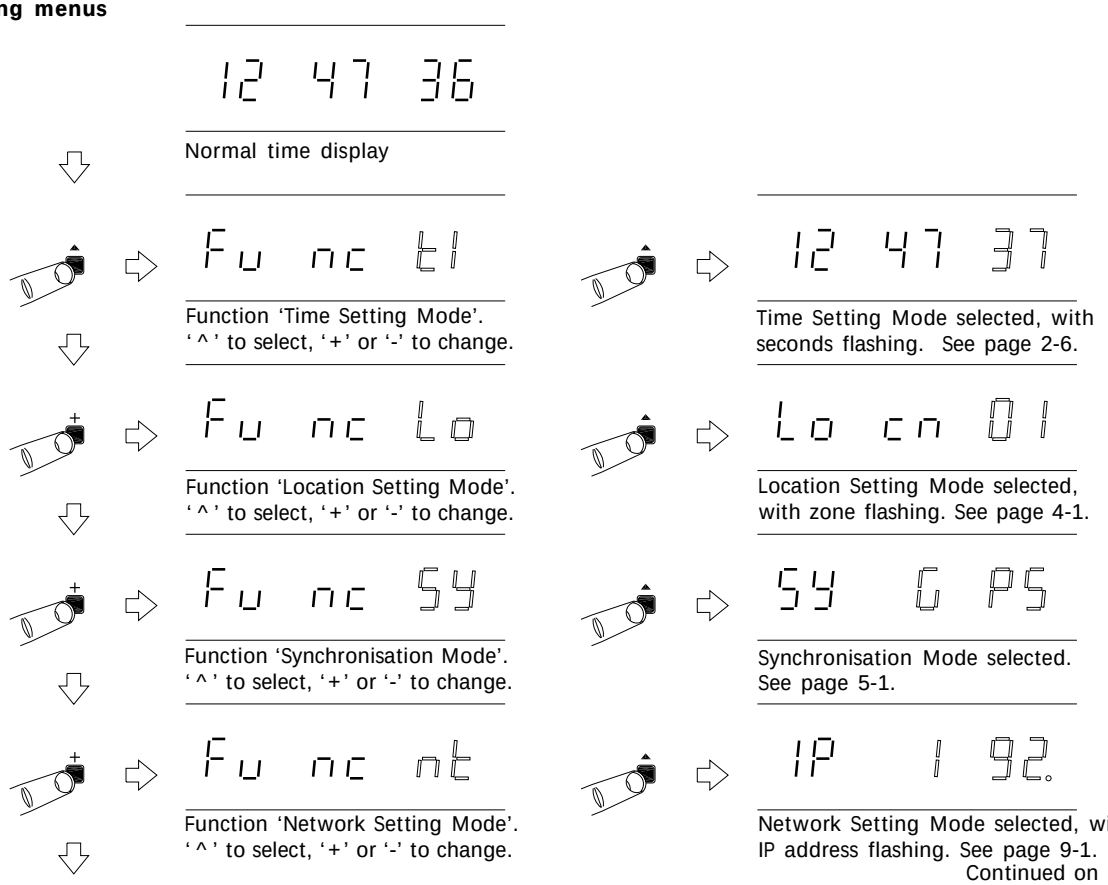
The modes will be displayed in the following order:

- tI Time Setting Mode
- Lo Location Setting Mode
- Sy Synchronisation Setting Mode
- nt Network Setting Mode (visible on all TimeLords - usable on TimeLord-Net versions only)
- Zo Zone Setting Mode
- S1 S1 Serial Output Setting Mode
- S2 S2 Serial Output Setting mode (.S2 & .S4 versions only)
- S3 S3 Serial Output Setting mode (.S4 versions only)
- S4 S4 Serial Output Setting mode (.S4 versions only)
- rL Relay Setting Mode
- Ir IRIG Setting Mode (visible on all versions - usable on -IRIG-OUT versions only)
- Eb EBU Setting Mode (EBU-OUT versions only)
- I1 Impulse Channel 1 Setting mode (-02 versions only)
- I2 Impulse Channel 2 Setting mode (-02 versions only)
- St System Setting Mode

To select any of the modes whilst they are displayed in the function mode press the △ button. This allows the user to enter a specific mode and make any necessary changes to the related settings.

To progress through the options use the △ button and to alter the values for these options use the + and □ buttons. On completion of any changes the △ and ▽ buttons can be used to save the settings and to either step forward or backward through any other options before returning to the normal time display.

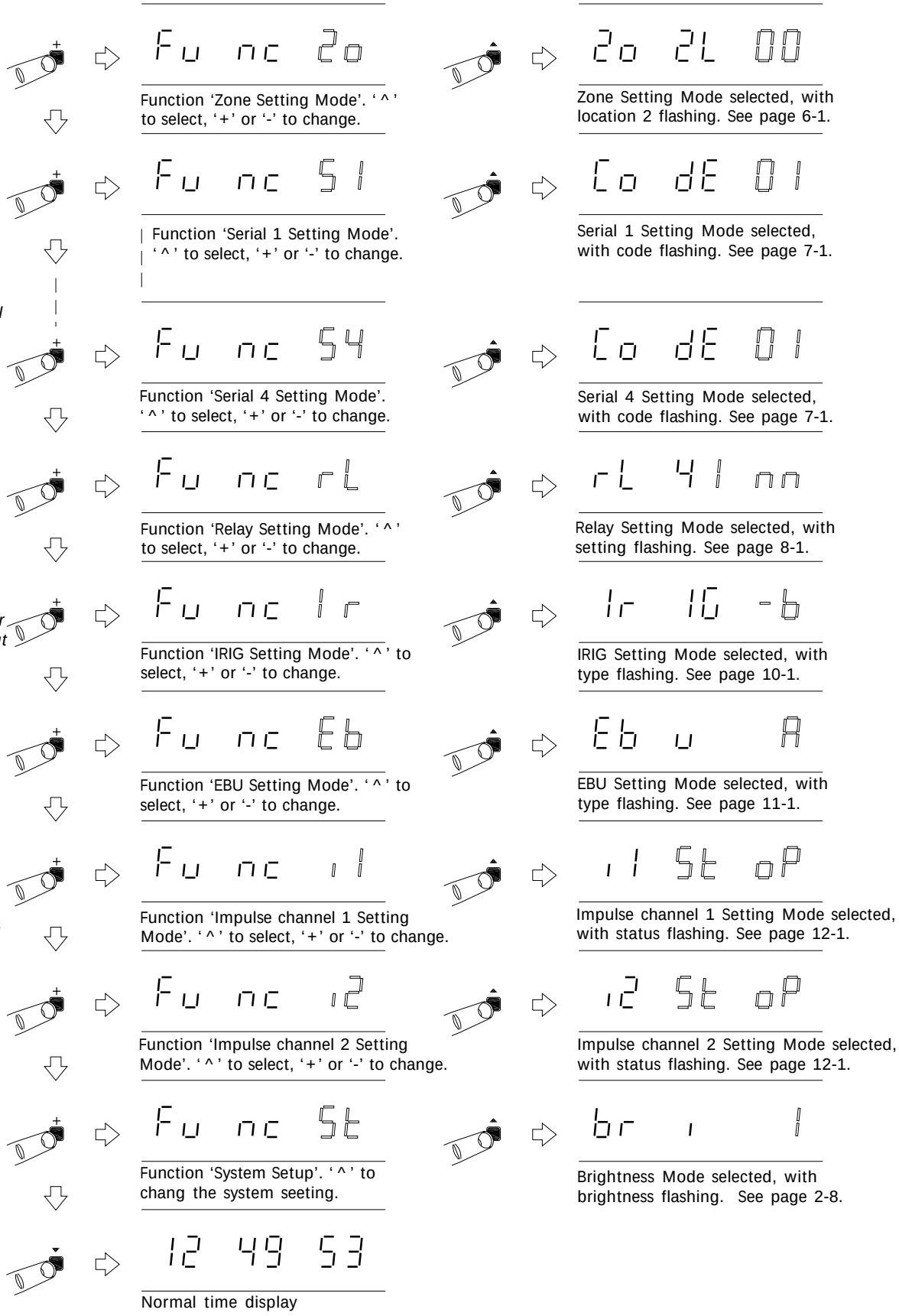
Programming menus



'Network Setting Mode' will appear on all expandable versions, but only be usable on net versions.

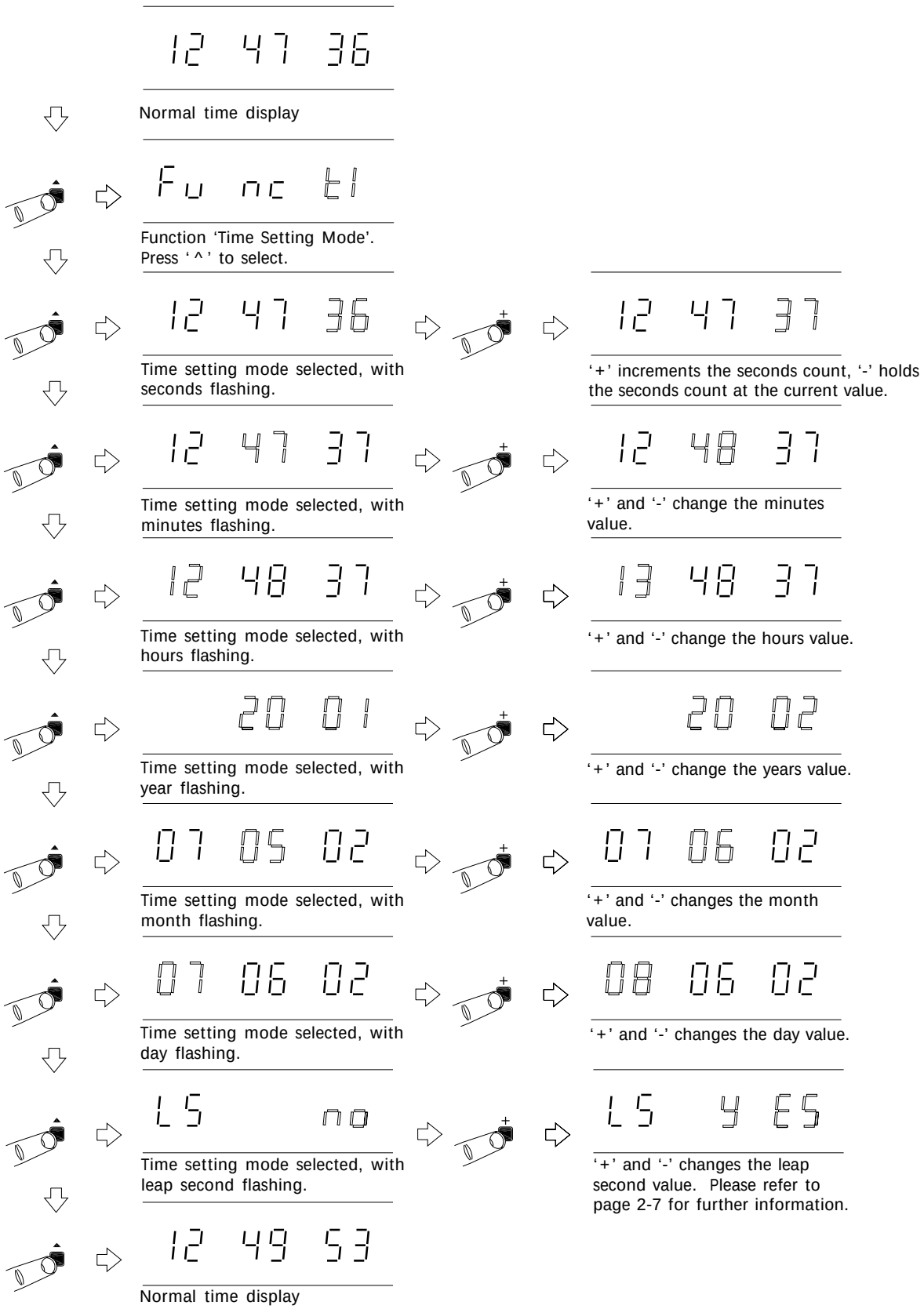
Continued on page 2-5

Programming menus cont.



Setting the Time

A detailed diagram with full instructions on manually setting the time and date is shown below.



Leap Second Insertion

The TimeLord can be programmed to allow for leap second insertion (one second is sometimes added at the end of March, June, September or December), to compensate for the deceleration of the Earth's rotational time with respect to the the Atomic clock (UTC).

This function is enabled by programming the 'LS' setting to yes (as shown on page 2-6).

Date, Sychronisation, Impulse Time and temperature Status Displays

When in normal time display mode the plus and minus buttons can be used to cycle through the date, synchronisation, impulse time (-02 versions) and temperature (expandable versions) status displays. When any of these displays is selected the TimeLord will return to normal time display mode after 2 minutes.

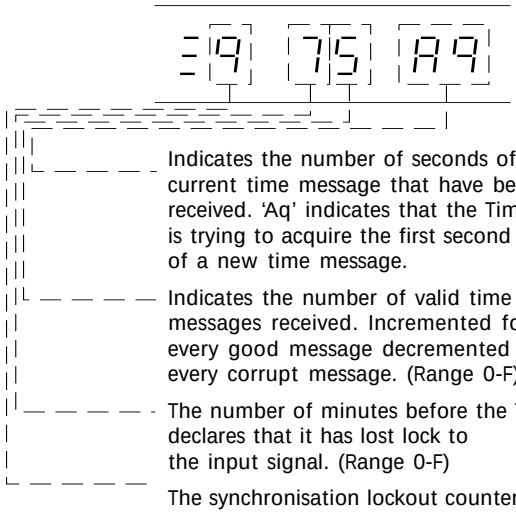
The Synchronisation status display provides useful information regarding the current quality of the MSF or DCF signals that are being received by a V-484 series radio receiver.

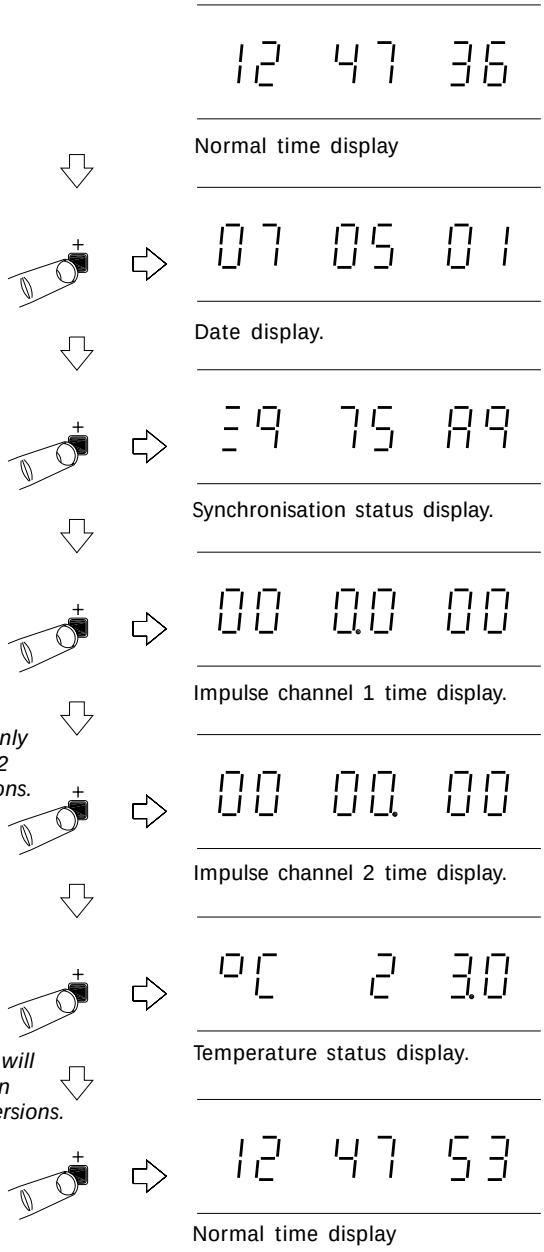
The two Impulse time displays indicate the Impulse time of both Impulse channels. Please refer to chapter 12 for further information.

The Temperature status display shows the internal temperature of the TimeLord Master Clock (not TimeLord-Lite).

Synchronisation Status Display

The synchronisation status display provides the following information relating to MSF or DCF signal reception.





System Set-up

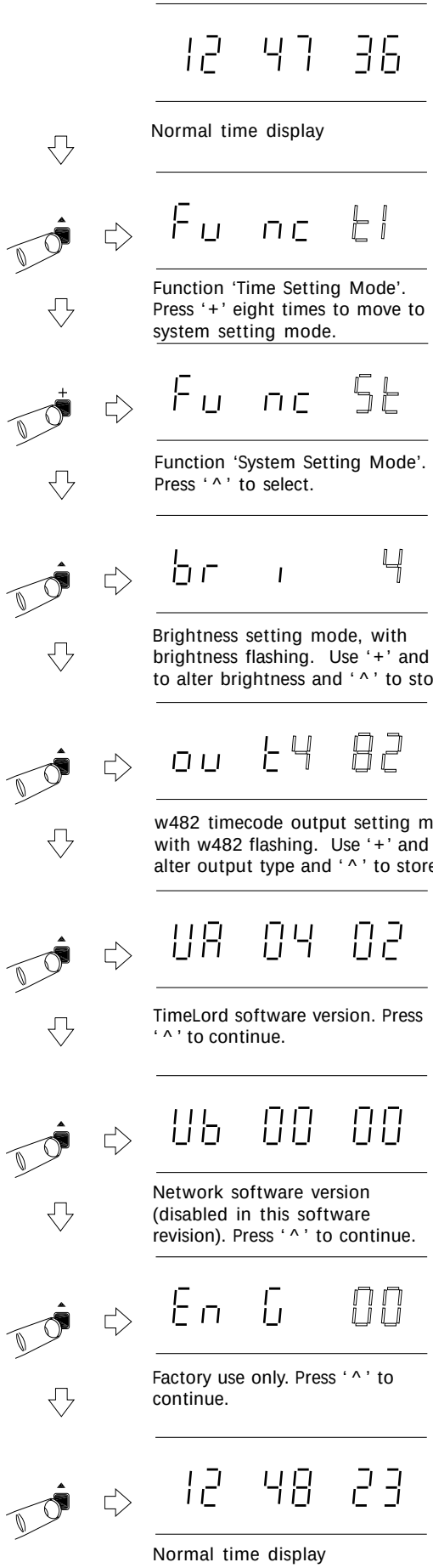
The system set-up menu contains general set-up options for the TimeLord Master Clock. The table below details the available options.

System set-up menu

Code	Function	Options
Bri	Display Brightness	1 - 4. (1 = Dimmest)
out	w482 output type	w482, DCF, MSF, -DCF, -MSF, L48, S48, HBG, -HBG
VA	TimeLord software version	
VB	network software version	(disabled in this software version)
EnG	factory use only	

w482 Timecode output

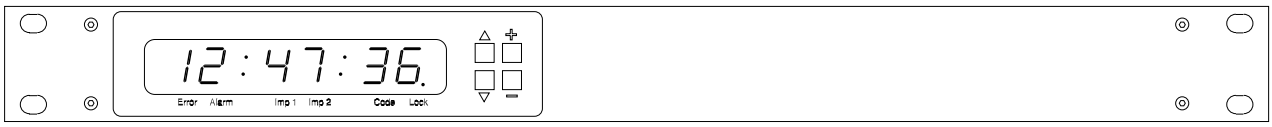
As shown in the table above, the w482 timecode output port may be set to output either w482 timecode or unmodulated MSF, DCF or HBG timecodes. The MSF, DCF & HBG outputs may be set to pulse high or low as required (MSF, DCF & HBG pulse high, -MSF, -DCF & -HBG pulse low). The L48 option implements longer w482 code pulse lengths for use with older 400 series digital clocks. The S48 option implements shorter than standard w482 code pulse lengths.



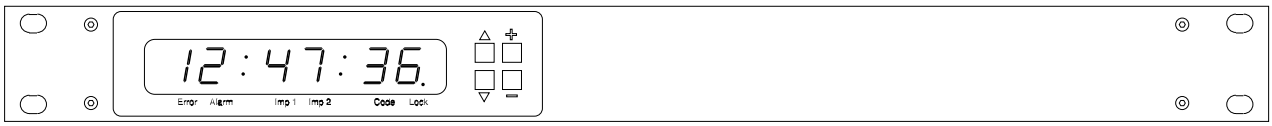
If your TimeLord is fitted with NTP, EBU, S2, S4 or .IMP options, you may need to press the '+' switch more than 8 times.

3 - Installation

TimeLord-Lite/T Desktop version



TimeLord-Lite - no expansion capability



TimeLord-Net and TimeLord-Net-Client

Warning - dangerous voltages - the TimeLord master clock must be disconnected from the mains supply prior to removing the top cover.

Power Supply Connection

The TimeLord family of master clocks are fitted with universal power supplies suitable for 110v - 240v ac operation. The desktop version may be supplied for 230v AC, 110vAC or 12v DC operation. Please specify appropriate end user location at time of order to enable correct power adapter or connector type to be supplied.

PSU order codes:

.AU - Australian style, 240v 50Hz ac.

.EU - European style, 230v 50Hz ac.

.UK - UK style, 230v 50Hz ac.

.US - US style, 110v 60Hz ac.

The TimeLord rackmount master clock is supplied with an IEC style mains lead.

The TimeLord-Lite/T is supplied with an external 12v DC PSU. If an alternative PSU is to be used, it should have a rating of greater than 0.4A at 12v DC.

The master clock must be connected to the appropriate supply after first verifying the correct voltage by reference to the supply voltage label fixed to the rear of the clock (rackmount versions) or on the external power supply (desktop).

A connection to the earth line must be made to ensure safe operation and ensure compliance with EMC regulations.

To ensure conformance with EN60950:

(A) For installations where the TimeLord master clock is to be permanently connected into the mains power circuit, a readily accessible disconnect device should be incorporated in the fixed wiring.

(B) For installations where the TimeLord master clock is to be plugged into the mains power circuit, a socketed outlet should be installed near the equipment and should be easily accessible.

All installation work should be performed in accordance with the Sixteenth Edition of the IEE Wiring Regulations.

Battery backup.

Expandable TimeLords are fitted with a Lithium battery which will maintain the internal time count for a period normally in excess of 1 year if the mains supply is interrupted.

The TimeLord-Lite is fitted with an automatically recharging battery which will, when fully charged, maintain the internal time count for a period in excess of 50 hours if the mains supply is interrupted.

Fuses and Output protection.

The TimeLord circuit board makes use of advanced automatically resettable fuse technology so that it is protected under fault conditions.

The universal power supply within the TimeLord uses a 20mm fuse rated at 2 Amps 250V. Please note that this fuse is not a user serviceable part.

External Connections

The external connections located on the rear of the TimeLord provide the following inputs and outputs:

Connection	Section
GPS / Synchronisation Connection	5
Relay Connection	8
IRIG* and EBU* Connection	10 & 11
RS232 and RS422/485 S1, S2*, S3* & S4* Connections	7
w482 Connection	6
10BaseT Ethernet* Connection	9
Impulse Connection*	12

** denotes optional items which may or may not be fitted in your unit.*

Please see the relevant sections of this manual for further information.

Operation

Please see section 2 for a quick start guide to getting your TimeLord system up and running.

4 - Location Setup

The TimeLord Master Clock provides advanced time zone functionality. Regardless of time synchronisation source, the TimeLord can be used to provide time and date information referenced to UTC, user 'local' time or other custom time zone. Incorporating 'Set Once' technology, the TimeLord will automatically calculate future seasonal time changes for all 64 of the preset time location code settings.

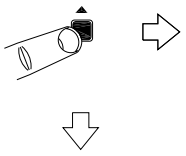
Setting the location

For installations where the output of the TimeLord is to be referenced to UTC / GMT, the location code should be set to 00. For installations where the output of the TimeLord is to be referenced to the 'local' time zone, select the appropriate location code from the table opposite. (eg. For a unit installed in Birmingham, England, where 'local' time output is required, location code 01 should be used.)

User Programmable Time Zone

For time-offsets and daylight saving time change dates not covered by the location codes on page 4-2, a user programmable time zone is provided. Information regarding the time offset from UTC and any daylight saving change rules may be input via a 12 digit code.

Please contact our technical department for further information regarding this function.

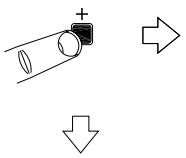


12 47 36

Normal time display

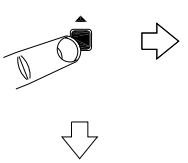
Func tI

Function 'Time Setting Mode'. Press '+' to move to 'Location Setting Mode'.



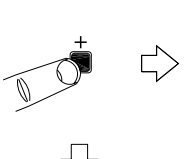
Func Lo

Function 'Location Setting Mode'. Press '^' to select.



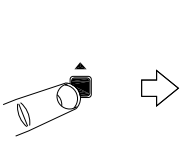
Lo cn 01

'Location Setting Mode' selected, with current location flashing. Use '+' and '-' to select the required location from the table on page 4-2.



Lo cn 02

Press '^' to store the new location setting and return to normal time display.

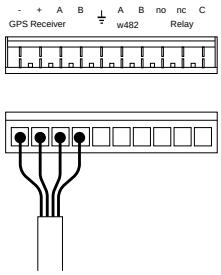


12 48 23

Normal time display.

Time Zone Locations				Time Zone Locations *cont*			
Code	**City / Location**	**GMT offset**	**Daylight Savings?**	**Code**	**City / Location**	**GMT offset**	**Daylight Savings?**
00	GMT, UTC, Monrovia, Casablanca	0	No	33	Azores, Cape Verde Is.	-1	Yes
01	Dublin, Edinburgh, London, Lisbon	0	Yes	34	Mid-Atlantic	-2	Yes
02	Amsterdam, Berlin, Brussels, Paris	+1	Yes	35	Brasilia	-3	Yes
03	Belgrade, Budapest, Prague, Zagreb	+1	Yes	36	Buenos Aires, Georgetown	-3	No
04	Athens, Istanbul, Minsk	+2	Yes	37	Newfoundland	-3 1/2	Yes
05	Bucharest	+2	Yes	38	Atlantic Time (Canada), Bermuda	-4	Yes
06	Cairo	+2	Yes	39	Caracas, La Paz	-4	No
07	Harare, Pretoria	+2	No	40	Bogota, Lima, Quito	-5	No
08	Helsinki, Riga, Tallinn	+2	Yes	41	Eastern Time (US & Canada)	-5	Yes
09	Israel	+2	No	42	Indiana (East)	-5	No
10	Kuwait, Riyadh, Nairobi	+3	No	43	Central Time (US & Canada), Mexico City	-6	Yes
11	Moscow, St. Petersberg, Volgograd	+3	Yes	44	Tegucigalpa	-6	No
12	Tehran (non leap-year)	+3 1/2	Yes	45	Arizona	-7	No
13	Abu Dhabi, Muscat, Baku, Tbilisi	+4	No	46	Mountain Time (US & Canada)	-7	Yes
14	Kabul	+4 1/2	No	47	Pacific Time (US & Canada)	-8	Yes
15	Ekaterinburg	+5	Yes	48	Alaska	-9	Yes
16	Islamabad, Karachi, Tashkent	+5	No	49	Hawaii	-10	No
17	Chennai, Kolkata, Mumbai, New Delhi	+5 1/2	No	50	Midway Island, Samoa	-11	No
18	Almaty, Dhaka, Colombo	+6	No	51	Eniwetok, Kwajalein	-12	No
19	Bangkok, Hanoi, Jakarta	+7	No	52	*User programmable time zone*	-	-
20	Beijing, Chongqing, Hong Kong, Urumqi	+8	No	53	Amman	+2	Yes
21	Perth, Singapore, Taipei	+8	No	54	Baghdad	+3	Yes
22	Osaka, Sapporo, Seoul, Toyko	+9	No	55	Tehran (leap-year only)	+3 1/2	Yes
23	Yakutsk	+9	Yes	56	Kathmandu	+5 3/4	No
24	Adelaide	+9 1/2	Yes	57	Santiago, Chile	-4	Yes
25	Darwin	+9 1/2	No	58	Newfoundland - 2007+ (US Energy Policy Act 2005)	-3 1/2	Yes
26	Brisbane, Guam, Port Moresby	+10	No	59	Atlantic Time - 2007+ (US Energy Policy Act 2005)	-4	Yes
27	Canberra, Melbourne, Sydney	+10	Yes	60	Eastern Time - 2007+ (US Energy Policy Act 2005)	-5	Yes
28	Hobart	+10	Yes	61	Central Time - 2007+ (US Energy Policy Act 2005)	-6	Yes
29	Vladivostok	+10	Yes	62	Mountain Time - 2007+ (US Energy Policy Act 2005)	-7	Yes
30	Magadan, Solomon Is., New Caledonia	+11	No	63	Pacific Time - 2007+ (US Energy Policy Act 2005)	-8	Yes
31	Auckland, Wellington	+12	Yes	64	Alaska - 2007+ (US Energy Policy Act 2005)	-9	Yes
32	Fiji, Kamchatka, Marshall Is.	+12	No				

5 - Synchronisation Setup



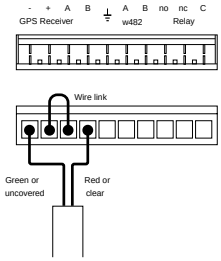
GPS connection

10 way terminal block

- -ve Power for V-488B/C GPS
+ +ve Power for V-488B/C GPS
A Signal A from V-488B/C GPS
B Signal B from V-488B/C GPS
⏚ EMC grounding point

Note:

A Screened cable should be used to connect the V-488C / V-488B GPS receiver to the TimeLord . The screen should be connected to the EMC grounding point on the TimeLord and on the V-488B GPS receiver.



MSF and DCF connection

10 way terminal block

- Green or uncovered wire from V-484 radio receiver.
+ Link to 'A' connector.
A Link to '+' connector.
B Red or clear wire from V-484 radio receiver.
⏚ EMC grounding point

Note:

A Screened cable should be used to connect the V-484 radio receiver to the TimeLord in areas of high electrical noise. The screen should be connected to the EMC grounding point on TimeLord only.

Synchronisation Setup

Code	Synchronisation source	Notes
None	Standalone operation using internal TCXO	No external reference, accuracy better than 0.1 sec/day. 0-45ºC (20-25ºC on TimeLord-Lite .
GPS	V- 488C/488B GPS Receiver System - Synchronisation from GPS satellites.	Very accurate time source. Can be used anywhere in the world.
DCF	V-484 DCF Recever - Synchronisation from the DCF time signal.	
MSF	V-484 MSF Receiver - Synchronisation from the MSF time signal.	
1 PPS	1 Pulse Per Second - Timebase generated from 1 PPS at RS232 / RS485 serial levels.	****Special Order Option**
Ser	Serial ASCII Data String - Synchronisation from an RS232 / RS485 serial ASCII time & date telegram.	****Special Order Option**
NTP	Network Time Protocol - Synchronisation from an NTP Time Source	Please refer to appendix D
4800	-	****Special Order Option**
IRIG	Synchronisation from an IRIG-B Timecode source.	****Special Order Option**

GPS Synchronisation

The V-488C and V-488B GPS receiver systems are designed to be automatically synchronised to time signals transmitted from the Global Positioning System (GPS) navigation network. The GPS constellation consists of 28 operational satellites, operating in 12 hour orbits at an altitude of 20,200km.

Both the V-488C and the V-488B GPS receiver have been designed for simple installation and operation by the end-user, requiring only a 4 wire interconnection to the TimeLord Master Clock. When synchronised to a V-488C or 488B GPS receiver system the TimeLord-Net Master Clock output signals are maintained within 50uS of UTC (100uS of UTC on TimeLord-Lite versions).

The reception gain pattern of both GPS systems is designed for full, upper hemispherical coverage with the gain diminishing at low elevations. This cross-section is consistent through 360 degrees and so the 3 dimensional gain pattern is a symmetrical spheroid surface.

Advantages of GPS time synchronisation:

- Very accurate synchronisation
- Can be used anywhere in the world
- Not subject to EM interference

Disadvantages of GPS time synchronisation:

- Antenna needs to be mounted externally with a clear view of 75% of the sky.

The V-488C GPS Synchronisation System

The V-488C GPS synchronisation system is housed in a single IP66 rated case containing an advanced combined Sony active antenna and 12 channel parallel GPS receiver module and a microprocessor based communications interface. The system is supplied complete with a post mounting clamp to enable the unit to be fixed to a suitable horizontal or vertical post of up to 2cm diameter. The antenna should be mounted on the roof of a building or under a suitable skylight.

The V-488B GPS Synchronisation System

The V-488B GPS receiver system comprises a post mounting active antenna and a separate receiver/decoder unit. The antenna module transmits the received GPS signals and receives power (5Vdc @ 25mA) from the GPS receiver/decoder module via a single 5 metre long RG58 coaxial cable. A post mounting clamp is supplied to enable the antenna to be fixed to a suitable horizontal or vertical post of up to 2cm diameter. The antenna may be mounted on the roof of a building or under a suitable skylight.

The GPS receiver/decoder unit contains a Motorola 8 Channel parallel receiver and a microprocessor based communications interface. The receiver/decoder module is housed in a robust aluminium case fitted with mounting points for wall mounting and protected to IP65. The module should be mounted in a protected location within 5 metres of the antenna.

V-488C and V-488B System Installation

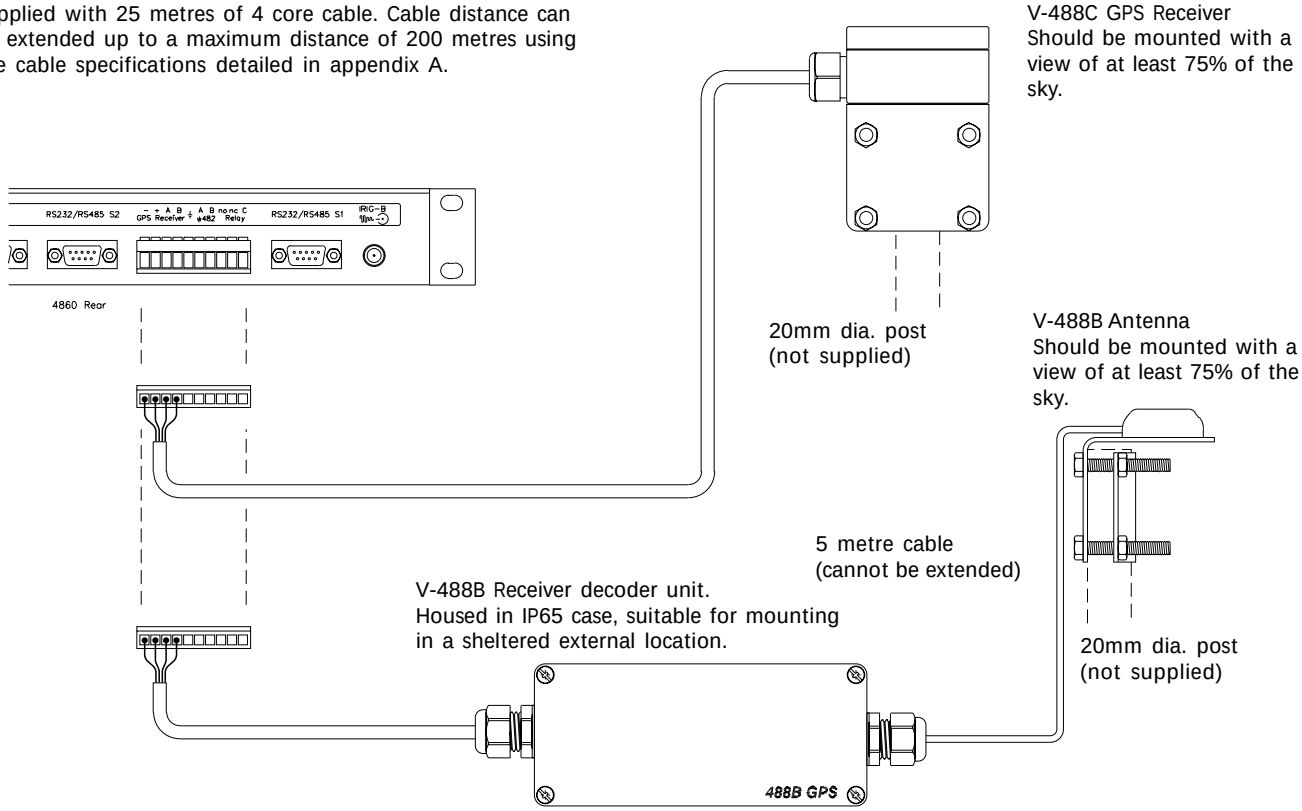
To ensure ease of operation and to remove the possibility of operator error, both the V-488C and V-488B GPS systems are designed to self initialise.

Ensure that the TimeLord is disconnected from the mains power supply when making connections to the V-488C / V-488B GPS receiver systems.

1 Install the V-488C unit or V-488B antenna module horizontally using the post mounting kit provided. Ensure that the unit has a clear view of at least 75% of the sky. If the sky view is reduced the interval between 'switch-on' and system time synchronisation will be considerably increased.

2 Connect the antenna module to the GPS receiver using the special 5m cable provided (V-488B systems only).

Both the V-488C and the V-488B GPS Receiver systems are supplied with 25 metres of 4 core cable. Cable distance can be extended up to a maximum distance of 200 metres using the cable specifications detailed in appendix A.



3 A connection between the V-488C / V-488B and the TimeLord should be made using the 25 metre four core cable supplied. If a longer cable distance is required Appendix A should be consulted for suitable cable specifications. The maximum distance between the GPS system and the TimeLord master clock is 200m. If a screened cable is used, the cable screen should be connected to the EMC ground connection on the 10 way terminal block, located on the rear of the TimeLord. On 488B systems, the screen should be connected to the screw fitting on the 488B receiver/decoder case. The screen is supplied pre-connected on V-488C units with captive cable connections.

4 The 4 GPS input connections located on the 10 way terminal block on the rear of the TimeLord, should be wired as shown in the diagram on page 5.1.

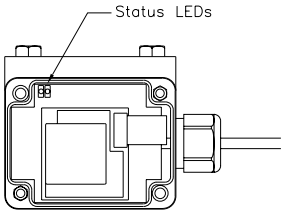
5 Connect the power supply to the TimeLord Master Clock.

6 Once the power has been applied the receiver will automatically begin to search the sky for all available satellites, during this process the green LED will flash. After three satellites have been acquired the green LED will stop flashing and become constantly illuminated, indicating that a precise date and time has been calculated from the satellite data transmissions. From a 'cold' start this process will typically take less than 10 minutes.

7 Ensure that the TimeLord is configured to synchronise from the GPS signal by following the procedure on page 5-3.

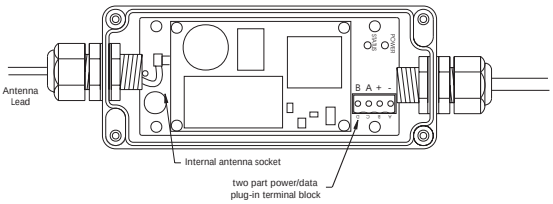
Once the green LED has illuminated the synchronising time signals are transmitted from the GPS system to the TimeLord. The TimeLord Master Clock should lock in and display the correct time within 5 minutes.

V-488C GPS Integral Receiver/Interface



25metre captive cable for connection to TimeLord Master Clock.

V-488B GPS Separate Receiver/Interface



Connections from TimeLord to V-488C / V-488B

V- 488C/488B GPS Connection	TimeLord Connection	Connection Colour (using supplied 25m cable)
+	+	Red
-	-	Blue
A	A	Yellow
B	B	Green

MSF and DCF synchronisation

MSF and DCF are the two most widely used radio time code signals. The DCF signal is derived from the atomic clocks at the Physics Institute of Brunswick and transmitted at a frequency of 77.5KHz from Manflingen, near Frankfurt in Germany. The MSF signal is referenced to the Caesium Beam Oscillators at the National Physical Laboratory and transmitted on a frequency of 60KHz from Rugby in the United Kingdom.

Under normal circumstances the DCF signal provides reliable operation at distances of up to 1500km, MSF signals are normally usable up to 1000km from the transmitter. Greater operating ranges are possible at night.

When synchronised to MSF or DCF using a V-484 radio receiver the TimeLord Master Clock output signals are maintained within 30mS of UTC.

Advantages of MSF and DCF time synchronisation:

- Lower purchase cost than GPS
- Can sometimes be installed internally.

Disadvantages of MSF and DCF time synchronisation:

- Can be difficult to find good location for signal reception.
- Suffers greatly from EM interference - Avoid locating near computers, electronic equipment, fluorescent lighting, lift equipment, metal girders, reinforced concrete walls and all other sources of electrical noise.
- MSF is off-air for a maintenance period of two weeks during the summer, and the first Tuesday of every January, April, July and October. MSF status can be checked by telephoning 020 8943 6493.

Installation

The V-484 series time code receiver should be mounted:

- At least 2.5 metres from the TimeLord Master Clock.
- At greatest practical distance from:
  Other electronic equipment including computers, fluorescent lights and signs, metal girders, reinforced concrete walls and any other sources of electrical noise.
- On the side of the building nearest Rugby (MSF) or Frankfurt (DCF).
- Preferably on the outside of the building (V-484.02 and V-484.03 only) as high as possible. The case is weatherproof to IP65 (484.02 and 484.03 only) but it is preferable to provide some protection from direct rain.
- With the cable entry on the lower face of the case. (V-484.02 and V-484.03 only)

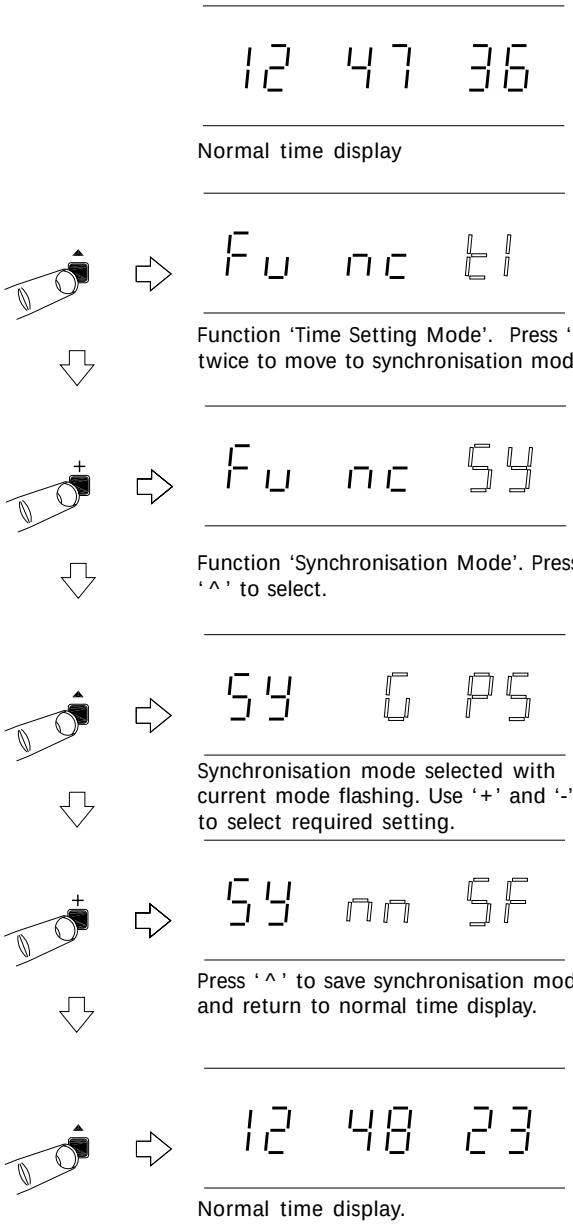
The antenna is supplied with 5 metres of two core cable, if a longer cable distance is required Appendix A should be consulted for suitable cable specifications. The maximum distance between the V-484 radio receiver and the TimeLord Master Clock is 200m.

If a screened cable is used, the cable screen should be connected to the EMC grounding terminal on the 10 way terminal block, located on the rear of the TimeLord.

Alignment

The V-484.02 (MSF) and V-484.03 (DCF) radio receivers have dual ferrite antennas, which normally permit location regardless of orientation to the transmitter. The receiver is mounted by means of four fixing holes in the rear surface which are accessed after removing the front cover. The four mounting holes are located outside of the central sealed compartment.

The V-484.06 (MSF) and V-484.07 (DCF) receivers have a single antenna element and are supplied with an adjustable mounting bracket so that the installer can ensure that the orientation of the longest face of the receiver is at 90° to the direction of the transmitter.



The front cover of the V-484.02 and V-484.03 receivers may be removed to enable the indicator LED to be viewed. The indicator LED on the V-484.06 and V-484.07 receiver is located on the front face of the unit.

The alignment of the receiver is correct when the LED flashes once per second. The Code LED located on the front of the TimeLord will flash at the same time as the LED in the V-484.

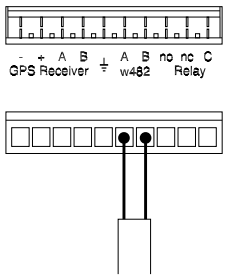
Signal reception

In good conditions the TimeLord master clock will take three minutes to synchronise with the transmitted time code from either DCF or MSF. When the TimeLord is 'locked' to the transmitted signal, the locked LED, located after the seconds display, is illuminated continuously. During periods of signal failure or signal corruption the clock will maintain timekeeping using its internal crystal oscillator.

1 PPS / Serial ASCII Synchronisation

Special order versions of the TimeLord Master Clock are available to facilitate synchronisation with an RS232 / RS485 level serial ASCII data string or timebase generation from an RS232 / RS485 level 1 Pulse Per Second source. The Serial variant will synchronise to Serial format 1 (as shown on page 7.1) transmitted at 9600 baud, 8 data bits, no parity, 1 stop bit at a 1 second repetition rate.

6 - w482 Time Zone Setup



TimeLord w482 Code Output

10 way terminal block

A w482 Code +

B w482 Code -

⏚ EMC grounding point

Note:

Polarity of connection is not critical.

If a screened cable is used for system interconnection, the screen should only be connected to the EMC grounding point on the TimeLord.

The w482® signal was developed for controlling electronic clocks, using a single cable pair data interconnection, in electrically noisy environments. A principal advantage of w482® is the ability to provide time information in any one of fifteen different synchronised time zones. All fifteen time zones can be individually configured from the front panel of the TimeLord, using 'Set Once' technology to allow automatic seasonal time change correction.

The w482® signal is transmitted at 4-24v amplitude and at a 50 bits per second data rate. The signal is virtually immune to electro-magnetic interference.

One TimeLord unit can control up to fifty 400A series slave displays located up to 1km from the master clock unit using a simple, non-critical cable pair.

Setup Procedure

1 Decide what time you want to display on your slave clocks. If you just want to display Local Time, as previously programmed during 'location' setting (section 4), proceed to stage 2.

If you have more than one time zone to display or want to display a different time zone from that set in the location setting, determine the zone location codes (Page 4-2) and program w482 zones '2' - 'A' accordingly.

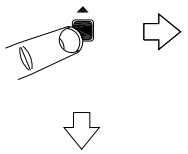
Ensure that the TimeLord system is disconnected from the mains power supply when making connections to the w482 output.

2 Connect the V-400A slave clocks to the TimeLord w482 output terminals. (See above and page 6-2).

Check that the V-400A (or V-470A) slave clock is programmed for w482 time code synchronisation. If the V-400A (or V-470A) slave clock is to be synchronised by a w482 time zone which is not zone 1, program the V-400A (or V-470A) clock accordingly.
Refer to the V-400A (or V-470A) series operating and installation manual for more details.

3 Apply power to the TimeLord.

Note: If you using the IRIG output (IRIG-OUT versions only) or EBU output (EBU-OUT versions only) and are using it in an application that requires the location setting to be set to a time zone other than the local time zone, w482 zone 2 should be programmed for the local time zone and the slave displays should be configured accordingly.

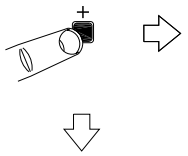


12 47 36

Normal time display

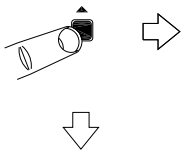
Fu nc t1

Function 'Time Setting Mode'. Press '+' four times to move to w482 zone setting mode.



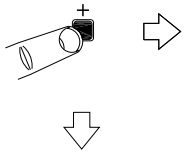
Fu nc 2o

Function 'w482 Zone Setting Mode'. Press ' ^ ' to select.



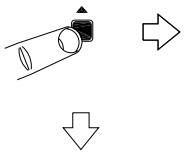
2o 2L 00

w482 Zone Setting Mode, zone 2 selected with current location flashing. Use '+' and '-' to change.



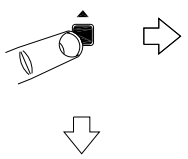
2o 2L 02

Press ' ^ ' to store the new zone 2 setting and move on to the w482 time zone 3 setting.

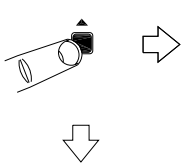


2o 3L 00

Zone 3 selected, press '+' and '-' to change current setting, ' ^ ' to move to next zone.

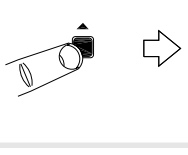


w482 zone settings 4 - F



2o FL 00

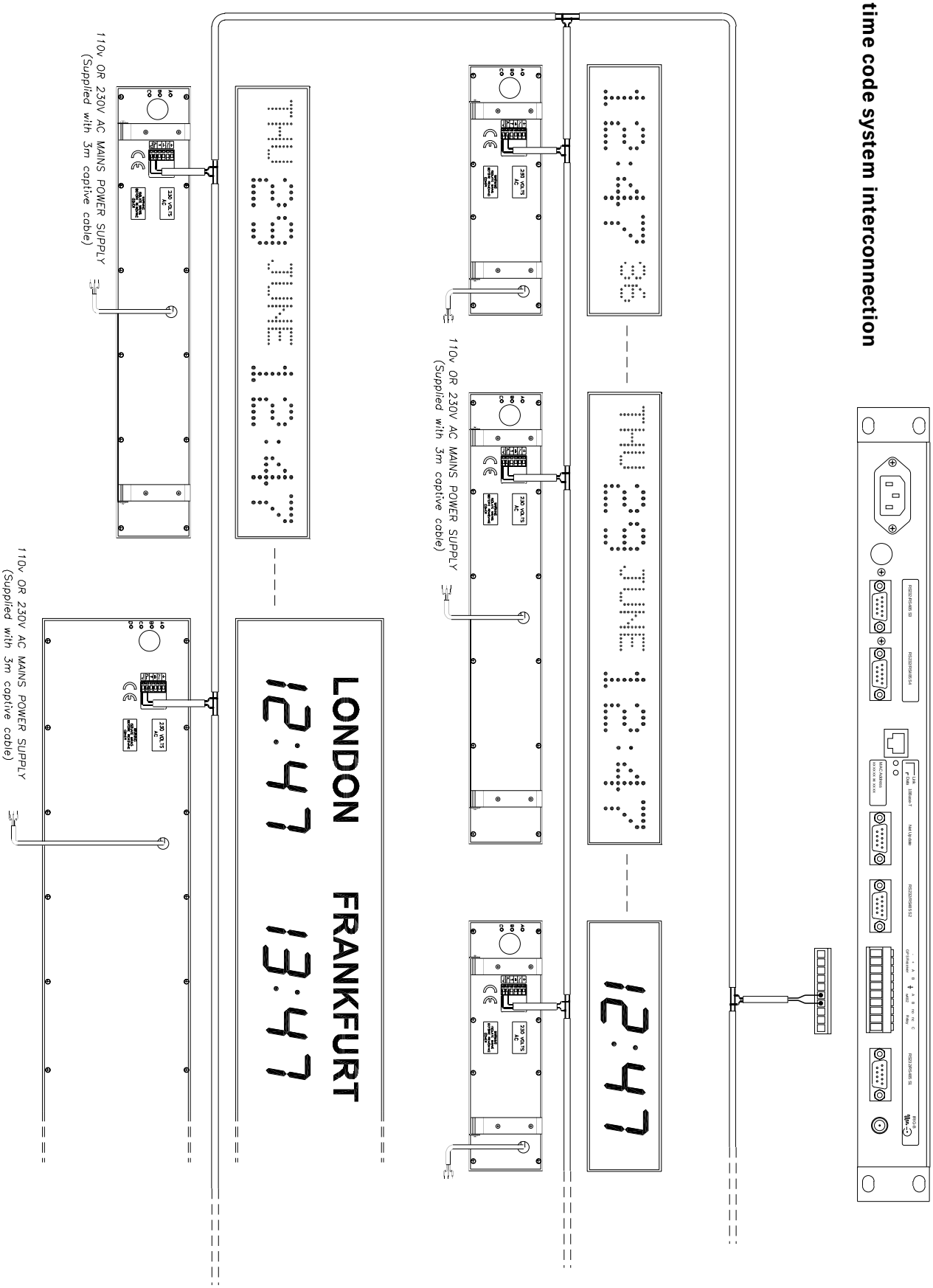
Zone F selected, press '+' and '-' to change current setting, ' ^ ' to return to normal time display.



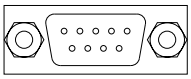
12 48 23

Normal time display.

w482 time code system interconnection



7 - RS232 & RS422/485 Serial Output



RS232/RS485 S1

TimeLord RS232 & RS485/422 Interface

DB9-F Connector

RS232

1 1PPS
2 Transmitted Data (TXD)
3 Received Data (RXD)
5 Signal Ground (GND)

RS485/422

8 'A' - non-inverting
9 'B' - inverting

Note:

The 1PPS signal is at RS232 levels and goes high for 100ms on the second edge.

Operation

The TimeLord Master Clock is fitted as standard with one RS232 & RS485/RS422 serial data output. The signals are accessed via the female DB9 connector labelled RS232/RS485 S1 mounted on the rear of the unit.

Additional serial outputs (.S2 & .S4 versions only)

The TimeLord is optionally available with two or four RS232/RS485 serial data outputs. Where installed, these signals are accessed via the S2, S3 and S4 female DB9 connectors. If your TimeLord is fitted with multiple serial ports, extra serial setting modes (S2, S3 & S4) will appear in the main programming menu to allow these ports to be individually configured using the procedure detailed below. (Please note: The RS232 level 1 pulse per second output is not present on pin1 of serial ports S3 & S4).

Setting the Message Format

The TimeLord has 71 different preprogrammed serial output messages. The desired message can be selected from the lists on page 7-2 and programmed into the TimeLord using the procedure on page 7-5. Please also refer to Appendix C for details of products compatible with the TimeLord.

Setting the Output Message Time Offset

The TimeLord serial output message may be referenced to the current location setting (see section 4) or UTC/GMT as detailed in the procedure on page 7-5 .

Data Formats

The serial messages numbered from 01 to 09 are user programmable. This allows the user to program information concerning the baud rate, data bits, parity, stop bits and serial repetition to ensure that the format chosen meets their requirements.

Some of the other serial data messages have factory preset transmission formats to ensure that system interconnection is trouble free.

Message Format

Serial Format 1 (Code 1)

STX Su St Mu Mt Hu Ht Du Dt Mtu Mtt Yu Yt St ETX

Serial Format 2 (Code 4)

T Yt Yu : Mtt Mtu : Dt Du : 0 W : Ht Hu : Mt Mu : St Su CR LF

Byte	Description	ASCII value
S	seconds	30h-39h
M	minutes	30h-39h
H	hours	30h-39h
W	day-of-week	31h-37h
D	day-of-month	30h-39h
Mt	month	30h-39h
Y	year	30h-39h
STX	start transmission	02h
ETX	end transmission	03h
CR	carriage return	0dh
LF	line feed	0ah
0	ASCII zero	30h
:	ASCII colon	3ah
St	status - see table	30h-3fh

Status byte - ASCII value 30h-3fh

Bit 0 undefined.
Bit 1 0 = Winter time, 1 = Summer Time
Bit 2 0 = not synchronised, 1 = synchronised
Bit 3 0 = no early warning bit, 1 = early warning bit

Application Notes

The TimeLord Information CD contains application notes detailing the use of the TimeLord with many different types of equipment. If you are unable to access the CD or require further information on the setup and use of the serial output please contact our technical support representatives.

The Serial Messages table on page 7.2 contains references to application notes which contain additional information specific to that serial message.

User programmable serial settings

Display	Setting	Range	Notes
bAud	Baud Rate	19 - 19200 baud, 96 - 9600 baud, 48 - 4800 baud, 24 - 2400 baud, 12 - 1200 baud.	Data transmission rate.
bitS	Data bits	7 - 7 data bits, 8 - 8 data bits.	Number of data bits in each ASCII character.
PAr	Parity	odd - Odd parity, EvE - Even parity, no - No parity.	Even and Odd Parity allow error checking of incoming signal.
StoP	Stop bits	1 - 1 stop bit, 2 - 2 stop bits.	Number of stop bits per character.
Rep	Serial Repetition	1SE - 1 serial message every sec, 1nn - 1 serial message every min, 5nn - 1 serial message every 5 min, 1 Hr - 1 serial message every hour, 24 Hr - 1 serial message every 24 hrs at Midnight, 4An - 1 serial message every 24 hrs at 4 AM, rSE - On demand, next second edge. P15 - 1 serial message at 15 mins past every hour.	The 'on demand' repetition setting allows the user to send one of the following ASCII characters to the clock and have it respond with the currently selected message. Valid 'on demand' characters: 's' (0x73), 'S' (0x53), 't' (0x74), 'T' (0x54) and '?' (0x3f)

Serial Messages

Code	Message Format	Repetition	Transmission Format	Notes
01	Std-serial Format 1	User Programmable	User Programmable	
02	Std-serial Format without status	User Programmable	User Programmable	
03	Std-serial Format 2	User Programmable	User Programmable	
04	Std-serial Format 2 with day of week	User Programmable	User Programmable	
05	Racal ICR64	User Programmable	User Programmable	
06	Schauer	User Programmable	User Programmable	
07	NetClock/2	User Programmable	User Programmable	AN128 - NTP synchronisation
08	GPZDA NMEA Message	User Programmable	User Programmable	
09	EES Format 5	User Programmable	User Programmable	
10	Scientific Atlanta / CSI	On Demand	Preset - 9600,8,e,2	AN111
11	Mitsubishi BRS5600 VCR	5 Min	Preset -1200,8,n,1	AN112
12	Panasonic	5 Min	Preset - 9600,7,o,1	AN113
13	Grundig / Plettac Vaz	5 Min	Preset - 9600,8,n,1	
14	Vision Factory Montage / Montage+	5 Min	Preset - 9600,8,n,1	AN115 & AN116 Montage+ has to be connected by RS232 if remote keyboard is used.
15	Tecton Drax	5 Min	Preset - 9600,8,n,1	AN101
16	Vicon VPS	5 Min	Preset - 9600,8,o,1	AN100
17	EBCDIC Racal ICR64 format	1 Hr	Preset - 4800,8,n,1	
18	Philips Projects Special Format	5 Min	Preset - 9600,8,n,1	
19	Cartner	1 Sec	Preset - 1200,7,e,1	
20	Dedicated Micros	User Programmable	User Programmable	AN127
21	Tecton Kramplex / Molynx Visilynx 2	5 Min	Preset - 9600,8,n,1	AN125 Visilynx 2 requires PCBV309 card fitted with software SW191
22	Vision Factory Cameo	5 Min	Preset - 19200,8,n,1	AN117 Can also be used with Montage+
23	ASC Telecom DL2 and Marathon	1 Sec	Preset - 9600,8,n,1	AN129 / AN136
24	Maxpro	User Programmable	User Programmable	
25	LUL Standard Format	1 Sec	Preset - 1200,8,e,2	
26	Wharton wSync & sync32 software	1 Sec	Preset - 9600,7,e,1	
27	Philips LTC3990/50 VCR	5 Min	Preset - 1200,8,n,1	AN???
28	LUL Northern Line Fomat 1	User Programmable	User Programmable	
29	LUL Northern Line Fomat 2	User Programmable	User Programmable	
30	AudioSoft	User Programmable	User Programmable	Audiosoft format without sync alarm notifier
31	Philips LTC2600 MultiplexerUK	5 Min	Preset - 9600,8,n,1	UK Format Date (LTC2600)

Continued on page 7-3

Serial Messages *(cont.)*

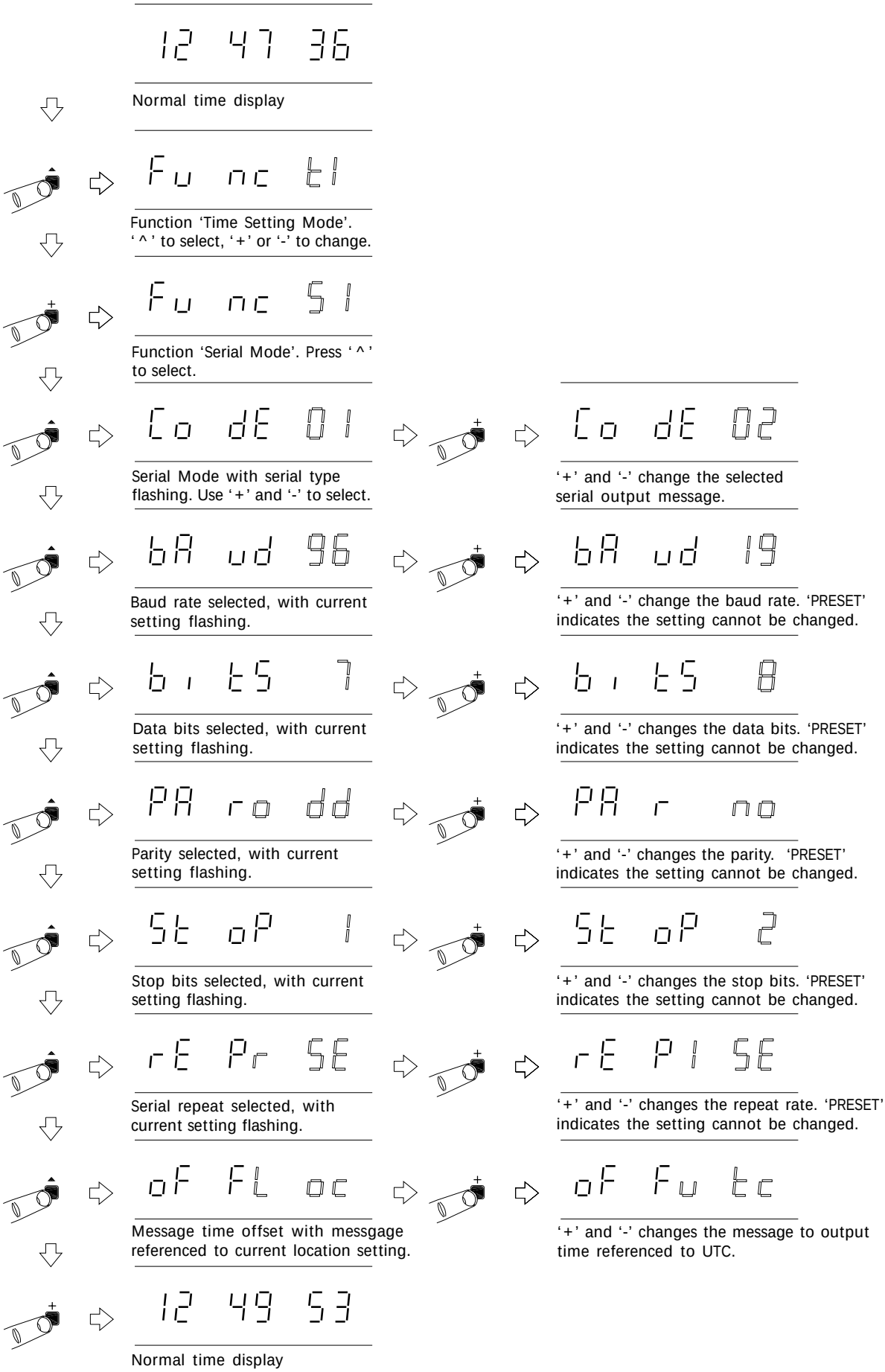
Code	Message Format	Repetition	Transmission Format	**Notes** (Please refer to specified application note on CD-ROM)
32	Philips LTC2600 Multiplexer US Burle TC8286 & TC8288 Multiplexers. Allegiant LTC8300 Series, LTC8511C, LTC8610/00, TC8719A, LTC 8810/00, LTC8910/00 with CPU rev 7.2	5 Min	Preset - 9600,8,n,1	US Format Date (LTC2600)
33	Philips LTC2600 Multiplexer ISO	5 Min	Preset - 9600,8,n,1	ISO Format Date (LTC2600)
34	Moser-Baer IF482	1 Sec	Preset - 9600,7,e,1	
35	Sony HSR-1/1P/2/2P	5 Min	Preset - 9600,8,n,1	AN135
36	GPZDA NMEA Message (Tardis)	1 Sec	Preset - 9600,8,n,1	Ensure that the latest version of Tardis is used
37	Geutebrück MultiScope	User Programmable	User Programmable	
38	Geutebrück TDT-10 / VicroSoft / AMC	User Programmable	User Programmable	
39	GPRMC NMEA Message (Syac DigiEye)	User Programmable	User Programmable	
40	Racal Wordsafe	User Programmable	User Programmable	GT message Standard Setting is 9600,8,n,1
41	Racal Wordnet Series 2	User Programmable	User Programmable	TG message Standard Setting is 9600,8,n,1
42	Tecton Darlex	15 Mins past every Hr	Preset - 9600,8,n,1	AN137
43	Macq Electronique SA	User Programmable	User Programmable	
44	Racal CD20	User Programmable	User Programmable	
45	Mitsubishi BRS, Multiple VCRs	5 Min	Preset - 1200, 8, n, 1	
46	Vision Factory Cameo D1	Once per day @ 4 AM	User Programmable	AN138
47	Norbain Vista Columbus	User Programmable	User Programmable	
48	Philips Divar	5 Min	Preset - 9600, 8, n, 1	AN140
49	Baxall DTL 960	5 Min	Preset - 9600, 8, n, 1	AN141
50	BAXNET / Vista - No advance	5 Min	Preset - 9600, 8, n, 1	**Special Order Only** - AN139
51	BAXNET / Vista - 1 Sec advance	5 Min	Preset - 9600, 8, n, 1	**Special Order Only** - AN139
52	BAXNET / Vista - 2 Sec advance	5 Min	Preset - 9600, 8, n, 1	**Special Order Only** - AN139
53	TBA	-	-	
54	TBA	-	-	
55	Vicon AurorAcorD / AurorA2000			
56	Dedicated Micros UNIPLEX Series I / II	User Programmable	User Programmable	Will not work with UNIPLEX software version 22
57	Panasonic WJSX850	User Programmable	User Programmable	
58	Panasonic WJHD500	User Programmable	User Programmable	
59	Tower Access Control	User Programmable	User Programmable	
60	Philips DVR1	5 Min	Preset - 9600, 8, n, 1	
61	Vortex Timelord	User Programmable	User Programmable	
62	Audiosoft v2	User Programmable	User Programmable	Audiosoft format with sync alarm notifier

Continued on page 7-4

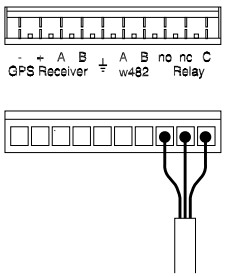
Serial Messages *(cont.)*

Code	Message Format	Repetition	Transmission Format	**Notes** (Please refer to specified application note on CD-ROM)
63	AIT Comfile	1 Sec	Preset - 9600,8,n,1	
64	Team Simoco DX3000	1 Min	Preset - 9600,8,n,1	
65	NATS Link Protocol	User Programmable	User Programmable	
66	NATS Link Protocol 2	User Programmable	User Programmable	NATS Link Protocol with Line Feed.
67	Pelco CM6800	User Programmable	User Programmable	
68	Remguard NetVu / DVIP	User Programmable	User Programmable	**MUST NOT** be set to 1 second repetition. Output should be referenced to UTC.
69	Norbain Vista VVRL27	User Programmable	User Programmable	
70	Panasonic WJ-HD316	User Programmable	User Programmable	
71	NetClock/2 - format 1	User Programmable	User Programmable	

Serial Setting Mode



8 - Relay Setup



TimeLord Relay Connections

10 way terminal block

no	N.O. Contact
nc	N.C. Contact
C	Common

Note:

The relay is configured so that contacts no-C are normally open and contacts nc-C are normally closed.

For example, if the relay is set to close every hour for 100ms, contacts no-C will close for 100ms on the hour, while contacts nc-C will open for 100mS.

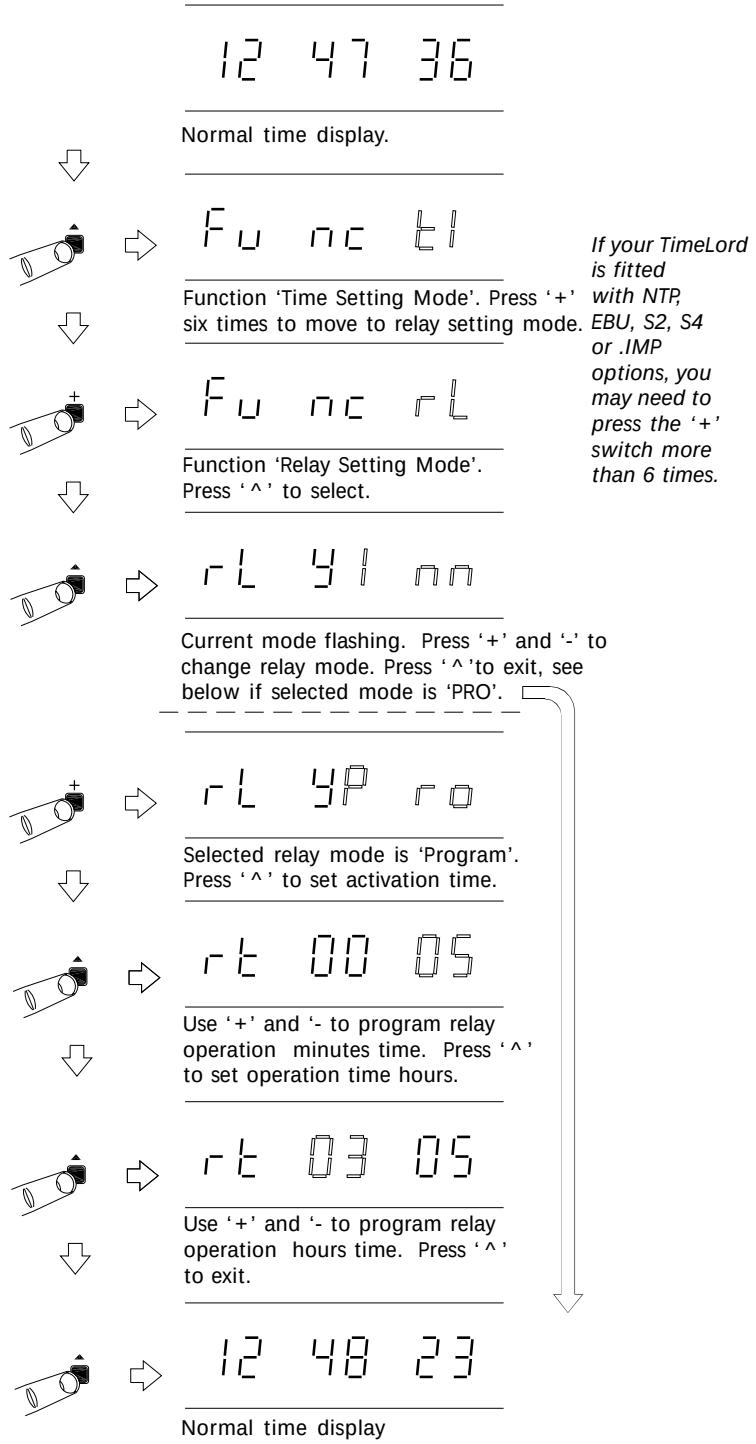
Operation

The relay can be programmed to operate every 5 seconds, every minute, every hour, once per day at a user programmable time or to signal a fault condition.

The relay contacts are rated for 500mA @ 30v DC operation. The minimum contact load is 1mA @ 5v DC. The contact closure duration is 100mS.

Setting the Programmable Relay Time

When the TimeLord is used to provide one contact closure per day it is recommended that the time chosen is at 03:00. This allows the synchronised equipment to be adjusted for the seasonal time change on the day that it occurs. Most conventional systems use a contact closure at 00:00 which will not update the synchronised equipment for the seasonal time change until the next day.

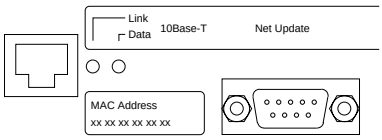


If your TimeLord is fitted with NTP, EBU, S2, S4 or .IMP options, you may need to press the '+' switch more than 6 times.

Relay Modes Table

Code	Mode
Pr	**Power** Contacts **no-C** closed while power is present. Contacts **nc-C** closed when power is removed.
Er	**Error** Contacts **no-C** closed while unit is operating correctly. Contacts **nc-C** closed when the unit is in an error state or the time has not been set since unit was first powered.
Loc	**Lock** Contacts **nc-C** closed while the 4850 / 4860 is synchronised to an external source. Contacts **no-C** closed while unit is unsynchronised.
5 SE	**5 Seconds** 100ms contact closure (contacts **no-C**) every five seconds.
1 M	**1 Minute** 100ms contact closure (contacts **no-C**) every minute.
1 Hr	**1 Hour** 100ms contact closure (contacts **no-C**) every hour.
Pro	**Programmable** 100ms contact closure (contacts **no-C**) once per day, at time programmable in hours and minutes.

9 - Network Configuration (*TimeLord-Net* versions only)



TimeLord-Net Network Interface

RJ45 10Base-T Ethernet Connector

DB9 Network software update port

Link Link LED indicating connection to network

Data Data LED indicating data on the network

Operation

The TimeLord-Net operates as a Network Time Server on a TCP/IP Computer network. The quick setup procedure should be followed to get the TimeLord-Net up and running quickly. Page 9-3 details the various protocols that the TimeLord-Net supports while pages 9-1 and 9-2 detail the basics behind IP addresses, subnets and gateways.

Pages 9-4 and 9-5 show the setting procedure in more detail.

The TimeLord-Net master clock has a 10Base-T Ethernet interface and must be connected either to a dedicated 10Base-T port or a switchable 10Base-T / 100Base-T port on your network.

Quick Setup

Install the TimeLord-Net as detailed in section 3 of this manual.

Attention: If you are unsure of the following network settings please contact your network administrator. Incorrect settings can adversely affect the performance of your network.

1) Program the IP address of the TimeLord-Net in dotted-decimal notation. (e.g. 192.168.0.41) Use the plus and minus buttons to increment and decrement each value. The up arrow will move on to the next value, the down arrow will return to the previous value.

2) Program the Subnet Mask of the TimeLord-Net in dotted-decimal notation. (e.g. 255.255.255.0) Use the plus and minus buttons to increment and decrement each value. The up arrow will move on to the next value, the down arrow will return to the previous value.

3) Program the default Gateway of TimeLord-Net in dotted-decimal notation. (e.g. 192.168.0.1). Use the plus and minus buttons to increment and decrement each value. The up arrow will move on to the next value, the down arrow will return to the previous value.

4) Use the CAT5 patch cable (supplied) to connect the TimeLord-Net to your TCP/IP Computer network. Ensure that the network connection used is compatible with 10Base-T. Check the green link led illuminates, confirming that correct connection has been made to the network.

Network Settings Table

Display Code	Setting
IP	**IP Address** This is the Internet Protocol address that the 4860net uses on the computer network.
Sb	**Subnet Mask** The subnet mask when combined with the IP address identifes the subnet (part of the bigger network) that the TimeLord-Nete is connected to.
Gt	**Gateway Address** The gateway address is used by the TimeLord Net when it needs to send information to computers and devices which are connected to other networks and subnets.
nLoc	**Synchronisation Alarm Status** This setting configures whether or not the NTP packets will indicate an alarm state if the TimeLord-Net is unsynchronised.
bcASt	**NTP Broadcast** This setting configures whether or not the TimeLord-Net will periodicaly broadcasts NTP time packets to the local subnet. If enabled, NTP packets are broadcast every 64 seconds. ****Special Order Option**

TCP/IP Concepts

IP Address

TCP/IP is todays most prevalent networking technology. It can be used for small Local Area Networks (LAN) of two or three users, right through to the other end of the spectrum where it is used as the protocol connecting every machine on the Internet.

Each connected computer must have a unique address to ensure that data transmitted from one location reaches the correct destination.

Blocks of addresses are assigned to organizations by the Internet Assigned Numbers Authority (IANA). Users and small organisations usually obtain their addresses from their Internet Service Provider while larger organisations liaise directly with the IANA.

The Internet Protocol (IP) uses 32 bit addresses, which when displayed to humans are usually written in dotted-decimal notation. Dotted-decimal notation is where the address is written as four decimal numbers, one for each byte of the address.

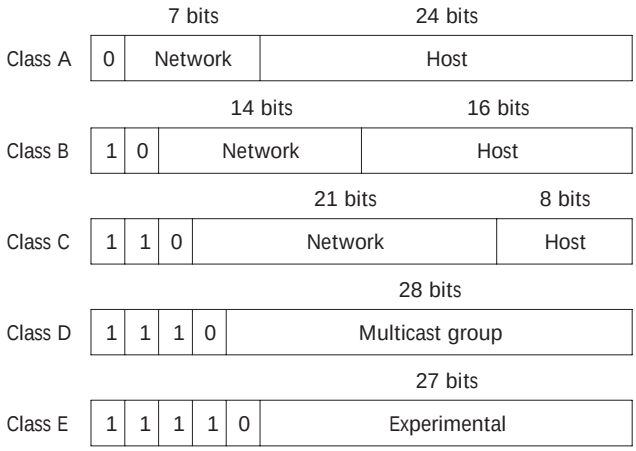
For example the dotted-decimal IP address 195.112.5.193 can be represented in the following formats:

Decimal representation: 3278898625

Hexadecimal representation: 0xC37005C1

Binary representation: 11000011 01110000 00000101 11000001

The IP address of a computer is constructed of two parts. The first part of the address identifies the network to which the computer or host is connected, the second part specifies the actual host itself. The TCP/IP software on each host can automatically determine the class of an IP address by examining the first byte of that address.



There are five different classes of address:

Class A - 1.x.x.x - 126.x.x.x

These addresses have a 8 bit network number and a 24 bit host number addresses. Each class A network can have 16,777,214 hosts.

Class B - 128.1.x.x - 191.254.x.x

These addresses have a 16 bit network number and a 16 bit host addresses. This means that each class B network can have 65,354 hosts.

Class C - 192.0.1.x - 223.255.254.x

These addresses have a 24 bit network number and an 8 bit host addresses. This means that each class C network can have 254 hosts.

Class D - 224.0.0.0 - 239.255.255.255

Class D network addresses are used for multicasting, which is where information sent from one address can be sent to many different hosts simultaneously.

Class E - 240.0.0.0 - 254.255.255.255

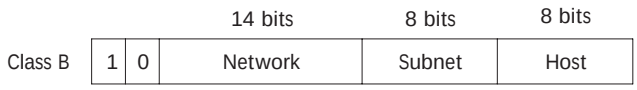
Class E network addresses are used for experimental purposes.

For each unique network number, the base address of the range (i.e. host number zero) is known as the network address and is not assigned to a host. The top address of the range is (i.e. host number set to all ones) the broadcast address which is used as the address for sending to all hosts on the same network number simultaneously.

Subnet Addressing

Subnet addressing allows us to split one IP network address into several smaller physical networks known as subnets. This is especially useful with Class A and Class B addresses where there are very large numbers of network hosts with the same network address.

A subnet is created by splitting the host address part of the IP address into two, the first being subnet address and the second host ID.



In the class B example shown above the address has been subnetted into 254 subnets, each with a possible 254 hosts.

Subnet Mask

The subnet mask is a 32 bit number which specifies how many bits of the IP address are for the network / subnet address and how many are for the host address.

For the class B subnet example used above the subnet mask would be as follows:

The following table details a few typical subnet masks and the network classes / subnets they describe.

Network & Subnet bit length	Subnet Mask	Typical Usage
8	255.0.0.0	Class A address with no subnets
16	255.255.0.0	Class B address with no subnets or Class A with 254 subnets, etc
24	255.255.255.0	Class C address with no subnets or Class B with 254 subnets.

Private IP addresses

With the massive growth of the Internet there was a real danger that the IANA would run out of IP addresses. To avoid this situation three blocks of IP addresses have been reserved for use in private networks. It is recommended that on an organisation's TCP/IP networks use these private network numbers for their networks and make use of a technology like NAT (Network Address Translation) to allow their users access to the Internet.

10.0.0.0 - 10.255.255.255

172.16.0.0 - 172.31.255.255

192.168.0.0 - 192.168.255.255

ARP & MAC

When one device (A) wants to send data to another device (B) on the same Ethernet LAN it must convert the IP address of the destination device to the Ethernet Media Access Control (MAC) address of that device. Each Ethernet device has a globally unique 48 bit MAC address which is assigned at time of manufacture.

If device A does not have B's MAC address an Address Resolution Protocol (ARP) request is broadcast onto the local Network. The ARP request contains the IP address of device B, so device B is the only device to respond. Device B sends its MAC address to device A and it is stored in device A's ARP table.
Device A can now send data directly to device B.

Gateway Address

The gateway address is used when a device on a network sends data to another device that is connected to a different network segment. The gateway device is typically a router connecting two different networks together.

When one device sends data to another device the TCP/IP software checks to see if the destination network address is the same as its own network address. If the network address is the same the data is transmitted normally, using ARP to resolve the destination MAC address if required.

If the network address is different the data is forwarded to the IP address specified in the 'Gateway' setting for routing onwards to the specified network. This routing process may occur several times as the data travels across different networks enroute to its destination.

Supported Protocols

Time Protocol (RFC868)

RFC868 defines the original TIME protocol, which provides site-independent, machine-readable date and time in response to a request from a client PC.

When a request is received the TimeLord-Net responds with a 32-bit time value corresponding to the number of seconds since midnight of January 1st 1900. This representation of time will serve until the year 2036.

Time Protocol is supported in the UDP mode of operation. (RFC868)

NTP (RFC1305 & RFC1119)

The Network Time Protocol (NTP) is the most widely used computer time synchronisation protocol in use today. It provides a mechanism to both organise a synchronisation subnet and distribute precise time synchronisation information to the local clocks of all participating computers. In most parts of the Internet today it is possible to use NTP to provide accuracy's of tens of milliseconds, depending on the characteristics of the synchronisation source, stratum of operation, the local network paths and the client software used.

The NTP standard has been designed so that it can provide reliable operation with clients and servers of vastly different specifications and across network paths with diverse delay and jitter characteristics. Most users of Internet NTP synchronisation make use of the standard NTP distribution available from http://www.ntp.org. This software package includes the full suite of NTP options and algorithms and has been ported to a wide variety of hardware platforms ranging from Personal Computers (PC's) to supercomputers.

We would recommend that, in large hierarchical time distribution projects, the standard NTP distribution be used on the Stratum 2 and 3 servers for maximum redundancy and client availability.

Network Time Protocol (NTP) v2, v3 and v4 clients are supported in both unicast and broadcast modes of operation. (RFC1305 & RFC1119)

SNTP (RFC2030 & RFC1769)

Simple Network Time Protocol (SNTP) v3 and v4 clients are supported in both unicast and broadcast modes of operation. (RFC2030 & RFC1769)

Simple Network Time Protocol (SNTP) is an adaptation of NTP, which can be used for applications where the ultimate performance and associated overhead of the full NTP implementation is not required.

Most PC client software is based on the SNTP specification and certainly for most intranet applications will provide a higher degree of accuracy than is required.

Simple Network Time Protocol (SNTP) v3 and v4 clients are supported in both unicast and broadcast modes of operation. (RFC2030 & RFC1769)

Synchronisation Alarm Status

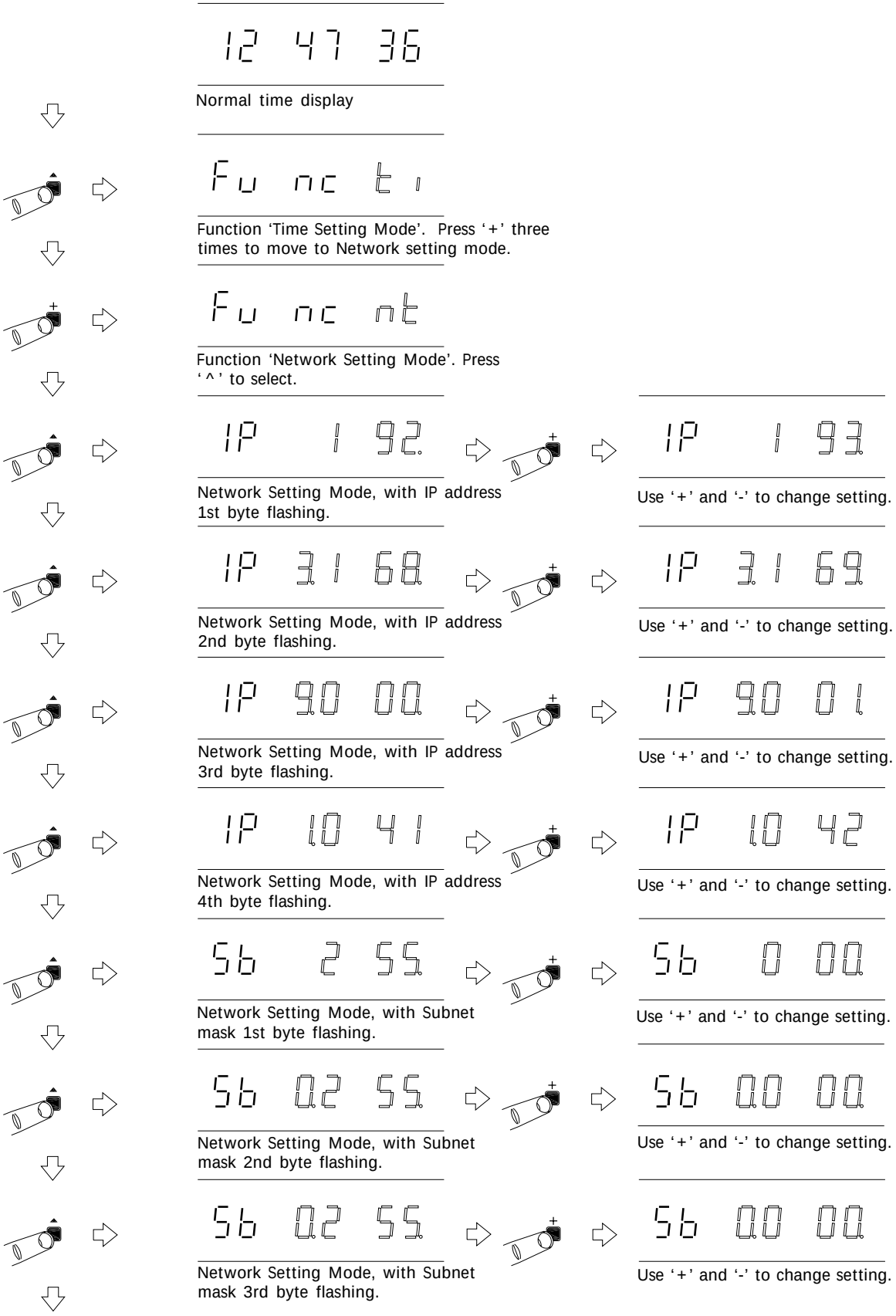
The NTP/SNTP version 4 message format has provision for a two-bit 'Leap Indicator' code that gives indication of an impending leap second and synchronisation alarm status. When 'nLoc' is set (y), the TimeLord-Net Master Clock will return an LI (Leap Indicator) value of '0' if the clock is synchronised and '3' if the clock is unsynchronised. When 'nLoc' is not set (n), the TimeLord-Net Master Clock will return an LI (Leap Indicator) value of '0' regardless of synchronisation status.

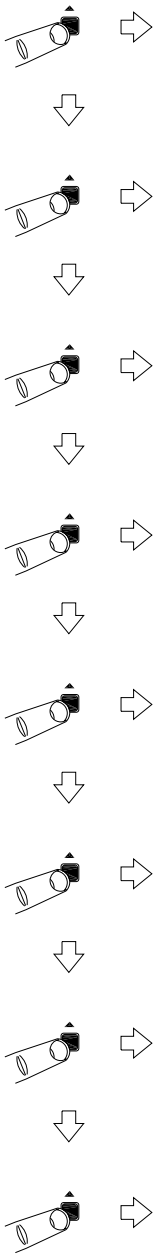
If the synchronisation source is set to 'none' and 'nLoc' is set, the TimeLord-Net will return an LI (Leap Indicator) value of '3'.

NTP Stratum definitions

Stratum	Definition
0	**Unspecified or Unavailable** This stratum is used to describe the stratum level of the orignal time signal source. In the case of GPS the actual GPS signal from the satellites can be viewed as stratum 0.
1	**Primary Reference Server** A server that derives its time from a external time reference, e.g. GPS or radio time code, is defined as a stratum 1 time server. Stratum time servers are at the root of the synchronisation subnet. The TimeLord-Net always operates as a primary reference server at stratum 1.
2-15	**Secondary and Greater Stratum Time Servers** A client computer synchronised to a time server operates at one stratum higher than the synchronisation source. Therefore if you have computers synchronised to the TimeLord-Net that in their turn provide time to other systems on your network the heiracy will be as follows: Stratum 1 - TimeLord-Net Stratum 2 - Secondary time servers Stratum 3 - Third level devices

Network setting menu





Sb 0.1 92	Sb 0.1 93
Network Setting Mode, with Subnet mask 4th byte flashing.	Use '+' and '-' to change setting.
Gt 1 92.	Gt 1 93.
Network Setting Mode, with Gateway address 1st byte flashing.	Use '+' and '-' to change setting.
Gt 3.1 68.	Gt 3.1 69.
Network Setting Mode, with Gateway address 2nd byte flashing.	Use '+' and '-' to change setting.
Gt 90 00.	Gt 90 01.
Network Setting Mode, with Gateway address 3rd byte flashing.	Use '+' and '-' to change setting.
Gt 11 29	Gt 11 30
Network Setting Mode, with Gateway address 4th byte flashing.	Use '+' and '-' to change setting.
nL oc n	nL oc y
Network Setting Mode, with synchronisation alarm status flashing.	Use '+' and '-' to change setting.
n uP n	n uP y
Network Setting Mode, with Network update flashing.	Use '+' and '-' to change setting. When set to 'y' the netUpdate software on the TimeLord CDROM is planned to allow installation of software upgrades into the TimeLord (available on future versions)
12 47 36	
Normal time display	

10 - IRIG Output (IRIG-OUT Option)

Optional IRIG Interface

BNC Connector

1KHz AM modulated balanced signal.

IRIG is a series of time codes originally developed in the 1940s by the International Range Instrumentation Group (IRIG) for recording time information on magnetic tape and wire for rocket test range instrumentation purposes. IRIG-B code is normally transmitted at a 100Hz bit rate, amplitude modulated on a 1KHz carrier, where the amplitude of a '1' bit is three times that of a '0' bit.

Standard IRIG-B code contains day-of-year and hours, minutes and seconds information, however a number of organisations have added their own extensions to the standard format. AFNOR NFS 87 500 timecode is a development of IRIG-B which is widely used in Europe and contains additional day, day-of-month and year information.

The IRIG output is available on the TimeLord-Lite and TimeLord-Net / Net-Client versions.

IRIG Setup

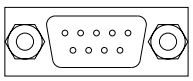
The different IRIG settings are detailed in the table below. The IRIG setting procedure is shown graphically in the diagram to the right of this text.

Setting the IRIG Signal Time Offset

The IRIG signal is referenced to the current Location setting (see section 4). If the output message is to be referenced to UTC/GMT the location setting should be set to 0.

RS485 level IRIG output

The IRIG signal is available at RS485/422 levels from the S1 serial output if the 'i485' setting is selected. Please note that if the 'i485' option is set to 'yes', the S1 RS485 interface cannot be used for serial data output.



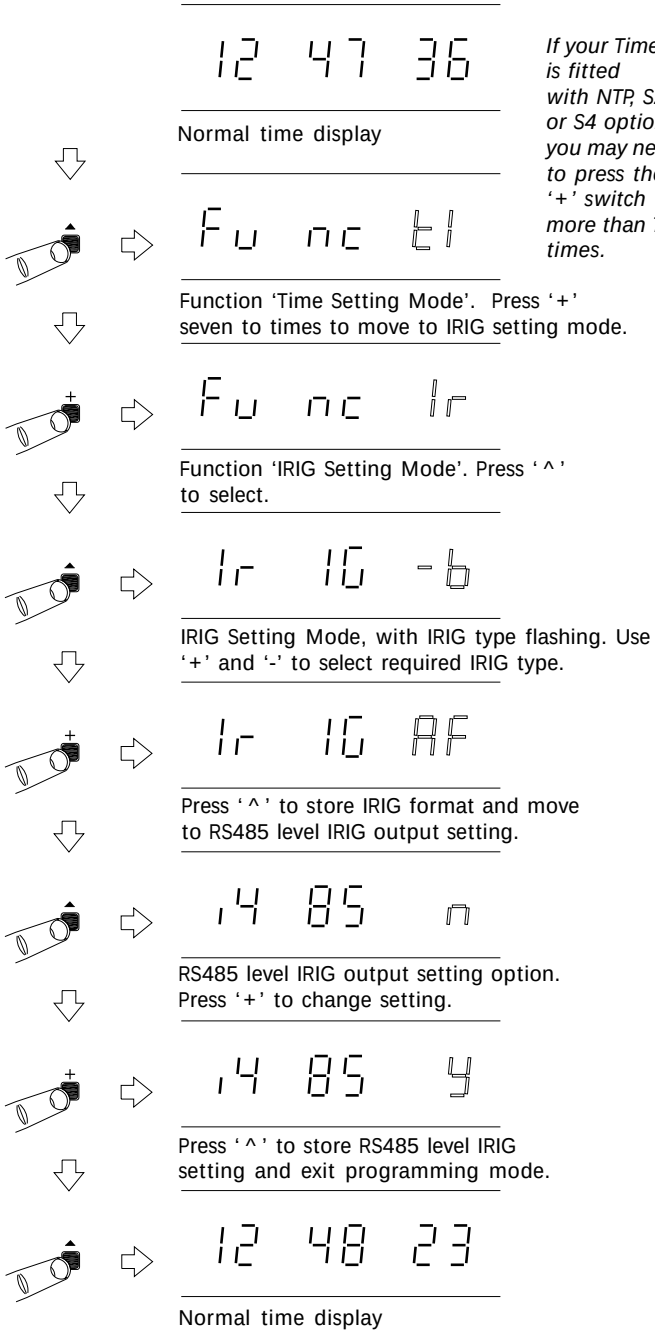
RS232/RS485 S1

i485 Interface

5	Signal ground
8	'A' - non-inverting
9	'B' - inverting

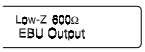
IRIG Setup

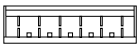
Code	Type	Bit Rate	Notes
-b	Standard IRIG-B (B123)	100Hz	1KHz AM modulated and also available at RS485 levels.
AF	Afnor NFS 87-500 (Variant A)	100Hz	Contains all of the obligatory information
IE	IEEE 1344 IRIG-B	100Hz	IRIG-B with IEEE1344 extensions.
NE	NENA IRIG-B	100Hz	IRIG-B with NENA xxx extensions.
N2	MIC20	100Hz	IRIG-B without date information.

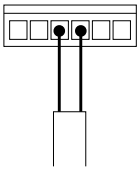


If your TimeLord is fitted with NTP, S2 or S4 options, you may need to press the '+' switch more than 7 times.

11 - EBU Output (EBU-OUT option)







TimeLord-Net EBU Timecode Interface

6 way terminal block

Low Z Low impedance signal

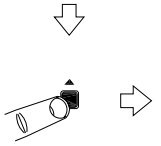
600Ω Balanced 600Ω signal

EBU

TimeLord-Lite EBU Interface

BNC Connector

Balanced 600Ω signal



If your TimeLord is fitted wtih NTP, S2 or S4 serial options, you may need to press the '+' switch more than 8 times.

EBU timecode is used in broadcast applications for 'stamping' time information on recordings and for the control of clocks and other intelligent systems. EBU time code is used in PAL and SECAM applications at 25 frames per second.

The signal data rate for EBU is 2000 bits per second, with each frame of data comprising 80 bits. The EBU standard defines the format for hours, minutes, and seconds information. Date information can be added to the signal in a number of formats within 'user bit' areas.

The EBU output is available on the TimeLord-Lite and TimeLord-Net / Net-Client versions.

TimeLord-Net versions are fitted with both 600Ω and low impedance outputs. Please note: Only one pair of outputs should be used at one time.

The TimeLord-Lite version is fitted with a 600Ω output.

EBU Setup

The different EBU settings are detailed in the table below.
Please see table on page 11-2 for EBU code formats.

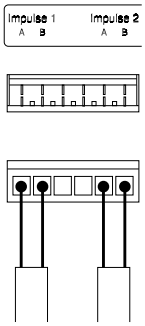
EBU Setup

Code	Type	Notes
A	Time only	Standard EBU .
B	Time and date format 1	EBU with date encoded in user bits.
C	Time and date format 2	EBU with alternate format of date encoded in user bits.

EBU timecode output formats

Data Bit	Format A - data bit content		Format B - data bit content		Format C - data bit content	
0	1	Frame Number units	1	Frame Number units	1	Frame Number units
1	2		2		2	
2	4		4		4	
3	8		8		8	
4	0	Unused bits	0	Unused bits	0	Status bit a
5	0		0		0	Status bit b
6	0		0		0	Status bit c
7	0		0		0	Status bit d
8	10	Frame number tens	10	Frame number tens	10	Frame number tens
9	20		20		20	
10	0	Unused bits	0	Unused bits	0	Unused bits
11	0		0		0	
12	0		1	Days units	0	
13	0		2		0	
14	0		3		0	
15	0		4		0	
16	1	Seconds units	1	Seconds units	1	Seconds units
17	2		2		2	
18	4		4		4	
19	8		8		8	
20	0	Unused bits	1	Months units	1	Years units
21	0		2		2	
22	0		4		4	
23	0		8		8	
24	10	Seconds tens	10	Seconds tens	10	Seconds tens
25	20		20		20	
26	40		40		40	
27	0	Unused bits	0	Unused bit	0	Unused bit
28	0		10	Days tens	10	Years tens
29	0		20		20	
30	0		10	Months tens	40	
31	0		0	Unused bit	80	
32	1	Minutes units	1	Minutes units	1	Minutes units
33	2		2		2	
34	4		4		4	
35	8		8		8	
36	0	Unused bits	0	Unused bits	1	Months Units
37	0		0		2	
38	0		0		4	
39	0		0		8	
40	10	Minutes tens	10	Minutes tens	10	Minutes tens
41	20		20		20	
42	40		40		40	
43	0	Unused bits	0	Unused bit	0	Unused bit
44	0		1	Years units	10	Month tens
45	0		2		0	Unused bits
46	0		4		0	
47	0		8		0	
48	1	Hours Units	1	Hours Units	1	Hours units
49	2		2		2	
50	4		4		4	
51	8		8		8	
52	0	Unused bits	0	Unused bits	1	Days units
53	0		0		2	
54	0		0		4	
55	0		0		8	
56	10	Hours tens	10	Hours tens	10	Hours tens
57	20		20		20	
58	0	Unused bits	0	Unused bits	0	Unused bits
59	0		0		0	
60	0		10	Years tens	10	Days tens
61	0		20		20	
62	0		40		0	Unused bits
63	0		80		0	
64	0	Sync word	0	Sync word	0	Sync word
65	0		0		0	
66	1		1		1	
67	1		1		1	
68	1		1		1	
69	1		1		1	
70	1		1		1	
71	1		1		1	
72	1		1		1	
73	1		1		1	
74	1		1		1	
75	1		1		1	
76	1		1		1	
77	1		1		1	
78	0		0		0	
79	1		1		1	

12 - Impulse Output (V-02 Option)



V-02 .IMP Dual Impulse Output

6 way terminal block

Impulse 1	Impulse Channel 1
Impulse 2	Impulse Channel 2

Operation

The TimeLord master clock is optionally available with dual channel 24V alternate polarity impulse outputs (Option V-02).

Each output may be programmed by the user for one of a number of different combinations of pulse length and repetition rate to drive impulse slave clocks requiring one second, half minute or one minute alternate polarity impulses.

The fully protected output drive circuits detect power failure and short circuit line fault conditions which are automatically corrected for on fault removal.

Automatic Correction

Automatic time correction following power failures, the removal of fault conditions and after seasonal time changes is carried out by increasing the pulse repetition rate or by stopping the impulses depending on which action will result in a shorter correction time.

In the 1 second - standard mode the system will take one hour to correct for each hour that the slave clocks are behind the master.

In the 1 second - slow correction mode the system will take approximately one and a half hours to correct for each hour that the slave clocks are behind the master.

The 1 second - seconds synchronisation only mode is intended for use with 4 wire slave clocks requiring both minute and second impulses.

Impulse Output Type Table

Code	Mode
non	No output
1SA	1 second - standard 0.4 sec. long impulse, 120 pulses per minute catch-up speed.
1Sb	1 second - slow correction 0.4 sec. long impulse, 85 pulses per minute catch-up speed.
1Sc	1 second - seconds only 0.4 sec. long impulse - for the seconds movement of slave clocks with separate seconds and minutes mechanisms.
30S	1/2 minute 0.5 sec. long impulse, 30 pulses per minute catch-up speed.
1nA	1 minute - standard 1.0 sec. long impulse, 30 pulses per minute catch-up speed.
1nB	1 minute - slow correction 3.0 sec. long impulse, 6 pulses per minute catch-up speed.

Commissioning

Please perform the following four procedures to commission your impulse clock system.

Setup Part A - Initial Setup Procedure

Before commencing this procedure, please ensure that all of the clocks are displaying the same time.

1) Install the TimeLord master clock as detailed in section 3 of this manual.
2) Program the required location as detailed in section 4 of this manual.
3) Connect any synchronisation option as detailed in section 5 of this manual.
4) Connect the analogue clocks to your chosen impulse channel as shown on page 12-4. Please refer to appendix A for recommended cable specifications.
5) For your chosen impulse channel, program the required 'Impulse output type'. This is part of the impulse channel setup procedure shown graphically on page 12-2. The 'Impulse Output Type Table' below details the options available.

Setup Part B - Synchronisation of clocks

This procedure ensures that all clocks on your chosen impulse channel are synchronised together. Before starting this procedure you should ensure that all clocks are displaying the same time.

6) Referring to the 'starting the impulses' procedure on page 12-3, select the 'pulse' option and press the ' ^ ' key. This action transmits a single pulse to all of the connected clocks.
7) Now examine the slave clocks. Reverse the impulse connections to all slave clocks that appear to have 'missed' a pulse and manually advance these clocks by two impulses. All clocks connected to this channel should now be in synchronisation.

Setup Part C - Programming the Impulse time

8) For your chosen impulse channel, program the 'Impulse Time'. This is part of the impulse channel setup procedure shown graphically on page 12-2. The 'Impulse Time' is the time that the analogue clocks are currently displaying. Please note that you must ensure that all of the analogue clocks on your chosen impulse channel are showing the same time.

Setup Part D - Starting the Impulses

9) Referring to the 'starting the impulses' procedure on page 12-3, select the 'run' option and press the ' ^ ' key to exit.

The channel will now be running and the master clock will calculate whether it will be quicker to output catch-up impulses or wait for the current time to reach the impulse time (as previously programmed).

Visual Indication of Operation and Error status

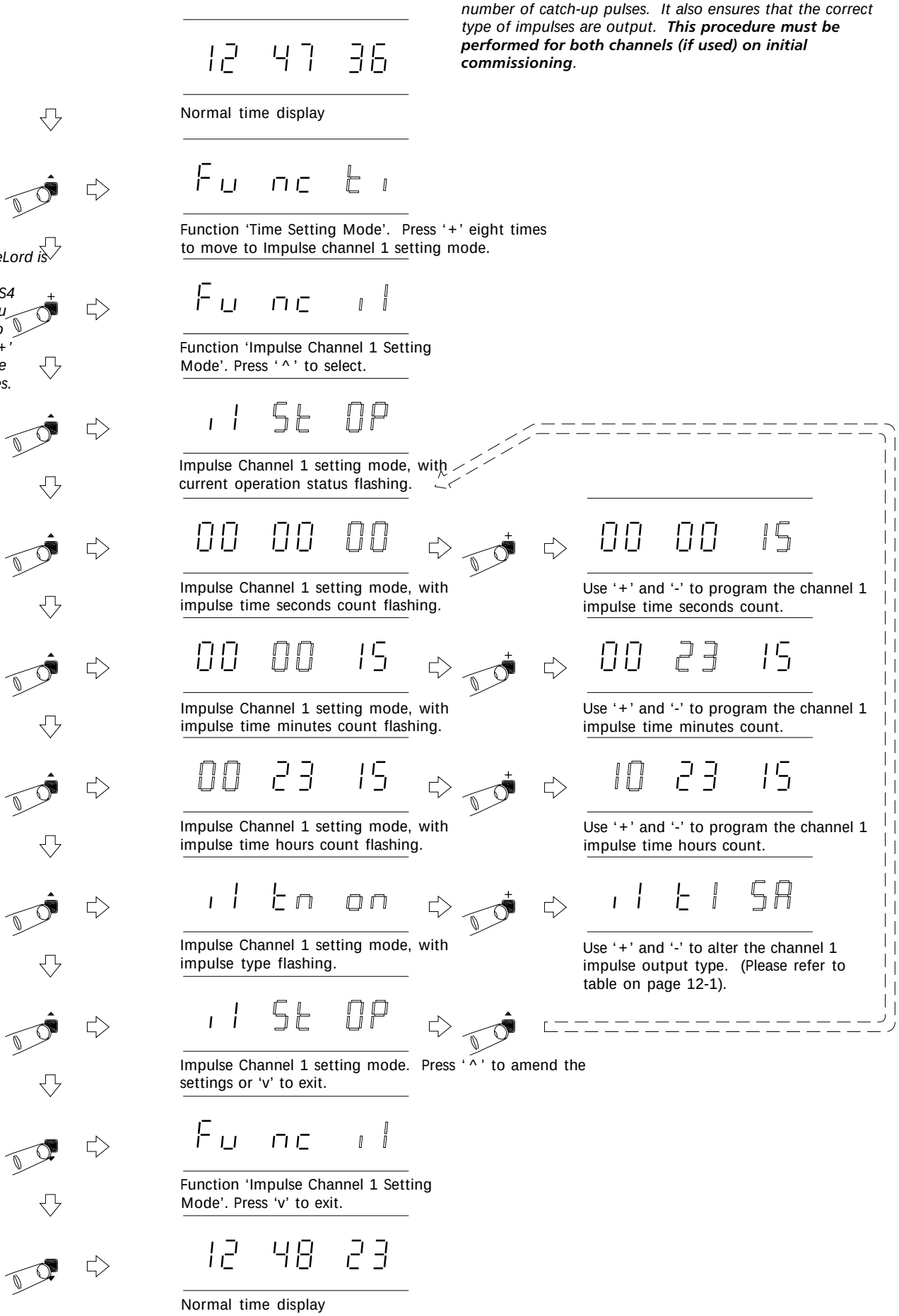
The TimeLord.IMP master clock provides full time visual indication of impulse channel operation and alarm status. When an impulse is transmitted, the relevant channel LED will illuminate below the time display on the front panel. If an overload or short circuit line fault occurs, the impulse alarm LED will flash along with the relevant channel LED.

The current impulse time of channels 1 and 2 may be examined by pressing the '+' key three or four times respectively when on the standard time display.

Please refer to page 12-3 for further details.

Impulse channel setup procedure

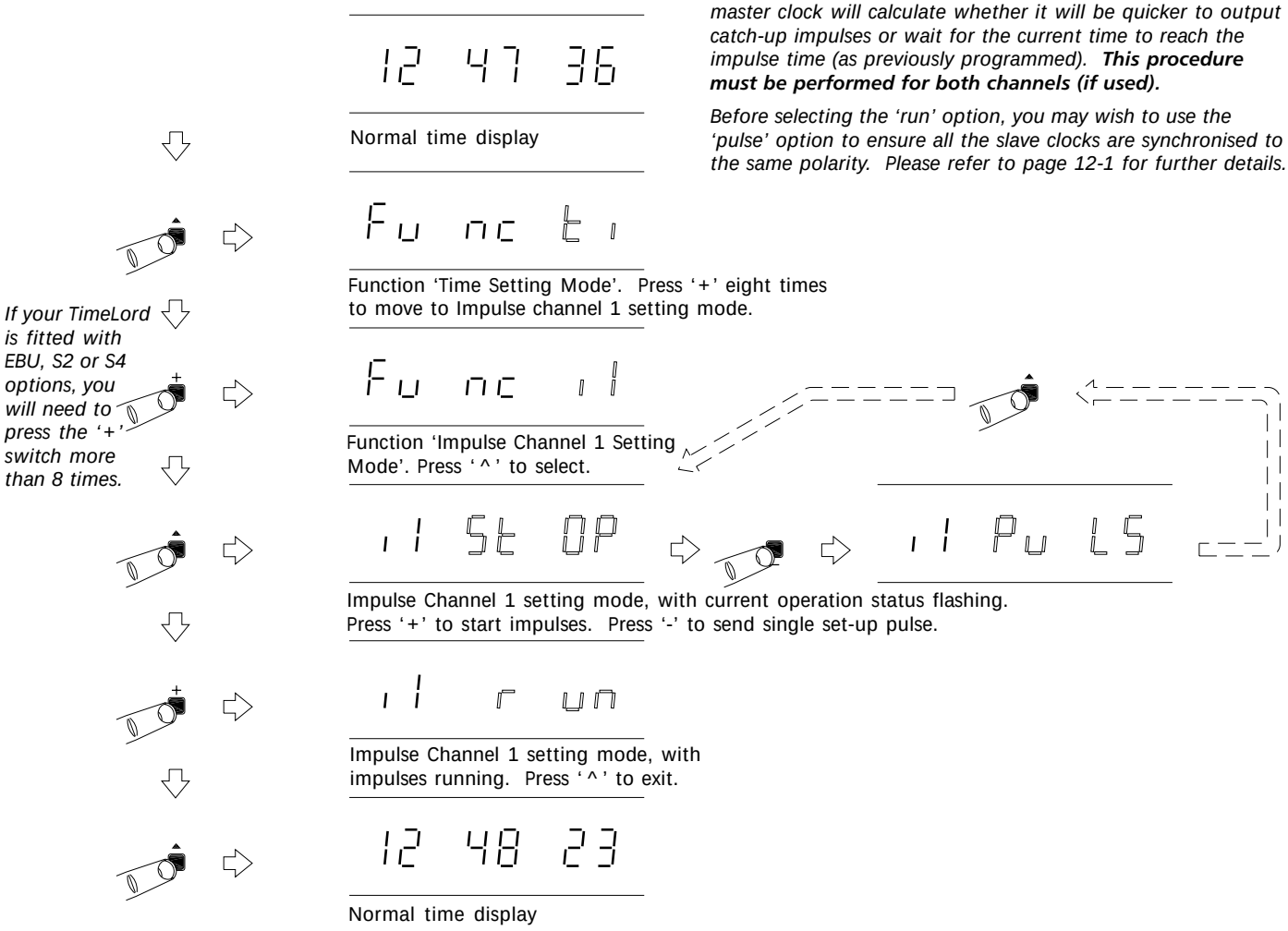
This procedure enables the master clock to know what time the slave clocks are displaying and thus calculate the required number of catch-up pulses. It also ensures that the correct type of impulses are output. ***This procedure must be performed for both channels (if used) on initial commissioning.***



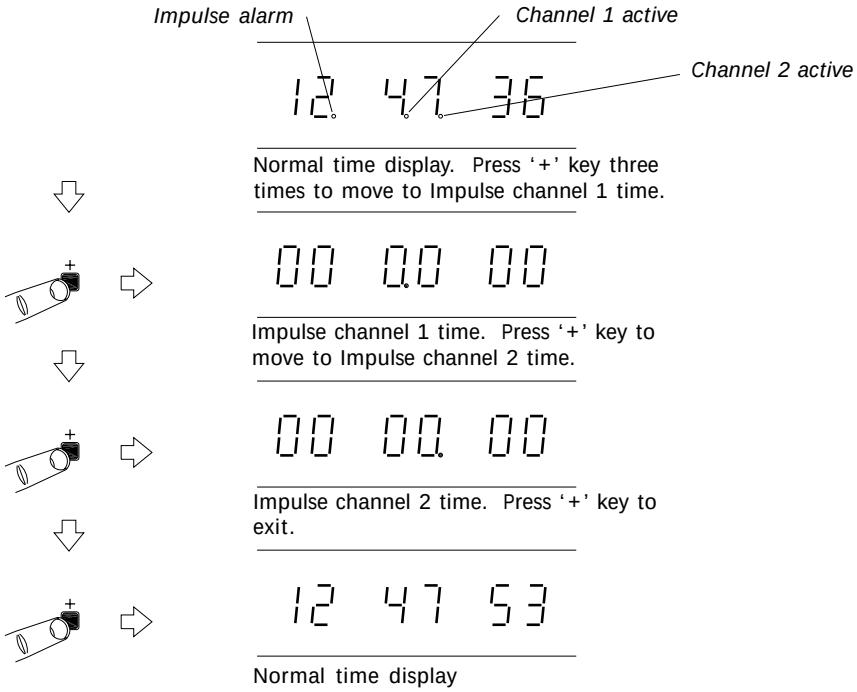
Starting the Impulses

This procedure will start the impulses running and should only be performed once the impulse channel setup procedure has been completed. Once the channel has been started, the master clock will calculate whether it will be quicker to output catch-up impulses or wait for the current time to reach the impulse time (as previously programmed). ***This procedure must be performed for both channels (if used).***

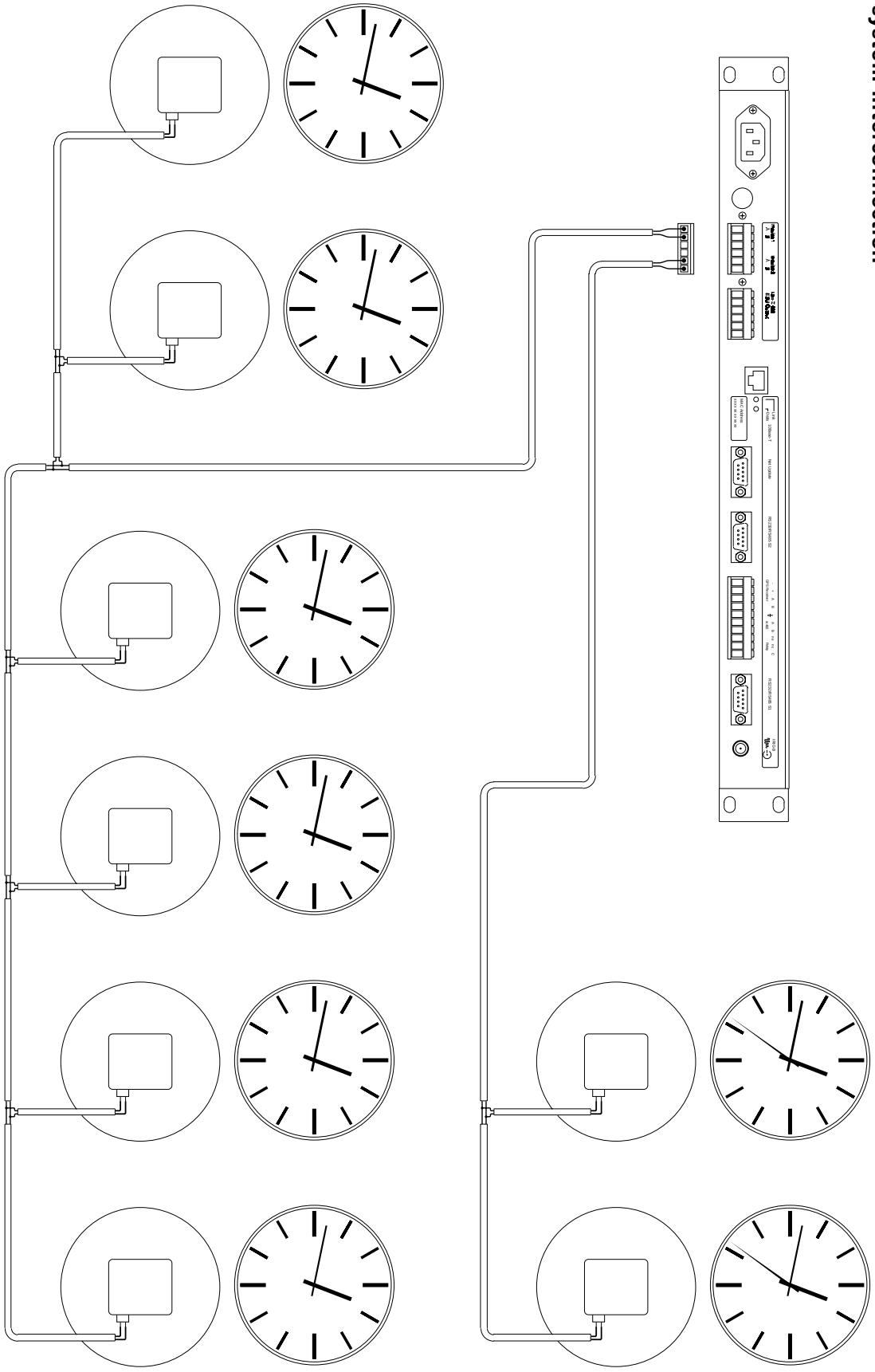
Before selecting the 'run' option, you may wish to use the 'pulse' option to ensure all the slave clocks are synchronised to the same polarity. Please refer to page 12-1 for further details.



Indication of current Impulse time



Impulse system interconnection



Appendix A - Cable Specifications

TimeLord-> V-488B/C GPS interconnection

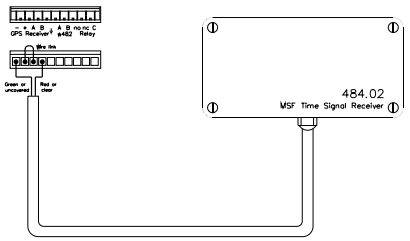
The V-488B and V-488C GPS Receiver systems are supplied with 25 metres of four core 7/0.2 (0.22mm²) screened cable. The cable screen should be grounded at the TimeLord end by means of the EMC rear grounding terminal and on the V-488B GPS receiver using the screw fitting provided.

For distances of up to 50 metres the length can be extended by adding an additional length of 7/0.2 cable. For greater distances, up to a maximum of 200m, 16/0.2 (0.5mm²) cable should be used.

Please note that the 5m cable which links the antenna to the V-488BGPS Receiver cannot be extended.

TimeLord -> V-484 MSF and DCF radio receiver interconnection

The V-484 series radio receiver is supplied with a 5m long unscreened cable as standard.



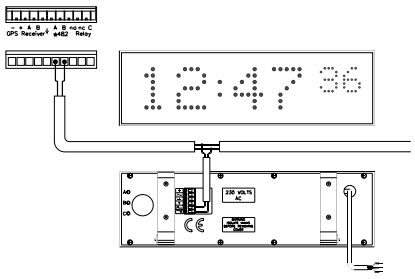
The cable length may be extended to 10m using unscreened cable, RS 367-943 - 22 awg or equivalent. In areas of high electrical noise a screened twisted pair should be used. The cable screen should be grounded at the TimeLord end only.

Cable length may be extended to 200m using a screened twisted pair cable, RS 368-340 - 22 awg or equivalent. (UL style 2092, Alpha 2401)

For screened LSOH (Low Smoke Zero Halogen) applications RS 362-140 (two pairs 7/0.25 - 22 awg) may be used. Equivalent to UL style 2493.

TimeLord -> Digital Displays w482 code interconnection

The w482 time code system is designed to have considerable immunity to external electrical interference and screened cable is only required in areas of high electrical noise.



Normal installations may use standard mains cable. (e.g. twin 1.5mm²) The size of the cable depends on the overall cable length, the number of clocks and their spacing on the cable.

The use of twin 1.5mm² cable will be adequate for installations of up to 50 clocks, calendar clocks or time-zone displays using up to 1km of cable. For LSOH applications low smoke cable to IEC332 and BS4066 may be used. RS212-7882 (1.5mm² Pirelli PSX™).

Unscreened data cables should not be run in proximity to power cables supplying fluorescent lighting or other sources of electrical noise.

In areas of high electrical noise a screened twisted pair should be used. The cable screen should be grounded at the TimeLord end only by means of the rear grounding terminal.

A suitable screened cable is RS 361-361, (twin 16/0.254 - 18 awg) equivalent to Alpha 2421, BICC H8093, UL style 2092 which is adequate for a spur controlling 25 clocks over a 1km cable run or a greater number of clocks over a shorter distance.

For screened LSOH applications RS 362-140 (two pairs 7/0.25 - 22 awg) may be used. Two conductors may be connected in parallel to provide a similar performance to 18 awg. Equivalent to UL style 2493.

For a Cat 5 installation, (24 awg) a single pair can be used to connect up to 10 400A series clocks or time-zone displays at a distance of up to 250m. For further distances or greater numbers of clocks, additional cores should be paired together, lowering the cable resistance.

TimeLord -> V-400A/470A interconnection (w482 code)

Cable Type	Max. Number of Clocks	Maximum Cable Distance
CAT5 (24 AWG)	10	250m
0.22mm² / 24AWG / 7/0.2	10	250m
0.5mm² / 20AWG / 16/0.2	50	300m
0.5mm² / 20AWG / 16/0.2	16	1000m
1.0mm² / 17AWG / 32/0.2	50	600m
1.0mm² / 17AWG / 32/0.2	30	1000m
1.5mm² / 15AWG	50	1000m

Note: The above data assumes that all cable interconnections are of negligible resistance when compared to that of the cable used.

If in doubt one should always consider the use of the next heavier gauge cable as this invariably increases system integrity at minimal additional system cost and allows for future system expansion.

All installation work should be performed in accordance with current Building Regulations and the Sixteenth Edition of the IEE Wiring Regulations, or equivalent local regulations.

TimeLord -> Analogue Impulse Clock interconnection

Cabling for analogue clock systems is highly dependent on the number of clocks, power consumption of the clock movements and distance of cable involved.

Based on the use of 10mA clock movements, each channel of the TimeLord.IMP master clock could drive 20 clocks (a total of 40 clocks). Alternatively, each channel of the TimeLord.IMP could drive 25x 8mA clock movements (a total of 50 clocks).

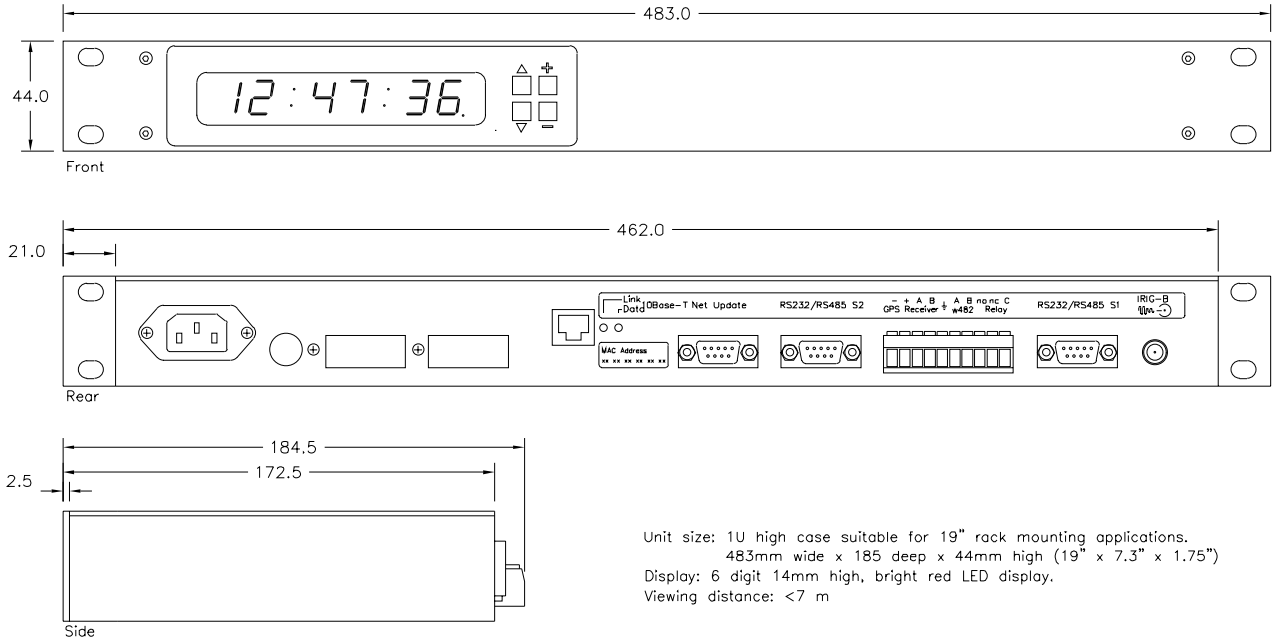
TimeLord -> Analogue Clocks (with hands) connections

Cable Type	Max. No of Clocks	Maximum Cable Distance
0.5mm² / 20AWG	20	300m
1.0mm² / 17AWG	20	650m
1.5mm² / 15AWG	20	1000m

Note: The above data assumes that all cable interconnections are of negligible resistance when compared to that of the cable used and the impulse clock movements draw 10mA each.

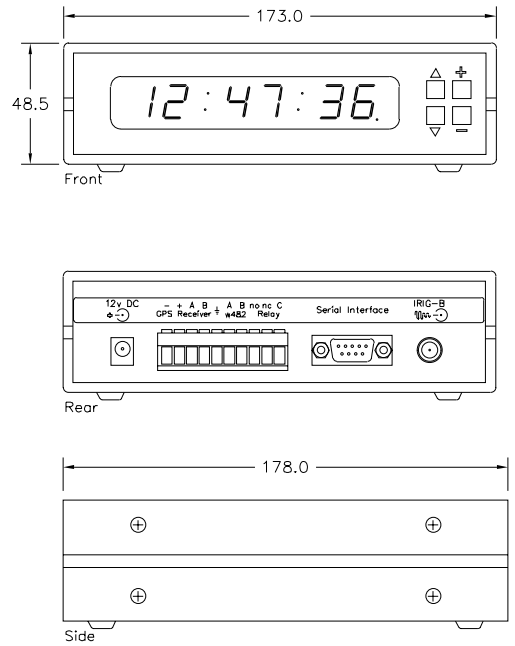
Appendix B - Case dimensions

TimeLord Rackmount Case - dimensions



Unit size: 1U high case suitable for 19" rack mounting applications.
483mm wide x 185 deep x 44mm high (19" x 7.3" x 1.75")
Display: 6 digit 14mm high, bright red LED display.
Viewing distance: <7 m

TimeLord-T Desktop Case - dimensions



Unit size: 173mm wide x 178mm deep x 49mm high high (6.8" x 7" x 2")
Display: 6 digit 14mm high, bright red LED display.
Viewing distance: <7 m

Appendix C - Supported devices

Listed below are some CCTV and other devices with known time synchronisation support from the TimeLord Master Clock. Please refer to the relevant chapters of this manual (and if applicable, the application notes located on the CD-ROM supplied) for further information on synchronisation procedures.

If the product you wish to synchronise is not detailed, please contact our technical department for further clarification.

Please note: Inclusion or exclusion of any product from these lists in no-way indicates an endorsement or otherwise of the respective products.

VCRs / Digital Recorders

Manufacturer / Device	Synchronisation method	Notes	Application note
Adder Digital Technology			
Digital Video Recorder	RS232	Windows 98 based - RS232 Serial Code 26 - refer to page 7-2	
Baxall			
DTL960	RS232	RS232 Serial Code 49 - refer to page 7-3	AN141
Dedicated Micros			
Digital Sprite, Digital Sprite 2, BX2	RS232	Need C-Bus adapter - RS232 Serial Code 20 - refer to page 7-2	AN127
Grundig / Plettac			
VAZ300	RS232	RS232 Serial Code 13 - refer to page 7-2	
Harmony			
Hard Disk Recorder	RS232	Windows PC based - RS232 Serial Code 26 - refer to page 7-2	AN132 (NT4 / 2000 / XP)
JVC			
SR-S990E	VFC (24Hr)		
Mitsubishi			
HS-S5600	RS232	RS232 Serial Code 11 / 45 (multiple VCRs) - refer to page 7-2	AN112
HS-S8300	RS232 or VFC (1Hr)	RS232 Serial Code 11 / 45 (multiple VCRs) - refer to page 7-2	AN133
Panasonic			
AG-6040, AG-6730, AG-6740, AG-6760	RS232 or VFC (24Hr)	RS232 Serial Code 12 - refer to page 7-2	AN113
AGTL750	VFC	Will set time to nearest 1/2min upon closure of contact	
AGTL300, AGTL700	None	These devices do not support external time synchronisation	
WJHD500	RS232	RS232 Serial Code 58 - refer to page 7-3	
Philips			
Divar	RS232	RS232 Serial Code 48 - refer to page 7-3	AN140
DVR1	RS232	RS232 Serial Code 60 - refer to page 7-3	
LTC3990/50	RS232	RS232 Serial Code 27 - refer to page 7-2	
Sony			
HSR-1, HSR-1P, HSR-2 HSR-2P	RS232	RS232 Serial Code 35 - refer to page 7-3	AN135
Tecton			
Darlex	RS232	RS232 Serial Code 42 - refer to page 7-3	AN137
The Vision Factory			
Cameo D1	RS232	RS232 Serial Code 46 - refer to page 7-3	AN138

Continued on page C-2

Appendix C - Supported devices - cont.

Matrix / Multiplexer / CCTV systems

Manufacturer / Device	Synchronisation method	Notes	Application note
Baxall			
BAXNET products	RS232	RS232 Serial Code 50/51/52 - refer to page 7-3	AN139
Coe			
Telecommand	RS232	RS232 Serial Code 1 - refer to page 7-2	AN120
Dedicated Micros			
Uniplex Series I / II	RS232	RS232 Serial Code 56 - refer to page 7-3	
Loronix / Verint			
CCTV system	RS232	Windows PC based - RS232 Serial Code 26 - refer to page 7-2	AN132 (NT4 / 2000 / XP)
Meyertech			
Zoneview	RS232	Needs rugby clock interface - Serial Code 1 - refer to page 7-2	AN123
Norbain			
Vista Columbus	RS232	Serial Code 47 - refer to page 7-3	
Panasonic			
WJSX850	RS232	RS232 Serial Code 57 - refer to page 7-3	
Petards			
Cobyt	RS232	RS232 Serial Code 1 - refer to page 7-2	
Philips			
Burle TC8286 & TC8288, Allegiant LTC8300 Series, LTC8511C, LTC8610/00, TC8719A, LTC8810/00, LTC8910/00 (with CPU rev 7.2)	RS232	RS232 Serial Code 32 - refer to page 7-3	
LTC2600	RS232	RS232 Serial Code 31 / 32 / 33 - refer to pages 7-2 / 3	
Synectics			
CCTV system	RS232	RS232 Serial Code 1 - refer to page 7-2	AN126
Tecton			
Drax	RS232	RS232 Serial Code 15 - refer to page 7-2	AN101
Kramplex	RS232	RS232 Serial Code 21 - refer to page 7-2	AN125
Miniplex	RS232	Only 17 channel version has time setting capability as standard, option on 8 channel and 4 channel versions - RS232 Serial Code 15 - refer to page 7-2	
Rugby Clock Interface	RS232	RS232 Serial Code 1 - refer to page 7-2	
The Vision Factory			
Cameo	RS232	RS232 Serial Code 22 - refer to page 7-2	AN117
Montage	RS422	RS422 Serial Code 14 - refer to page 7-2	AN115
Montage plus	RS232 / RS422	RS232 / RS422 Serial Code 14 - refer to page 7-2	AN116
Ultrak Maxpro			
Max1000	RS232	RS232 Serial Code 24 - refer to page 7-2	
Vision Research Company			
Krammer 4	RS232	RS232 Serial Code 1 - refer to page 7-2	AN102

Continued on page C-3

Appendix C - Supported devices - cont.

Acces Control / Intruder Detection systems

Manufacturer / Device	Synchronisation method	Notes	Application note
ADT			
Site Guard	RS232	Windows PC based - RS232 Serial Code 26 - refer to page 7-2	AN132 (NT4 / 2000 / XP)
Grosvenor Technology			
Janus	RS232	Windows PC based - RS232 Serial Code 26 - refer to page 7-2	AN132 (NT4 / 2000 / XP)
Tower			
Access Control	RS232	RS232 Serial Code 59 - refer to page 7-3	

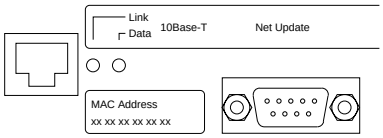
Voice Recorders

Manufacturer / Device	Synchronisation method	Notes	Application note
ASC Telecom			
DL2	RS232	RS232 Serial Code 23 - refer to page 7-2	AN129
Marathon Pro, Marathon Advanced, Marathon Compact	RS485	Time-Master PCB standard on Pro, optional on Advanced & Compact - RS232 Serial Code 23 - refer to page 7-2	AN136
ATIS			
MDS2000	RS232	Windows 98 - RS232 Serial Code 26 - refer to page 7-2	
Audiosoft			
Various	RS232	RS232 Serial Code 30 - refer to page 7-2	
Neal			
6501	RS232	RS232 Serial Code 8 - refer to page 7-2	AN124
Nice			
Various	IRIG-B *(4861 only)	IRIG-B *(4861 only) - refer to page 10-1	
Racal			
ICR64	RS232	RS232 Serial Code 5 / 17 - refer to page 7-2	
Wordnet Series II	RS232	RS232 Serial Code 41 - refer to page 7-3	
Wordsafe	RS232	RS232 Serial Code 40 - refer to page 7-3	

Misc. systems

Manufacturer / Device	Synchronisation method	Notes	Application note
Ascom			
NIS2000	RS232	RS232 Serial Code 1 or 3 - refer to page 7-1	

Appendix D - NTP Synchronisation option (TimeLord-Net-Client versions only)



TimeLord Network Interface

RJ45 10Base-T Ethernet Connector

DB9 Network software update port

Link Link LED indicating connection to network

Data Data LED indicating data on the network

Operation

The Network Time Protocol (NTP) synchronisation option enables the TimeLord-Net-Client to synchronise to an NTP time source on a TCP/IP Computer network. The quick setup procedure should be followed to get the TimeLord-Net-Client up and running quickly. With NTP selected as the synchronisation source, a reduced set of options will appear in the Network Setting menu as detailed in the NTP Network Settings Table below.

Please refer to chapter 9 for further information regarding TCP/IP concepts and NTP. Please note that the TimeLord-Net-Client cannot operate as a Network Time Server.

The TimLord-Net Client has a 10Base-T Ethernet interface and must be connected either to a dedicated 10Base-T port or a switchable 10Base-T / 100Base-T port on your network.

NTP Network Settings Table

Display Code	Setting
IP	**IP Address** This is the Internet Protocol address that the TimeLord-Net uses on the computer network.
Sb	**Subnet Mask** The subnet mask when combined with the IP address identifes the subnet (part of the bigger network) that the TimeLord-Net is connected to.
Gt	**Gateway Address** The gateway address is used by the 4860net when it needs to send information to computers and devices which are connected to other networks and subnets.
nt	**NTP Server IP Address** This is the Internet Protocol address of the NTP time server that the TimeLord-Net-Client uses as its Time Source.

Quick Setup

Install the TimeLord-Net-Client as detailed in section 3 of this manual.

Attention: If you are unsure of the following network settings please contact your network administrator. Incorrect settings can adversely affect the performance of your network.

1) Select ntP (NTP - Network Time Protocol) as the synchronisation source in the 'Synchronisation Mode' menu. Please refer to chapter 5 for further details.

2) In the Network Setting menu, program the IP address of the TimeLord-Net-Client in dotted-decimal notation. (e.g. 192.168.0.41) Use the plus and minus buttons to increment and decrement each value. The up arrow will move on to the next value, the down arrow will return to the previous value. This procedure is shown graphically on pages D-3 & D-4. Please refer to the NTP Network Settings Table below and chapter 9 for further information.

3) In the Network Setting menu, program the Subnet Mask of the TimeLord-Net-Client in dotted-decimal notation. (e.g. 255.255.255.0) Use the plus and minus buttons to increment and decrement each value. The up arrow will move on to the next value, the down arrow will return to the previous value. This procedure is shown graphically on pages D-3 & D-4. Please refer to the NTP Network Settings Table below and chapter 9 for further information.

4) In the Network Setting menu, program the default Gateway of TimeLord-Net-Client in dotted-decimal notation. (e.g. 192.168.0.1). Use the plus and minus buttons to increment and decrement each value. The up arrow will move on to the next value, the down arrow will return to the previous value. This procedure is shown graphically on pages D-3 & D-4. Please refer to the NTP Network Settings Table below and chapter 9 for further information.

5) In the Network Setting menu, program the IP address of the NTP time server in dotted-decimal notation. (e.g. 192.168.0.41) Use the plus and minus buttons to increment and decrement each value. The up arrow will move on to the next value, the down arrow will return to the previous value. This procedure is shown graphically on pages D-3 & D-4. Please refer to the NTP Network Settings Table below and chapter 9 for further information.

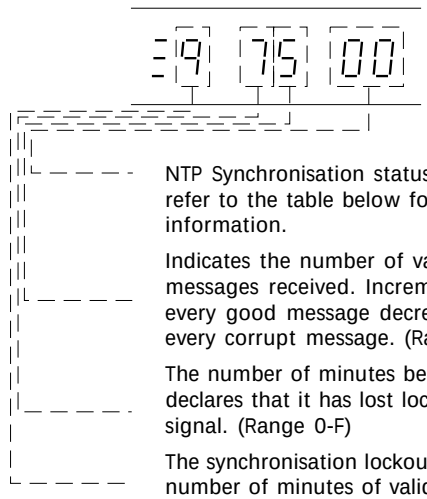
6) Having returned to the time screen, cycle the power on the TimeLord-Net-Client Master Clock.

7) Manually set on the time on the TimeLord-Net-Client Master Clock to within half an hour of the real time (please refer to page 2-4 for further details of this procedure).

8) Use the CAT5 patch cable (supplied) to connect the TimeLord-Net-Client to your computer network. Ensure that the network connection used is compatible with 10Base-T. Check the green link led illuminates, confirming that correct connection has been made to the network.

Synchronisation Status Display

When in normal time display mode the plus and minus buttons can be used to cycle through the date, synchronisation and temperature status displays, as detailed on page 2-5. However, when NTP is selected as the synchronisation source, the synchronisation status display operates as detailed below



NTP Synchronisation status - please refer to the table below for further information.

Indicates the number of valid time messages received. Incremented for every good message decremented for every corrupt message. (Range 0-F)

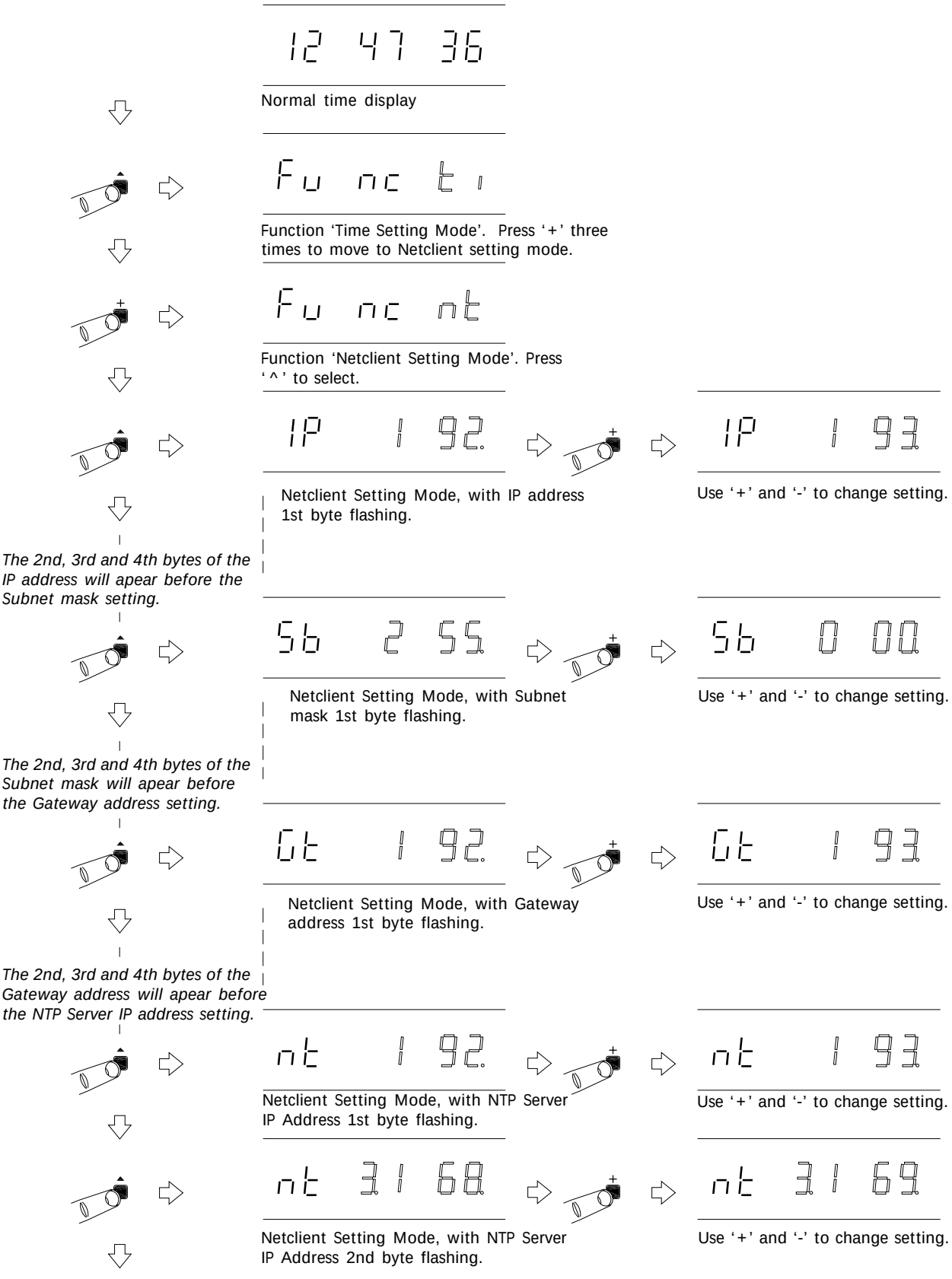
The number of minutes before the TimeLord declares that it has lost lock to the input signal. (Range 0-F)

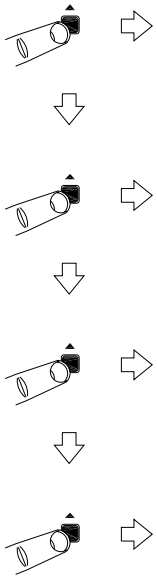
The synchronisation lockout counter, the number of minutes of valid, but different time messages required before the TimeLord will synchronise to the new time. (Range 0 - 9)

NTP Synchronisation Status Table

Display Code	
00	**Initialising** The Ethernet port is initialising.
01	**Error** There is a non-specific error.
02	**Transmission failure** The TimeLord-Net-Client is not able to transmit data to the NTP Time Server.
03	**Receive failure** The TimeLord-Net-Client is not receiving data from the NTP Time Server.
04	**Receive error** The TimeLord-Net-Client is receiving unreliable data from the NTP Time Server.
05	**Synchronised** The TimeLord-Net-Client is syncrhonised to the NTP Time Server.
06	**Time difference error** The TimeLord-Net-Client has received NTP information that indicates the time difference between the time on the TimeLord-Net-Client is ±30 minutes. The TimeLord-Net-Client will reject this information.

When the TimeLord master clock is programmed to synchronise from an NTP time source, the network setting menu will be replaced by the following netclient setup menu.





nt 90 00

Netclient Setting Mode, with NTP Server IP Address 3rd byte flashing.

nt 90 01

Use '+' and '-' to change setting.

nt 10 00

Netclient Setting Mode, with NTP Server IP Address 4th byte flashing.

nt 10 01

Use '+' and '-' to change setting.

n uP n

Netclient Setting Mode, with Network update flashing. This mode cannot be exited if set to 'y'.

n uP y

Use '+' and '-' to change setting. When set to 'y' the netUpdate software on the TimeLord CDROM can be used to install a software upgrade into the TimeLord. (Available on future versions)

12 49 53

Normal time display

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