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Atomic Time Code Receiver **ASR-60**

Connection details and general information

Receives MSF 60.000 kHz transmission
Generates RS422 data output with time and date
Sealed to IP65



notes

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Introduction

Please contact us if you need help, if you have a complaint, or if you have suggestions to help us improve our products or services for you.

If you contact us about a product you already have, please tell us the full model number and serial number, so that we can give you accurate and fast help.

This product has a 2 year warranty. We will put right or replace any item which is faulty because of bad workmanship or materials. This warranty does not cover damage caused by misuse or accident.

IMPORTANT

If this equipment is important to your process, you may want to buy a spare to cover possible failure or accidental damage in the future.

This is because at some times, for example during our factory shutdown periods, you may have to wait several weeks for an equivalent replacement. Or, we may have no stock at the time you urgently need it.

You may also need to pay extra carriage charges if you want a fast, guaranteed courier service. Warranty repairs or replacements are normally returned with a standard courier service.

We do not offer any compensation for losses caused by failure of this instrument.

If you do not agree with these conditions, please return this item now, in unused, clean condition, in its original packaging and we will refund the purchase price, excluding any carriage paid.

We thought you'd prefer to know about possible delays and extra charges now, rather than during a panic.

We always try to improve our products and services, so these may change over time. You should keep this manual safely, because future manuals, for new designs, may not describe this product accurately.

We believe these instructions are accurate, and that we have competently designed and manufactured the product, but please let us know if you find any errors.



Warnings

Please carefully read all warnings and ONLY install the item when you are sure that you've covered all aspects.

- * Connect the equipment according to current IEE regulations and separate all wiring according to IEC1010.

- * Power supplies to this equipment must have anti-surge (T) fuses rated at 1A for DC supplies in the range 11-30VDC.

- * Check that the model number and supply voltage suit your application before you install the equipment.

- * Don't touch any circuitry after you have connected the equipment, because there may be lethal voltages on the circuit board or connector terminals.

- * Only adjust on-board switches or connections with the power turned off.

- * Make sure all screw terminals are tight before you switch the equipment on.

- * Only clean the equipment with a soft dry lint-free cloth. Do not use any solvents.

***Safety FirstDon't assume anything..... Always double check.
If in doubt, ask someone who is QUALIFIED to help you in the subject.***

Description

What does ASR60 stand for?

Atomic **S**tandard **R**eceiver tuned to **60** kHz.

The ASR60 receives time code signals from the MSF transmitter on 60.000 kHz. and uses this information to generate an RS422 serial data output. The data includes time and date information for the UK, and is useful for applications where accurate time referencing is needed.

For example, the data can be fed to a London Electronics large digit display to give a precise time readout in public places such as airports, train stations, radio stations etc.

MSF is the radio signal which broadcasts the national time standard for the UK.

The MSF service broadcast from Anthorn is the principal means of sending and sharing the UK national standards of time and frequency which are maintained by the National Physical Laboratory. It had been transmitted from Rugby, in Warwickshire for many years, until Anthorn went active on April 1 2007.

Transmission is 24 hours a day, and the carrier frequency is maintained at 60.000 kHz to within 2 parts in 10^{12} .

It can be satisfactorily received throughout much of north and west Europe and Ireland.

What do the letters MSF stand for?

Well, they do not stand for anything. MSF is simply a call sign which uniquely identifies the broadcast. M is one of three prefixes (2, G or M) allocated to the UK by international agreement for station identification. There is speculation that SF was intended to represent the words 'standard frequency', but NPL has no evidence for this.

Who provides the Service?:

The MSF 60 kHz standard time and frequency service is funded by the Department of Trade and Industry (DTI) as part of its provision of time and frequency measurement standards in the UK. The maintenance and development of those standards is carried out by the National Physical Laboratory (NPL), with the MSF 60 kHz signal being transmitted from the Rugby Radio Station by BT Radio Engineering Services under contract from NPL. The signal is generated at Anthorn using the atomic clocks and time code equipment provided by NPL. The broadcast signal is monitored and controlled relative to the national time standard at the NPL site in Teddington.

Reception notes:

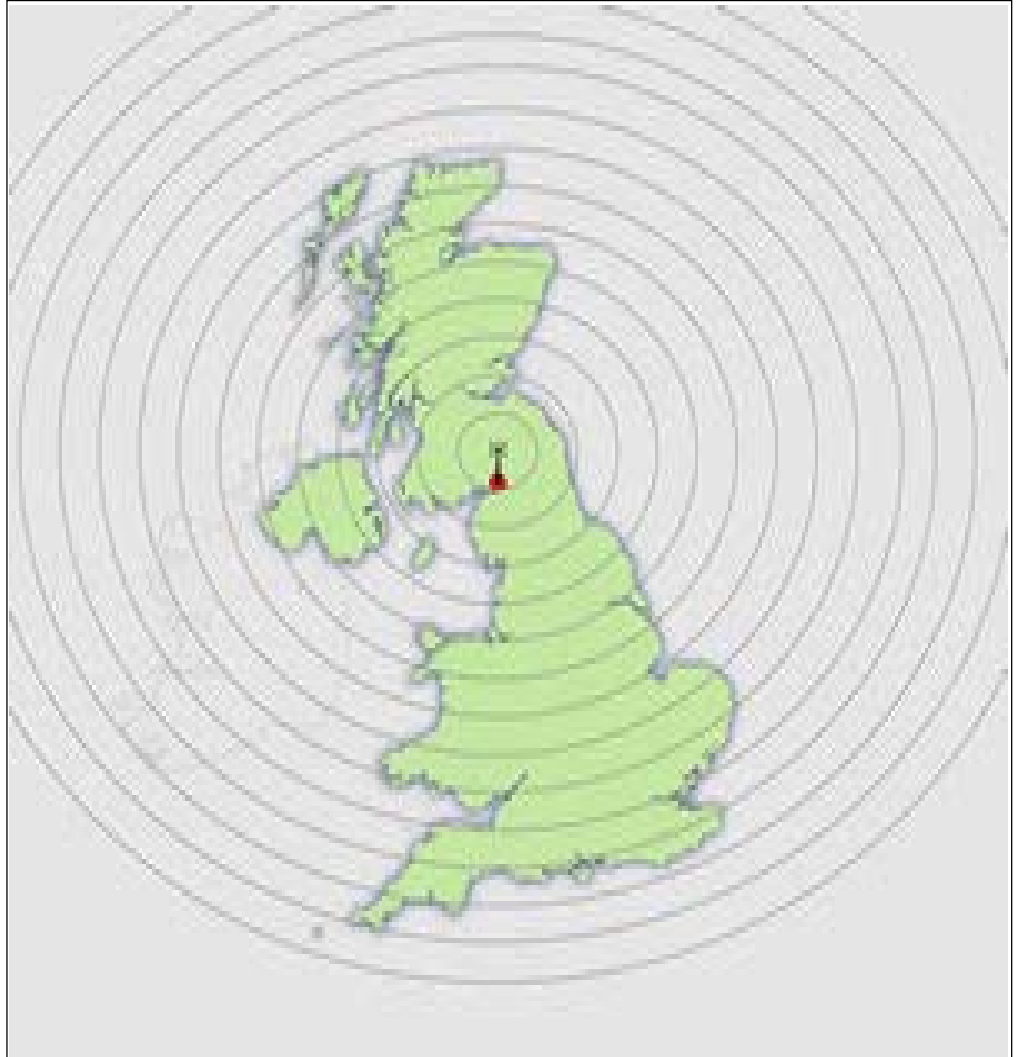
Reception limits are mainly caused by local interference and screening due to nearby metal-work, for example in a steel-framed building. Because the ASR60 can be mounted outside and can send its signal over hundreds of metres, you should be able to mount the receiver where there is good signal quality.

Do not mount the receiver near fluorescent lighting, variable speed drives or other electrically noisy devices.

The signal is essentially constant throughout day and night (no fading) and is practically unaffected by local geography, such as hills or valleys. This is due to its very long wavelength of 5 km.

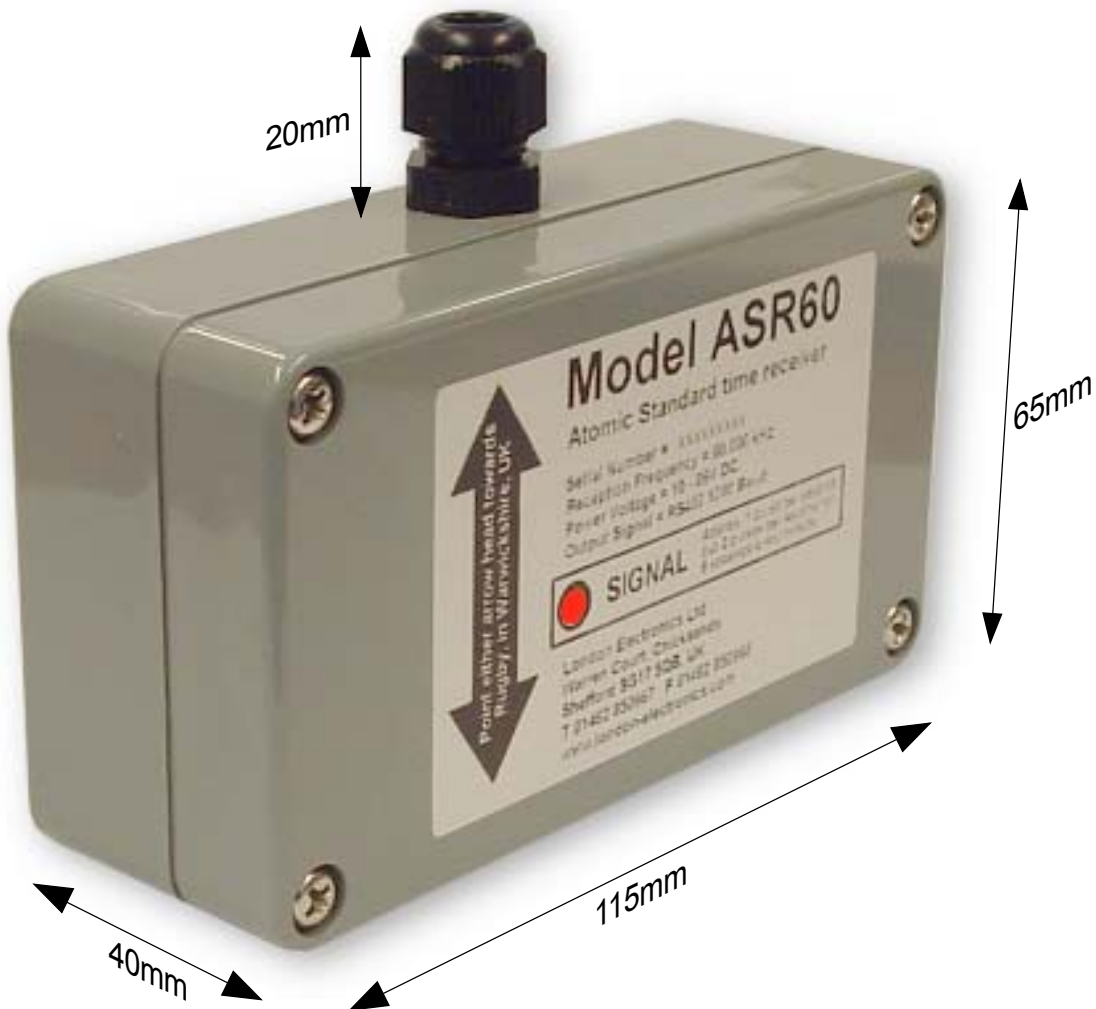
Where is the transmitter?

The transmitter at Anthorn is at latitude $54^{\circ} 55' N$, and longitude $3^{\circ} 15' W$.



Dimensions and weights

Case width	:	115.0	mm
Case forward projection	:	40.0	mm
Case height	:	65.0	mm
Cable gland height	:	20.0	mm
Typical weight	:	175	grams
Operating conditions	:	0 to 50	degrees C
Storage conditions	:	-20 to +70	degrees C
Case sealing	:	IP65	
Case Material	:	PolyCARBONATE	
Cable dimensions	:	Accepts 4 core screened cable 4.5 to 6.5mm dia.	
Flammability Class	:	V0 (UL94)	



Mounting the receiver

The ASR60 mounts onto a triangular wall bracket. This allows you to rotate the receiver to face the transmitting antenna, for best reception. The receiver can be wired up to 500 metres away from the device it will connect to.

Ideally, mount the receiver outside, at least 15 metres away from electrically noisy equipment such as discharge lighting (fluorescent, arc, strobe), switch-mode power supplies, variable speed drives, video monitors, televisions, arc welders etc.

Do not mount the receiver inside a metal lined or reinforced concrete building, because this will screen the signal from the receiver.

You will need to rotate the main enclosure to point at the transmitter, which is located in Rugby, Warwickshire.



Connections to the receiver

WARNING:

Do not open the receiver enclosure if moisture or dirt could contaminate the electronics. Only open in clean, dry conditions.

Remove the 4 outer corner screws, so that you can lift the grey lid, to expose the electronic assembly.

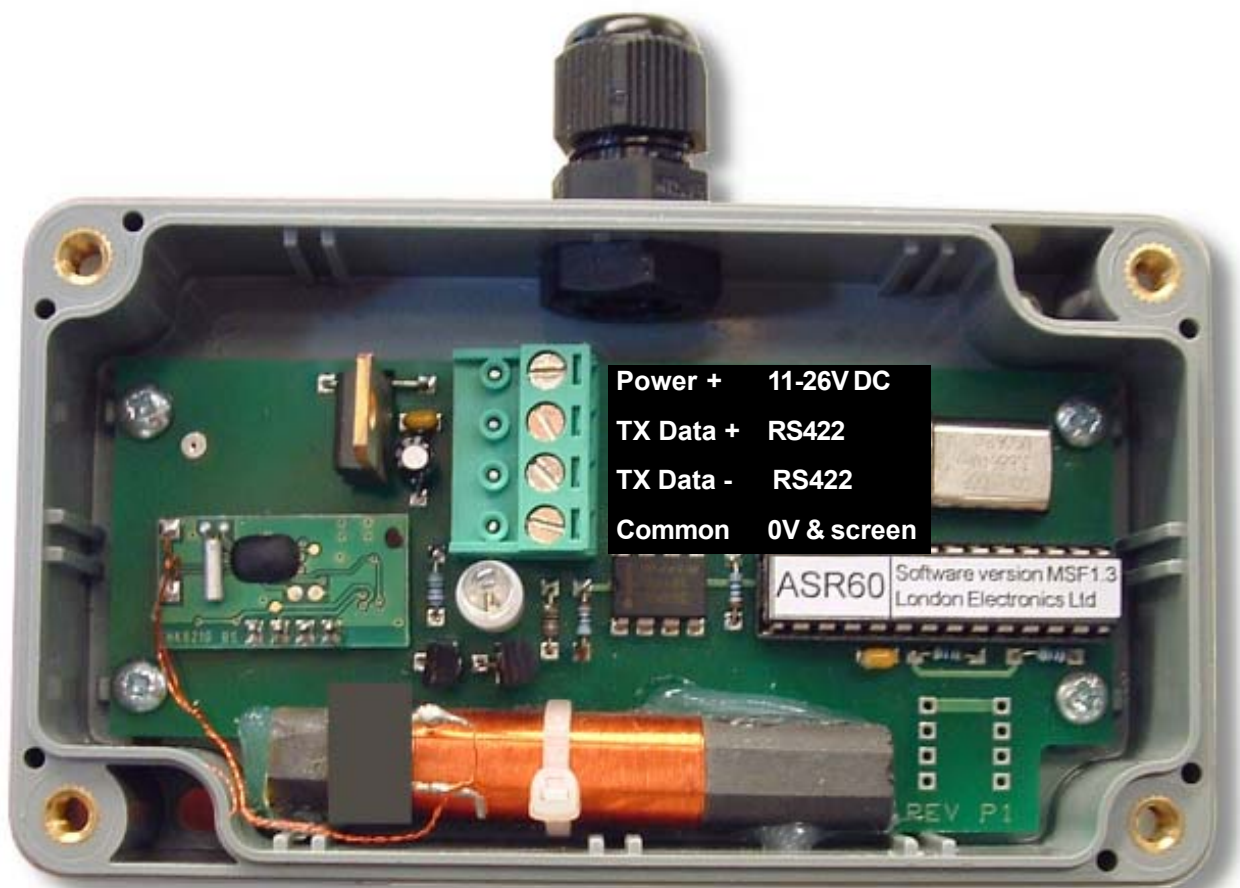
Feed your 4 core cable through the cable gland and wire to the terminal block as shown below.

Use good quality 4 core SCREENED cable with protective outer plastic sheath. Connect the screen to the COMMON terminal.

You can have up to 500 m of cable between the receiver and the other equipment in the system.

Some typical connections to London Electronics remote displays (refer to their manuals also):-

ASR60	INT-S panel mounting display	C17XX large display
TX Data + TX Data - Common	Terminal 3 Terminal 2 Terminal 1 (Set rear switches for RS422/485)	Green Data A Blue Data B Yellow Common (Set for RS422/485)



Data from the receiver

The data string updates every second and is in the format...

<hr><min><sec><day><mnth><yr><Status><cr>

So at 13:53:12 on the 10th of April 2005, with data coming from rugby synchronised signal, the string would have been seen as :-

13|53|12|10|04|05|+|<cr> (Spaces for clarity only, to show separation of data fields)

Each field has the following characteristics:-

hr : from 00 to 23

min : from 00 to 59

sec : from 00 to 59

day : from 01 to 31

mnth : from 01 to 12

yr : last 2 digits. For example in 2005 this will be 05

status : A + sign when data has been updated by MSF (Hex 2b)
: A - sign when data comes from backup crystal oscillator. (Hex 2d)

cr : ASCII 13 Carriage return (Hex 0d)

When you first switch the unit on, the hours, minutes, days, months and years will be —. The seconds will be numeric, incrementing 1 per second, but not locked. So, a typical switch-on data string may look like

----12-----

As soon as the receiver has twice successfully decoded the full date and time, the data string will include all numeric values.

It may typically take around 3 minutes for the unit to lock and provide full data output after switch-on. This period will be longer if the receiver is in a poor reception area or if local interference is corrupting the signal.

This is because the receiver looks for several consecutively correct data receptions before it uses the data. This helps to eliminate received-data errors caused by noise or loss of signal.

Only the time information will be updated during loss of signal. The date will remain at the last value received.

Specifications

Power supply	: 11 to 26 V DC at up to 100mA
Reception frequency	: 60.000 kHz.
Data output	: RS422 at 2400 Baud
Signal detection LED	: Flashes in time with received slow data. Nominally 1 per second, except at around 15 seconds past the minute when flashing occurs twice per second for 6 seconds.
Precision	: Within 1 second while status sign in data is +

When status sign is -, the data is derived from an internal free running crystal, which would have been corrected at the time the last + status occurred. The free running crystal oscillator has a nominal long term precision of 0.01% This means that after 10000 seconds, an error of 1 second may be expected. Date is not updated in loss of signal.

The internal crystal oscillator has a temperature coefficient of 100 parts per million per degree C.

As soon as reception is restored, the internal crystal oscillator will be corrected again within 3 minutes.

If you only want to use high certainty precision data, you can accept only data which has a + following it, and ignore data with a -

+ = Hex 2b
- = Hex 2d

Case width	: 15.0 mm
Case forward projection	: 40.0 mm
Case height	: 65.0 mm
Cable gland height	: 20.0 mm
Typical weight	: 175 grams
Operating conditions	: 0 to 50 degrees C
Storage conditions	: -20 to +70 degrees C
Case sealing	: IP65
Case Material	: PolyCARBONATE
Cable dimensions	: Accepts 4 core screened cable 4.5 to 6.5mm dia.
Flammability Class	: V0 (UL94)

Revisions

Rev 1	21 April 2005	Baudrate changed to 2400
Rev2	19 May 2005	Software version 1.4 released. Single string at top of minute, not 2.

Notes

Declaration of Conformity

We designed and manufactured this Product to meet the following specifications :

EN55022:1987 Conducted Emissions: Class B
EN55022:1987 Radiated Emissions : Class B
IEC801-2:1984 Electro-Static Discharge Immunity: 8kV Air
IEC801-3:1984 Radiated ElectroMagnetic field Immunity: 3V/m

The products conform with these standards:

EN50081-1:1992 (normative)
EN50082-1:1992 (normative)

and comply with the requirements of Council Directive 89/336/EEC for Electro-Magnetic Compatibility,
& are designed to meet 72/23/EEC safety directive.

Conditions

The device covered by this certificate must be installed according to the following conditions :-

Cabling must be routed separately to heavy power carrying cabling (includes relay output wiring)
All signal cabling must be screened. The screen must only be connected to the power earth terminal

Signed as true and correct, for and on behalf of London Electronics Ltd.

Warren Court, Beds.

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J.R.Lees Director