Eddystone Broadcast

XE40 Series
40W FM Exciters

Installation
and
Operation

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SECTION ONE : INTRODUCTION

! CAUTION !

These Exciters operate at **high RF power levels, internal supply energy levels and mains supply current levels**. They also incorporate devices containing **toxic BeO**. Installation, operation and maintenance of this unit must therefore, only be carried out by suitably qualified personnel, familiar with and fully utilising the safety procedures such equipment demands.

NO attempt at installation should be made without full reference to and compliance with SECTION TWO : INSTALLATION.

NO attempt at internal maintenance should be made without full reference to and compliance with the appropriate sections (fuse changing and internal option links which are detailed in INSTALLATION).

1.1 : GENERAL DESCRIPTION

The XE40 Series of FM Exciters provide output powers of up to 40W in the standard Band ll frequency range of 87.5-108MHz. They are capable of generating a standard mono or stereo FM signal from a variety of analogue or digital audio or data sources (including left/right audio, MPX, RDS, SCA, DARC etc.). It is important to note that the Exciter options supplied will depend on the user's actual requirements in this regard which, therefore, must be clearly specified at time of ordering.

The Exciters are totally self-contained (including forced air-cooling) and can be mounted within a standard 19 inch rack with at least 500mm depth and 1U height (plus 1U for ventilation). All that is required is a connection to a mains supply, to source(s) of modulation and to an antenna or to an amplifier, such as the Eddystone Broadcast S7600, S7900, XA500 and XA1000 Series, if greater output power is required. Remote control and monitoring of the Exciter can be by serial RS232 or TCP/IP connection (as specified at time of ordering) using asynchronous data. Basic parallel control and monitoring is also provided on all variants.

One optional baseband input module and one optional serial remote control module can be fitted in any Exciter. These modules have input/output connections available on the rear panel of the Exciter. The Exciter will recognise any such module fitted and provide the appropriate control automatically on a 'Plug and Play' basis. One example is a Stereo Encoder module, which encodes left/right analogue inputs into a stereo composite/MPX signal, which can modulate the Exciter.

The Exciter can also be supplied with a front panel mains supply switch (-02 variant).

The Exciter consists of a number of modules described as follows (1.1.1 – 6 inc.). Front and rear views, block and circuit diagrams, showing these modules are bound at the rear of this manual (E2163-00GA, E2163-00BK and E2163-00CT).

1.1.1 : Main Board and Front Panel Module

The Front Panel section has back illuminated, high contrast 2 line by 16 character display and separate 'CPU', 'SYSTEM NORMAL' and 'MUTE' red/green indicators. A single front panel button is provided to select the desired display with two easily accessible internal buttons to set frequency and the status of any optional baseband input modules.

The Front Panel section also has a preset control, SET POWER, adjustable via an access hole in the front panel, for setting the Exciter output power level. A connector providing a sample of the final RF output signal is provided for temporary connection to external monitoring equipment.

The -02 variant also has a front panel power supply switch.

The Main Board section contains all the basic baseband input circuitry (Composite/MPX and RDS/SCA) the modulator and associated frequency synthesiser, the main hardware control and microprocessor and all connections to other boards, modules and options within the Exciter. A 15 way 'D' socket on the rear panel is also provided, which carries all the parallel control and monitoring connections.

The output from the Power Supply Module (section 1.1.3) feeds a DC-DC converter on the Main Board which provides a regulated +12V supply to the rest of the Main Board, where it is further converted to +5V, -12V and +22V as required. The original output from the Power Supply Module is fed out of the Main Board, at its original +27.5V level, to the 40W Amplifier Module (section1.1.2)

The two baseband inputs to the Main Board (via the rear panel connectors) are summed together before being applied to the direct frequency modulator (i.e. modulation is directly applied to the 87.5 to 108MHz oscillator). The RDS/SCA input is unbalanced and has 75Ω or 10kΩ input impedance setting options. The Composite input has balanced (75Ω or 13.3kΩ) and unbalanced (75Ω or 20kΩ) setting options. The options are set using links on the Main Board. These inputs have separate input level setting controls adjustable via access holes on the rear panel

There is also a Composite output on the rear panel (with 75Ω output impedance). This only provides an output from an optional baseband module, which generates a composite/mpx signal from an input to that module (the Stereo Encoder /S option for example). This internally generated signal can be directed to the input summer (to modulate the Exciter directly) by having the rear panel 'Loop' switch in the upper 'Int' position. With the switch in the lower ''Ext' position the internally generated signal is normally taken out of the Composite output and directed via external units (such as an RDS generator) back into the Exciter's main Composite input.

The direct frequency modulator uses a low microphony transmission line resonator in a low noise transistor oscillator circuit. DC coupling of the audio modulating signals, right through to the final modulating varicap diodes, gives optimum frequency response and stereo separation over the whole audio range. Extra tuning varicap diodes, controlled by dc voltages derived from an output frequency, software based look-up table, give high linearity and near constant deviation sensitivity over the whole output frequency range. The output of the modulator is harmonically filtered, buffered and amplified to provide a low level drive for the 40W Amplifier Module (section 1.1.2). The output driver Mosfet produces a maximum output in excess of 0.5W.

The output frequency of the Exciter is set by a phase lock loop controlled by the Main Board microprocessor. The loop filter output controls the main tuning varicap diodes of the oscillator. This filter has two software switched time constants. A very long time constant is selected when the loop is settled in its normal modulating mode (optimising low frequency audio performance). A much shorter time constant is temporarily selected when the frequency is being changed, to ensure frequency changes can be made in a relatively short period. Whilst such changes are being made (or if the loop is out of lock for any other reason) the low level drive from the Main Board and the 40W Amplifier are both muted.

The output frequency is locked to a highly stable 12.8MHz Temperature Controlled Crystal Oscillator (TCXO) on the board.

Analogue circuitry generates a control reference voltage to set the bias voltage applied to the output Mosfet in the Amplifier Module (see section 1.1.2) and the driver Mosfet on the Main Board itself. This control voltage is initially set by the front panel SET POWER control to generate a desired power output level. Excessive reverse power or heatsink temperature, above preset 'trip' points, then automatically adjusts the set control voltage, gradually reducing the output power ('fold-back'). Various muting or external interlock conditions also over-ride the set control voltage, instantaneously reducing the power output to a minimum.

The microprocessor on the Main Board provides all control and monitoring of the hardware on the board, including analogue to digital conversion of forward/reverse power, temperature, set power and modulation levels. It also interfaces, via serial data links, with optional modules and the Front Panel section. The single channel frequency and settings of any optional modules are stored in its non-volatile 'flash' memory.

A separate hardware 'watchdog' circuit monitors the running of the microprocessor's program and provides warnings to Front Panel and to rear panel output, if the program fails to run, and also automatically mutes the Exciter's output. The microprocessor also generates a mute signal under various circumstances (e.g. when the synthesiser is out of lock). A separate safety 'Interlock' relay

provides an over-riding mute signal if the external Interlock line is open-circuited, irrespective of any internal Exciter condition.

Two sockets are provided on the Main Board for the connection of optional modules. One is for a baseband input module (/S Stereo Encoder etc.) and the other for a serial remote control module (/T TCP/IP etc.). The connections are standardised and the microprocessor will automatically recognise and provide appropriate control and monitoring of whatever module is fitted to whatever socket ('Plug and Play'). The baseband module socket has a Composite/MPX output connection from the module, which is directed to the rear panel Composite output connector and 'Loop' switch (and hence back to the modulator).

1.1.2 : 40W Amplifier Module

The 40W Amplifier Module is fitted on a heatsink with its fins isolated in a 'tunnel' between the front and rear panels. It is fan cooled with the forced air directed principally through the tunnel, over the heatsink fins, thus reducing ingress of dust to actual circuitry. The Module can provide at least 40W (typically greater than 45W) output from the low level drive from the Main Board, using a single ended output Mosfet.

The Amplifier Module also contains an output low pass filter (seven section Elliptical giving a very high level of attenuation at harmonic frequencies) followed by a directional coupler to measure output forward and reverse power. A sensor to measure heatsink temperature is also provided. Voltages from the coupler and sensor are fed to the Main Board to enable accurate setting of forward output power, with an automatic reduction in that power if reverse power or heatsink temperature becomes excessive.

A low level sample of the output power is taken from the Amplifier Module (after the low pass filter section) to feed the front panel RF MON output connector.

As already described, the Main Board contains (analogue) circuitry to generate a control reference voltage to set the bias voltage applied to the output Mosfet in the Amplifier Module and the driver Mosfet on the Main Board. This control voltage is initially set by the front panel SET POWER control to generate a desired power output level. Excessive reverse power or heatsink temperature, above preset 'trip' points, then automatically adjusts the set control voltage, gradually reducing the output power ('fold-back'). Various muting or external interlock conditions also over-ride the set control voltage, instantaneously reducing the power output to a minimum.

The Amplifier Module also contains the supply circuitry for the 24V DC fan. This drive circuitry includes a thermal fuse and a rotation detector to signal a fault to the Front Panel and remotely, if the fan does not rotate.

A microprocessor on the Main Board provides all monitoring of the hardware on the Amplifier Module, including analogue to digital conversion of forward/reverse power, heatsink temperature and set power level. Digitised versions of all the mentioned levels and various fault conditions (low power, power fail etc.) are displayed on the Front Panel and remotely.

1.1.3 : Power Supply Module

The universal AC (88-264V AC, 47-63Hz) Power Supply module converts the mains input supply voltage to +27.5V DC. This voltage is fed to the Main Board and from there to the 40W Amplifier Module. On the Main Board it is converted to various other levels before use.

1.1.4 : Serial Remote Control and Monitoring Board (/A and /T options only)

Serial ASCII remote control and monitoring, either at RS232 level (/A option) or utilising TCP/IP (/T option) can also be provided on all variants. The optional board is fitted in the rear of the unit and has a nine way 'D' plug in the case of the RS232 /A option or an RJ45 connector in the case of the TCP/IP /T option. The board contains a microprocessor, which receives serial data from the Main Board (see section 1.1.1) and converts it into asynchronous ASCII data representing Exciter analogue levels and status. On the /A option, this data is presented at RS232 level. On the /T option it is fed via an additional circuit which provides TCP/IP protocols and levels. External muting using serial control is also enabled via this optional board.

1.1.5 : Stereo Encoder Module (/S option only)

This optional module converts left/right analogue stereo signal inputs to a standard composite/mpx signal, which can be used to modulate the Exciter. It also has switchable pre-emphasis, limiting and clipping functions and a rear panel output of the 19kHz pilot generated by the module.

The inputs to the module are via rear panel XLR sockets. The balanced left/right analogue inputs are on the Encoder Module itself with internal option links to set 600Ω or 20kΩ input impedance. These inputs may also be externally wired for unbalanced operation, the input impedance then being 600Ω or 13.3kΩ. A third pin on each socket is provided for cable screen grounding, either directly or through a capacitor (internal option link). These inputs have separate input level setting controls, adjustable via access holes on the rear panel of the Encoder Module.

The input signal is fed through pre-emphasis, limiter and clipper circuits in turn. The first circuit applies 25, 50 or 75uS or no pre-emphasis as selected via the Front Panel. The limiter and clipper circuits can also be similarly and independently selected on or off. The limiter provides automatic gain control, limiting the peak deviation to approximately 55kHz, the clipper provides a soft clipping action, clipping the deviation at about 70kHz.

A switching multliplexer is used to convert the processed left/right audio into a standard composite/mpx signal, which is further filtered and amplified before being fed to the Main Board. The 38kHz sub-carrier (switching signal) and 19kHz pilot tone are generated by a digital 'Walsh' function generator, a sample of the 19kHz being made available at the rear panel PILOT O/P connector. Note that the 19kHz pilot (in the composite/mpx output only) can be switched on or off from the Front Panel and that a warning is issued if the pilot fails.

A microprocessor on the Encoder Module provides all control and monitoring of the hardware on the board. It also interfaces, via a serial data link, with the hardware control microprocessor on the Main Board. Encoder control settings made from the front panel are sent from the Main Board and then, after being stored for use in the Encoder Board microprocessor, reverted for display on the Front Panel.

1.1.6 : Re-Broadcast Receiver Module (/R option only)

This optional module demodulates a wideband FM, input RF signal (in the range 87.5 to 108MHz) to provide a mono/composite/MPX baseband signal, which can be used to modulate the Exciter (i.e. re-broadcast.

The input to the module is via a rear panel 50Ω N Type socket. This input is passed through a pre-tuned passband filter to a passive double-balanced mixer. A single, fixed frequency, crystal oscillator provides the local oscillator injection for the mixer (10.7MHz below the RF input frequency). The 10.7MHz I.F. output from the mixer passes through a three-stage amplifier/ceramic filter to a integrated circuit which provides further amplification, limiting and quadrature F.M. detection. The audio output of the detector, after amplification, phase compensation, low pass filtering and buffering provides the composite/MPX output of the module, which is fed to the Main Board.

A microprocessor at the front of the Re-Broadcast Module provides all control and monitoring of the hardware on the board. The received signal strength, as a DC level, is fed to an A/D converter in the microprocessor. The presence of a signal, above a threshold level, is also signalled to the microprocessor, which interfaces, via a serial data link, with the hardware control microprocessor on the Main Board for display on the Front Panel (or remotely).

1.2 : VARIANTS AND OPTIONS

The main variants and options (indicted by number or letter suffixes respectively) are as follows :-

E2163-01	XE40 40W Exciter, Universal AC Supply
E2163-02	XE40 40W Exciter, Universal AC Supply, front panel supply switch

/A	Fitted with RS232 Serial Remote Control Module *
/T	Fitted with TCP/IP Serial Remote Control Module *
/S	Fitted with Analogue Input Stereo Encoder **
/R	Fitted with Re-Broadcast Receiver **

* Note - only one serial remote control option can be fitted.

** Note - only one baseband input or receiver module can be fitted.

For example, E2163-01/ST :- XE40 40W Exciter with a universal AC supply and fitted with an analogue input stereo encoder and TCP/IP remote control optional modules.

1.3 : TECHNICAL SPECIFICATIONS

The XE40 Series of FM Exciters is designed to meet or exceed ETSI Standards :-

EN 301 489-01 : ERM/EMC for Radio Equipment, Part 1, Common Technical Requirements.
EN 301 489-11 : ERM/EMC for Radio Equipment, Part 11,Special Conditions for FM Transmitters.
EN 302 018-02 : ERM (Spectral Occupancy) for the FM Radio Broadcast Services
EN 60215:1989 : Safety Requirements for Radio Transmitting Equipment.

'Overall' performance is specified with the RF output demodulated using a high quality FM/AM demodulator and a high quality stereo or mono decoder. Audio and composite/mpx test sources also exceed the rated Exciter performance by at least 10dB or equivalent.

The normal stereo signal generated by the Exciter or source consists of :-

±75kHz maximum deviation due to a mono signal
±67.5kHz maximum deviation due to left/right stereo signals
(less in both cases if RDS and/or SCA signals are also generated)
±6.75kHz deviation due to 19kHz pilot tone (stereo signals only)
giving a total maximum of approximately ±75kHz

Unless otherwise specified, 'overall' performance is specified at the above deviation levels with +8dBu/5.5V peak to peak test signal(s). Pre-emphasis is applied in the Exciter or test source and de-emphasis applied in the measuring equipment. Any other Exciter signal processing circuitry (e.g. limiters, clippers etc.) is switched off.

1.3.1 : Common Specifications (plus /A and /T options)

RF Output Port	50Ω nominal, N Type Connector
Carrier Frequency	87.5-108MHz in 50kHz steps in a single stored channel (in programmable non-volatile 'flash' memory). The channel can only be programmed locally. Frequency change time approximately 15secs (RF output muted during change period). Performance equal to or better than :- Stability : ± 2ppm maximum over –5 to +50deg.C (±200Hz at 100MHz) Ageing : ±1ppm over first year (±100Hz at 100MHz) Adjustment : ±3ppm using internal trimmer (±5ppm using voltage trimmer) Variation : ±2ppm with 75kHz deviation applied (±200Hz at 100MHz) Under normal operating and maintenance conditions, the resulting frequency error should be less than ±200Hz, typically less than ±100Hz.
Output Power	With any load with a return loss >14dB (1.5:1 VSWR) any angle. Adjustable over range of at least 5W to 40W Variation : Not more than ± 0.5dB under all specified operating conditions
Output Power Shutdown	Output power is automatically reduced or shutdown to ensure that any load producing reverse power greater than approximately 4W including open and short circuits, does not cause any damage to the Exciter. Excessive heatsink temperature (greater then +90 deg.C) also automatically reduces or shutdowns the output power.

Reverse Intermodulation	Reverse intermodulation products will be better than or equal to –10dB, relative to the interfering incident signal, this being offset over the range ±300kHz to ±20MHz (but remaining within 87.5MHz to 108MHz).
Spurious and Harmonic Emissions	In the range 9kHz to 1000MHz : - Better than or equal to –75dBc - typically better than –85dBc In the range 87.5MHz to 137MHz : - Better than or equal to –85dBc at greater than 500kHz removed from carrier. Measured in a 10kHz bandwidth, with and relative to, an unmodulated carrier.
Adjacent Channel Spurious Emissions	Better than or equal to –20dBc at ±125kHz removed from carrier Better than or equal to –40dBc at ±150kHz removed from carrier. Better than or equal to –60dBc at ±175kHz removed from carrier Better than or equal to –80dBc at ±200kHz removed from carrier. Better than or equal to –85dBc at ±300kHz to ±500kHz removed from carrier. Measured in a 1kHz bandwidth, with a ±75kHz deviation, 400Hz mono signal. Spurious levels relative to peak signal carrier/sidebands (i.e. within a spectrum mask defined by above limits).
Modulation	F3E (monophonic) or F8E (stereophonic) to CCIR recommendation 450-3 for pilot tone systems. RDS/SCA modulation facilities as also provided. Maximum deviation in excess of ±200kHz (at better than-40dB ,1% distortion) Deviation variation over carrier frequency range (fixed input level) : - Better than ±5% (±3.75kHz at 75kHz deviation) typically ±3% (±2.25kHz) Note that stereo modulation requires the /S option Stereo Encoder to be fitted, or the use of an external stereo coder feeding the Exciter's Composite/MPX input. In the case of the /S option, maximum deviation is then limited to ±150kHz.
Incidental Amplitude Modulation	Synchronous (AM due to FM):- Not greater than 0.5% with audio deviation (excluding pilot) of ±40kHz at a modulation frequency of 400Hz. Asynchronous (residual AM due to hum and noise with no FM modulation) :- Not greater than 0.3%. Both measured average ±peak, unweighted, in a 10Hz to 20kHz bandwidth, with pre-emphasis applied in the Exciter, but with no de-emphasis on the measuring equipment, which is used as an AM demodulator only. The rated performance is maintained from maximum to at least half rate output power.

Composite/MPX Input (stereo source)	DC to 100kHz input via floating 75Ω BNC connector. Input impedance internally preset to :- balanced 75Ω or 20kΩ (coaxial screen floating) or unbalanced 75Ω or 13.3kΩ (coaxial screen internally grounded) Input sensitivity for ±67.5kHz deviation (exc. pilot): +8dBu : 5.5V peak to peak (adjustable from rear panel with maximum sensitivity typically +4dBu/3.5V). Overall frequency response : better than ±0.2dB over 5Hz - 15kHz (rel. 1kHz) Measured with deviation (excluding pilot) set to 18dB below ±67.5kHz (±8.4kHz) at 400Hz modulation - fixed test level to pre-emphasised test source then causing deviation to rise with modulation frequency. Overall stereo separation : better than 48dB over 40Hz to 10kHz (typ. 55dB) Overall harmonic distortion : better than –60dB (0.1%) over 40Hz to 10kHz (typ. –66dB). Measured in a bandwidth of twice the fundamental to 22kHz. Overall signal to noise ratios better than : - RMS A weighted : 75dB RMS CCIR468-3 weighted : 65dB - RMS unweighted : 70dB Q-Peak CCIR468-3 weighted : 65dB - Q-Peak CCIR unweighted : 65dB All measured relative to deviation of ±67.5kHz (excluding pilot) and 400Hz modulation (set up with an RMS unweighted measurement).
RDS/SCA Input	57kHz to 100kHz input via 75Ω BNC connector Input impedance internally preset to unbalanced 75Ω or 10kΩ Input sensitivity for ±2.0kHz deviation (typical RDS): 1V peak to peak Input sensitivity for ±5.5kHz deviation (typical SCA): 2.8V peak to peak (input adjustable from rear panel with maximum sensitivities of approximately 500mV and 1.4V peak to peak respectively).
Composite/MPX Output	DC to 100kHz output via 75Ω BNC connector Output impedance : unbalanced 75Ω . Output level for ±75kHz total deviation : - 5.5V peak to peak open circuit - matches Composite/MPX Input sensitivity for looping through zero gain external equipment (loop switch on ‘Ext’, all input impedances high). Note that this output is <u>only</u> provided from an optionally fitted baseband input module, which has a Composite/MPX output (such as the /S option Stereo Encoder). Performance of this output essentially matches that of the source module.
Status Indications	Selectable front panel reading of output forward and reverse power, frequency, heatsink temperature and any optional baseband input module settings. Selected screen also shows any relating fault or condition (‘Low’, High’, ‘Muted’, ‘Interlock’, ‘Phase Lock Fail’, ‘Fan Fail’ etc.) Green/red pass/fail led indicators of system normal and CPU status. Green/red/amber indicator of mute/interlock status

Local Control	Single front panel push-button to select status display and two easily accessible internal push buttons to select frequency and any optional baseband input module settings.
Remote Control and Monitoring	Basic parallel control/monitoring including a safety interlock (on 15 way 'D' socket). RF monitoring BNC output on front panel.
Serial Remote Control and Monitoring (/A and /T options)	RS232 (/A) or TCP/IP (/T) using 2400, 4800, 9600 or 19200 Baud asynchronous data (1 start, 8 data, 2 stop, no parity) rate selectable from front panel. All local control and monitoring is duplicated over the serial link. RS232 on nine way 'D' plug, TCP/IP on RJ45 socket.
Environmental	Ambient Temperature (operating) : -5 to +50 deg.C Ambient Temperature (storage) : -20 to +70 deg.C Relative Humidity (operating) : Less than or equal to 95%, non condensing with the Exciter at a higher temperature than the ambient. Altitude (operating) : Up to 3000 metres a.s.l.
Mechanical	Width : 483mm (19 in.) Height : 43mm (1U) Depth : 500mm Weight : Approx. 6kg. Notes depths are intrusion into rack including cabling at the rear.
Power Supplies Supply currents are nominal only.	Single phase input on 10A IEC connector: - Universal AC : 88-264VAC (47-63Hz) Peak inrush current 35A at 115VAC input Peak inrush current 65A at 230VAC input 1.1A at 88V to 0.35A at 264V at 40W RF output

1.3.2 : Stereo Encoder Module Specifications (/S option only)

Left/Right Inputs	DC to 15kHz left/right analogue stereo inputs via two 3 pole XLR connectors Input impedance internally preset to balanced 600Ω or 20kΩ (600Ω or 13.3kΩ if externally unbalanced by grounding one balanced input side). Input sensitivity for ±67.5kHz deviation (excluding pilot) at 400Hz :- +8dBm (600Ω input) : +8dBu : 5.5V peak to peak (left and right separately adjustable from rear panel with maximum sensitivities typically -4dBu/1.4V). Pre-emphasis set internally to :- none, 25uS, 50uS or 75uS. Overall frequency response : better than ±0.4dB over 30Hz - 15kHz (rel. 1kHz) (integral lowpass filters provide greater than 60dB rejection at 19kHz). Measured with deviation (excluding pilot) set to 18dB below ±67.5kHz (±8.4kHz) at 400Hz modulation - fixed test level to pre-emphasised input then causing deviation to rise with modulation frequency. Overall stereo separation : - better than 48dB over 40Hz to 10kHz (typ. 60dB) Overall harmonic distortion : better than –58dB (0.13%) over 40Hz to 10kHz (typ. –64dB). Measured in a bandwidth of twice the fundamental to 22kHz. Overall signal to noise ratios : - Overall signal to noise ratios better than : - RMS A weighted : 70dB RMS CCIR468-3 weighted : 58dB - RMS unweighted : 65dB Q-Peak CCIR468-3 weighted : 58dB - Q-Peak CCIR unweighted : 58dB All measured relative to deviation of ±67.5kHz (excluding pilot) and 400Hz modulation (set up with an RMS unweighted measurement).
Pilot Tone Output and Deviation	Set on/off internally. 19kHz ±2Hz output via 50Ω SMA connector Pilot deviation : ±6.75kHz (adjustable from the rear panel over at least ±6kHz to ±7.5kHz) Output Impedance : approximately 100Ω. Output level : approximately 5V peak to peak sinewave (open-circuit)
38kHz Sub-carrier Suppression	Better than 40dB relative to ±75kHz deviation (typically better than 60dB).
Limiter and Clipper	Separately selectable internally. 'Automatic level control circuit limiting maximum peak deviation to approximately ±55kHz. Soft clipping circuit operating at approximately ±70kHz.

1.3.3 : Re-Broadcast Receiver Module Specifications (/R option only)

RF Input (rejection and selectivity measured with mono signal)	Single preset frequency within range 87.5 to 108MHz, via rear panel 50Ω 'N' Type coaxial connector (frequency must be specified at time of ordering). Operating input level : approximately -80dBm to at least –20dBm. (Ultimate signal to noise ratio reached at approximately –55dBm) Image rejection : an unwanted modulated signal, at 21.4MHz below the wanted signal frequency and of level 0dBm, will generate a final output equivalent to a signal at the wanted frequency of level lower than approximately –90dBm. I.F rejection : an unwanted modulated signal, at 10.7MHz and of level 0dBm, will generate a final output equivalent to a signal at the wanted frequency of level lower than approximately –90dBm. Adjacent channel selectivity : with a wanted signal modulated at 400Hz to give 75kHz deviation and of a level to give 60dB signal to noise ratio (RMS 'A' weighted) typically –80dBm, the relative levels of an unmodulated unwanted signal, at various offsets, required to produce a 6dB drop in signal to noise ratios, are as follows :- At +/- 500kHz unwanted level typically greater than +55dB relative to wanted. At +/- 400kHz unwanted level typically greater than +55dB relative to wanted. At +/- 250kHz unwanted level typically greater than +45dB relative to wanted.
Signal Level Indication	-95dBm to –50dBm (outside this range, indication is given as <-95dBm or >-50dBm) Signal present is also indicated when the signal is above a preset level of approximately –80dBm.
Exciter Output Power Muting	The re-broadcasted output signal from the Exciter is automatically muted when the received signal is not indicated as being present.
Re-Broadcasted Output Signal	With an RF input signal level of at least –50dBm :- Overall frequency response : better than ±0.3dB over 30Hz - 15kHz (rel. 1kHz) Measured with deviation (excluding pilot) set to 18dB below ±67.5kHz (±8.4kHz) at 400Hz modulation - fixed test level to pre-emphasised test source then causing deviation to rise with modulation frequency. Overall stereo separation : better than 45dB over 40Hz to 6kHz (typ. 55dB) dropping to better than 35dB at 10kHz. Overall harmonic distortion : better than –50dB (0.3%) over 40Hz to 10kHz (typ. –55dB). Measured in a bandwidth of twice the fundamental to 22kHz. Overall signal to noise ratios better than : - RMS A weighted : 70dB RMS CCIR468-3 weighted : 60dB - RMS unweighted : 65dB Q-Peak CCIR468-3 weighted : 60dB - Q-Peak CCIR unweighted : 60dB All measured relative to deviation of ±67.5kHz (excluding pilot) and 400Hz modulation (set up with an RMS unweighted measurement). The signal to noise ratios deteriorate by approximately 10dB when the input signal falls to about –80dBm (mono) or –60dBm (stereo).

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SECTION TWO : INSTALLATION

! CAUTION !

These Exciters operate at **high RF power levels, internal supply energy levels and mains supply current levels**. They also incorporate devices containing **toxic BeO**. Before commencing installation, it is recommended that the complete INSTALLATION section is read and understood. **The instructions should then be strictly followed, by suitably qualified personnel, otherwise sub-standard or even dangerous operation may result.**

2.1 : PHYSICAL DIMENSIONS AND FITTING

2.1.1 : Installation Accessories

Various installation accessories may be supplied as required. A list of these (including spare fuses) is given below. Actual requirements depend on the configuration of the equipment supplied (e.g. options fitted, number and type of modulating sources, separate to or already fitted into a 19 inch rack, whether or not leads are supplied ready made etc.). Note that extra, unlisted parts may be required for connections to any Amplifier that is supplied (see manuals supplied with them).

Typical Quantity	Description	Function
1	IEC mains connector/lead	For connection to mains supply.
1	3.15A (T) HBC 5x20mm Fuse	For protection of mains supply input
1	N type 50Ω coaxial free plug plus low loss RF coaxial cable as req'd (rated in excess of Exciter output power at maximum ambient temperature)	For connection to RF output
1-3	BNC type 50Ω or 75Ω coaxial free plug(s) plus coaxial cable as req'd	For connection to Composite/RDS/SCA inputs and Composite output
1	15 Way D plug c/w cover.	For connection to leads from parallel control/monitor ancillary equipment.
1 (/A option)	9 Way D socket c/w cover.	For connection to leads from serial RS232 control/monitor ancillary equipment.
1 (/S option)	SMA type 50Ω coaxial free plug plus coaxial cable as req'd	For connection to Pilot tone output
2 (/S option)	XLR 3 pin free plugs plus screened cable as req'd	For connection to Left and Right Audio inputs
1 (/R option)	N type 50Ω coaxial free plug plus coaxial cable as req'd	For connection to Antenna Input
Length as req'd	Multi-core screened cable (number of cores as required).	Control/monitor leads.
Length as req'd	Heavy gauge grounding wire/strap.	For safety earth lead.

Typical Quantity	Description	Function
4	Screws c/w plastic cup washers and rack caged nuts.	For fixing unit into19 inch rack.
2	Side support 'L' brackets c/w fixing screws and washers.	For extra support to carry the Exciter's weight in the rack.

2.1.2 : Rack Mounting

If the Exciter is not supplied ready mounted in a 19 inch rack, this will be required to be done at time of installation. The 19 inch rack requires 1U space for the Exciter itself, which is fixed to the front of the racking using four screws, plastic cup washers and caged nuts. The total intrusion into the rack, including rear panel connectors, is approximately 500mm.

The 19 inch rack should ideally be of standard 600mm depth and requires at least 2U height per Exciter **(allowing 1U clear space to be available above each Exciter for ventilation purposes)**. Additional height will be required if an Amplifier or other equipment is to be fitted into the same rack.

Additional bottom support 'L' brackets may also be required at each side, below the Exciter, to help carry its weight. The Exciter is then fixed to the front of the racking using four screws, plastic cup washers and caged nuts.

2.2 : EXTERNAL CONECTIONS

All permanent external connections are made at the rear of the unit in accordance with system requirements. The connections required are made as described in the following sub sections.

2.2.1 : Mains Supply Connector

This is a standard IEC connector PL02, at the right rear of the unit, intended for connection to a single phase (plus protective earth) supply. The input is protected by a 20mm 3.15A(T) HBC fuse fitted in a carrier in PL02. The supply is in the range 88-264VAC (47-63Hz) with no setting required. The supply current at 40W RF output varies between about 1.1A at 88V supply, down to 0.35A at 264V supply.

! CAUTION !
The mains supply lead to the Exciter must use at least **5A rated three core (P+N+protective earth)** insulated cable. **An approximately 5A HBC fuse MUST be provided at the supply distribution board, or in the associated plug at the supply outlet, to protect this lead.** Also, since the supply input circuitry contains a filter, which passes current to the Exciter chassis, **the chassis must be connected to a safety ground** via the earthing bolt provided adjacent to the mains supply input connector.
The IEC lead terminates at the supply outlet in three wires, generally colour coded as follows :-

Brown	Line
Blue	Neutral
Green/yellow	Prot. Earth

Care MUST be taken to connect these leads to the supply as detailed in the above table. If a lead with different coloured wires is used, further advice MUST be taken.

Also ensure whilst making any connections to the mains supply, that the Exciter's rear panel interlock circuit at SK05, pins 14 and 15, is open-circuit (i.e. Exciter muted).

2.2.2 : RF Output Connector

! CAUTION !

When operating, high RF Voltages are present on this connector. Always ensure when making connections here, or working on any load connected, that the Exciter's mains supply is either disconnected or switched to 'off' at the distribution board (preferably being locked in that position).

This is an N Type coaxial socket SK09 at the rear of the unit. Care must be taken to use adequately rated (at maximum ambient temperature) low loss cable for the lead to the antenna, amplifier or load.

2.2.3 : SCA/RDS Input Connector

This is a 75Ω BNC type coaxial socket SK06 at the rear of the unit used for interconnection to RDS (Radio Data System) or SCA (Subsidiary Carrier Authority) modulating signals in the range 57 to 100kHz. 50Ω or 75Ω BNC plugs can be used for connections to these inputs, with matching screened coaxial cable, not exceeding three metres in length.

This input can be internally set to unbalanced 75Ω or 10kΩ (see E2163-00GA) with its sensitivity set using the adjacent rear panel control.

Input sensitivity for ±2.0kHz deviation (typical RDS): 1V peak to peak (500mV at maximum sensitivity)
Input sensitivity for ±5.5kHz deviation (typical SCA): 2.8V peak to peak (1.4V at maximum sensitivity)

2.2.4 : Composite Input Connector

This is a floating 75Ω BNC coaxial socket SK07 at the rear of the unit used for interconnection to a composite/multiplex modulating signal in the range from DC up to 100kHz. A 50Ω or 75Ω BNC plug can be used for connection to this input, with matching screened coaxial cable, not exceeding three metres in length.

The input can be internally preset to balanced 75Ω or 20kΩ (coaxial screen floating) or unbalanced 75Ω or 13.3kΩ (coaxial screen internally grounded), with its sensitivity set using the adjacent rear panel control - (see E2163-00GA).

Input sensitivity for ±67.5kHz deviation (excluding pilot) : +8dBu : 5.5V peak to peak
(maximum sensitivity approximately : +4dBu : 3.5V peak to peak)

2.2.5 : Composite Output Connector (and Loop Switch)

This is a 75Ω BNC coaxial socket SK08 at the rear of the unit used for interconnection to external equipment, typically for RDS insertion, after which it is routed back to the Exciter's Composite Input Connector (see 2.2.4) and thence to the modulator. **In this situation, the rear panel 'Loop' switch SW01 must be in the lower 'Ext' position**. A 50Ω or 75Ω BNC plug can be used for connection to this output, with matching screened coaxial cable, not exceeding three metres in length.

This output can only be sourced from an optionally fitted module which has a composite/mpx output, such as the /S Stereo Encoder. It cannot be sourced from the composite/mpx signal directly applied to the modulator within the Exciter.

When the composite/mpx signal from the optionally fitted module is to be routed directly to the modulator, the rear panel 'Loop' switch SW01 must be in the upper 'Int' position. This is the normal mode of operation.

The output is unbalanced 75Ω, at a level, for ±75kHz deviation, of 5.5V peak to peak (open circuit). This matches the input sensitivity of the Exciter's Composite Input Connector (see 2.2.4) when the external equipment has nominally 0dB insertion gain and all input impedances (external equipment and Exciter's Composite input) are set to high.

2.2.6 : RF Monitor Connector

This is a 50Ω BNC coaxial socket SK01 on the right hand side of the Exciter front panel. This provides an harmonically filtered sample of the Exciter's forward output power at a level, into 50Ω, approximately 54dB below the power being delivered into the load (e.g. approximately –8dBm at 40W power output). This connector is for test purpose only with the test equipment and lead being disconnected when not in use. **NOTE that the levels of any harmonics present are not necessarily equal to those at the antenna.**

2.2.7 : Status Connector

This is a 15 Way D socket SK05 at the rear of the unit. This is used to enable basic external monitoring and control. Multi-core screened cable, not exceeding 3 metres in length, should be used for the interconnecting lead.

The lead terminates in a 15 Way free D plug at the Amplifier end which is wired as follows :-

Pin 1	System Normal status output (pulled to ground when good)
Pin 2	DC (regulated) Supply status output (pulled to ground when good)
Pin 3	PLL Lock status output (pulled to ground when good)
Pin 4	Rev Power High (approx. 4W - pulled to ground when good)
Pin 5	Fan status output (pulled to ground when good)
Pin 6	Fwd Power Fail (approx. –12dB rel. max o/p - pulled to ground when good)
Pin 7	Forward Power Low (approx. –2dB rel. set o/p - pulled to ground when good)
Pin 8	Heatsink Temperature status output (pulled to ground when good i.e.<90deg.C)
Pin 9	CPU status output (pulled to ground when Main Board CPU good)
Pin 10	Mute RF input (ground to mute) – for control not safety purposes
Pin 11	+12v dc fused supply output (50mA maximum)
Pin 12	Chassis Ground – use for above status outputs and control input
Pin 13	Chassis Ground – use for above status outputs and control input
Pin 14	Chassis Ground – use for pin15 safety interlock ground
Pin 15	Safety Interlock input (ground to de-mute)

Any of the 'pulled to ground when good' status outputs required to be used, must be returned to a supply of no greater than 25V and must be limited to drawing no more than 50mA each by additional external resistance (100Ω is provided internally).

All of the 'ground to operate' inputs (except pin 15, the safety interlock) are internally pulled up to +5V via 12kΩ and must be fed from a voltage free source of less than 1kΩ to ground to operate (open circuit for a high non-operating state). These inputs are protected against constant application of up to ±25V dc directly applied.

For the safety interlock, a circuit has to be made between pins 14 and 15, which open-circuits to mute the Exciter or short-circuits to de-mute. If there are no external safety interlock switches, a short direct link is made, this being the state in which any connector is normally supplied. If connections need to be made to external safety switches, this link is removed and the switches are wired in a series loop to the connector so that if any switch opens, the link is broken. Note that the safety interlock provides the most direct, and thus safest, muting of output power. The Mute RF input pin 10 (ground to mute) is read by software (with a short delay) and thus is not so direct, being intended for control purposes only **and not as part of a safety interlock system**.

! CAUTION !

For the safety interlocks to work correctly, the external switches and link wiring must 'float' (i.e. must not be grounded at any point, apart from at the Exciter itself). The total loop resistance should not exceed approximately 10Ω. The external wiring may also be ferrite loaded for emc requirements.

2.2.8 : REMOTE Port Connector (/A RS232 Serial Remote Control option)

This is a 9 Way D plug PL03 on the optional module at the rear of the unit. This enables all the control and monitoring, detailed in Section 2.4, to be performed using a personal computer with its (RS232) COM port connected to this port. Multi-core screened cable, not exceeding 30 metres in length, should be used for the interconnecting lead. The lead terminates in a 9 Way free D socket at the Exciter end which is wired as follows :-

Pin 1	Not connected
Pin 2	Received Data (to Exciter)
Pin 3	Transmit Data (from Exciter)
Pin 4	Not Connected
Pin 5	Ground
Pin 6	Not Connected
Pin 7	Not Connected
Pin 8	Not Connected
Pin 9	Not Connected

Note that the assigned pin numbers and their functions are for a standard 9 pin plug on 'Data Terminal Equipment' (DTE) such as computers. Standard crossover or 'null modem' leads must thus be used for connection to a personal computer or PC. The length of the interconnecting lead may be extended by use of compatible RS422/485 or fibre-optic line drivers.

2.2.9 : REMOTE Port Connector (/T TCP/IP Serial Remote Control option)

This is an RJ45 connector SK03 on the optional module at the rear of the unit. This enables all the control and monitoring detailed in Section 2.4 to be performed using TCP/IP (Transmission Control/Internet Protocol).

This arrangement requires the unit to be assigned a unique Internet Protocol address. When first connected to the network via its RJ-45 connector, the Exciter's TCP/IP adapter will attempt to acquire an IP address automatically (it's quite common to have networks configured to use 'DHCP', which provides these addresses on demand). The address to which a device has been assigned can then be determined and, if required, be overridden with a desired fixed value, using Eddystone supplied software.

2.2.10 : Left and Right Audio Input Connectors (/S Stereo Encoder version only)

These are two three pin XLR sockets at the rear of the unit (fitted to the rear of the /S Stereo Encoder module) used for interconnection to stereophonic modulating signal (or monophonic using a single input). Twin, separately screened cables, not exceeding three metres in length, should be used for the interconnecting leads.

Each lead terminates in a three pin XLR plug at the Exciter end which is wired as follows :-

Pin 1	Direct chassis ground – or, Chassis ground via 150n/50V capacitor
Pin 2	Signal (+)
Pin 3	Signal (-)

The input impedance can be set internally to balanced 600Ω or 20kΩ with pin 1 either connected directly to chassis ground or via a capacitor (see E2163-00GA). The input sensitivity of each input is set separately using the adjacent rear panel controls, with pre-emphasis set from the front panel to none, 25uS, 50uS or 75uS.

Input sensitivity for ±67.5kHz deviation (exc. pilot) at 400Hz :+8dBm (600Ω input) :+8dBu : 5.5V p to p (maximum sensitivity approximately : -4dBm (600Ω input) : -4dBu : 1.4 peak to peak)

Note that each input can be made unbalanced by externally connecting one of the balanced signal input lines to ground (pin 2 or pin 3 to pin 1). The input impedance then becomes 600Ω or 13.3kΩ.

2.2.11 : Pilot Output Connector (/S Stereo Encoder option only)

This is a 50Ω SMA coaxial socket SK04 at the rear of the unit used for interconnection to external equipment, typically RDS generators, which generate a sub-carrier which requires phase locking to harmonics of the Stereo Encoder, 19kHz, pilot tone (57kHz in the case of RDS). An SMA plug is used for connection to this output, with matching screened coaxial cable, not exceeding three metres in length. The output is approximately 100Ω, at a level of 5V peak to peak, sinewave (open circuit).

2.2.12 : Antenna Input Connector (/R Re-Broadcast option only)

This is a 50Ω 'N' type coaxial socket on the rear of the optional module, used for interconnection to a Band ll receiving antenna (87.5 to108MHz) possibly via intermediate amplifiers, splitters etc. A 50Ω 'N' type plug is used for connection to this input, with matching low loss RF coaxial cable.

Operating input level : approximately -80dBm to at least –20dBm.

2.3 : SETTING UP PROCEDURES

2.3.1 : Fuses

If any problems occur after the Exciter has been installed and switched on, fuses may need to be checked and possibly replaced. However, a blown or high impedance fuse would generally indicate the presence of a fault, which would need correcting.

The type, function and access to fuses is as follows :

Type	Function	Access
3.15A (T) HBC 5x20mm Fuse	For protection of ac supply input circuitry. If this fuse blows, all Exciter operation ceases	FS1 at the right rear of the unit (being part of mains input socket PL02). **! CAUTION ! Ensure that the mains supply is either disconnected or is switched to 'off' at the distribution board (preferably being locked in that position).**
0.14A Hold mini SMD Resettable Fuse	For protection of the +12V dc output on the rear panel Status connector SK05. If this fuse goes high impedance, any external equipment powered off this supply will cease operation.	Access to this fuse is not normally required (smd fuse is fitted to the Main Board, on which SK05 is located). This fuse will automatically reset if the externally supplied equipment is momentarily disconnected or if the mains supply to the Exciter is interrupted.
0.21A Hold SMD 030-2 Resettable Fuse	For protection of the internal fan and its supply leads. If this fuse goes high impedance, this fan will cease operation and a Fan Fail indication will be provided on the front panel lcd display (when displaying temperature). After a period, the Output Amplifier temperature will increase and the output power eventually turn down (with an over-temperature indication).	Access to this fuse is not normally required. This smd fuse is fitted on the narrow printed circuit board on the right hand side of the Exciter. This fuse will automatically reset if the Fan is momentarily disconnected or if the mains supply to the Exciter is interrupted.

2.3.2 : Internal Option Links

The option links are detailed on diagram E2163-00GA bound at the rear. The links are either physically removable, two position, shorting types (LK) or miniature changeover switches (SW).

The links are found at the rear of the Main Board and the rear of the /S Stereo Encoder Board (the /R Rebroadcast module has no input settings to adjust).

! CAUTION ! Ensure that the Exciter's mains supply is either disconnected or switched to 'off' at the distribution board (preferably being locked in that position) before removing the top dust cover. All boards are then immediately accessible, the Main Board in the centre, and any optional boards fitted, at the rear left hand side of the Exciter.

The Main Board option switches/links are as follows :-

Switch/Link	Function	Default (Factory) Setting
SW2	SCA/RDS Input Impedance - 75Ω or High Z	High Z (10kΩ)
SW3	Composite Input Type – Balanced or Unbalanced	Unbalanced
SW4	Composite Input Impedance - 75Ω or High Z	High Z

The /S Stereo Encoder Board option switches/links are as follows :-

Switch/Link	Function	Default (Factory) Setting
SW1/LK1	Left Channel Input Impedance – 600Ω or High Z	600Ω
SW2/LK2	Left Channel Ground – AC (capacitor) or DC (direct)	DC
SW3/LK3	Right Channel Input Impedance – 600Ω or High Z	600Ω
SW4/LK4	Right Channel Ground – AC (capacitor) or DC (direct)	DC

2.3.3 : Output Frequency and Power Level Adjustment

If the Exciter is not supplied with preset frequency and output power level, its single frequency channel store will need to be loaded and its front panel POWER control will need to be set. If being used as a drive for an amplifier, the manual for the amplifier must be consulted for information on the level of drive output power required and **care must be taken that the maximum drive level for that amplifier is not exceeded.**

The procedure is as follows :

1) Ensure the Exciter has been installed as detailed in sections 2.1 and 2.2 and the internal option links are set as in 2.3.2 (as required).

2) Break the rear panel Interlock connection between pins 14 and 15 of SK05 and ensure all external sources of modulation are switched off.

3) Apply power to the Exciter (ensure the supply is on and the front panel switch, if fitted, is on).

4) Ensure that the LCD display illuminates (briefly displaying Exciter type information) and all LED displays are on red, green or amber. If not, follow fuse checking procedure as detailed in section 2.3.1 (fault finding may be required if this occurs).

5) Check that the LCD display settles, showing the 'Fwd Power' screen which gives forward and output power (near zero because of interlock).

6) Set the Exciter's front panel SET POWER twelve turn control to fully anti-clockwise (i.e. minimum power setting).

7) If the frequency is to be loaded or altered, access the two internal push button switches. These are directly below two apertures in the front edge of the Exciter top cover, just above and to the left of the LCD display. If the Exciter is fitted in a rack, the rack fixing screws will need to be released, and the Exciter carefully pulled forward by about 25-30mm.

8) To load or change the frequency, first select the 'Freq' screen using the single front panel push button, then use the two internal push button switches to load a new frequency. The display will change to 'Freq Entry' whilst this is being done. The left hand internal push button will select MHz, and the right hand button will select kHz. Any frequency can be set, in 50kHz steps, between 87.5MHz and 108MHz.

9) The new frequency will not be loaded until the single front panel push button is pressed and held for about 3 seconds, the display then returning to the 'Freq' screen, showing the new frequency. If this is not done within about 3 seconds of the last internal button press, it will automatically return to the 'Freq' screen, with the original frequency unchanged.

10) The single channel frequency is stored in non-volatile 'flash' memory and is thus retained whilst power is removed.

11) Reconnect the rear panel Interlock connection between pins 14 and 15 of SK05 and re-select the 'Fwd Power' screen using the front panel single push button.

12) Turn the Front Panel SET POWER control clockwise to increase the selected Exciter's output power until the required 'Fwd' power is obtained, as indicated on the LCD display The displayed 'Rev' power depends on the return loss of the load presented to the Exciter's RF output but should generally be less than one twentieth of the 'Fwd'. To ensure complete accuracy, an external calibrated power meter should be used to measure the 'Fwd' output power.

The Exciter will now be ready for operation with audio and or data sources applied to the rear panel inputs, the instantaneous deviation being displayed on the modulation screen bargraph. Input levels or the corresponding rear panel sensitivity controls may need adjusting to obtain the required deviation. Note that when the /S Stereo Encoder option is fitted, its Limiter and Clipper functions (on or off) will affect the deviation levels obtained from the Left/Right inputs.

Settings of any optional remote control or baseband input module may also need adjustment (section 2.3.5).

The Front Panel RF MON output can be used to check the close-in spectrum of the Exciter output signal, noting that any harmonic levels shown will not necessarily be the same as those present at the Exciter output.

2.3.4 : Serial Remote Control Baud Rate Setting (/A and /T options only)

When either the RS232 (/A) or TCP/IP (/T) Serial Remote Control module is fitted, the remote control asynchronous Baud rate may be set using the Exciter front panel push button. This may be done in any display (except 'Freq Entry' and any baseband input 'Opt' display) by pushing and holding the button for at least 3 seconds, until the display shows the already set Baud rate (2400, 4800, 9600 or 19200). By pressing the same button immediately and repeatedly, the Baud rate can be cycled through the four choices until the desired rate is displayed. Approximately 3 seconds after the desired rate is selected, the display will return to the previous display, with the new Baud rate stored in non-volatile EEPROM.

2.3.5 : Stereo Encoder Settings (/S option only)

The settings of the Stereo Encoder when fitted (pre-emphasis off/25uS/50uS/75uS, limiter on/off, clipper on/off and pilot on/off) may be viewed from the front panel and altered internally.

If the settings are to be altered, access the two internal push button switches. These are directly below two apertures in the front edge of the Exciter top cover, just above and to the left of the LCD display. If the Exciter is fitted in a rack, the rack fixing screws will need to be released, and the Exciter carefully pulled forward by about 25-30mm.

To change a setting, first select the appropriate screen (pre-emphasis/pilot or clipper/limiter) using the single front panel push button. Then use the left hand internal push button switch to select the required pre-emphasis or clipper settings or the right hand internal switch to select the required pilot or limiter settings).

Note that the limiter should normally be switched on if the clipper is in operation. The limiter operates at a lower deviation level than the clipper. It thus prevents the possibility of excessive distortion occurring if the clipper operates on high, non-limited levels of modulation rather than just the short transient peaks of modulation resulting from the finite attack time of the limiter circuit.

2.4 : SERIAL REMOTE CONTROL AND MONITORING (/A and /T Serial Remote Control options only)

2.4.1 : Introduction

Serial control via the rear panel REMOTE connector (/A option, section 2.2.8) uses asynchronous data (1 start, 8 data, 1 stop bit, no parity) at 2400, 4800, 9600 or 19200 Baud. Control commands and status monitor requests are detailed in section 2.4.2. The content of status monitor information reverted from the Exciter is detailed in section 2.4.3. The same functions are also enabled using TCP/IP via a rear panel RJ45 connector (/T option section 2.2.9).

The Baud rate is set using the front panel push button (section 2.3.4) but it should be noted that in the case of TCP/IP, this rate must match that set into the Exciter TCP/IP interface module by the external remote control system (normally 9600Baud). In the case of RS232 it must match that of the external remote control system.

The individual data bytes are defined in ASCII form, to enable basic control and monitoring using a PC running a terminal program. However, a PC program with a dedicated textual and/or graphical user interface is required for proper implementation of a remote control and monitoring system. Eddystone Broadcast should be contacted for further information regarding such programs and hardware implementations using the RS232 and TCP/IP ports directly or via USB or TCP/IP adaptors.

2.4.2 : Control Commands and Status Monitor Requests

All command and status monitor requests are initiated by the remote control unit (PC) – the Exciter never outputs any serial data via the RS232 or TCP/IP connector unless requested to by that unit.

The remote control unit always sends a sequence of three bytes, waiting for each byte to be 'echoed' correctly before the next one is sent (which must be within 500mS of the previous one). A wait of 500mS is also recommended before the sequence is timed out and aborted. A new sequence of three bytes then can be attempted. Note that an echo will not be returned when an invalid sequence is detected by the Exciter.

The three bytes are :-

First byte	'Handshake' (always ASCII #) – indicates start of sequence
Second byte	'Command' – indicates form of control or status monitoring
Third byte	'Status Requests' (after ASCII ? Command) - gives details of status monitoring required or 'Controls' (after ASCII + Command) - gives details of control required

Details of the Handshake, Command, Status Request and Control bytes are given in the following four tables. Typical examples of controller generated sequences are as follows :-

# ? 0	Request to revert Output Power, frequency and type
# + M	Mutes the Exciter
# + S	Demutes (starts) the Exciter

Handshake (first byte sent from controller)			
Title	Function	Hex	ASCII
Async_Hshake	Remote input handshake	23	#

Remote Input Commands (second byte sent from controller)			
Title	Function	Hex	ASCII
Query_Status	Status query (request to revert)	3F	?
Exc_State	Exciter state Mute or Start	2B	+

Remote Input Status Requests (third byte sent from controller after ? command)			
Title	Function	Hex	ASCII
Op_Stat	Revert output power, frequency and type	30	0
Sys_Stat	Revert Exciter status	59	Y
Ana_Stat	Revert deviation/temperature/rec'd signal	57	W

Remote Input Controls (third byte sent from controller after + command)			
Title	Function	Hex	ASCII
Mute	Set Exciter to mute	4D	M
Unmute	Set Exciter to start/unmute	53	S

2.4.3 : Reverted Status Monitor Information

The status of the Exciter is reverted in response to a ? command (see section 2.4.2). After the third byte is echoed back to the remote control unit, a further fifteen bytes are sent immediately from the Exciter, with no delays between individual bytes (each 1 start, 8 data, 1stop, no parity).

The first fourteen of the fifteen bytes contains the specific status information requested. The last byte is an exclusive OR checksum of those fourteen bytes. This checksum can be used by the remote control unit to check that the information has not become corrupted.

The meanings of the various bytes in the information string are defined in the table below.

Reverted Status Information (meanings of bytes reverted in response to **?** command)			
Title	Meaning	Hex	ASCII
Norm	Status normal	4E	N
N_Norm	Status not normal	4F	O
Stat_Low	Status low	4C	L
Stat_High	Status high	48	H
Fail	Status fail	46	F
Off	Status off	52	R
On	Status on	51	Q
Mute	Status muted	4D	M
Start	Status start	53	S
De_Sel	Status de-selected	44	D
Int_Sel	Status internally selected	49	I
Ext_Sel	Status externally selected	56	V
None	None	57	W
N_Known	Not known	58	X
N_Applic	Not applicable	5A	Z
Direct Display	Numerical values	30-39	0-9
Direct Display	Sign	2B 2D	+ -
Direct Display	Decimal point	2E	.
Direct Display	Blank	00	NUL
Direct Display	Less than	3C	<
Direct Display	Greater than	3E	>

Most meanings are general. A string of fourteen system status information bytes would typically contain several 'N's, each one indicating that a particular status (forward power, reverse power etc.) is 'Normal'.

Direct display bytes give an immediate numerical display of power, modulation and temperature etc., even when using a basic terminal program.

If the Exciter contains no known good information about a particular status, the 'X' byte is reverted. This occurs if the Exciter is unable to interrogate individual modules within the unit and thus cannot determine their status. The 'Revert Output Status Request' (ASCII 0) returns the Exciter type and can be used by the Remote Control Unit to determine the power rating of the Exciter being interrogated.

The following three tables detail the contents of the various strings of reverted status information. The final column in each defines which ASCII values a particular byte can have. The table above defines the meanings of these values. The first byte in each table is the echo of the third byte sent from the remote control unit.

Reverted Output Data Block (15 extra bytes reverted in response to **# ? 0** sequence)		
Title	Status	Possible Values (ASCII)
Op_Data1	Output data status request byte	third byte echo fixed at 0
Op_Data2	Output forward power MSB (10Watt)	Null (blank) 0 to 9 (inc) or X
Op_Data3	Output forward power MSB-1 (1Watt)	
Op_Data4	Output forward power LSB (0.5 Watt)	
Op_Data5	Output reverse power MSB (10Watt)	
Op_Data6	Output reverse power MSB-1 (1Watt)	
Op_Data7	Output reverse power LSB (0.5 Watt)	
Op_Data8	Output frequency MSB (10MHz)	8 9 0 (=10) W* or X
Op_Data9	Output frequency MSB-1 (1MHz)	0-9 W* or X
Op_Data10	Output frequency LSB+1 (100kHz)	0-9 W* or X
Op_Data11	Output frequency LSB (10kHz)	0 5 W* or X
Op_Data12	Remote OS number MSB	0 to 9 (inc) and . (decimal point) or X
Op_Data13	Remote OS number MSB-1	
Op_Data14	Remote OS number LSB	
Op_Data15	Exciter type	((10W)) (30W) + (40W) or X
Op_Data16	Output data 8 bit EOR checksum (of 2-15 inc. only)	

*Note: 'none' (W) indicates that no frequency is programmed, causing the Exciter power output to be muted.

Reverted Exciter Data Block (15 extra bytes reverted in response to **# ? Y** sequence)		
Title	Status	Possible Values (ASCII)
Ex_Data1	Exciter data status request byte	third byte echo fixed at Y
Ex_Data2*	Exciter system normal status	N O X
Ex_Data3	Exciter forward power status	N L F X
Ex_Data4	Exciter reverse power status	N H X
Ex_Data5	Exciter heatsink temperature	N H X
Ex_Data6	Spare	Z X
Ex_Data7	Exciter voltage status	N F X
Ex_Data8	Spare	Z X
Ex_Data9	Exciter phase lock status	N F X
Ex_Data10	Spare	Z X
Ex_Data11	Exciter heatsink cooling fan status	N F X
Ex_Data12	Spare	Z X
Ex_Data13	Exciter Ext. Mute State	M S X
Ex_Data14	Exciter Interlock State	M S X
Ex_Data15	Exciter Remote Mute State	M S X
Ex_Data16	Exciter status 8 bit EOR checksum (of 2-15 inc. only)	

Reverted Analogue Data Block (15 extra bytes reverted in response to **# ? W** sequence)		
Title	Status	Possible Values (ASCII)
Ana_Data1	Analogue#1 request byte	third byte echo fixed at W
Ana_Data2	Deviation MSB (kHz)	Null (blank) 0 to 9 (inc) or X
Ana_Data3	Deviation MSB-1 (kHz)	
Ana_Data4	Deviation LSB (kHz)	
Ana_Data5	19kHz Pilot Status	N F X Z*
Ana_Data6	Spare	Z X
Ana_Data7	Spare	Z X
Ana_Data8	Temperature MSB (deg.C)	Null (blank) 0 to 9 (inc) + and - or X
Ana_Data9	Temperature MSB-1 (deg.C)	
Ana_Data10	Temperature LSB (deg.C)	
Ana_Data11	Received signal level MSB (dBm)	< and > and - Null (blank) 0 to 9 (inc) or X or Z*
Ana_Data12	Received signal level MSB-1 (dBm)	
Ana_Data13	Received signal level LSB+1 (dBm)	
Ana_Data14	Received signal level LSB (dBm)	
Ana_Data15	Received signal status	N L X Z*
Ana1Data16	Analogue status 8 bit EOR checksum (of 2-15 inc. only)	

*Note: 'not applicable' (Z) indicates that the appropriate option is not fitted.

SECTION THREE : OPERATION

Once installed and set up as described in Section Two, no manual operation is provided apart from selecting the required meter display. If the SYS NORMAL LED shows red, step through the various displays, using the push button, to determine which do not show 'Normal'. **Note, that for output power to be generated, the Exciter's rear panel Interlock input, SK05, pins 14-15, must be short circuited, either directly, or by the closing of all connected interlock circuits (see section 2.2.8).** The SYS NORMAL and MUTE LED's will show red and it will be so indicated, on the Fwd and Rev Power screens, if the Interlock is open and the Exciter thus muted.

3.1 : CONTROLS AND DISPLAYS

The controls and displays available and their functions are as follows :

3.1.1 : Front Panel

Marked	Type	Function
Unmarked Button	Momentary Push Button Switch	To select required display, cycles through :- Fwd Power displays level in Watts and related status Rev Power displays level in Watts and related status Freq displays frequency in MHz and related status Mod display modulation level in kHz with a bargraph Temp displays level in Deg.C and related status Option displays any fitted baseband or RF input option status
SET POWER	Preset Potentiometer (twelve turns)	To set output power (clockwise to increase power).
CONTRAST	Preset Potentiometer (single turn)	To optimise Display Contrast.
SYS NORM	LED Display	Red indicates 'Not Normal' by any of: – Fwd Power low, failed or external Interlock open Rev Power high, Temp. high or Phase lock fail. Power supply low or fan fail (External muting for control purposes is considered as 'Normal') Green indicates normal operation.
MUTE	LED Display	Red indicates external Interlock open (muted) Amber indicates normal external muting. Green indicates unmuted.
CPU	LED Display	Red indicates module CPU (microcontroller) failure, other LED displays being automatically turned off in this situation. Green indicates normal CPU operation.
Unmarked Display	16 Character by 2 line LCD (back illuminated by-green LEDs)	Displays Forward Power, Reverse power Frequency, Modulation level, Heatsink Temperature or any fitted baseband or RF input option (including related status in all cases) as selected by adjacent push button switch.
O I	Rocker Switch (on front panel of –02 variant)	To switch power supply on ('I') or off ('O')

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