ELECTRICAL DESCRIPTION

2.1 INTRODUCTION

This section describes, in detail, the operating theory behind the XT300. To aid understanding, the unit has been subdivided into blocks, each of which is fully described below. The block diagram is shown in Fig. 3

2.2 POWER SUPPLY

This circuit comprises a board, mounted on a heat sink, which is fixed to the central part of the lower section of the unit. The power supply generates the various modules that make up the XT300. The transformer has a selectable input from 110V to 240V and three outputs:
A. 30/0/30V (9A), B. 36V (0.5A), and C. 20V (1A).

This power supply is composed of two main parts: after having undergone filtering for mains-borne interference, the supply is transformed into four lower voltages, rectified, smoothed and stablized to the following values: +12V, +15V +15 variable and +50V to obtain the higher efficiency switching power supply (85-90%).

The +15V supplies the encoder mixer, the PLL card, the VCO card, the meter card and the alarms card. The +12V supplies the fan . The +15V variable supplies the input of the RF power module amplifier driver (BLF244) and the 50V supplies the final power stage (BLF278).

The variable voltage of the final stage driver is controlled by the PWR ADJ control which determines the RF power output of the exciter. The automatic control of the output power guarantees the power level set by the PWR ADJ control right across the frequency range and independently of the other variables such as temperature, load variations etc.

The system works by comparing the value set by the PWR ADJ control with the actual power output of the unit and compensating accordingly.

2.3 AUDIO INPUT CARD

This card is situated on the rear panel of the exciter. The card filters all audio signal inputs to the unit, removing RF interference, before supplying them to the encoder mixer or mono/mpx card. The main operating parameters of the exciter are available for remote monitoring via the telemetry connector.

2.4 STEREO CODER CARD (only for Stereo Version)

This card is situated in the lower part of the unit.

The card can function either as a stereo encoder or as a simple mixer for the various audio inputs. The function may be selected by a control situated on the front panel. In the stereo encoder mode, the 19 KHz pilot tone is derived from a quartz crystal reference oscillator. So too is the sampling frequency which allows the L and R signals to be separated from the multiplexing signal. Plus the suppresion of the 38 KHz frequency. The level of the left and right signals are set by the corresponding selector situated on the front panel. The signals are filtered at 15 KHz and pre-emphasized (50 uS CCIR, 75 uS FCC) before being sent to the multiplexing circuit. The audio signals from the two SCA inputs are mixed in to provide the output. In the mixer mode (Mono/Mpx) the stereo encoder is bypassed, the right input accepts a mono signal and the left input accepts a multiplex signal up to 100 KHz. The SCA inputs remain unchanged. Three rectifiers allow the peak levels of the two inputs "Left/MPX" and "RIGHT/MONO" to be displayed on the analog meter, and provide the audio detector circuit with the deviation level.

2.5 PLL CARD

The PLL card is situated internally, in the upper part of the unit. The circuit includes a reference crystal oscillator (optional high stability), a logic section that includes the frequency dividers and comparator. The reference crystal oscillator generates a 4 MHz frequency that is divided to generate a fixed 1 KHz signal. This signal is compared to the operating frequency generated by the VCO divided based on the frequency set on the contraves board. An indicator situated on the front panel signals the "unlocked" condition. The comparator output (AFC signal) is sent to the varicap diodes situated on the VCO card.

2.6 VCO CARD

The VCO card is situated internally, in the upper part of the unit. This module includes an audio input stage at low frequency, a voltage controlled oscillator (VCO) and driver stage. The audio signal supplied by the encoder mixer is amplified and then injected into the VCO to provide class F3 modulation. The voltage controlled oscillator (VCO) generates the signal on the frequency set on the contraves. This signal is amplified to 300mW level (25dBm) to drive the final stage and sent to the PLL circuit situated on the PLL card. The operating frequency generated by the VCO is divided down before being compared to a reference frequency, generated by a high stability oscillator (standard 5 ppm).

The error voltage is filtered and used to compensate the VCO frequency and guarantee its stability. A trimmer is present on this card for adjustment of deviation.

2.7 RF POWER AMPLIFIER

The final power stage is mounted on a heat sink to dissipate waste heat and is enclosed in a totally screened metal container, fixed to the upper-middle part of the central section of the unit. The RF signal coming from the stereo decoder or Mono/MPX at a power level of about 300mW, reaches the driver stage (BLF244) and is amplified to a level from about 300mW to 8W before being further amplified by the final stage (BLF278) to a level of up to 300W. The resultant signal is then filtered by a low-pass filter which removes any harmonic content. A directional coupler allows the direct and reflected power levels to be measured and displayed on the analog multimeter and fedback to the power supply for automatic control of the output power (see power supply description). A BNC connector situated on the rear panel provides a power signal at -60db of the amplifier output power.

2.8 METER CARD

This card is situated centrally on the front panel. The card receives direct and reflected power signals from the power supply which, in turn, come from the final power stage. The stereo encoder card supplies deviation and left and right signal levels. These signal levels are then displayed on the analog meter according to the position of the rotary selector situated on the front panel.

2.9 FREQUENCY SELECTOR CARD

This card is located on the left-hand side of the front panel. The operating frequency selected by the frequency control is represented by a signal which is supplied to the frequency dividers that form part of the PLL circuits found on the PLL card.

2.10 ALARMS CARD

This card is fixed in the lower part of the unit. This circuit allows 7 adjustments via trimmers, the threshold of the external and internal output level, internal and external VSWR level, temperature and to preset the maximum value of the output power. In case of a fault there is no automatic reset, because the transmitter automatically reduces the output power to continue transmitting without interruption, even if at minimum power.

2.11 SOFT START

The soft start is mounted on a board placed on the front side of the transmitter. The circuit eliminates the current spikes generated by the transformer when it is powered.

2.12 MONO/MPX CODER CARD (Mono Version)

This card is located in the lower part of the unit. The Mono/MPX card is an Audio Mixer at four inputs: two balanced (Mono and MPX) and two unbalanced (SCA1 and SCA2). Mono and MPX input level can be set through decade thumbwheel switches on the front panel, on 5 fixed positions and on a variable position from -12 dBm to +9 dBm (preset at 0 dBm). It's possible to set the pre-emphasis value at 50uS, 75uS or linear. Then, it's possible to insert or remove a low pass filter at 15KHz.

2.13 CLIPPER CARD

This card is attached with a sandwich structure on the coder card and is accessible from the lower part of the equipment. Its function is to limit drastically any audio signal that exceeds a prefixed threshold. Therefore, it's used to avoid any type of over-modulation which exceeds maximum peak permitted of +/- 75 KHz.

INSTALLATION

3.1 INTRODUCTION

This chapter contains the information required for installation of the XT300 exciter and for preliminary checks.

3.2 UNPACKING

Remove the unit from its packaging and before any other operation, check for damage that the unit may have suffered in transit and check to be sure all front panel controls are functioning.

3.3 INSTALLATION

1) Check that the line voltage selector is correctly set for the local supply. Check also that the A.C. Line Protection Fuse (Fig.2 Item 7) is mounted on the rear panel. The currrent sizes of the fuses are as follows:

220-240V	6.3A
100-120V	12.5A

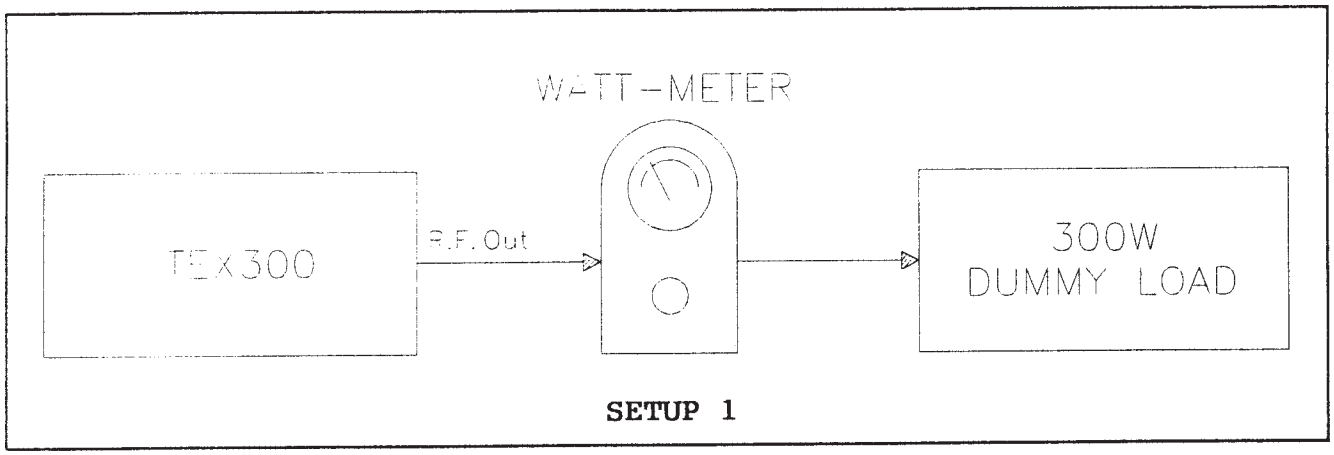
2) Now ensure that the PWR ADJ control (Fig. 1A Item 9 or Fig. 1B Item 5) is rotated fully counter clockwise, using a small screwdriver (the pot is a ten turn pot so care should be taken to verify the minimum position). Units are normally shipped with this control at minimum.

WARNING: When the unit is switched on with the control at its minimum position, power output is about 10W.

3) Connect a dummy load with a power rating of at least 300W continous to the R.F. output, situated on the rear panel of the unit. It is advisable to connect a bypass wattmeter in series with this load in order to verify the accuracy of the units own internal wattmeter (see setup 1).

4) Connect a switch, via a cable, to the R.F. Mute connector (Fig. 2 Item 4) on the rear panel so that the switch is able to short the central conductor to its ground. Leave the switch in the short-circuit position.

5) Switch the unit's ON/OFF switch (Fig. 1A Item 13 or Fig. 1B Item 9) to the OFF position.



SETUP 1

6) Connect the line cord. (Fig.2 Item 1)

(It is essential that the unit be properly grounded to ensure both the safety of the operator as well as the correct functioning of the equipment.)

7) Switch the power switch (Fig. 1A Item 13 or Fig 1B Item 9) to the ON position and check that the three green internal voltage LEDs, (Fig. 1A Item 7 or Fig. 1B Item 3) and the red unlock LED (Fig. 1A Item 15 or Fig. 1B Item 11) are all on. Select the desired operating frequency using the corresponding selector. The red UNLOCK LED should switch off within 30 seconds, indicating that the oscillator has locked onto the operating frequency. The frequency selector comprises five figures of which three to the left of the decimal point represent (from left to right) hundreds MHz, tens MHz, and MHz. The two figures to the right of the decimal point represent (from left to right) hundreds of KHz and tens of KHz.

EG: 098.45= ninety eight megahertz and four hundred and fifty kilohertz.

EG: 103.94= one hundred and three megahertz and nine hundred and forty kilohertz.

Furthermore, if a frequency is selected beyond the two limits of the 87.5-108 band, the amplifier will continue to work even though the displayed frequency no longer corresponds to the operating frequency of the unit.

Transmitting outside the legal band (87.5-108 MHz) is an offense and may lead to prosecution.

8) After having verified that the UNLOCK LED is off and that the unit is therefore locked to the selected operating frequency, switch the switch connected to the REMOTE connector so as to remove the short circuit between the center conductor and the ground. The R.F. output is now enabled and should correspond to a power level of about 10W. To check this reading, select FWD on the meter selector and read the power from 375W FSD scale.

9) Using a small screwdriver, rotate the PWR ADJ control clockwise; the power output should increase progressively to a maximum of 300W. Check the value with the bypass wattmeter which should be within +/- 10% of the front panel meter.

10) With the power output at 300W, select a new operating frequency well away from the current value.
Eg: 107 MHz: the UNLOCK LED should switch to on and the power output should fall to zero at the same time. Only when the UNLOCK LED switches off (unit locked to new frequency) should the power output resume its previous level.

11) Automatic power control check.
It is advisable to start this procedure with the operating frequency set to 87.50 MHz. When locked to this frequency, the PWR ADJ control should be adjusted for an output power of 150W. Now, with no further adjustment of the PWR ADJ control, change the operating frequency in steps of 4-5 MHz, ensuring that the output power remains constant at 150W.

12) SWR alarm check.
For this test, adjust the PWR ADJ control for a power output of 10W. Disconnect the output load and check that the SWR LED lights. Now adjust the PWR ADJ control to check that the unit switches on again at a reflected power level of about 10% of the output power. Turn the PWR ADJ control for maximum power and check that the reflected power does not exceed 30W. Reconnect the output load and check that REF falls to zero, the SWR LED goes out and the PWR FWD jumps to 300W.

13) Now short circuit the center conductor of the remote input to ground and the output should drop instantly to zero. Removing the short should cause the power output to return, gradually, to its previous level.

14) Deviation reading check.
The maximum input sensitivity is determined by the position of the input level control. In the -12/+9 position, the sensitivity will depend on the L/MPX and R/MONO controls. Put the selector in the DEV position. Connect a low-distortion audio generator to the LEFT and RIGHT inputs. Inject a 400 Hz tone at a level of 0dBm (775mVrms=2.2Vpp). Put the INPUT LEVEL control in the 0dBm position. Select stereo mode (corresponding LED will switch on). Enable the pilot using the relevant switch (the green LED will switch on). With the selector in the R/MONO position, check that the reading is 0dBm, measured on the +3db FSD scale. Repeat the operation for the L/MPX. Check that the deviation reading is 100%.

3.4 OPERATION USING THE INTERNAL STEREO CODER (only for stereo version)

1) Inject the pilot tone checking that the corresponding LED switches on.

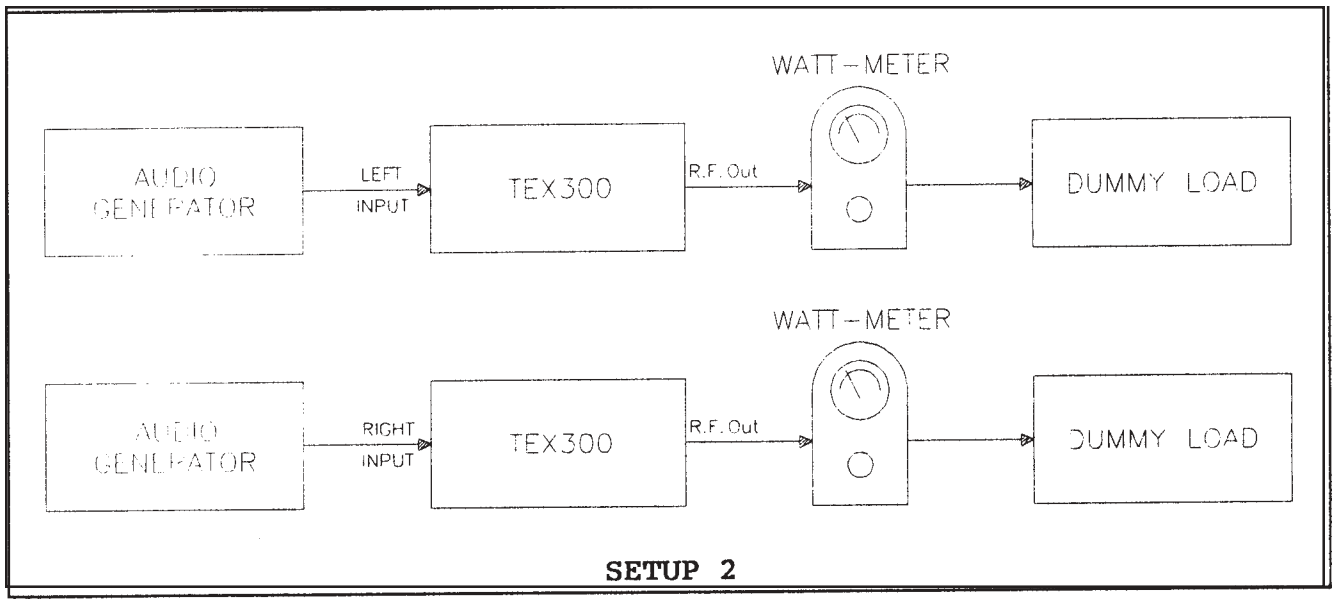
2) Select STEREO operation confirmed by the corresponding LED.

3) Select the sensitivity of the audio LEFT/RIGHT inputs to match the signal level being supplied to the unit.

4) Connect the signal source to the LEFT/RIGHT inputs. These are balanced inputs (see setup 2).

5) Check on the internal analog meter that the L/R signal levels are those expected, selecting the desired input with the corresponding control.

6) The effective modulation level may be measured on the analog multimeter by selecting DEV with the corresponding selector.



SETUP 2

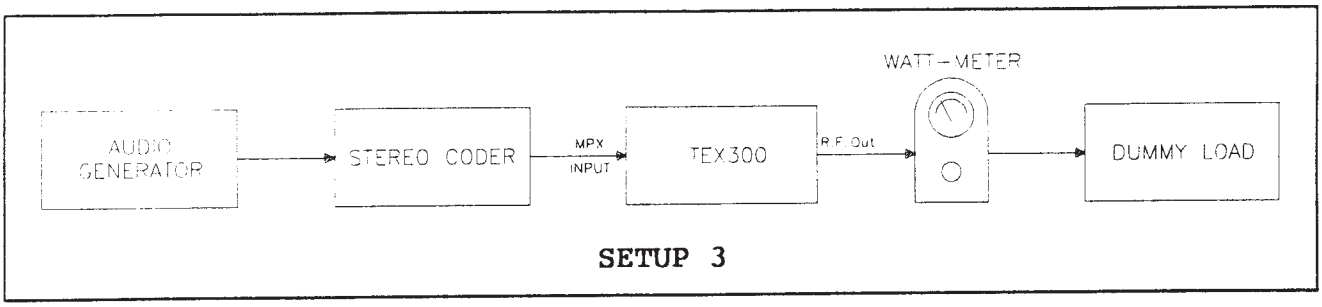
3.5 CONNECTION OF AN EXTERNAL STEREO-PHONIC SOURCE

1) Connect the stereo source's output to the MPX input of the unit (see setup 3).

2) Adjust the stereo encoder to obtain just the 19 KHz subcarrier output and ensure the total absence of signal on the LEFT and RIGHT inputs of the encoder.

3) Adjust the output level of the encoder to obtain the correct level as displayed on the analog meter of the XT300.

4) Inject audio signals into the LEFT and RIGHT inputs of the encoder and adjust the sensitivity of the input to obtain a peak reading of MAX= 75KHz with both channels enabled.



SETUP 3

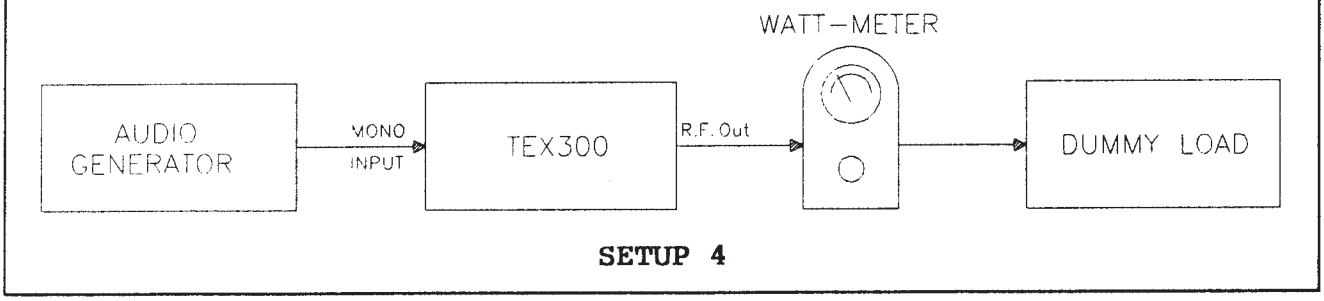
3.6 MONOPHONIC TRANSMISSION

1) Connect the signal source (audio mixer, receiver, compressor etc.) to the MONO input. This input is unbalanced (see setup 4).

2) Select the desired input level.

3) Adjust the signal level of the equipment connected to the XT300 (with the audio signal present) for a peak reading of DEV MAX=75KHz

NOTE: International standards permit a maximum deviation (DEV MAX) of 75KHz for frequency modulated, radiophonic transmissions. Exceeding this limit will only result in the degradation of the signal quality. In the case of mono transmissions the stereo input is available for frequencies between 15 KHz and 100KHZ (i.e. subcarriers for SCA, RDS etc.).



SETUP 4