

RT1
Real Time Spectrum Analyser
Preliminary
Operating Instructions

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Introduction

The RT1 Real Time Spectrum Analyser represents a breakthrough in audio analysis, offering capabilities far beyond the reach of conventional devices.

Operational simplicity has not been sacrificed to implement this flexibility, with intuitive controls and a clear menu-driven LCD display allowing quick measurements to be made confidently.

The RT1 combines rugged construction for reliability on the road with the performance needed for the most demanding consultancy project.

Features

- Powerful analysis tool combining 1/3 octave RTA, SPL meter, RT₆₀ analysis and a swept frequency analyser in one unique product.
- Fully controllable pink noise and sine wave oscillator output sources included.
- RTA features simultaneous Bar and Peak displays with separately adjustable time constants.
- Accurate RT₆₀ measurement, using internally gated noise or external source. Auto and manual window functions for direct RT₆₀ measurement (result).
- Swept analysis measurements using tracking filters, allow narrow band problems to be identified and plotted via the printer port.
- Accurate SPL meter displays absolute or relative SPL, with average or peak response.
- Both RT₆₀ and RTA modes each have 32 non volatile memories with accumulate function. The RTA memories allow memory to memory compare and memory to real time compare (difference) functions.
- Independently selectable 'A' weighting filters for both 1/3 octave and SLM displays.
- Crystal locked switched capacitor 1/3 octave filters for long term stability.
- Printer port for directly driving industry standard printers, allows permanent copies of any display curve to be made, with user selectable title and automatic time and date stamp.
- Time / Level mode displays historical information on peak levels attained.
- Mic and Line inputs with mic inputs on front and rear panel.
- The LED bar graph display has selectable average and peak response with switchable resolution of 1 or 2dB per LED.
- Manual and Auto range control of input attenuator setting.
- RS 232 computer port provided. RS 422 option available.
- A high quality measurement microphone is included with each unit.

Thanks

Thank you for choosing the XTA RT1 for your application. Please spare a little time to digest the contents of this manual (figuratively speaking), so that you obtain the best possible performance from this unit.

All XTA products are carefully engineered for world class performance and reliability.

If you would like further information on this or any other XTA product, please call us.

We look forward to helping in the near future.

XTA Electronics Ltd.

Safety Warnings

Please note the following information which is provided for your safety:

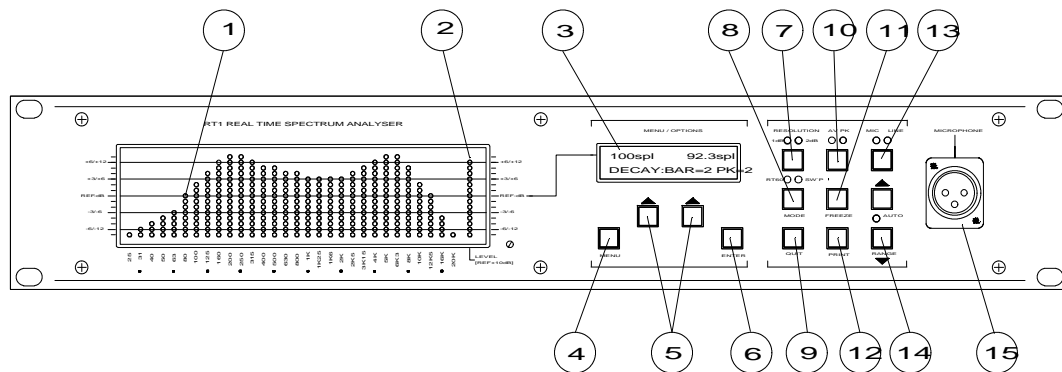
- Check correct operating voltage is set on the power supply before connecting mains power.
- Do not expose this unit to rain or moisture.
- Do not expose this unit to excessive heat.
- Replace all fuses with correct type only.
- Do not remove the covers from this unit. No user serviceable parts inside - refer all servicing to qualified personnel.

The mains power cord to the power supply is fitted with a safety earth (ground) connection. Do not operate this unit with this connection removed.

Unpacking the RT1

After unpacking the unit please check carefully for damage. If damage is found, please notify the carrier concerned at once. Any claim must be instigated by you, the consignee. Please retain all packaging in case of future reshipment.

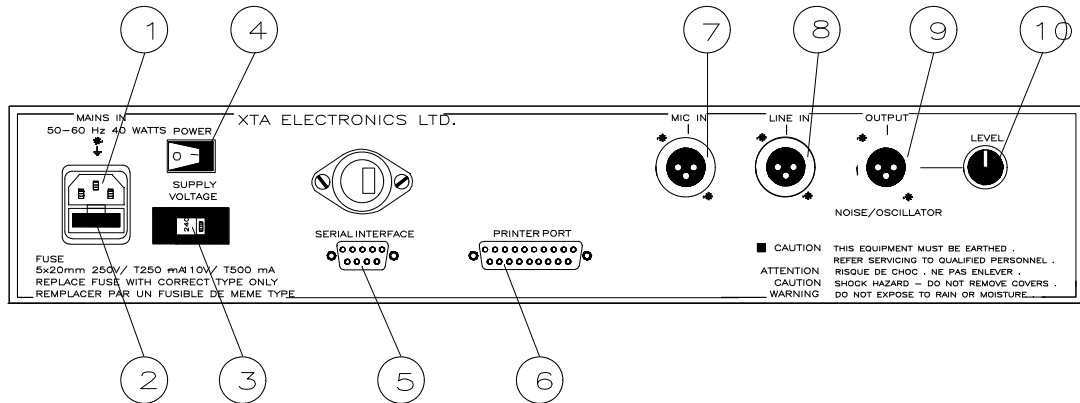
Front Panel Functions



1. **Main RTA Display** - Displays power level at 30 one third octave centre frequencies 25Hz to 20kHz. Display range is switchable to $\pm 7\text{dB}$ / $\pm 14\text{dB}$ about the centre reference point.
2. **Level** - Displays the overall level at audio frequencies. This level is 10dB greater than shown on the panel calibration.
3. **LCD Display** - Shows menu options and various parameters dependant on the menu selection. See operating section for detailed information.
4. **Menu** - Allows menu functions to be previewed on the LCD display.
5. **Option Keys** - Adjust parameters and options. See operating section for detailed information. Also allows up/down control of menu selection when previewing menu.
6. **Enter** - Confirms the chosen menu option and enters this as the working mode.
7. **Resolution** - Selects the RTA display resolution to 1 or 2dB per LED.
8. **Mode** - Selects between the three basic operating modes for the RT1
 - RTA = No LED's light .
 - RT₆₀ = RT₆₀ LED lights.
 - Sweep = SW'P LED lights.
9. **Quit** - Returns unit to basic default operating mode from existing menu selection.
10. **Response** - Selects average or peak response measurements for the main RTA display.
11. **Freeze** - 'Holds' RTA and SLM measurements. The LED flashes until the 'freeze' function is cancelled by pressing the 'freeze' key again.
12. **Print** - Holds display and prints current display information. If no printer is connected "No Printer" is displayed on the LCD display. See 'Printer' section for detailed information.
13. **Mic/Line** - Selects mic or line input sources via independent XLR connectors.
14. **Range Keys** - Set the operating reference for the RTA in 7 ranges from -50dBu to +10dBu, with line source selected or 50spl to 110spl with microphone source selected. Pressing both keys together selects 'auto-range' mode and lights the 'auto' LED.

15. **Mic Input** - Microphone input XLR with phantom powering to suit XTA measurement microphone. For convenience a second paralleled mic. input connector is provided on the rear panel. Only one mic. input should be used at any time.

Rear Panel Functions

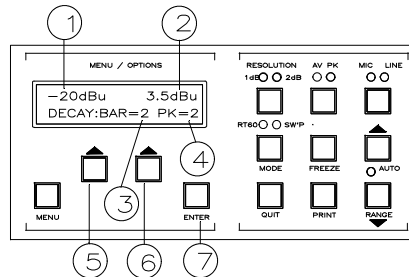


1. **Mains Power** - is connected via a standard IEC socket. A compatible power cord is supplied with the unit.
2. **Mains Fuse** - is located in the mains inlet socket. A spare fuse is provided within the pull-out compartment. Always replace fuse with the correct type as shown on the rear panel legend.
3. **Voltage Selector** - Switches between two nominal operating voltages. Please ensure this is set for the correct voltage before operating. Disconnect power to the unit before resetting this selector.
4. **Power Switch** - a double pole switch is provided, isolating both live and neutral connections.
5. **Serial Interface Port** - An RS232 (optional RS422) interface via a 9 pin D shell connector allows connection of external equipment / computer.
6. **Printer Port** - this centronics / IBM compatible port allows the direct connection of approved printers via a standard 25 pin D shell connector. See 'Printer' section for detailed information.
7. **Mic. Input** - identical to the front panel microphone input and connected in parallel.
8. **Line Input** - This balanced input allows line level signals to be selected as the RTA input source, when 'line' is selected on the front panel. The connector is a 3 pin female XLR type, wired pin 2 'Hot', pin 3 'Cold' and pin 1 ground.
9. **Output** - Pink noise and oscillator signal sources are provided within the RT1 and when selected, are available via this 3 pin male XLR connector. The output is balanced and wired pin 2 'Hot', pin 3 'Cold' and pin 1 ground.

10. **Output Level** - Controls the level of the output signal between 'off' and +6dB.

Operating the RT1

Basic RTA Mode. This is the default mode for the unit and can be accessed at any time by pressing 'Quit.', assuming RTA is selected on the 'Mode' key.



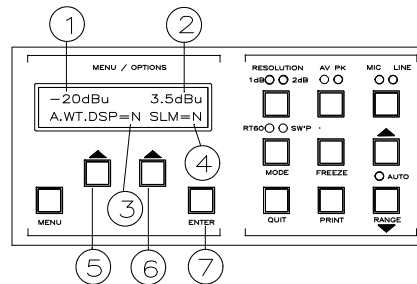
1. **Ref. Level** - Shows the current reference level as selected via the range keys. The display reads dBu when line input is selected and spl for mic. input. Note: with 'A' weighting filter selected display shows dBA / spA.
2. **SLM** - Sound pressure meter readout, calibrated in dBu for line input and spl for mic. input. Note: (a) with 'A' weighting filter selected display shows dBA / spA. (b) with spl relative selected, display shows dBr.
3. **Bar Decay** - Shows decay time for RTA bar (column) display.
4. **Peak Decay** - Shows decay time for RTA peak hold display.
5. **Option Key 1** - Adjusts Bar decay time from '0' (off) to '5' (slow). '0' position is not available when peak hold decay is set at '0' (off).
6. **Option Key 2** - Adjusts Peak hold decay time from '0' (off) to '%' (infinite hold). '0' position is not available when bar decay is set at '0'.
7. **Enter Key** - Not used

Notes: The following additional options are available in this mode, using the appropriate menu selection.

- (i) 'A' weighting filters on / off for sound level meter.
- (ii) 'A' weighting filters on / off for main RTA display.
- (iii) SPL relative. i.e. SLM displays difference in dB from a pre-set reference level.
- (iiii) SLM mode can be set for Average or Peak reading with a choice of times.

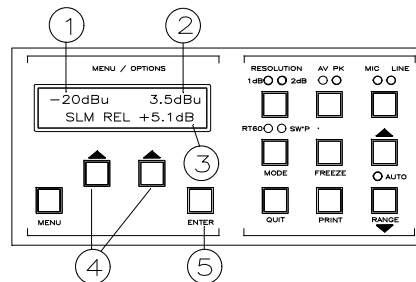
RTA Menu Options

'A' weighting Press menu and select 'A' weighting by using menu key or option keys. Press 'Enter' to load selection.



1. **Ref. Level** - Shows Ref. level as in basic RTA mode.
2. **SLM** - Shows SLM readout as in basic RTA mode.
3. **RTA Status** - Shows 'A' weighting filter status for main RTA display (Yes / No).
4. **SLM Status** - Shows 'A' weighting filter status for SLM readout (Yes / No).
5. **Option Key 1** - Selects 'A' weighting Status for main display.
6. **Option Key 2** - Selects 'A' weighting Status for SLM readout.
7. **Enter Key** - Not used.

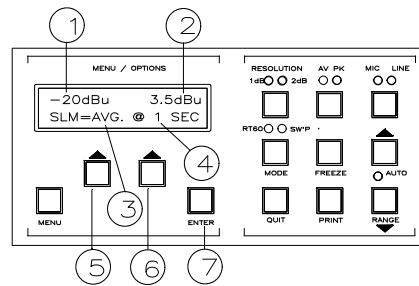
SPL Relative. Press menu and select 'SPL Relative' by using menu key or option keys. Press 'Enter' to load selection.



1. **Ref. Level** - Shows Ref. level as in basic RTA mode.
2. **SLM** - Shows SLM readout as in basic RTA mode.
3. **Ref. Level** - Shows current reference level in dB, or [OFF] if SLM Rel. Option is not selected.
4. **Option Keys** - Sets reference level for SLM.
5. **Enter Key** - Toggles SLM relative mode on / off.

SLM Modes

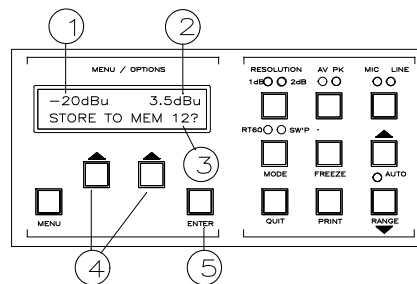
Press menu and select 'SLM Modes' by using menu key or option keys. Press 'Enter' to load selection.



1. **Ref. Level** - Shows Ref. level as in basic RTA mode.
2. **SLM** - Shows SLM readout as in basic RTA mode.
3. **SLM Mode** - Displays current SLM mode, Average (AVG.) or Peak reading.
4. **Response** - Displays response time for SLM; instantaneous (INST.), 1 Sec, or 8 Secs.
5. **Option Key 1** - Selects SLM mode.
6. **Option Key 2** - Selects SLM response time.
7. **Enter Key** - Not used.

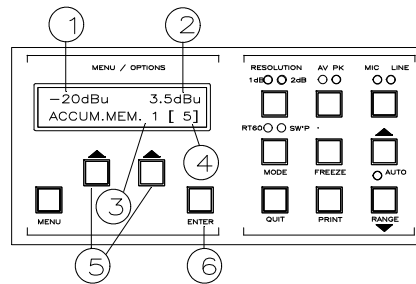
Memory Store.

Press menu and select 'Memory Store' by using menu key or option keys. Press 'Enter' to load selection.



1. **Ref. Level** - Shows Ref. level as in basic RTA mode.
2. **SLM** - Shows SLM readout as in basic RTA mode.
3. **Mem No.** - Shows memory number selected via option keys. '?' after the number identifies a memory previously used.
4. **Option Keys** - Selects memory location number from 1 to 32.
5. **Enter Key** - Loads current display information into memory currently selected.

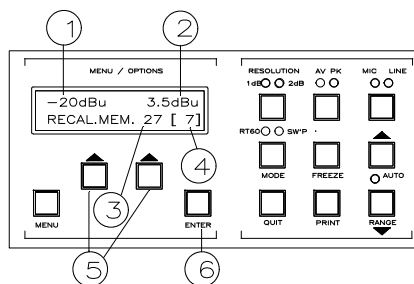
Memory Accumulate. Press menu and select 'Memory Accum.' by using menu key or option keys. Press 'Enter' to load selection.



1. **Ref. Level** - Shows Ref. level as in basic RTA mode.
2. **SLM** - Shows SLM readout as in basic RTA mode.
3. **Mem No.** - Shows memory number selected via option keys.
4. **Accumulations.** - Shows the number of accumulations made into the current memory location.
5. **Option Keys** - Selects memory location number from 1 to 32.
6. **Enter Key** - Adds present information to any previous accumulation loaded into the current memory location.

Note: If new measurements are to be accumulated into a memory location that has previous accumulations i.e. 4. above displays [1] or more, The memory must be, in effect, erased by storing the first measurement using the 'Memory Store' function then using the memory accumulate function for subsequent 'additions'.

Memory Recall. Press menu and select 'Memory Recall.' by using menu key or option keys. Press 'Enter' to load selection.



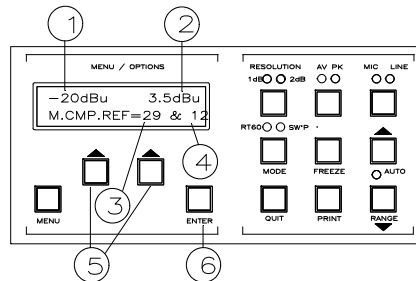
1. **Ref. Level** - Shows Ref. level as in basic RTA mode.
2. **SLM** - Shows SLM readout as in basic RTA mode.
3. **Mem No.** - Shows memory number selected via option keys.
4. **Accumulations.** - Shows the number of accumulations made into the current memory location.
5. **Option Keys** - Selects memory location number from 1 to 32.

6. **Enter Key** - Not used.

Memory Compare.

Press menu and select 'Memory Compare.' by using menu key or option keys. Press 'Enter' to load selection.

This function allows the information in two memories to be compared, and the resultant difference curve to shown on the main RTA display.

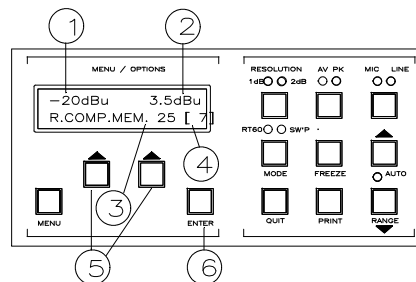


1. **Ref. Level** - Shows Ref. level as in basic RTA mode.
2. **SLM** - Shows SLM readout as in basic RTA mode.
3. **Ref.Mem No.** - Shows the reference memory number, as selected via option keys.
4. **Comp.Mem No.** - Shows the memory number for the information to be compared with the reference.
5. **Option Keys** - Selects memory location number for Ref.Mem. or Comp.Mem (see below).
6. **Enter Key** - Toggles 'option key 'control between Ref.Mem No. and Comp.Mem No.

Real Time Compare.

Press menu and select 'Real Time Compare.' by using menu key or option keys. Press 'Enter' to load selection.

This function allows real time measurements to be compared with information stored in a memory. The resultant difference curve to shown on the main RTA display.

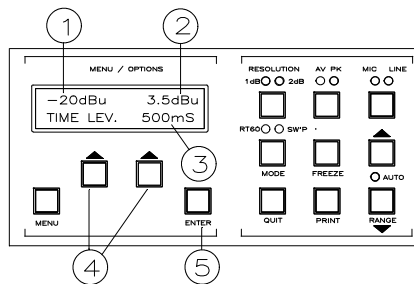


1. **Ref. Level** - Shows Ref. level as in basic RTA mode.
2. **SLM** - Shows SLM readout as in basic RTA mode.
3. **Mem No.** - Shows the memory number selected as the reference via option keys.
4. **Accumulations.** - Shows the number of accumulations in the current memory location.

5. **Option Keys** - Selects memory number required.
6. **Enter Key** - Not used.

Time Level Mode. Press menu and select 'Time Level Mode' by using menu key or option keys. Press 'Enter' to load selection.

This option allows peak or average level information obtained via the SLM section to be displayed against time on the main RTA display. In this way an historical picture of the maximum levels reached is obtained. The 'time-base' of the RTA display is adjustable between 62.5mS and 256 seconds per LED column, giving a maximum display period of between 1.875 seconds and 2 hours 13 minutes. This information can be printed in the normal way.

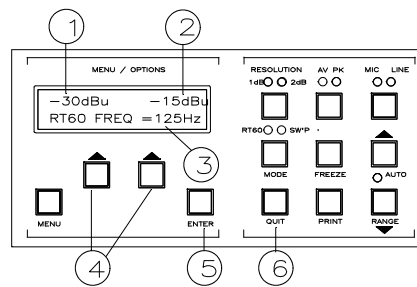


1. **Ref. Level** - Shows Ref. level as in basic RTA mode.
2. **SLM** - Shows SLM readout as in basic RTA mode.
3. **Time Base.** - Shows the current time base of the RTA display, adjustable between 62.5mS and 256 seconds per LED column.
4. **Option Keys** - Sets RTA display time base.
5. **Enter Key** - Press to initiate time level measurement.

RT60 Mode

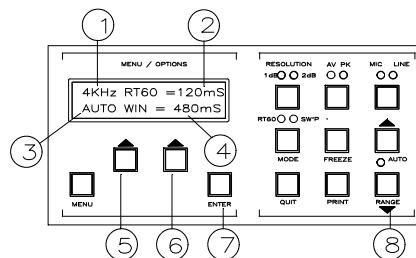
The RT1 provides for accurate measurement of RT_{60} reverberation time using internally gated noise or an external source. Auto and manual window functions are provided. RT_{60} decay curve (window) is shown on the main RTA display and the RT_{60} time is shown on the LCD screen. Measurements can be taken at any octave centre frequency 31Hz to 16kHz or 'wideband'. The decay curve can be expanded on the RTA screen, if required, to aid manual adjustments of the measurement 'window'. RT_{60} measurements can be stored, recalled or accumulated into memory as in the RTA mode.

RT60 Default Mode. Press mode key until RT₆₀ LED lights. Pressing Quit whilst in RT60 mode will always return the unit to this default mode.



1. **Ref. Level** - Shows the current reference level as selected via the range keys.
2. **SLM** - Shows level for line or mic. input.
3. **Frequency** - Shows RT₆₀ centre frequency as selected by option keys. Note 'O/LEV' indicates wideband measurements. If a signal is present the centre frequency and level will show on the RTA display.
4. **Option Keys** - Selects RT₆₀ centre frequency.
5. **Enter Key** - Gates output 'off' and initiates RT₆₀ measurement. When the measurement is complete the unit will enter 'measurement mode'.
6. **Quit Key** - Selects 'measurement mode' to display last measurement.

RT60 Measurement Mode.



1. **Frequency** - Shows RT₆₀ centre frequency used for the measurement.
2. **RT60 Time** - Shows the RT₆₀ time calculated by the RT1.
3. **Window Status** - Shows the measurement window status as set by option key 1.
 Auto - for automatic RT₆₀ calculations.
 Start - to manually edit window start point.
 End - to manually edit window end point.
4. **RTA Display Time** - Shows the full scale horizontal axis time period for the RTA display. This can be adjusted via option key 2, to expand the displayed decay curve.
 Note: Display time = 60mS = 2mS per LED column.
 120mS = 4mS per LED column etc.

5. **Option Key 1** - Sets measurement window status.
6. **Option Key 2** - Sets RTA display horizontal time period.
7. **Enter Key** - Not used.
8. **Range Keys** - These are used to adjust measurement window start and end points, dependant on the status set by option key 1. The 'auto' LED will flash when these keys are active. Adjustments made using these keys will be shown on the main RTA display, with 'solid' columns representing the new measurement window. The recalculated RT_{60} time, based on this new window, will be displayed in the LCD window.

RT60 Menu Options. Pressing the menu key and using the two option keys allows all RT_{60} menu options to be previewed and loaded if required via the enter key. Operating procedures are identical to those discussed previously for the RTA menu options. The following options are available:-

- (i) Store to memory. (an additional 32 memories available for RT_{60} only).
- (ii) Accumulate to memory.
- (iii) Memory Recall.

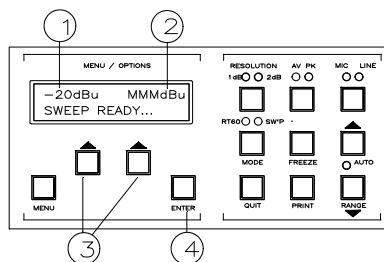
Note to manually edit a recalled memory, press the enter key following memory recall, to make it the 'current' decay curve.

Sweep Mode

The provision of sweepable sine wave and band limited pink noise output sources, together with tracking filters for input measurements, further extends the capabilities of the RT1.

Start and end frequencies and sweep speed are adjustable. Manual adjustment ("nudging") of centre frequency is also possible allowing problem frequencies to be identified, using the SLM readout. Although the RTA display has only one third octave resolution, using the external printer, or simply the SLM meter reading allows the full one twelfth octave resolution to be realised above 63Hz (1/6 octave below).

Sweep Ready Press mode key until SW'P LED lights. Pressing Quit whilst in sweep mode will always return the unit to this default mode (unless a sweep is in progress).

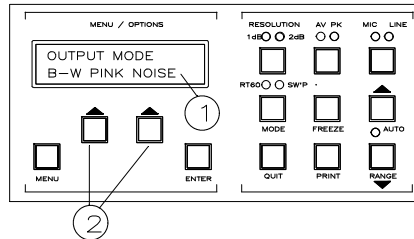


1. **Ref. Level** - Shows the current reference level as selected via the range keys.
2. **SLM** - Shows level for line or mic. input. Note a low (off scale) reading may be shown since outputs are gated off.
3. **Option Keys** - Allow manual setting of measurement centre frequency. (Not used for 'auto' sweeps).

- Enter Key** - Gates output 'on' and initiates sweep after a wait period. Sweep parameters are as previously set via the sweep menu. The LCD display now shows the measurement centre frequency. As discussed previously, manual adjustments can be implemented at any time via the option keys.

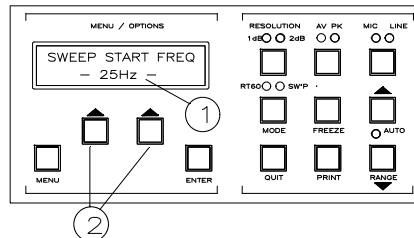
Sweep Menu Options

Output Mode Press menu and select 'Output Mode.' by using menu key or option keys. Press 'Enter' to load selection.



- Output mode** - Displays current output mode.
 - B-W Pink Noise - Band limited Pink Noise.
 - Sine wave.
- Option Keys** - Toggle between the two output modes.

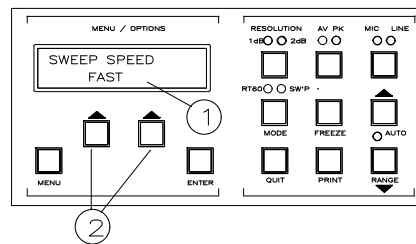
Sweep Start Frequency Press menu and select 'Sweep start freq.' by using menu key or option keys. Press 'Enter' to load selection.



- Start Frequency** - Shows the current sweep start frequency.
- Option Keys** - Set Sweep start frequency.

Sweep End Frequency Press menu and select 'Sweep End freq.' by using menu key or option keys. Press 'Enter' to load selection. This option operates as 'Start Frequency' above.

Sweep Speed Press menu and select 'Sweep Speed' by using menu key or option keys. Press 'Enter' to load selection.



1. **Sweep Speed** - Displays sweep speed; slow, medium or fast.
2. **Option Keys** - Set Sweep speed.

Unit Set-up Menu Options

This menu is accessed by pressing quit and mic/line keys whilst in RTA mode.

The following options are available.

1. **Printer Type** = Epson FX80
Epson LQ850
IBM Proprinter
Canon BJ10

Use option keys to view options and enter key to confirm printer choice.

A start symbol identifies the current selection.

2. **Computer Port** = On / Off.

Use option keys to select status and confirm choice with enter key.

3. **Time and Date** - Automatic time and date stamp is provided for printer output and this information is stored in memory with measurement information.

To reset:- (i). Use option keys to move flashing cursor.

(ii). Use range keys to change.

4. **User Name** - Automatic labelling is provided for printer output, of up to 16 characters.

To Set:- (i). Use option keys to move cursor.

(ii). Use range keys to change.

Using an External Printer

Any approved centronics compatible printer can be directly connected to the printer port via the 25 pin D shell connector using a standard cable. The RT1 must first be set for the correct printer type using the Unit set up menu.

With the printer then connected, any current measurement or recalled memory can be printed by simply pressing the 'Print' key. Problems such as lack of paper (or printer!) are described on the LCD window.

Automatic Time / Date and Name labelling is provided. See 'Unit Set up menu' section for more information.

Specifications

1/3 Octave Display

Number: 30 x 1/3 octave band pass filters
ANSI Type E Class 2. Relative filter flatness $\pm 0.8\text{dB}$.
1 x Overall level (20-20kHz) $\pm 0.5\text{dB}$.

Weighting: 'A' or 'flat' filters.

Time constants: 10 user selectable.

Display range: $\pm 7\text{dB}$ in 1dB resolution, $\pm 14\text{dB}$ in 2dB resolution, relative to input attenuator setting.

Memories

Number 32 addressable non volatile memories with 40 actual stores, allowing true accumulation method, for both RTA and RT60 modes.

Sound Level Meter

Response modes: Fast, 1Sec. and 8 Sec. peak or average reading.

Range: 54spl to 130spl. Referenced to 93.8spl=15mV rms. (Mic input), in 6 x 10dB ranges

Readout:: 4 digit LCD with overload and underange indication.

Display modes: continuous or hold.

Weighting: 'A' or 'flat' filters.

Frequency response: 20-20kHz $\pm 0.6\text{dB}$

Meets requirements of IEC 651-1979

Preamplifier / Attenuator

Line impedance: > 10kohms

Mic. impedance: > 5kohms

Bandwidth: 20-20kHz $\pm 0.5\text{dB}$

Mic. phantom power: 15VDC

Ranges: 6 in 10dB steps. Ref=+10dBu to -40dBu (110spl to 60spl)

Output

Number: 1 electronically balanced (gateable).

Impedance: < 60ohms source.

Level: Adjustable (+6dBu max.) via rear panel control.

Modes: Full bandwidth pink noise, 1 octave band-limited pink noise, sine wave (25-20kHz).

Ports

Printer: Centronics compatible via 25 pin D shell connector.

Computer: RS 232 standard (optional RS 422) via 9 pin D shell connector

Power Requirements

Consumption: <40 VA

Voltage: 110 / 220V $\pm 15\%$ @ 50/60Hz

Physical

Size: 3.5"(2U) * 19" * 11.5" (88mm * 482mm * 290mm) excluding connectors.

Weight: 6.2kg Net (8.2kg Shipping)

Warranty

This product is warranted against defects in components and workmanship only, for a period of one year from the date of shipment to the end user. During the warranty period, XTA will, at its option, either repair or replace products which prove to be defective, provided that the product is returned, shipping prepaid, to an authorised XTA service facility.

Defects caused by unauthorised modifications, misuse, negligence, act of God or accident, or any use of this product that is not in accordance with the instructions provided by XTA, are not covered by this warranty.

This warranty is exclusive and no other warranty is expressed or implied. XTA is not liable for consequential damages.