Section 3 Operation

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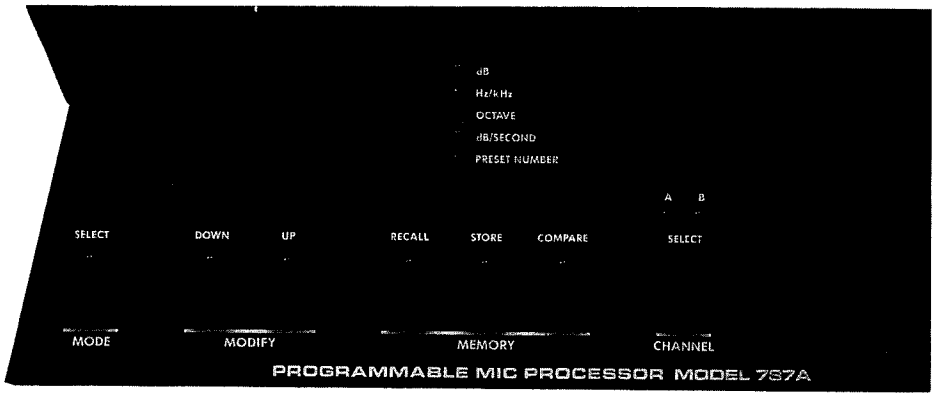
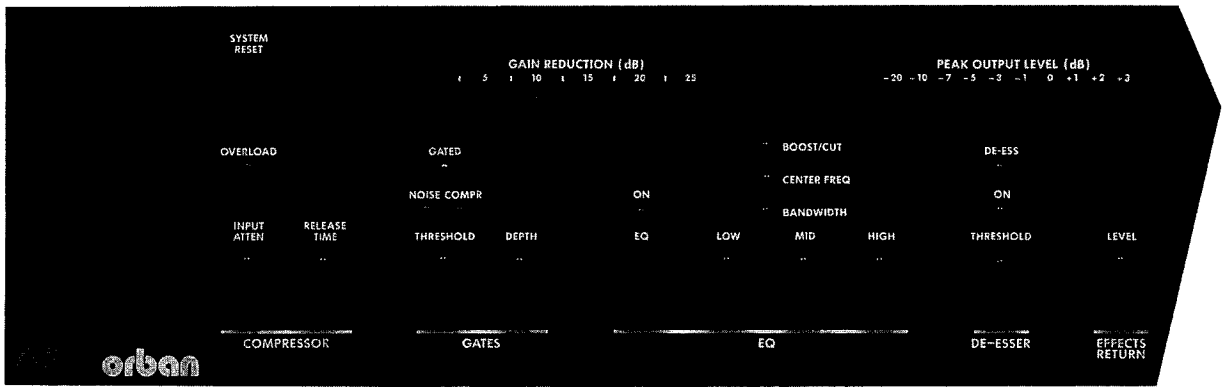
787A Controls and Displays



General notes:

- A flashing key light indicates that there is another step in programming that function.
- The UP and DOWN keys light when they can be used. The rate of change accelerates when UP or DOWN is held down.
- Display messages that begin with E are error messages — see page 5-2.
- A flashing decimal point on the numeric display indicates that the internal back-up battery level is low — see page 4-2.
- Panel display brightness can be adjusted with a BRIGHTNESS trimmer, accessible through a hole in the front left corner of the 787A's top cover.
- The SYSTEM RESET button resets the 787A's microprocessor should it "hang up" (it does not erase memory or cause audible glitches). The audio output is muted momentarily when RESET is pressed. See page 3-9 for a discussion of muting. The RESET button is also used to control certain functions and options.



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Audio Processing

The 787A's audio processing functions include compression, noise gating, equalization, and de-essing. A send-return port with return level control is provided for external effects processing.

The arrangement of the 787A's audio processing circuitry is illustrated by the block diagram on page 3-5.

The values displayed when pressing the audio processing function keys are the *current control settings* (also known as *front panel settings*). The unit of measure for the displayed value is indicated by the lights to the right of the display.

If + L o c is displayed when an audio processing function key is pressed, the controls are locked — see 3-12.

If the optional 787ASL second channel slave unit is installed, the A or B channel must be selected — see 3-20.

Control Setting Ranges

Control:	Range:			
COMPRESSOR INPUT ATTENUATION	+5	to	−25dB	
COMPRESSOR RELEASE TIME	1	to	50dB/second	
GATE THRESHOLD	0	to	−30dB, OFF	
NOISE GATE DEPTH	0	to	−25dB	
BOOST/CUT	+16	to	−30dB, −∞ (- - -)	
CENTER FREQUENCY*	30	to	632Hz	low band
	210	to	7.65kHz	middle band
	420	to	15.3kHz	high band
BANDWIDTH	0.1	to	5 octaves	
DE-ESSER THRESHOLD	0	to	−48dB	
EFFECTS RETURN LEVEL	+16	to	−30dB, OFF	
OUTPUT LEVEL (on rear panel)	0	to	10 (arbitrary scale)	

* The coarse center frequency scale is logarithmic, with ten steps per octave. The fine center frequency scale is linear, with 2.5Hz steps for the low band, 30Hz steps for the middle band, and 60Hz steps for the high band. Note that the displayed frequency is rounded off as necessary.

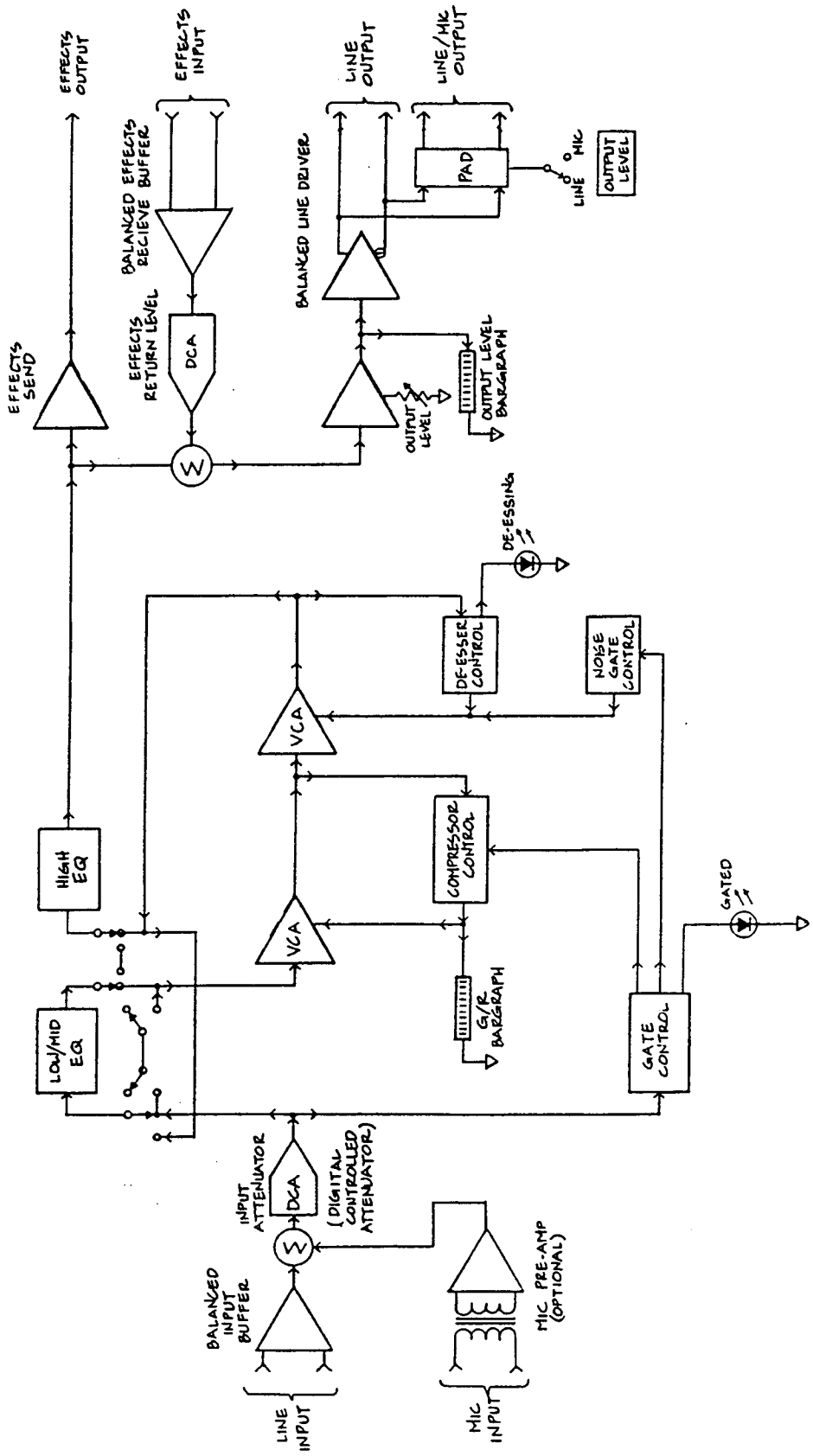

Fig. 3-1: Simplified Block Diagram

Compression

The 787A's compressor automatically controls the level of the audio signal by increasing gain when the input signal is quieter and decreasing the gain when the signal gets louder. The action of the compressor depends on the level of the audio signal and on the settings of three parameters:

The **input attenuator** controls the overall amount of gain reduction by setting the signal level going into the gain control circuitry.

To change the input attenuation level:

Press INPUT ATTEN; the current input attenuation level will be displayed, expressed in dB. Press UP or DOWN to change the level.

Be careful not to adjust the controls to produce so much gain reduction that the **red segment** of the GAIN REDUCTION display lights. Unlike the displays in some processors, the red segment of the 787A's GAIN REDUCTION display gives a warning that must be heeded. When the display is in the red, the compressor has run out of gain reduction range, the circuitry is being overloaded, and various nastinesses are likely to commence.

The **release rate** determines how fast the gain recovers when the audio level decreases suddenly: faster rates produce audio that is more consistent and dense, while slower rates give a more natural sound.

To change the release rate:

Press RELEASE TIME; the current release rate will be displayed, expressed in dB/second. Press UP or DOWN to change the release rate.

To prevent noise rush-up and pumping, the compressor will *slowly* move to 10dB gain reduction when the level of audio is below the **compressor gate threshold.**

To change the compressor gate threshold:

Press GATE THRESHOLD; the current compressor gate threshold level will be displayed, expressed in dB. Press UP or DOWN to change the threshold. Set the threshold to OFF to disable the compressor gate.

The GATED light will light when the compressor gate is active.

- The **GAIN REDUCTION display** shows the true peak gain reduction in dB. If the red LED at the far right of the bargraph lights, no further gain reduction is available.
- The **PEAK OUTPUT LEVEL display** indicates the peak output level of the 787A just before its final "active transformer" line amplifier. The display reads the true peak value (±0.5dB) of a 10-microsecond pulse.
- The **OVERLOAD light** will light when there is an overload anywhere in the 787A. To correct this, reduce the input level with the INPUT ATTEN key, reduce the level of the signal applied to the 787A, or reduce the amount of equalization boost.

Why use compression?

Compression is used to decrease the peak-to-average ratio, to enhance the intelligibility of audio, or to modify characteristics of the sound.

As a speaker or singer moves nearer to then back from the microphone, the level of the microphone's output will vary. If the level at the listener's ear is allowed to vary too much, it may become difficult to distinguish the performer's voice from background audio. Compression of the microphone signal can be used to make the audio level more consistent.

Decreasing the peak-to-average ratio also enables use of a higher *average* level in recording or broadcast media with limited bandwidth. Using compression in this way yields a denser, louder, more "processed" sound.

Increasing gain reduction and compressor release rate can dramatically change the waveform of the processed audio to give it more "punch." This technique can be used to strengthen a voice or alter the characteristic sound of a musical instrument. To achieve this effect, increase the INPUT ATTEN setting until the GAIN REDUCTION display indicates over 10dB of gain reduction, and increase the RELEASE TIME setting to at least 4dB/second.

Noise Gating

The 787A's noise gate prevents gain increase of low-level noise by attenuating signals that are below the noise gate threshold. The amount of attenuation applied is adjustable.

To turn the noise gate on:

Press GATE THRESHOLD; the NOISE light will light when the noise gate is on. Press GATE THRESHOLD again to turn the gate (and the light) off.

To change the noise gate threshold:

Turn the noise gate on by pressing GATE THRESHOLD; the current gate threshold level will be displayed, expressed in dB. (Both the compressor gate and the noise gate use the same threshold.) Press UP or DOWN to change the threshold.

To change the amount of attenuation applied by the noise gate:

Press DEPTH; the current amount of attenuation will be displayed, expressed in dB. The noise gate must be on (indicated by a lit NOISE light) for the DEPTH key to function. Press UP or DOWN to change the amount of attenuation.

The GATED light will light when the noise gate is active.

Equalization

The 787A's equalization circuitry enables you to individually boost or attenuate the low, middle, or high frequency components of the audio. The bandwidth (Q) and center frequency of each of these three bands is adjustable.

Equalization is useful for correcting deficiencies in the source medium or in room acoustics. It can also be used to create special effects and to acoustically imitate the ambiance of a particular room or environment.

To turn on the equalization circuitry:

Press EQ; the ON light above the key will light when equalization is on. Press EQ again to turn equalization (and the light) off.

To change the amount of boost or cut:

Select a band by pressing LOW, MID or HIGH. Repeatedly press the same key until the BOOST/CUT light is lit; the current boost (+) or cut (−) of the selected band will then be displayed, expressed in dB. Press UP or DOWN to change the amount of boost or cut.

Equalization must be on (indicated by a lit ON light) for the LOW, MID or HIGH keys to function.

To change the center frequency of a band:

Select the band by pressing LOW, MID or HIGH. Repeatedly press the same key until the CENTER FREQ light is lit; the current center frequency of the selected band will then be displayed, expressed in Hz or kHz. Press MODE to toggle between a coarse or fine scale. Press UP or DOWN to change the center frequency.

The center frequency is shown in kHz if it has a decimal point, and in Hz if it does not.

Both the MODE key and the LOW, MID or HIGH key will flash once to indicate a change to the coarse scale, or twice to indicate a change to the fine scale. The 787A returns to the coarse scale whenever a preset is recalled or stored.

Because MODE is used to toggle between fine and coarse center frequency scales, you must first exit center frequency selection by pressing another audio processing key before you can access other special modes with the MODE key.

To change the bandwidth of a band:

Select the band by pressing LOW, MID or HIGH. Repeatedly press the same key until the BANDWIDTH light is lit; the current bandwidth of the selected band will then be displayed, expressed in octaves. Press UP or DOWN to change the bandwidth.

- The LOW and MID equalization bands can be positioned before or after the compressor (see step 2-C on page 2-4). The 787A is shipped with these bands positioned before the compressor. If you experience pumping when using large boosts, placing the LOW and MID bands after the compressor will eliminate the pumping.
- The audio output is momentarily muted when EQ is pressed. Muting eliminates potential pops caused by large level changes when switching from one set of control settings to another. Because this muting may not be wanted in some applications, it is defeatable. Pressing RESET and INPUT ATTEN at the same time and then releasing RESET toggles muting on and off. The display will then indicate whether muting is on or OFF.

De-Essing

The 787A's de-esser attenuates vocal sibilance when the audio peaks with energy above 6kHz exceeds the de-esser threshold level.

To turn on the de-esser:

Press DE-ESSER THRESHOLD; the ON light above the key will light when the de-esser is on. Press DE-ESSER THRESHOLD again to turn the de-esser (and the light) off.

To change the de-esser threshold:

Turn the de-esser on by pressing DE-ESSER THRESHOLD; the current de-esser threshold level will be displayed, expressed in dB. Press UP or DOWN to change the threshold. Decreasing the threshold increases the amount of de-essing.

- The DE-ESS light will light when the de-esser is active.

Effects Port

Audio can be taken from a point following the compressor, equalization, and de-esser, processed by an external effects device, then returned to the 787A prior to the OUTPUT LEVEL pot. Reverb and "psychoacoustic excitation" for example, can be readily added in this way.

To adjust the effects return level:

Press EFFECTS RETURN LEVEL; the current effects return level will be displayed, expressed in dB. Press UP or DOWN to change the level. Set the effects return level to OFF to disable the effects return port.

The EFFECTS SEND level (approximately +4dBu) cannot be adjusted.

Memory

Up to 99 sets of control settings can be stored in memory for later retrieval. A set of control settings in memory is called a *preset.*

The current control settings can be quickly alternated with any preset to facilitate easy comparison.

If the optional 787ASL second channel slave unit is installed, the A or B channel must be selected — see page 3-20.

- The preset number is preceded by a c if the current control settings have been changed since the preset was recalled.
- To abort recall or store before finishing, press any key to the left of the DOWN key. To abort compare, press COMPARE again.
- Presets can also be recalled by remote control, or through the optional MIDI or RS-232 interfaces — see page 3-13.
- The audio output is muted momentarily when RECALL or COMPARE is pressed. Muting eliminates potential pops caused by large level changes when switching from one set of control settings to another. Because this muting may not be wanted in some applications, it is defeatable. Pressing RESET and INPUT ATTEN at the same time and then releasing RESET toggles muting on and off. The display will indicate whether muting is on or OFF.

To store the current settings:

Press STORE; the most recently stored or recalled preset number will be displayed. If you want to store to a different preset number, press UP or DOWN until the preset number you want is displayed. Press STORE again.

Control settings can be stored as presets 1 through 99.

Be sure to write down the preset number when you store a controls set-up. Include a note explaining how the preset is to be used. A sample log sheet is on page 3-22.

When you press STORE the second time, the control settings *previously* stored as that preset are temporarily saved in a special register called the LAST preset (located after preset 99). This gives you one last chance to change your mind and retrieve them.

To recall a preset:

Press RECALL; the most recently stored or recalled preset number will be displayed. If you want to recall a different preset, press UP or DOWN until the number of the preset you want is displayed. Press RECALL again.

Control settings can be recalled from presets 0 through 99. Preset 0, which can only be recalled, is an essentially "flat" set-up of the controls.

To compare a preset with the current control settings:

Press COMPARE. Press UP or DOWN until the number of the preset you want to compare with the front panel is displayed.

Repeatedly press COMPARE to alternate between current and preset settings. When the COMPARE key is lit, the preset settings are active; when the key light is off, the front panel settings are active.

To compare two presets, first recall one of the presets to the front panel.

Restricting Access to Controls

Access to the 787A's audio processing controls can be restricted to authorized users with a 4-digit programmable security code. When the controls are locked, only the keys which recall and compare preset control settings, unlock controls, and reset the system will function.

To lock controls:

Press MODE. Press UP or DOWN until - Loc is displayed. Hold down MODE while pressing INPUT ATTEN — then release both keys. Press UP or DOWN to display the first two digits of your security code, then press MODE to enter those digits. Press UP or DOWN to display the second two digits of your security code, then press MODE to enter those digits. + Loc will be displayed to indicate the controls are now locked.

The INPUT ATTEN key will flash when MODE is held down to remind you of which key to press. This two-key maneuver makes it more difficult to accidentally lock the controls.

You may use any four-digit number for your security code. The security code is set to 00, 00 at the factory, and resets to 00, 00 whenever the controls are unlocked.

Be sure to record the security code in a safe place.

To unlock controls:

Press MODE. Press UP or DOWN until + Loc is displayed. Press MODE again. Press UP or DOWN to display the first two digits of your security code, then press MODE to enter those digits. Press UP or DOWN to display the second two digits of your security code, then press MODE to enter those digits. - Loc will be displayed to indicate the controls are now unlocked.

- + Loc is displayed when a locked key is pressed.
- If you lose the security code, you can still unlock the controls. Remove the 787A's top cover and press LOCKOUT RESET button S1 to unlock the controls. S1 is located on the digital circuit board about 3 inches (8 cm) behind the RECALL key. This resets the security code to 00, 00.
- In situations where it is desirable to restrict access to *all* front-panel controls, an optional acrylic **security cover** can be installed. This arrangement might be appropriate, for example, when the 787A is being controlled entirely by remote control or through the optional MIDI interface. For the 787A, order SC2 CLEAR for a clear transparent security cover, SC2 BLUE for a blue transparent security cover, or SC2 WHITE for an opaque white security cover. For the 787ASL, order SC1 CLEAR, SC1 BLUE, or SC1 WHITE.

External Control

The 787A can be controlled through external remote control, or through a MIDI or RS-232 interface. Remote control is discussed below. See page 3-14 for MIDI interface information; see page 3-17 for RS-232 interface information.

The audio output is muted momentarily when front panel settings are received via MIDI or RS-232 interface. Muting eliminates potential pops caused by large level changes when switching from one set of control settings to another. Because this muting may not be wanted in some applications, it is defeatable. Pressing RESET and INPUT ATTEN at the same time and then releasing RESET toggles muting on and off. The display will indicate whether muting is ON or OFF.

Remote Control

The 787A can be remotely controlled through the optional MIDI or RS-232 interface, through the optional basic remote control accessory (ACC024), or through your remote control system connected to the REMOTE terminals on the 787A's rear panel.

The UP, DOWN, RECALL, and CHANNEL functions can be controlled by an external remote control system. RECALL must be invoked before UP or DOWN is. Momentarily ground the appropriate terminal to activate a function.

The basic remote control accessory, which is designed to be mounted at the console, has UP, DOWN, RECALL, and CHANNEL keys and a digital preset number display.

The front panel lights and displays will reflect remote control activity.

If the 787ASL second channel slave unit is installed, both it and the host 787A are controlled through the host 787A — the 787ASL has no REMOTE terminals.

MIDI Interface

Presets can be recalled with instructions sent through the MIDI interface. Preset memory or current front panel settings can be sent to or received from another device through the MIDI interface. The MIDI channel can be assigned, and the MIDI interface can be disabled from the front panel. To do any of this, the optional MIDI interface board must be installed.

If the optional 787ASL second channel slave unit is installed, the A or B channel must be selected — see page 3-20.

To assign MIDI channel:

Press MODE. Press UP or DOWN until chn is displayed. Hold down MODE and press INPUT ATTEN. Press UP or DOWN until the desired MIDI channel (1 through 16) is displayed, then press MODE.

The assignedd MIDI channel is used both for sending and receiving data. The assigned channel is effective immediately, even before you press MODE the last time.

Set the channel to OFF to disable the MIDI interface.

To send preset memory or front panel settings:

First connect the sending unit to the receiving unit and set the MIDI channel the same for both the sending and receiving units. If the receiving unit is a 787A or 787ASL, make sure receiving is not disabled (see below).

Press MODE. Press UP or DOWN until snd (send memory) or SFP (send front panel) is displayed. Press MODE again to execute your selection.

The display will blank out to show that the data is being sent. snt (sent) will be displayed when the transmission is completed. If the download is to a 787A or 787ASL, the display on the receiving unit (or its host) will read rcv (receiving) while the data is being received, and rcd (received) when transmission is completed.

One 787A's preset memory (containing all presets, from 1 through 99) can be sent to another 787A's memory. One 787A's current front panel settings can be sent to another 787A's "front panel."

Memory and front panel settings can also be sent to or received from an appropriate computer or memory device. Sending memory and front panels to or from a device other than a 787A (or 787ASL) is intended for archiving only — no provision has been made for controlling other devices, or for modifying settings from external devices.

To disable the 787A's ability to receive data:

Press MODE. Press UP or DOWN until + rcE (receive enabled) is displayed. Hold down MODE and press INPUT ATTEN; on will be displayed. Press UP or DOWN until OFF is displayed. Press MODE; -rcE (receive not enabled) will be displayed.

MIDI Implementation Data

Commands can be sent to the 787A through the MIDI interface to recall a preset or to send the preset memory or front panel settings to another device. The data needed to implement these commands follows.

"n " in the hex code column should be replaced by one of the alternatives listed in the corresponding explanation. Unless preceded by a "D ," all numbers in the explanations are also given in hexadecimal form.

PROGRAM CHANGE data sent from 787A:

Hex code:	Explanation:
C n	MIDI channel number: n = 0 through F (D 1 – D 16)
n n	preset number: n n = 00 through 64, 7F (00 = preset D 1, 64 = preset D 99, 7F = preset D 0)

PRESET DATA sent from 787A:

Hex code:	Explanation:
F 0	system exclusive command
0 0	
0 0	
2 1	Orban ID
0 n	MIDI channel number: n = 0 through F (D 1 – D 16)
0 1	787A product code
0 1	function: preset memory send
0 n	787A channel: n = 1 (channel A data) or 2 (channel B data) or 3 (channel A and B data)
n n	first byte of memory data
.	
.	
.	
n n	last byte of memory data
F 7	end of system exclusive

CURRENT SETTINGS DATA sent from 787A:

Hex code:	Explanation:
F 0	system exclusive command
0 0	
0 0	
2 1	Orban ID
0 n	MIDI channel number: n = 0 through F (D 1 – D 16)
0 1	787A product code
2 1	function: current settings send
0 n	787A channel: n = 1 (channel A data) or 2 (channel B data) or 3 (channel A and B data)
n n	first byte of memory data
.	
.	
.	
n n	last byte of memory data
F 7	end of system exclusive

PROGRAM CHANGE REQUEST sent to 787A:

Hex code:	Explanation:
C n	MIDI channel number: n = 0 through F (D 1 – D 16) (00 = preset D 1, 64 = preset D 99, 7F = preset D 0)
n n	preset number: n n = 00 through 64, 7F (00 = preset D 1, 64 = preset D 99, 7F = preset D 0)

PRESET DATA SEND REQUEST sent to 787A:

Hex code:	Explanation:
F 0	system exclusive command
0 0	
0 0	
2 1	Orban ID
0 n	MIDI channel number: n = 0 through F (D 1 – D 16)
0 1	787A product code
4 1	function: request preset memory send
0 n	787A channel: n = 1 (channel A data) or 2 (channel B data) or 3 (channel A and B data)
F 7	end of system exclusive (after receiving this byte, the 787A will send PRESET DATA)

CURRENT SETTINGS DATA SEND REQUEST sent to 787A:

Hex code:	Explanation:
F 0	system exclusive command
0 0	
0 0	
2 1	Orban ID
0 n	MIDI channel number: n = 0 through F (D 1 – D 16)
0 1	787A product code
4 2	function: request current settings send
0 n	787A channel: n = 1 (channel A data) or 2 (channel B data) or 3 (channel A and B data)
F 7	end of system exclusive (after receiving this byte, the 787A will send CURRENT SETTINGS DATA)

RS-232 Interface

Presets can be recalled with instructions sent through the RS-232 interface. Memory or current front panel settings can be sent or received through the RS-232 interface. The RS-232 baud rate (data transmission rate in bits per second) can be selected, and the RS-232 interface can be disabled from the front panel. To do any of this, the optional RS-232 interface board must be installed.

The 787A's RS-232 interface has a DB-25 connector with DCE (digital communications equipment) wiring. RS-232 handshaking is used to prevent overflow of the input character buffer. The 787A uses the XON(^Q)/XOFF(^S) protocol. A separate RS-232 link must be used for each 787A unit. RS-232 data is transmitted in bytes of 8 bits, with no parity and 1 stop bit.

If the optional 787ASL second channel slave unit is installed, the A or B channel must be selected — see page 3-20.

To select RS-232 baud rate:

Press MODE. Press UP or DOWN until bPS (bits per second) is displayed. Hold down MODE and press INPUT ATTEN. Press UP or DOWN until the desired baud rate is displayed, then press MODE again.

The RS-232 baud rate can be set to 300, 600, 1200, 2400, 4800, 9600, or 19,200 bits per second. (Baud rates with decimal points are expressed in kbps, as: 1.20 = 1.20 kbps, or 1200 bps.) Set the baud rate to OFF to disable the RS-232 interface.

The selected baud rate is effective immediately, even before you press MODE the last time.

To send preset memory or front panel settings:

First connect the sending unit to the receiving unit and set the baud rate the same for both the sending and receiving units. If the receiving unit is a 787A or 787ASL, make sure receiving is not disabled (see below).

Press MODE, then press UP or DOWN until Snd (send memory) or SFP (send front panel) is displayed. Press MODE again to execute your selection.

The display will blank out to show that the data is being sent, then display Snt (sent) when the transmission is completed. If the download is to a 787A or 787ASL, the display on the receiving unit (or its host) will read rcv (receiving) while the data is being received, and rcd (received) when transmission is completed.

One 787A's preset memory (containing all presets, from 1 through 99) can be sent to another 787A's memory. One 787A's current front panel settings can be sent to another 787A's "front panel."

Memory and front panel settings can also be sent to or received from an appropriate computer or memory device. Sending memory and front panels to or from a device other than a 787A (or 787ASL) is intended for archiving only — no provision has been made for controlling other devices, or for modifying settings from external devices.

To disable the 787A's ability to receive data:

Press MODE. Press UP or DOWN until + rcE (receive enabled) is displayed. Hold down MODE and press INPUT ATTEN; on will be displayed. Press UP or DOWN until OFF is displayed. Press MODE; -rcE (receive not enabled) will be displayed.

RS-232 Implementation Data

Commands can be sent to the 787A through the RS-232 interface to recall a preset or to send the preset memory or front panel settings to another device. The data needed to implement these commands follows.

"n" in the ASCII code column should be replaced by one of the alternatives listed in the corresponding explanation. All data should be limited to ASCII characters in the range 32 through 127.

PROGRAM CHANGE data sent from 787A:

ASCII code:	Explanation:
55	787A product code
56	787A product code
55	787A product code
32	function: program change
n	787A channel: n = 65 (channel A data) or 66 (channel B data) or 67 (channel A and B data)
n	preset number
10	end of transmission

PRESET DATA sent from 787A:

ASCII code:	Explanation:
55	787A product code
56	787A product code
55	787A product code
33	function: preset memory send
n	787A channel: n = 65 (channel A data) or 66 (channel B data) or 67 (channel A and B data)
n	first byte of memory data
.	
.	
.	
n	last byte of memory data
10	end of transmission

CURRENT SETTINGS DATA sent from 787A:

ASCII code:	Explanation:
55	787A product code
56	787A product code
55	787A product code
34	function: current settings send
n	787A channel: n = 65 (channel A data) or 66 (channel B data) or 67 (channel A and B data)
n	first byte of memory data
.	
.	
.	
n	last byte of memory data
10	end of transmission

PROGRAM CHANGE REQUEST sent to 787A:

ASCII code:	Explanation:
55	787A product code
56	787A product code
55	787A product code
32	function: request program change
n	787A channel: n = 65 (channel A data) or 66 (channel B data) or 67 (channel A and B data)
n	preset number
10	end of transmission

PRESET DATA SEND REQUEST sent to 787A:

ASCII code:	Explanation:
55	787A product code
56	787A product code
55	787A product code
35	function: request preset memory send
n	787A channel: n = 65 (channel A data) or 66 (channel B data) or 67 (channel A and B data)
10	end of transmission (after receiving this byte, the 787A will send PRESET DATA)

CURRENT SETTINGS DATA SEND REQUEST sent to 787A:

ASCII code:	Explanation:
55	787A product code
56	787A product code
55	787A product code
36	function: request current settings send
n	787A channel: n = 65 (channel A data) or 66 (channel B data) or 67 (channel A and B data)
10	end of transmission (after receiving this byte, the 787A will send CURRENT SETTINGS DATA)

Second Channel Slave Unit

When the optional 787ASL second channel slave unit is installed, the control settings of both units are displayed on and controlled from the host 787A's front panel. The lights above the CHANNEL key on the host 787A indicates which unit is being controlled from the host's front panel. The 787A is channel A; the 787ASL is channel B.

The INPUT ATTEN of each channel can be adjusted separately to adjust channel balance. Although all controls may be set differently for each channel when they are STEREO COUPLED, both channels will receive the same gain reduction and gating as the channel that requires the *most* gain reduction. Stereo coupling better preserves stereo imaging. When operated independently, each channel's INPUT ATTEN can be adjusted to achieve the desired gain reduction for that channel.

The controls for both units are locked or unlocked simultaneously when the optional 787ASL second channel unit is installed.

When the optional 787ASL second channel unit is installed, the channel must be specified when performing certain memory and interface functions.

Memory:

- Select the CHANNEL the preset will be recalled *from* before pressing RECALL the first time; select the CHANNEL the preset will be recalled *to* before pressing RECALL the second time.
- Select the CHANNEL for store or compare before pressing STORE or COMPARE the first time. The selected channel's front panel settings are stored in or compared with the selected channel's memory. To store a preset from one channel as a preset for the other channel, first recall the preset to the other channel's front panel.
- If both channels are selected, the selected preset will be simultaneously recalled from the 787A's memory to 787A's front panel, and from the 787ASL's memory to its "front panel." Similarly, presets will be simultaneously stored in both memories from the corresponding front panels if both channel are selected before storing.
- If the 787ASL is set to STEREO COUPLE, the same preset will be recalled to both channels. A ≠ will appear before the preset number when RECALL is first pressed if the active settings for one channel are not the same as the stereo-coupled preset. When the 787ASL is set to STEREO COUPLE, presets are stored, recalled, and compared in pairs.

MIDI or RS-232 interface:

- Select the 787A CHANNEL that will be affected before selecting the MIDI channel, or sending the memory or front panel. Press MODE after selecting one or both 787A channel(s).
- Memory and front panels can be sent between a 787A and a 787ASL, between two 787ASLs, or between a 787ASL and an external storage device.
- The MIDI or RS-232 interface board is installed in the 787A only; the 787ASL is interfaced through its host 787A.

Quick Reference

To modify equalization parameters:

Press EQ to turn equalization on or off.
Toggle LOW, MID, or HIGH to select band and parameter.
When CENTER FREQ is lit, toggle MODE for coarse or fine scale.
Press UP or DOWN to modify displayed value.

To modify other audio processing parameters:

Press INPUT ATTEN, RELEASE TIME, GATE THRESHOLD, GATE DEPTH, DE-ESSER THRESHOLD, or EFFECTS RETURN LEVEL.
Press UP or DOWN to modify displayed value.

To recall preset:

Press RECALL.
Press UP or DOWN to display PRESET NUMBER.
Press RECALL.

To store preset:

Press STORE.
Press UP or DOWN to display PRESET NUMBER.
Press STORE.

To compare preset with panel:

Press COMPARE.
Press UP or DOWN to display PRESET NUMBER.
Toggle COMPARE.

To lock or unlock audio controls:

Press MODE.
Press UP or DOWN to display LOC.
To lock, hold down MODE while pressing INPUT ATTEN.
To unlock, press MODE.
Press UP or DOWN to display first two digits of security code.
Press MODE.
Press UP or DOWN to display second two digits of security code.
Press MODE.

To select interface channel, speed:

Press MODE.
Press UP or DOWN to display CHN or BPS.
Hold down MODE while pressing INPUT ATTEN.
Press UP or DOWN to display channel, bits per second, or OFF.
Press MODE.

To send memory or front panel:

Press MODE.
Press UP or DOWN to display SEND (send memory),
or SEND (send front panel).
Press MODE.

To disable receive:

Press MODE.
Press UP or DOWN to display + RCV.
Press MODE.
Press UP or DOWN to display -RCV.
Press MODE.

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Log sheet:

Date:

Preset #	Channel (A, B, STEREO)	Set-up used for:	External effects:

Section 4 Maintenance

page contents

4-2 Routine Maintenance

4-3 Getting Inside the Chassis

4-3 Performance Evaluation, Alignment

CAUTION

The installation and servicing instructions in this manual are for use by qualified personnel only. To avoid electric shock do not perform any servicing other than that contained in the Operating Instructions unless you are qualified to do so. Refer all servicing to qualified service personnel.

Routine Maintenance

No routine maintenance of this product is required.

If the front panel becomes soiled, clean it with a mild household detergent and a damp cloth. Stronger solvents should not be used because they may damage plastic parts, paint, or the silk-screened lettering (99% isopropyl alcohol can be safely used).

An internal battery protects the 787A's memory during power failures and temporary disconnection. The battery will normally last up to 5 years. The decimal point on the display will flash when the battery needs to be replaced.

IMPORTANT

Before replacing the battery, download the contents of memory through the MIDI or RS-232 interface (see page 3-14 or 3-17) to save presets while the battery is being replaced.

To replace the battery:

First disconnect the 787A from AC power, and remove its top cover (see page 4-3). Replace the battery with a 3-volt lithium battery, such as Duracell® DL2032 (see Fig. 4-1 for location of battery), then replace the top cover. The memory will be unaffected for 15 to 30 seconds after the battery is removed — so work quickly!

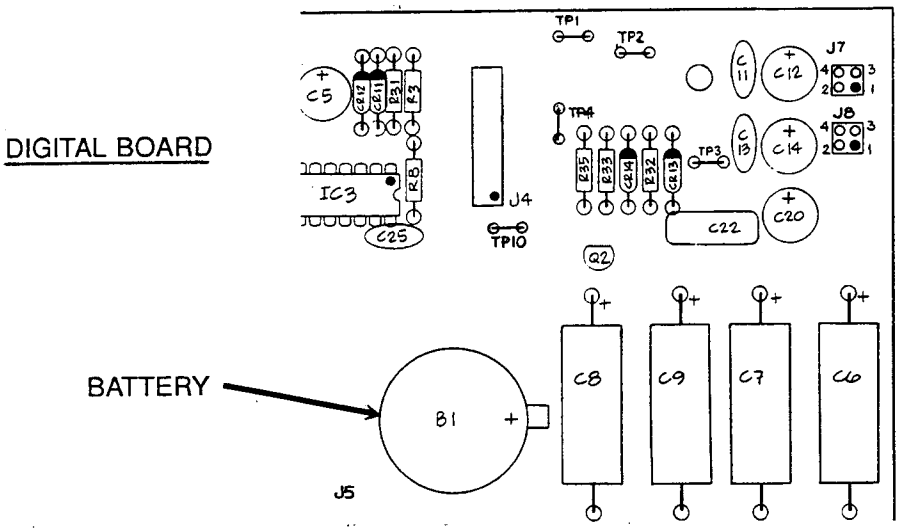

Fig. 4-1: Location of Memory Back-up Battery

Getting Inside the Chassis

To access the circuit boards, remove all ten screws holding the appropriate cover in place, then lift that cover off. (The 787ASL's covers are attached with six screws each.)

Remove the *top cover* for access to the jumpers on the component side of the analog circuit board. After removing the top cover, remove the three screws from each mounting flange (at the front of either side, behind the front panel) to access the rear of the front panel circuit board.

Remove the *bottom cover* for access to the equalization circuit board or the solder side of the digital circuit board.

When replacing the covers, replace all screws snugly (be careful not to strip the threads by fastening the screws too tightly).

Performance Evaluation, Alignment

Use these instructions to thoroughly check the performance of the 787A. To test a 787SL, use this procedure and the host 787A.

The evaluation includes checks of the power supplies, main audio paths, enhancement VCA circuitry, compressor and enhancer control, display calibration, gating control logic, and output stages.

IMPORTANT

Because the 787A circuitry is highly stable, routine performance evaluation and alignment are *not* required and *not* recommended. The following evaluation procedures are extremely thorough, and they are included primarily for reference. If you are familiar with the operation of your 787A, problems with its circuitry will be readily apparent to you in the audio or in abnormal behavior of the ENHANCEMENT display. **If you must perform these tests**, be sure you have the necessary equipment (see 4-4). If you do not have the proper instruments, please use Orban's excellent factory service facility (see page 5-7).

See assembly drawings in Section 6 for locations of components and test points. *All test points are located on the main circuit board.*

Perform procedures in order without skipping steps.

Equipment required:

Audio oscillator
With a residual distortion below 0.0015%

THD analyzer
With a residual distortion below 0.0015%

Audio voltmeter
Accurate to 2.0%

DVM
Accurate to 0.02%

Low frequency spectrum analyzer
Tektronix 5L4N in a 5111 BiStable mainframe, or equivalent. Alternatively, a sweep generator with 50-15,000Hz logarithmic sweep can be used with an oscilloscope in x/y mode.

Frequency meter
Accurate to 0.1%

Note: A Soundtech 1700 A/B will satisfy the first three requirements.

1) Remove the top and bottom cover:

A☐ Remove the eight screw which hold the top cover in place, then lift off the top cover.

B☐ Remove the eight screw which hold the bottom cover in place, then lift off the bottom cover.

2) Check power supply:

NOTE: All test points in this section are located on the digital (DG) board.

A☐ If present, remove the ground link on the rear panel terminal strip.

B☐ Verify the following resistances:

Between:	And:	Resistance:
Power cord ground pin	Chassis	0Ω
Each of the power cord blades	Chassis	∞Ω

C☐ Verify the following resistances:

Between:	And:	Resistance:
GROUND ⏚	GROUND ⏚	∞Ω
GROUND ⏚	Chassis	0Ω
GROUND ⏚	Test point TP11 (power supply common)	0Ω

D☐ Replace ground link, if used in your system.

E☐ Power up and measure the unregulated ±22V supplies at TP7 and TP1.

F☐ Verify that they are between ±18 and ±28 volts.

G☐ Measure the unregulated 8V supply at TP8 and verify that it is between +7 and +12.5 volts.

H☐ Measure the unregulated phantom supply at the collector of Q1 and verify that it is between +52V and +70V.

I☐ Measure the outputs of the ±15 volt regulators at TP2 and TP3

J☐ Verify that they are 15.0 volts, ±0.7V.

K☐ Measure the outputs of the Analog and the Digital +5 regulators at TP5 and TP6.

L☐ Verify that they are +5.0 volts, ±0.2V.

M☐ Measure the output of the +48 volt regulator at TP4 and verify that it is +48 volts, ±2V.

N☐ Verify the presence of +48V on pin 8 of J5 of the analog (AG) board.

O☐ Monitor the regulated power supply rails at TP2, TP3, TP4, TP5 and TP6 with the oscilloscope.

P☐ Press the RESET button to stop the processor and verify that the observed noise and ripple is below 4MV peak on all 5 supplies.

Q☐ Using the DVM, monitor the side of R72 on the AG board that is closest to IC16.

R☐ Verify a voltage of +9.2 (±0.1V).

S☐ Monitor pin 1 of IC18 and verify a voltage of −9.2V (±0.1V).

T☐ Power down, wait 5 seconds, and monitor the cathode of CR12 on the DG board.

U☐ Verify the presence of 3.0VDC (±0.2V).

V☐ Power up and monitor TP5 on the AG board with the DVM.

W☐ Adjust the REFERENCE TRIM pot (R139) for a reading of 3.0VDC (±0.1V).

3) Check display

A☐ With the oscilloscope, verify that the characteristic waveforms of the memory request and I/O request are present at pins 19 and 20 of IC4 (Z80) Refer to Figures 1 and 2. This indicates that the processor is running.

B☐ Power down and remove IC7 (DG board) from its socket and the Analog board power connector from J2.

C☐ Power up and verify that all processor controlled LEDs and display segments are lighted (the OVERLOAD, GATED and DE-ESSING should not be ON).

D☐ Rotate the DISPLAY BRIGHTNESS control (R2) through its range and verify proper operation.

E☐ Push the RESET button and verify that all LEDs and segments go out.

F☐ Verify that the GAIN REDUCTION and OUTPUT LEVEL bar graphs are fully illuminated.

G☐ Power down, replace IC7 and the AG power connector, Restore the power.

4) Check Digital Operation

A☐ Perform a RAM check by holding the RECALL key, momentarily pushing RESET, and releasing the RECALL key. Any display other than 00 indicates a RAM defect.

B☐ Push the RESET again to exit RAM check.

C☐ Push the RECALL key, MODIFY to program 0, push RECALL again.

D☐ Push the keys listed below and verify the indicated action. Each key will cancel the previously selected key.

Push INPUT ATTEN key, LED lights, push MODIFY, LED lights: display changes to a **NUMERIC** indication in dB. MODIFY changes the display within a range of −25dB to +5dB.

Push RELEASE TIME, LED lights, push MODIFY, LED lights: display changes to a numeric indication in dB/SECOND. MODIFY changes the display within a range of 1.0 to 50.0 dB/SECOND. Leave at 50dB/sec.

Push GATES-THRESHOLD, LED lights, push MODIFY, LED lights: display reads

- OFF, pushing again will toggle the NOISE GATE ON and OFF, MODIFY one step up and the green GATED LED will probably light if the gate circuit is functioning. MODIFY will adjust the GATE THRESHOLD within a range of -30dB to -0.0dB. Leave the GATE THRESHOLD at -30dB and leave the NOISE GATE ON.

Push GATES-DEPTH, LED lights, push MODIFY, LED lights: display has a numeric indication in dB, MODIFY changes the display within a range of -25.0dB to 0.0dB. Select COMPRESSOR GATE THRESHOLD and MODIFY to OFF.

Push EQ ON to toggle the EQ ON LED ON and OFF. No other LEDs change. Leave ON.

Push LOW EQ, LED lights, push MODIFY, LED lights one of the EQ FUNCTION LEDs lights, the corresponding units display LED (dB, Hz/kHz, OCTAVE) lights: subsequent pushes toggle the FUNCTION LEDs through the three functions with the corresponding units display LED lighting. The display will change accordingly. MODIFY will change the display as follows: BOOST/CUT -inF to +16dB, CENTER FREQ 30Hz to 632Hz, Q .10 TO 5. Leave at 0.0dB BOOST/CUT.

Push MID EQ, LED lights: same action as above except that **FREQ** range is 210Hz to 7.65kHz. Leave at 0.0dB BOOST/CUT.

Push HI EQ, LED lights: same action as above except that **FREQ** range is 420Hz to 15.3kHz. Leave at 0.0dB BOOST/CUT.

Push DE-ESS THRESHOLD, LED lights: display reads OFF, second push lights ON and MODIFY, display reads 0.0dB. Subsequent pushes toggle between ON and OFF, leave ON. MODIFY changes the display within the range of -48.0dB and 0.0dB. Leave at 0.0dB and OFF.

Push EFFECTS RETURN, LED lights, push MODIFY, LED, lights: display reads OFF. One push of MODIFY UP changes the display to -30.0dB. Subsequent MODIFY UP changes the display within a range of -30.0dB to +16.0dB.

Push MODE SELECT. First push starts flashing, lights MODIFY: display reads -Loc. Second push **hold down** flashes INPUT ATTEN. Push INPUT ATTEN key and display will read 00. Push twice more and MODIFY will go out, display will read + Loc and none of the audio processing keys will have any effect. Push the LOCKOUT RESET button on the Digital board and the display will change to -Loc.

Push RECALL. First push starts flashing, lights MODIFY: display reads PRESET NUMBER 0. MODIFY changes the display within the range of 0 to 99 and then LASt. Leave at 0. Second push and RECALL and MODIFY go out.

Push STORE: same as above except no LASt preset and it will not stop flashing until you change the preset to something other than 0.

Push COMPARE. First push starts key flashing and lights MODIFY. Change the program number with MODIFY. Second push changes the display back to the previous program number and the MODIFY and COMPARE go out. Subsequent pushes toggle between the previous two programs. Leave COMPARE OFF.

Push CHANNEL. No action. If a slave is connected the key will toggle between A, B, A+B and back to A.

Push REAR PANEL REMOTE. Momentarily ground the RECALL terminal and verify that the RECALL key starts flashing. Ground the UP and then the DOWN terminals and verify operation. Ground the RECALL terminal and verify that the RECALL key stops flashing. If a slave is connected, repeatedly ground the CHANNEL terminal and verify the same operation as the previous (CHANNEL) step.

5) Check memory functions

A☐ Select GATE THRESHOLD and MODIFY UP so the GATED LED lights.

B☐ Select the EQ ON key.

C☐ Select the DE-ESSER key and toggle to ON.

D☐ Select STORE and MODIFY UP to PRESET #1 (or any unused preset) then push STORE again. This will store GATE ENABLED, EQ ON and DE-ESSER ON in PRESET #1.

E☐ Select RECALL and MODIFY DOWN to PRESET #0.

F☐ Push RECALL again and verify that the functions above turn OFF.

G☐ Select COMPARE and MODIFY to PRESET #1.

H☐ Repeatedly push COMPARE and verify that the unit toggles between PRESETS 1 and 0.

I☐ Leave with COMPARE OFF and in PRESET #0.

6) Check audio input stage

NOTE: Unless otherwise specified: Distortion and noise measurements are taken in a 20-20000Hz bandwidth, tolerances are ±100Hz and ±0.5dB, the (−) INPUTS and OUTPUT are connected to ground and the OUTPUTS are loaded with 600 ohms. Test points referred to are on the analog (AG) board.

A☐ Connect the oscillator to the (+) INPUT of the 787A.

B☐ Adjust the oscillator for 1kHz and a level of +4.0dBm.

C☐ Monitor TP1 with the audio voltmeter, oscilloscope and THD analyzer.

D☐ Push INPUT ATTEN key and MODIFY to display a reading of −5dB and verify a level of −12.0dBm (±1.0dB).

E☐ Verify that the THD is below 0.05%.

F☐ Mute the signal and verify a residual noise below −75dBm.

G☐ Observe the oscilloscope for 'popcorn' noise or oscillation.

H☐ Restore the signal.

I☐ Connect the oscillator output to both the (+) and (−) INPUTs and verify a common mode cancellation of at least 50dB.

J☐ Disconnect the oscillator from the (−) INPUT and re-connect the ground.

K☐ Select INPUT ATTEN key and MODIFY to +5dB then DOWN to −25dB.

L☐ Verify that the signal is progressively reduced by the amount indicated on the display.

NOTE: In this and every other MODIFY function, every push of the key must have the indicated effect with no skips or jumps over its entire range of adjustment. MODIFY the INPUT ATTEN UP to −10dB.

M☐ Move jumper A to the −10 position and verify that the level observed increases by 14dB. Return the jumper to the +4 position.

7) Check compressor and control

A☐ Jumper the equalizer (EQ) board to POST compressor.

B☐ Select INPUT ATTEN key and MODIFY to −10dB.

C☐ Center the GAIN TRIM pot (R23).

D☐ Adjust the oscillator for +4dBm output.

E☐ Monitor TP2 with the audio voltmeter, THD analyzer and oscilloscope.

F☐ Verify a signal of −4dBm (±1dB).

G☐ Verify a G/R indication of about 10dB.

H☐ Push the INPUT ATTEN key and MODIFY UP until the red 25dB G/R LED barely lights.

I☐ Mute the signal and verify that the G/R indication starts to drop.

J☐ Push the RELEASE TIME key and MODIFY the release time toward 50dB/sec.

K☐ Verify that the release time progressively shortens.

L☐ Restore the signal.

M☐ Measure the release time at 50dB/sec, 12dB/sec and 5dB/sec.

N☐ Verify that the decay time to 0 (or 2.5dB) of G/R is about 0.5 seconds, 2.0 seconds and 5.0 seconds at the respective release time setting.

O☐ Restore the signal, push the INPUT ATTEN key and MODIFY to 20dB of G/R.

P☐ Monitor TP2 with the THD analyzer and adjust the DISTORTION NULL control (R37) for minimum THD.

Q☐ Verify that this level is below 0.1%.

R☐ Adjust the oscillator for +4dBm output and connect it, through a 10k resistor, to TP4.

S☐ Adjust the THUMP NULL control (R30) for minimum 1.0kHz feedthrough.

T☐ Disconnect the oscillator.

U☐ With the INPUT ATTEN set for +5dB, adjust the oscillator output level so the 5dB G/R LED just lights.

V☐ Note the audio level at TP2 and increase the oscillator output level by 15dB.

W☐ Verify that the G/R meter indicates 20dB of G/R (±1 segment) and that the level at TP2 increases by no more than 1dB.

X☐ Monitor TP3 with the DVM.

Y☐ Increase the oscillator level until the DC level is 10.0 volts. The G/R meter should indicate 25dB of G/R. Alternately monitor TP3 and TP4 and adjust the GAIN TRIM control for the same reading on both test points (±0.1V).

8) Check compressor and noise gate

A☐ Mute the oscillator and push the GATE THRESHOLD key.

B☐ Verify a display of OFF and that the green GATED LED is OFF.

C☐ MODIFY UP for a display of −30 (−29 is satisfactory) and verify that the GATED LED lights.

D☐ Restore the oscillator and set its output level (and the 787A INPUT ATTEN, if necessary) to produce about 20 dB of G/R.

E☐ Verify that the GATED LED goes out.

F☐ Mute the oscillator.

G☐ Verify that the GATED LED lights and the G/R indication holds and then slowly drifts to 10dB of G/R. MODIFY the GATE THRESHOLD DOWN to OFF and verify that the G/R indication decays to 0dB.

H☐ Restore the oscillator.

I☐ Adjust the oscillator level to 0dBm, push the INPUT ATTEN key, MODIFY to 0dB.

J☐ Push the GATE THRESHOLD key and MODIFY UP.

K☐ Verify that the GATED LED lights when the display reads −8dB (±2 steps).

L☐ Adjust the oscillator for −10dBm.

M☐ Turn the NOISE GATE ON and verify that the GATED LED is still ON.

N☐ Push the DEPTH key, note the level at TP2, and MODIFY the DEPTH down.

O☐ Verify that the level reduction corresponds to the display indication.

P☐ Turn the NOISE GATE OFF and verify that the signal returns to its original level.

Q☐ MODIFY the COMPRESSOR GATE to OFF.

R☐ Mute the oscillator and allow the indicated G/R to decay to 0.

S☐ MODIFY the COMPRESSOR GATE to −30.0dB.

T☐ Verify that the GATED LED lights and that the G/R indication drifts up to 10dB of G/R over a period of about 2 minutes. It is important that it reach its full GATED G/R.

U☐ Turn the NOISE GATE ON, MODIFY the DEPTH to −25dB and monitor TP2 with the DVM. Adjust the DE-ESS THUMP NULL (R41) until there is no difference in the DC level as the NOISE GATE is toggled between ON and OFF. This level will be very close to 0 volts.

NOTE: It is very important to do this as precisely as possible.

V☐ Turn the GATE THRESHOLD and the NOISE GATE to OFF.

W☐ Restore the oscillator.

9) Check parametric equalizer

A☐ Connect the spectrum analyzer input to TP10 on the EQ board and the tracking generator to the 787A INPUT.

B☐ Adjust the INPUT ATTEN and tracking generator output to a convenient level.

C☐ Set the analyzer for 10dB/division.

D☐ Turn the EQ ON, select LOW-BOOST/CUT and MODIFY UP to +16dB.

E☐ Select LOW-CENTER FREQuency and verify a 16dB boost (±1dB) at the indicated frequency. Return to 0.0dB BOOST/CUT.

F☐ Repeat step 2 for the MID and HIGH bands to verify basic EQ operation.

G☐ Return each band to 0dB BOOST/CUT.

H☐ Disconnect the spectrum analyzer, reconnect the oscillator and audio voltmeter.

I☐ Select MID-CENTER FREQuency, MODIFY to 7.65kHz, select MID-BANDWIDTH, MODIFY to .10 octave and set the oscillator for 7.65kHz.

NOTE: In this and the next step, use a frequency meter to verify the oscillators frequency. Monitor TP8 with the audio voltmeter and note the level observed. Monitor TP7 and adjust the MID GAIN TRIM control (C7) until the level is the same as observed at TP8 (±0.2dB).

J❑ Select HIGH-CENTER FREQuency, MODIFY to 15.3kHz, select HIGH-BANDWIDTH, MODIFY to .10 octave and set the oscillator for 15.3kHz. Monitor TP10 with the audio voltmeter and note the level observed. Monitor TP9 and adjust the HIGH GAIN TRIM control (C12) until the level is the same as observed at TP10 (±0.1dB).

K❑ Monitor TP10 with the audio voltmeter.

L❑ Select HIGH-BANDWIDTH and MODIFY to 5 octaves.

M❑ Select HIGH-BOOST/CUT.

N❑ While observing the voltmeter, MODIFY UP and verify that the boost conforms to the display indication.

O❑ Repeat MODIFYing DOWN.

P❑ Disconnect the oscillator and audio voltmeter.

Q❑ MODIFY UP to 0dB cut.

R❑ Connect the spectrum analyzer input to TP10 on the EQ board and the tracking generator to the 787A INPUT.

S❑ Adjust the INPUT ATTEN and tracking generator output to a convenient level.

T❑ Set the analyzer for 10dB/division.

U❑ Select LOW-BOOST/CUT and MODIFY UP to +16dB while observing the spectrum analyzer.

V❑ Verify that the boost increases to +16dB (±1dB).

W❑ Select LOW-BANDWIDTH and MODIFY in the range of 5 octaves to .10 octave.

X❑ Leave at .1 octave.

Y❑ Verify the proper adjustment of "Q".

Z❑ Select LOW-BOOST/CUT and MODIFY DOWN to -inF.

A1❑ Verify a cut of at least 40dB (you may need to use a manual sweep to see the true depth of the notch).

B1❑ Select LOW-CENTER FREQuency and MODIFY through its range.

C1❑ Verify that the cut frequency changes corresponding to the display indication. Return to 0.0dB BOOST/CUT.

D1❑ Repeat step 8 for the MID and HIGH bands.

E1☐ Refer to Figure 3 for a typical family of curves.

F1☐ Reset the EQ jumpers to PRE/POST configuration, turn EQ OFF and disconnect the spectrum analyzer.

10) Check EFFECTS RETURN

A☐ Connect the oscillator to the (+) EFFECTS RETURN INPUT and ground the (−) INPUT.

B☐ Push the EFFECTS RETURN key and MODIFY UP to +16.0dB.

C☐ Turn the OUTPUT LEVEL control fully CCW.

D☐ Adjust the oscillator to +4dBm at 1kHz.

E☐ Monitor pin 1 of IC5 with the audio voltmeter.

F☐ Verify a level of +17dBm (±1dB).

G☐ Verify a THD of less than 0.01%, mute the oscillator and verify that the residual noise is below −75dBm.

H☐ Restore the oscillator.

I☐ Increase the oscillator level to +8dBm and verify that the OVERLOAD LED starts flashing.

J☐ MODIFY the EFFECTS RETURN DOWN until the LED stops flashing.

K☐ Verify that the level observed is +19.0dBm (±1.0dB).

L☐ Return the oscillator level to +4dBm and MODIFY UP to +16.0.

M☐ Connect the oscillator to the (+) and (−) EFFECTS RETURN INPUTS.

N☐ Verify a common mode cancellation of at least 50dB.

O☐ Disconnect the oscillator from the (−) INPUT and reconnect the (−) INPUT to ground.

P☐ MODIFY DOWN and verify that the level observed is reduced corresponding to the display indication.

Q☐ Verify that the signal mutes when the display reads OFF.

R☐ MODIFY UP to +16.0.

S☐ Turn the OUTPUT LEVEL control fully CW.

T☐ Do not disconnect the oscillator.

11) Check output stage

A☐ Mute the EFFECTS RETURN signal and remove the ground from the (−) OUTPUT.

B☐ Monitor the (+) OUTPUT, then the (−) OUTPUT with the DVM.

C☐ Verify that the DC offset is below 15mV, typically 5mV.

D☐ Ground the (−) OUTPUT terminal, load the OUTPUT with a 600 ohm resistor and monitor the (+) OUTPUT terminal with the audio voltmeter, THD analyzer and oscilloscope.

E☐ Adjust the oscillator for an output level just below the threshold of clipping.

F☐ Verify that this level is greater than +20dBm.

G☐ Turn the OUTPUT LEVEL CCW until the OUTPUT level is +18dBm.

H☐ Verify that the THD is below 0.03%.

I☐ Observe the VU meter and verify that the 0dB segment is barely lit (±0.5dB in output level).

J☐ Ground the (+) terminal, monitor the (−) terminal and repeat steps 3 and 4.

K☐ Disconnect the oscillator from the EFFECTS RETURN.

L☐ MODIFY to OFF and remove the ground on the (+) OUTPUT terminal and place it on the (−) terminal.

12) Check DE-ESSER

A☐ Connect the spectrum analyzer to the INPUT and OUTPUT of the 787A. Select the DE-ESSER and turn it ON.

B☐ MODIFY the THRESHOLD to −48.0dB.

C☐ Select th INPUT ATTEN key and MODIFY to −10dB.

D☐ Set the analyzer to 2dB/division and increase the tracking generator output (and/or INPUT ATTEN and OUTPUT LEVEL) until the de-essing action is clearly visible.

E☐ Turn the DE-ESSER OFF and verify that the DE-ESSER action ceases.

F☐ Turn the DE-ESSER ON.

G☐ MODIFY UP step by step while verifying that the de-essing action diminishes. Refer to Figure 4 for typical curves.

H☐ Turn the DE-ESSER OFF and verify that the observed response is flat (±0.25dB).

13) Check EFFECTS SEND

A☐ Connect the oscillator to the INPUT of the 787A and adjust it to produce about 10dB of G/R. Turn the EQ OFF.

B☐ Monitor the EFFECTS SEND terminal with the audio voltmeter, THD analyzer and oscilloscope.

C☐ Verify a level of −1.0dBm (±1.0dB), and a THD below 0.10%.

D☐ Push the INPUT ATTEN key, MODIFY DOWN to −25.0dB, mute the signal and verify a residual noise below 70dBm.

E☐ Check for 'popcorn' or oscillation with the oscilloscope.

F☐ Monitor the (+) EFFECTS SEND terminal with the DVM.

G☐ Verify a DC offset of less than 25mV.

14) Check overall performance

A☐ Connect the oscillator to the INPUT of the 787A.

B☐ Monitor the OUTPUT with the audio voltmeter, THD analyzer and oscilloscope.

C☐ RECALL program 0 if another program has been selected.

D☐ Turn the OUTPUT LEVEL control fully CW.

E☐ Adjust the oscillator level to +4dBm and the INPUT ATTEN to produce 20dB of G/R.

F☐ Set the RELEASE TIME to 5dB/sec.

G☐ Measure the THD at 35Hz, 1kHz, 5kHz and 15kHz.

H☐ Verify that the THD is below 0.05%.

I☐ Mute the signal, set the GATE THRESHOLD to −30.0dB and wait for the G/R to drift up to 10dB.

J☐ Select the INPUT ATTEN key and MODIFY to −25dB.

K☐ Measure the residual noise and verify that it is below −65dBm.

L☐ Restore the signal and RECALL any other program.

M☐ Verify that the signal mutes momentarily as the program changes. If it does not, execute the MUTE function. Toggle and verify operation of the mute circuitry.

Section 5 Troubleshooting

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CAUTION

The installation and servicing instructions in this manual are for use by qualified personnel only. To avoid electric shock do not perform any servicing other than that contained in the Operating Instructions unless you are qualified to do so. Refer all servicing to qualified service personnel.

Problems and Possible Causes

Always verify that the problem is not in the source material being fed to the 787A, or in other parts of the system.

Keys do not respond:

The controls may be locked — see page 3-12. If the display and key lights are dark, check to see that the unit is plugged in.

Security code lost:

If the security code is lost, remove the 787A's top cover, and press LOCKOUT RESET button S1 to unlock the controls. S1 is located on the digital circuit board about 3 inches (8 cm) behind the RECALL key.

Error messages:

E - 1 : Time-out error or component failure on the optional MIDI or RS-232 interface board.

E - 2 : Memory or front panel send attempted with MIDI channel (or RS-232 baud rate) set to OFF (see page 3-14 or 3-17).

E - 3 : Attempted to send memory, front panel settings, or commands, but receiving unit is disabled (see page 3-14 or 3-17).

Flashing decimal point on the display:

The memory back-up battery is low and should be replaced. See page 4-2.

Memory loss after power failure:

The memory back-up battery is dead or missing. If the contents of memory were archived through the MIDI or RS-232 interface prior to the power failure, reload the memory (see page 3-14 or 3-17) *after* replacing the battery (see page 4-2).

PEAK OUTPUT LEVEL display flashes when key pushed:

This is normal, and does not indicate a problem.

Display shows bPS when MIDI interface installed, or cHn when RS-232 interface installed:

When one of these optional interface boards is installed, the display is toggled to the appropriate mode label: cHn for MIDI, or bPS for RS-232. It is remotely possible that the display could be accidentally toggled to the wrong mode label after installation. To correct this, press RESET while holding down MODE to toggle to the other mode label.

Optional basic remote control accessory doesn't work:

It is possible that the basic remote control accessory could be accidentally disabled after installation. To correct this, press RESET while holding down MODE, then release RESET. The display will toggle from OFF to rEC to indicate that the remote control accessory is enabled.

Program mutes when key pressed:

The audio output is normally muted when the RESET, EQ, RECALL, or COMPARE keys are pressed, or when front panel settings or RECALL are received via MIDI or RS-232 interface or remote control.

Press the RESET button while holding down the INPUT ATTEN key to toggle muting on and off. The display will indicate whether muting is On or OFF when these are pressed.

RFI, hum, clicks, or buzzes:

A grounding problem is likely. Review the information on grounding in Section 2.

The 787A's moderate RF suppression should be adequate for the vast majority of installations. However, installation next to a high-power transmitter may still cause problems. Additional RF suppression, careful examination of the grounding scheme, and other techniques familiar to the broadcast engineer may have to be employed.

Power supply problems:

The voltage regulators are operated conservatively, and can be expected to be extremely reliable. Before replacing the regulators, check to see whether other abnormalities in the circuitry (such as a shorted IC) have caused excessive current demand which is in turn causing the regulator ICs to either limit current or go into thermal shutdown (the two built-in protective modes). If it becomes necessary to replace a regulator, be sure to replace its heat dissipator securely.

Regulator ICs are frequency-compensated by capacitors at their outputs to prevent high-frequency oscillations. If one of these capacitors is ever replaced, be sure to use a low-inductance aluminum electrolytic. (A tantalum can fail because the current-delivering capacity of the power supply can cause a runaway condition if the dielectric is punctured momentarily; a high-inductance aluminum can fail to prevent a regulator from oscillating.) Check for oscillation on the power bus with an oscilloscope if C12, C13, C15, or C18 on the digital circuit board is replaced.

Output module failure:

The 5532 and 411 opamps used in the balanced output module may be freely replaced as necessary. However, the circuit is extremely sensitive to the characteristics of the resistors, so field repair of resistor failure (which is very unlikely) requires replacement of the entire output module in question if adequate headroom and common-mode rejection are to be maintained (see page 5-7 for information about factory service).

Diagnostic Routines

Checking the RAM

There are two diagnostics routines built into the 787A's software. One routine will check for errors in the RAM IC. The other routine will clear the entire contents of the RAM and intitialize all of the presets and operating parameters.

To verify RAM IC works correctly:

Press RECALL and RESET and release RESET. The display will show 0 0 . Press RECALL to envoke the RAM test. The display will momentaraly blank, and then 0 0 will be displayed if no errors occur. If any errors are detected, the number of blocks of memory affected will be displayed. In this case the RAM should be replaced. Pressing the RESET key will return the unit to its normal operating mode.

NOTE: The contents of memory will not be affected as a result of this test.

To clear the contents of the RAM IC :

Press RECALL and RESET and release RESET, then RECALL. The display will show 0 0 . Press UP to display 0 1 . Press RECALL and hold. The display will show c l r and the INPUT ATTEN LED will blink. Push INPUT ATTEN and then release both keys. The display will briefly show c l d and then return to 0 0 , the RAM diagnostics program. Pressing the RESET key will return the unit to its normal operating mode.

WARNING

All of the PRESETS stored in the unit will be erased forever. The RS-232, MIDI, or remote control and the EQ mute operating settings may need to be restored manually. Refer to the corresponding sections of this manual for instructions on how to configure the settings.

Components: Fault Diagnosis, Replacement

If you want to troubleshoot on the component level instead of returning the unit to the factory for service, read the circuit description in Section 6 before continuing. Servicing on the component level requires a deeper understanding of 787A circuitry.

Here are some suggestions for component-level troubleshooting:

IC opamps are operated such that the characteristics of their associated circuits are essentially independent of IC characteristics and dependent only on external feedback components. The feedback forces the voltage at the (−) input terminal to be extremely close to the voltage at the (+) input terminal. Therefore, if you measure more than a few millivolts difference between these two terminals, the IC is probably bad.

Exceptions are ICs used without feedback (as comparators) and ICs with outputs that have been saturated due to excessive input voltage because of a defect in an earlier stage. However, if an IC's (+) input is more positive than its (−) input, yet the output of the IC is sitting at −14 volts, the IC is almost certainly bad. The same holds true if the above polarities are reversed. Because the characteristics of the 787A's circuitry are essentially independent of IC opamp characteristics, an opamp can usually be replaced without recalibration.

A defective opamp may appear to work, yet have extreme temperature sensitivity. If parameters appear to drift excessively, freeze-spray may aid in diagnosing the problem. Freeze-spray is also invaluable in tracking down intermittent problems. But *use it sparingly*, because it can cause resistive short circuits due to moisture condensation on cold surfaces.

See the introduction to the parts list on page 6-23 for detailed information on **ordering parts**. Nearly all parts used in the 787A have been very carefully chosen to make best use of both major and subtle characteristics. For this reason, parts should always be replaced with *exact duplicates* if so indicated in the parts list. It is very risky to make "close-equivalent" substitutions because of the possibility of altering performance and/or compliance with regulatory requirements.

Certain parts are selected to tighter than normal specifications (most such parts are noted in the parts list — but it is almost always wiser to return the defective card to the factory for service). Certain parts require partial recalibration if replaced, and this may or may not be practical in the field (such parts are also noted in the parts list).

It is important to use correct technique when **replacing components** mounted on printed circuit cards. Failure to do so may result in circuit damage and/or intermittent problems. Because solder flows well into the through-holes of the double-sided plated-through circuit boards used in the 787A, a technique like the following is required.

To replace a component:

1) Remove the old component.

It is sometimes easier to cut the offending components from its leads, than removing the leads as described below.

A☐ Clear each lead to be removed by melting the solder *on the solder side* (underneath) of the printed circuit card. As soon as the solder is molten, vacuum it away with a spring-actuated de-soldering tool (like the Edsyn Soldapullt®).

Use a **30-watt soldering iron** — do *not* use a soldering gun or a high-wattage iron! DO NOT OVERHEAT THE CARD. Overheating will almost surely cause the conductive foil to separate from the card base. Even with care, it is easy to blister the enamel solder-mask coating (in most cases, this is no cause for concern: the coating is there mainly to prevent moisture from condensing between the traces and to simplify wave-soldering).

B☐ Release the component by gently wiggling each of the leads to break solder webs, then lift the component out.

2) Install the new component.

A☐ Bend the leads of the replacement component so they will fit easily into the appropriate circuit card holes.

B☐ Solder each lead to the bottom side of the card.

Use a 30-watt soldering iron and a good brand of *rosin-core* solder. Make sure that the joint is smooth and shiny.

If no damage was done to the plated-through hole when the old component was removed, soldering of the top (component side) pad is not necessary. But if removal did not progress smoothly, it would be prudent to solder each lead on the component side of the hole to avoid potential intermittent problems.

C☐ Cut each lead of the replacement component close to the solder (underneath) side of the circuit card with a pair of diagonal cutters.

D☐ Remove all residual flux with a cotton swab moistened with a solvent.

Suitable solvents include 1,1,1-trichloroethane (sold as Energine® Fireproof Cleaning Fluid), naphtha (sold as Energine® Regular Cleaning Fluid), and 99% isopropyl alcohol.

Make sure that the flux has actually been removed, and not just made less visible by smearing. While most rosin fluxes are not corrosive, they can slowly absorb moisture and become sufficiently conductive to degrade circuit performance.

Technical Support, Factory Service

If you require technical support, contact Orban customer service. Be prepared to accurately describe the problem. Know the serial number of your 8282 — this is printed on the rear panel of the unit.

Telephone: (1) 510/351-3500 or Write: Customer Service
Orban
or Fax: (1) 510/351-1001 1525 Alvarado Street
San Leandro, CA 94577 USA

Shipping Instructions

To ship the 787A, use the original packing material if it is available. If it is not, use a sturdy, double-wall carton no smaller than 22 × 15½ × 6.5 inches (56 × 37 × 16.5 mm) with a minimum bursting test rating of 200 pounds (91 kg). Place the chassis in a plastic bag (or wrap it in plastic) to protect the finish, then wrap cushioning material around it. Do not pack the unit in crumbled newspaper — use bubble sheets, large foam beads, thick fiber blankets, or similar packing materials. Put at least 1.5 inches (4 cm) of cushioning on all sides of the unit, and tape the cushioning in place to prevent shifting during shipment. Close the carton without sealing it and shake it vigorously — if you can hear or feel the unit move, use more packing. Seal the carton with 3-inch (8cm) reinforced fiberglass or polyester sealing tape (narrow or paper tapes won't hold), top and bottom in an H pattern. Mark the package with the name of the shipper, and with these words in red:

DELICATE INSTRUMENT, FRAGILE!

Insure the package appropriately. Ship prepaid, *not collect.* Do not ship parcel post. Your Return Authorization number must be shown on the label, or the package will *not* be accepted.

The terms of our Warranty are detailed on a separate Warranty Certificate supplied with the unit. After expiration of the warranty, a reasonable charge will be made for parts, labor, and packing if you choose to use the factory service facility. Repaired units will be returned C.O.D. In all cases, transportation charges (which are usually quite nominal) are paid by the customer.