

STEREO ECHO PANEL PA8/291

Introduction

The PA8/291 is a module in the Type-D range of sound control equipment. It contains the *A* and *B* go and return circuits to the echo device, the controls to vary the decay period of two remote reverberation plates, and a programme meter to monitor the go circuits. The return circuits include a cut key, fader and width and offset controls, the latter two having bypass switches. There are two level-raising amplifiers in each return circuit and one in each go circuit. External output amplifiers, AM7/3, are however needed in the go circuit to raise the output to zero volume. The go circuits may be paralleled by a key if a mono feed to the echo device is required. Auxiliary units such as R.S.A.s may be inserted into the go or return paths.

The equipment is mounted on a modified CH1/35J chassis having overall dimensions of 16 by 2¼ by 9 inches.

General Description

The controls mounted on the front panel, from the top, are:

1. Pushbutton locking switch to parallel the *A* and *B* go inputs. P.P.M. meter, and three-position rotary switch to connect the *A* or the *B* input, or an external input, to the P.P.M.
2. The echo plate controls, comprising *On/Off* switch, *A* or *B* channel selection switch, reverberation time meter, and increase and decrease pushbutton switches.
3. The return circuit controls, comprising double fader PNN/18Q/1S, width control PZ/10Y/1, offset control PNN/26/Y2, width and offset bypass toggle switches and cut key.
4. *A* and *B* prehear pushbutton switches.

The equipment mounted internally on the chassis, from the top, comprises:

(a) Left-hand Side

Go circuit input transformers T1, T2 (LG/71A).
 Go circuit input amplifiers A1, A2 (AM9/8).
 Return circuit amplifiers A3, A4 (AM9/8) with their output transformers T8, T7 (LL/76M).
 Go circuit output transformers T3, T4 (LL/88A).

(b) Right-hand Side

Return circuit output amplifiers A6, A5 (AM9/8) with their output transformers T12, T11 (LL/76M).
 Isolating transformers T9, T10 (LL/76M) and return circuit input transformers T5, T6 (LL/88A).
 P.P.M. amplifier A7 (ME12/5).

On the rear of the chassis is the fuseholder for the 250-mA amplifier supply fuse.

Circuit Description (Fig. 1)

General

There are two identical go circuits (*A* and *B*) having

an input impedance of 10·7 ohms when separate, and 8·4 ohms when paralleled. After the input transformer there is a level-raising amplifier with a gain of 25 dB, whose output is taken to the R.S.A. insertion point, and from here via matching resistors to the external output amplifiers AM7/3. The outputs from these amplifiers are returned to the panel and at this point the programme-meter amplifier, via the selection switch SB, may be connected across the lines to measure the level sent to the echo device. The secondary circuits of the output transformers T3 and T4 are used as phantom circuits for the d.c. control signals for increasing or decreasing the reverberation time. Switch SF selects the plate to be controlled. The control circuit is similar to that in the UN3/4 (described in the Instruction for the EMT 140 artificial reverberation plate) but provision has been made to switch the controls and indication to either of two reverberation plates. While altering one plate the other plate remains on its existing setting. Thus for identical settings, as normally used for stereo, each plate is set up in turn to the same setting on the meter.

The two return circuits are taken to input transformers T5, T6, whose primaries are used as phantom circuits for the reverberation time d.c. indication signal. An insertion point is provided after the transformer for devices which require zero volume input and output. Following this is the cut key KA and a 30-dB attenuator before the RSA insertion point. Across the return circuits from the insertion jackfield are the prehear take-off points switched by keys SG and SH, and at this point also is the double echo fader. Level-raising amplifiers A3 and A4 having gains of 22 dB follow the fader, and the cross-mix width control is bridged across the two lines between balancing transformers at the outputs of the amplifiers. The width control adds a variable proportion of the *A* signal to the *B* line and vice versa to narrow the image, and subtracts the signals to widen the image. The widening effect has a limited range.

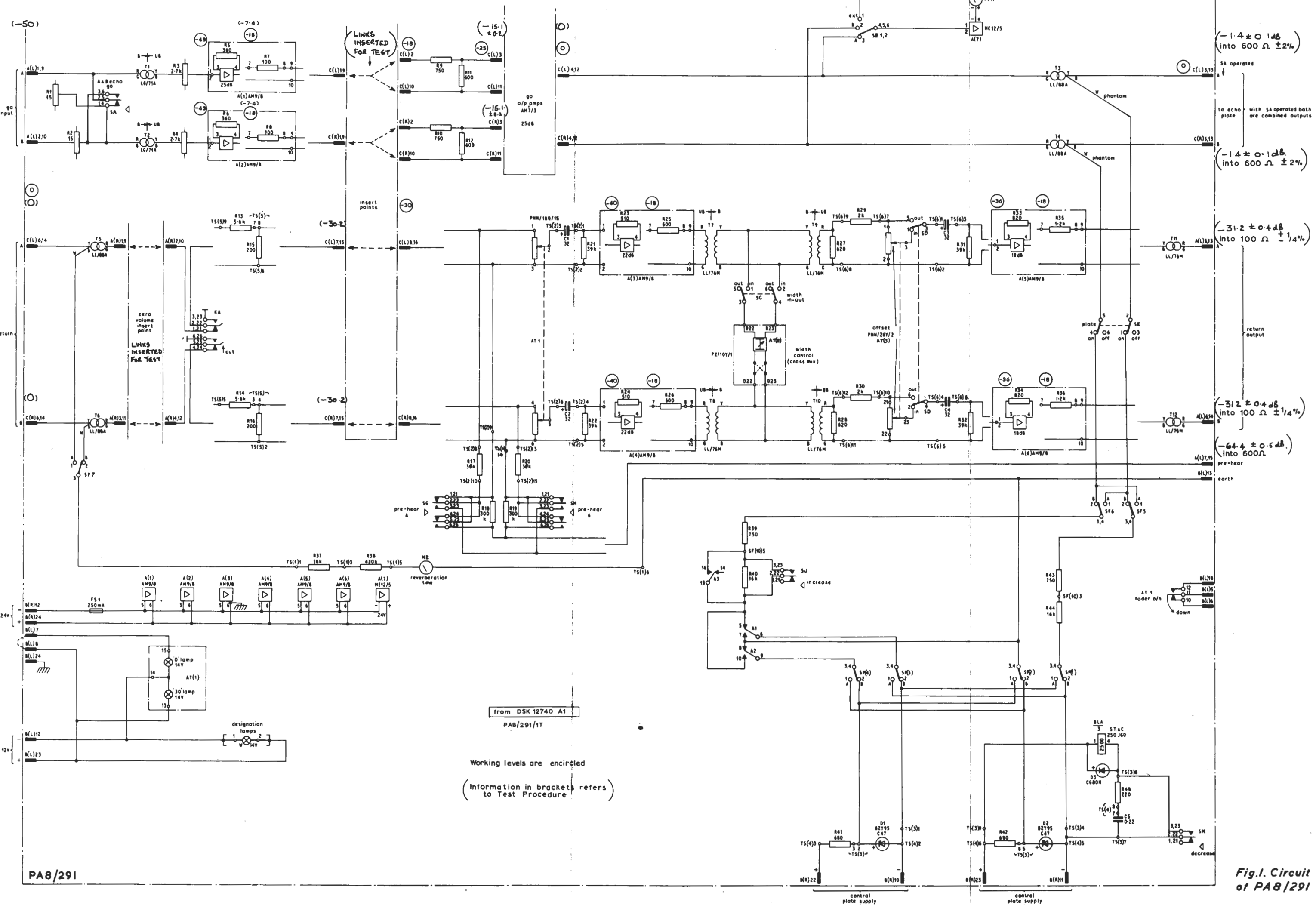
The offset attenuator which follows the width control reduces the level of the *A* signal by up to 5 dB in steps of 1 dB when rotated anticlockwise from its mid position, and similarly for the *B* signal when rotated clockwise. Both the width and the offset control may be switched out of circuit.

The return circuits are completed by amplifiers A5 and A6, which have gains of 18 dB, and output transformers T11 and T12. Where the amplifiers follow switching circuits, additional coupling components consisting of a 32-μF series capacitor and 39-kilohm series resistor are fitted to reduce the effect of d.c. leakage.

Supplies

The amplifiers require a 24-volt d.c. stabilised supply and have a total current consumption of 90 mA.

The lamps need a 12-volt supply and consume 160 mA.



from DSK 12740 A1
PA8/291/1T

Working levels are encircled
(Information in brackets refers to Test Procedure)

TEST PROCEDURE

Apparatus Required

- Portable Routine Line Tester RLT/1P
- Tone Source TS/10
- 60-dB Attenuator AT/30
- Repeating Coil
- Amplifier Test Meter ATM/1
- Loudspeaker Unit LS5/1
- Two 64-volt d.c. Stabilised Supplies
- Oscilloscope
- Desk Panel Tester TE1/13 including connector cables TE1A/2A-G
- Two 5·1-kilohm ± 2 per cent Resistors
- 51-kilohm ± 2 per cent Resistor

D.C. Tests

General

Plug the module to tester TE1/13 and apply power. It is recommended that the module should be d.c. tested completely before a start is made on further tests.

D.C. Feeds

Remove the *Meter Link* from the tester and insert a milliammeter capable of reading up to about 100 mA. Check the total feed current shown on the meter, which should be about 94 mA.

Lamps

The designation lamps should function as soon as power is applied to the tester. Strap B(L)7 to B(L)8 to B(L)23 and check that the two fader lamps light.

D.C. Test Schedule

Remove power from the TE1/13 and make resistance measurements on the module in accordance with the schedule in Table 1. Resistances above 10 kilohms should be measured with the routine line tester RLT/1P in the *A/E*, *B/E*, and *A/B Insulation* modes; resistances below 10 kilohms should be measured in the *E-A-E*, *E-B-E* and *Loop R(A-B)* modes.

Note:- The lower tag number of a pair is designated as the *A* leg.

Reverberation Plate Control Circuit

1. 'Plate On' Condition

Connect two 64-volt d.c. stabilised power supplies to the 4-mm sockets B(R)10,22 and B(R)11,23 taking the negative to the lower numbered tag in each pair. Connect a milliammeter of f.s.d. 10 mA in series with a 5·1-kilohm resistor between tags C(L)5 (negative) and B(L)13 (positive); call this milliammeter No. 1. Connect a similar milliammeter and resistor between tags C(R)5 (negative) and B(L)13 (positive); call this milliammeter No. 2. Access to C(L)5 and C(R)5 may be obtained using single-enders Type TE1A/2B. Check that, with the *Plate* switch *On*, both meters read about 2 mA.

2. Reverberation Time 'Increase/Decrease'

With the *Plate Select* switch on *A*, operation of the *Increase* button should increase the current in milliammeter No. 1 to about 8 mA. Operation of the *Decrease* button should reverse the direction of the current, which should still be 8 mA. The reading of milliammeter No. 2 should remain constant at 2 mA during this test.

With the *Plate Select* switch on *B*, operation of the *Increase* button should increase the reading of milliammeter No. 2 to about 8 mA, and operation of the *Decrease* button should also produce a reading of about 8 mA, but with the current in the reverse direction. Milliammeter No. 1 should have a constant reading of 2 mA.

3. Reverberation Time Meter

Check the calibration of the meter by application of d.c. test voltages, as follows, to tags C(L)6 (negative) and B(L)13 (positive) via a 51-kilohm resistor. Access to C(L)6 can be obtained via a single-ender TE1A/2B. The *Plate Select* switch should be in position *A*.

Rev. Time	Volts
1 second	19·2
2 seconds	25·6
3 seconds	32·0
4 seconds	38·4

Move the *Plate Select* switch to position *B* and apply 38·4 volts to C(R)6 and B(L)13. The meter should read 4.

A.C. Tests (Fig. 1)

For all tests described in the remainder of this Instruction, the test terminations indicated in brackets on Fig. 1 are required. As some of these are different from those wired on the relevant TE1/13 tester jacks, the *Listen* jacks A(L)5,13 and A(L)6,14 must each be plugged to a 100-ohm jack and the *Listen* jacks C(L)5,13 and C(R)5,13 each to a 600-ohm jack.

The following jack connections on tester TE1/13 (using cables TE1A/2A) are also required for all the tests described in the remainder of this Instruction.

Jack	to	Jack
C(L)1,9		C(L)2,10
C(R)1,9		C(R)2,10
C(L)7,15		C(L)8,16
C(R)7,15		C(R)8,16
A(R)1,9		A(R)2,10
A(R)3,11		A(R)4,12

TABLE 1

TE1/13 Jack Nos.	RLT/1P Mode			Relevant Module Control Settings
	E-A-E or A/E	E-B-E or B/E	Loop R or A/B	
A(L)1,9	∞/∞	∞/∞	3 Ω /0·5 Ω	A+B echo go switch normal/operated
A(L)2,10	∞/∞	∞/∞	3 Ω /0·5 Ω	A+B echo go switch normal/operated
A(L)5,13	∞	∞	$\approx 60\Omega$	
A(L)6,14	∞	∞	$\approx 60\Omega$	
A(L)7,15	∞ 33k Ω 33k Ω	300k Ω 0 0	∞ 33k Ω 33k Ω	normal prehear A operated prehear B operated
B(L)5,6	∞/∞	∞/∞	0/ ∞	fader down/fader up
B(L)5,18	∞/∞	∞/∞	∞ /0	fader down/fader up
B(L)7,12	∞	∞	... Ω	
B(L)8,12	∞	∞	... Ω	
B(R)1,13	∞	∞	$\approx 316\Omega$	meter switch on ext.
B(L)24 B(R)24	∞	0	∞	
C(L)2,10	∞	∞	1350 Ω	dummy plug jack C(L)3,11
C(L)3,11	∞	∞	600 Ω	dummy plug jack C(L)2,10
C(L)4,12	∞	∞	$\approx 65\Omega$	meter switch on ext.
C(L)5,13	∞	∞	$\approx 40\Omega$	
C(L)6,14	∞	∞	$\approx 40\Omega$	
C(L)7,15	∞	∞	$\approx 200\Omega$	
C(R)2,10	∞	∞	1350 Ω	dummy plug jack C(R)3,11
C(R)3,11	∞	∞	600 Ω	dummy plug jack C(R)2,10
C(R)4,12	∞	∞	$\approx 65\Omega$	meter switch on ext.
C(R)5,13	∞	∞	$\approx 40\Omega$	
C(R)6,14	∞	∞	$\approx 40\Omega$	
C(R)7,15	∞	∞	$\approx 200\Omega$	
A(R)1,9	∞	∞	$\approx 65\Omega$	
A(R)3,11	∞	∞	$\approx 65\Omega$	
A(R)2,10	∞/∞	∞/∞	$\approx 5\cdot6k\Omega/\infty$	echo cut normal/operated
A(R)4,12	∞/∞	∞/∞	$\approx 5\cdot6k\Omega/\infty$	echo cut normal/operated

TABLE 2

Apply tone to jack	Tone Level (dB)	Conditions	Use 50-k Ω amp det to measure at jack	Level (dB)	Tolerances (dB)		
					40*Hz	1 kHz	15*kHz
A(L)1,9	-50	-	C(L)3,11	-15.4	+0.2 -0.2	± 0.2	+0.0 -0.4
A(L)2,10	-50	-	C(R)3,11	-15.4	+0.0 -0.2	± 0.2	+0.0 -0.4
C(L)4,12	0	-	C(L)5,13 (600 ohms)	-1.4	+0.0 -0.2	± 0.1	+0.0 -0.1
C(R)4,12	0	-	C(R)5,13 (600 ohms)	-1.4	+0.0 -0.2	± 0.1	+0.0 -0.1
C(L)6,14	0	Fader at max. Width and Offset switches to Out.	A(L)5,13 (100 ohms)	-31.2	+0.0 -0.2	± 0.4	+0.0 -0.2
C(L)6,14	0	Operate Prehear pushbutton.	A(L)7,15 (600 ohms)	-67.0	+0.0 -0.2	± 0.5	+0.0 -0.2
C(R)6,14	0	Fader at max. Width and Offset switches to Out.	A(L)6,14 (100 ohms)	-31.4	+0.0 -0.2	± 0.4	+0.0 -0.2
C(R)6,14	0	Operate Prehear pushbutton.	A(L)7,15 (600 ohms)	-67.0	+0.0 -0.2	± 0.5	+0.0 -0.2

*Relative to level at 1 kHz

Circuit Transmission Tests

Repower the TE1/13 and carry out circuit transmission tests in accordance with Table 2.

Peak Programme Meter

1. Apply 1-kHz tone at 0 dB to sockets C(L)4,12 and set the *P.P.M.* switch to *A*. The meter should read 4.
2. If necessary, adjust the ME12/5 *Sensitivity*, *Law 1* and *Law 2* controls in accordance with the Technical Instruction on the ME12/5.
3. Apply 1-kHz tone at 0 dB to sockets C(R)4,12 and set the *P.P.M.* switch to *B*. The meter should read 4.
4. Repeat applying tone to sockets B(R)1,13 and with the *P.P.M.* switch set to *Ext*.

Operation of Switched Controls**General**

For the following tests use a monitoring loudspeaker (e.g., LS5/1) connected to the *Listen* output of the T.P.M. section of the ATM/1. In each instance the loudspeaker volume control should be set for reasonable listening level when the T.P.M. is registering normal programme peaks.

'A + B Echo Go' Switch

Apply programme at a volume of -60 dB to jack A(L)1,9. Check on jack C(L)3,11 that operation of the '*A + B Go*' pushbutton does not produce audible clicks, and that programme is applied cleanly to jack C(R)3,11.

'Echo Cut' Key

Apply programme at 0 dB volume to jack C(L)6,14. Operate the fader to maximum and the width and offset switches to *Out*. Programme from the *Echo Return* output on jack A(L)5,13 (100 ohms) should be cut cleanly by operation of the *Echo Cut* key and there should be no breakthrough.

Repeat feeding programme at jack C(R)6,14 and listening on jack A(L)6,14 (100 ohms).

Width Control

Apply programmes at 0 dB volume to jack C(L)6,14 and with the *Cut* key at normal, the fader at maximum, the *Width* toggle-switch at *In* and the *Offset* toggle-switch at *Out*, listen at A(L)6,14 (100 ohms).

Check that rotation of the *Width* control varies the level of programme in clean steps, reaching a maximum when the control is fully anticlockwise.

Using an asymmetric signal (see under heading *Phasing* below), check the phasing between C(L)6,14 and A(L)6,14. The two signals should be in phase as the control is rotated from its fully anticlockwise position until at 0 when there should not be any output. Further clockwise rotation should give an increasing output in antiphase to the input signal.

Offset Control

Apply programme at 0 dB volume to jack C(L)6,14 and listen on A(L)5,13 (100 ohms) and A(L)6,14. With *Cut* key normal, fader at maximum, *Width* control at *N* and *Offset* toggle switch *In*, check that rotation of the *Offset* control clockwise reduces the output at A(L)5,13 while anticlockwise rotation reduces the output at A(L)6,14. The level variations should be in clean steps with no audible clicks.

Prehear Pushbuttons

Apply programme at 0 dB volume to jack C(L)6,14. The prehear output on jack A(L)7,15 should be made and cut cleanly by operating and releasing the *Prehear* pushbutton *A* and this operation should have no audible effect on the programme on jack A(L)5,13.

Repeat applying programme to jack C(R)6,14 and listening first at jack A(L)7,15 and then at A(L)6,14 while operating and releasing *Prehear* pushbutton *B*.

Operation of Fader

Apply programme at 0 dB volume to jack C(L)6,14 and monitor as described under *Operation of Switched Controls: General*, at jack A(L)5,13 (100 ohms). The fader should operate in a noise-free manner and there should be no break-through on the bottom stud.

Repeat applying programme to jack C(R)6,14 and monitor at jack A(L)6,14 (100 ohms).

Phasing

Using an asymmetric test waveform, check with an oscilloscope connected to the *Listen* output of the T.P.M. section of the ATM/1 that inputs and outputs are in phase.

An asymmetric wave may conveniently be produced by shunting a tone source (TS/10 set for +10 output) with a suitable diode (say AAY 32).

WWM(X) 6/71