

DESIGNS DEPT. MANUFACTURING INFORMATION

No. 6.333(78)

Audio Delay Equipment EP1M/23

*J.W.H. O'Clarey*  
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GP

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Title Sheet

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DS/SPA4

DESIGNS DEPARTMENT MANUFACTURING INFORMATION

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Audio Delay Equipment EP1M/23

1. Introduction

The function of this equipment is to equalise the modulation received from co-channel transmitters, in places where the service areas overlap. It will delay an audio signal by a pre-set time between 1.5 and 12 ms, as well as compensate for the dispersion introduced by repeater amplifiers. On the application of a suitable uni-directional pulse, the equipment will automatically check or correct the signal polarity.

The equipment consists of the following units in a PN3/55 crate:

Audio delay unit UN14/12,  
Dispersion equaliser EQ3/35,  
Automatic polarity Corrector MN4/6 and  
Power Supply PS2/163

These units may be assembled in a variety of different ways, to provide a large range of dispersion and delay characteristics. However the specification below refers to the most common case where only 1 of each unit has been installed.

A relay mounted in the back of the PN3/55 bypasses the equipment if the power supply fails or if one of the units is unplugged.

2. Specification

Performance Data

Inputs:

Audio input	Balanced
Audio input impedance	Greater than 10k $\Omega$
Audio input level	zero programme volume
Power consumption	190 - 270 volts @ 25mA

Outputs:

Audio output	Balanced
Audio output impedance	Less than 50 $\Omega$
Audio output level	zero programme volume
Delay range	1.5 - 12mS (plus delay in low pass filters and dispersion units).
Delay increments	10 or 20 $\mu$ s
Delay variation with temperature	$\pm$ 0.01% from 10 $^{\circ}$ to 50 $^{\circ}$ C

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Frequency response	+0.5dB from 100Hz to 6.5kHz
Gain variation with delay	±0.5dB from 1.5 - 12mS delay
Total harmonic separation	Better than 50dB for an input signal of 1kHz at +8dBm into 600Ω.
Signal to noise ratio	Better than 50dB4w

Mechanical Data

Chassis PN3/55

Installation Data

Mains input socket	Cannon XLR-LNE-3
Audio input fixed plug	Cannon XLR-3-31
Audio output socket	Cannon XLR-3-32

Rules Governing the position of the sub units:

1. The power supply must be in the right-most position.
  2. An audio delay unit UN14/12 must be in the left-most position.
  3. A combination of audio delay units and dispersion equalisers (EQ3/35) may be placed immediately to the right of the audio delay unit.
  4. An automatic polarity corrector unit (MN4/6) must be inserted immediately to the right of the other audio units.
- e.g. No. 1 The equipment would normally consist of the following units from left to right: UN14/12, EQ3/35, MN4/6, 3 spare positions and PS2/163.
- e.g. No. 2 A fully equipped crate may consist of the following units from left to right: UN14/12, UN14/12, UN14/12, EQ3/35, EQ3/35, MN4/6, and PS2/163. (Although this combination would have a worse specification than that given above due to the extra delay units).

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Audio Delay Equipment EP1M/23

PRODUCTION TEST SCHEDULE

1. Description

The function of this equipment is to equalise the modulation received from co-channel transmitters, in places where the service areas overlap. It will delay an audio signal by a pre-set time between 1.5 and 12mS, as well as compensate for the dispersion introduced by repeater amplifiers. On the application of a suitable uni-directional pulse, the equipment will automatically check or correct the signal polarity.

The equipment consists of the following sub-units in a PN3/55:

- Audio Delay Unit UN3/12,
- Dispersion Equaliser EQ3/35,
- Automatic Polarity Corrector MN4/6 and
- Power Supply PS2/163

These units may be assembled in a variety of different ways to provide a wide range of delay and dispersion characteristics. However this production test schedule assumes that one of each unit has been installed.

2. Information

- |                          |  |
|--------------------------|--|
| a) Design Section        | Transmission Section   |
| b) Designer              | M.T. Ellen   |
| c) Engineer responsible  | D.C. Savage  |
| d) Handbook              | 6.163(78)  |
| e) Technical Instruction | Not available on the 1/7/78  |
| f) Other information     | .....  |
| g) Pre-Production batch  | This production test schedule has been tested on a pre-production batch in Designs Department. |

3. Manufacturing Performance Specification

- a) Input Requirements: Low distortion sine-wave 20Hz to 15kHz at +10dBm max.
- b) Outputs: Similar to input but delayed by up to slightly more than 12mS.
- c) Power Supply: 190 - 270 volts at 25mA

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d) Performance:

Gain	0 + 0.5dB at 1kHz over full delay range (1.5 - 12ms).
Frequency response	+ 0.5dB from 100Hz to 6.5kHz.
Total Harmonic separation	better than 50dB for an input signal of 1kHz at +8dBm into 600Ω.
Signal to noise ratio	better than 50dB4w

4. Warning

- a) This unit is powered from the mains and therefore contains voltages above 30 volts a.c.
- b) The sub-units in this equipment contain MOS devices. Ensure that they are not subjected to electrostatic discharges.

5. Test Apparatus Required

1 AC Test Equipment type EP14/1.  
1 AVO

6. Inspection

- a) Check that the PN3/55 will only accept the units with the correct coding comb positions (see D45456 A1)
- b) This unit is mains powered. Check that the mains connectors are correctly wired and that the earth connections are intact.
- c) Check the wiring to the following components:

Relay	RLA
Plug	PLA
Socket	SKA

- d) Check that the following units are inserted in the correct positions:

UN14/12 (left-hand position)  
EQ3/35 (to the right of the UN14/12)  
MN4/6 (to the right of the EQ3/35)  
PS2/163 (in the right-hand position)

7. Test Procedures

7.1 To Check the Power Supply

- a) Connect the equipment to the mains. Check the voltages between pins 17 and 9 of SKD and between 11 and 9 of SKD.
- b) The voltages should be 25 and 12.5 volts respectively (pin 9 negative).
- c) If this test is not passed check the power supply PS2/163 and re-check the wiring of the EP1M/23.

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## 7.2 To Check the Frequency Response

a) Set the delay of the UN14/12 to 6mS by setting the internal switches as follows:

Switch position	Switch setting
13	1
12	1
11	0
9	0
8	0
7	0
6	0
4	0
3	0
2	0
1	0
'U' Link	6mS

Set the EQ3/35 so that all its sections are in operation. Connect the A.C. test set oscillator (600Ω source, internal 600Ω termination and 0dBm) to PLA. Connect the A.C. test set detector (high impedance, mean indication) to SKA. Measure the frequency response.

b) The gain should be constant within  $\pm 0.5$ dB from 100Hz to 6.5kHz. The loss should be greater than 20dB at 15Hz and 10kHz relative to the level at 1kHz.

c) If the frequency response is incorrect check the individual units. If the output is non-existent check the wiring of the EP1M/23, in particular RLA.

## 7.3 To Check the Gain

a) Leave the equipment set up as in section 7.2 and measure the gain at 1kHz.

b) The gain should be  $0 \pm 0.5$ dB.

c) If this test is not passed check the individual units.

## 7.4 To Check Distortion

a) Leave the equipment set up as in section 7.3 but increase the output from the oscillator to +8dBm and set it to 1kHz. Press the "mean" button and adjust the attenuator setting to obtain a centre reading on the meter. Then press the "1kHz harmonic" button and readjust the attenuator settings.

b) The difference should be greater than 50dB.

c) If this test is not passed check the individual units.

### 7.5 To Measure the Signal to Noise Ratio

- a) Leave the equipment set up as in section 7.4 but reduce the oscillator output level to 0dBm and press the TPM button. Check that the TPM indicates 4 when the attenuator is at 0dB. Replace the oscillator with a 600Ω resistor, press the "weighted" button and re-adjust the attenuator to make the TPM peak to 4. Note the new attenuator setting.
- b) The reading should be better than 50dB (i.e 50dB4w).
- c) If this test is not passed check the individual units.

### 7.6 To Check the Bypass Relay

- a) Set the equipment up as in section 7.3 to measure gain. Remove each sub unit in turn and then switch the mains power off and then on again. Note the meter reading on the EP14/1.
- b) The meter reading should indicate a gain of  $0 \pm 0.5$ dB under all conditions (except for a transient reduction while RLA is de-energising).
- c) If this test is not passed check the wiring to RLA.

045455A4

ISS. 2  
CHANGE 14-3-79

ITEM No.	No. OFF	DESCRIPTION	C/C'T REF.	BBC REF. OR DRG. No.
DRAWING NUMBERS				
		PARTS LIST	045455 A4	
		ASSY & WIRING	045456 A1	
		DETAILS	045457 A2	
		P.B WIRING	045458 A1s	
		P.B DRILLING	045459 A2	
FURTHER INFORMATION REQUIRED FOR MANUFACTURE :-				
UNIT ASSY INFORMATION			E.A 10484	
UNIT WIRING INFORMATION			E.A 10137, E.A 10140	
1.	1	PANEL, PN3/SS, MODIFIED BY CONTRACTOR AS FOLLOWS :- L.H FRONT VERTICAL.		045457A2 DET 1
2	1	PANEL, TERMINATION, PN3A/57, MODIFIED BY CONTRACTOR AS FOLLOWS :- R.H BRACKET L.H BRACKET		045457 A2 DET 2 " DET 3
3	28	PN3A/58, PANEL, G.P GUIDE		
4	7	THUMBSCREW NUT, TAPPED M4		S-56818 - 0327645
5				
6	7	PN3A/60A, PANEL, G.P. INDEX MOUNTING		
7				
8	1	PRINTED BOARD		045458 A1s, 045459 A2.
9				
10	1	PS2/163, POWER SUPPLY		
11	AR	UN1A/12, AUDIO DELAY UNIT		
12	AR	EQ3/35, DISPERSION EQUALISER.		
13	1	MN4/6, AUTO POLARITY CORRECTOR UNIT.		
14				
15	AR	PN3A/75, DUMMY PANEL.		
16				
17				
18				
19	1	PLUG, FIXED, MINIATURE, XLR 3 POLE	PL.A	S24933 - 0091829
20	1	SOCKET, FIXED, MAINS, 4 POLE MINIATURE	sk.A	S27702 - 0377664
21	1	SOCKET PROTECTOR & MOUNTING KIT		S27703 - 0377518
22	1	SOCKET, FIXED, MAINS, 3 POLE MINIATURE	sk.B	S27700 - 0023036
23	1	COVER, FIXED SOCKET		S27931 - 0237075
24	1	SOCKET, FIXED, MINIATURE, XLR 3 POLE	sk.C	S27733 - 0236165
25	7	SOCKET, PRINTED WIRING, 17 POLE	sk0-k	S27887 - 0326132.
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