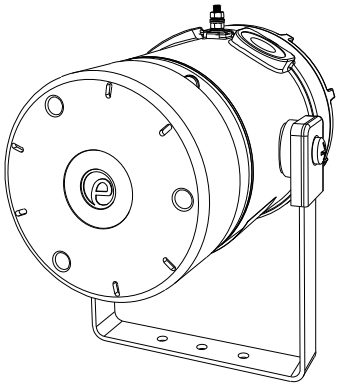
INSTRUCTION & SERVICE MANUAL
D1xS1 & D1xS2 RADIAL ALARM HORNS
For Use In Hazardous Locations - Dust



The D1xS1 & D1xS2 alarm horns are classified by UL as Audible Signaling Appliances for General Signaling in Hazardous Locations

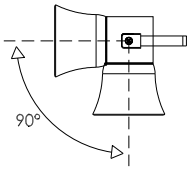
1) Introduction

The D1xS1 & D1xS2 range are UL Classified alarm horns which produce a loud warning signal in a hazardous area. Sixty-Four first stage alarm sounds can be selected by internal switches and each one can be externally changed to a second, third or fourth stage alarm sound. The alarm horn may be used for Dust applications in Class II Division 1 & 2 and Class III Division 1 & 2 as well as Class II Zone 20, 21 and 22. D1xC1 & D1xC2 combined alarm horn & strobe units and D1xL1 & D1xL2 Loudspeakers are also available as well as variants for Explosive Gas Atmospheres.

2) Warnings

CAUTION
TO REDUCE THE RISK OF IGNITION OF HAZARDOUS ATMOSPHERES:
DISCONNECT FROM SUPPLY BEFORE OPENING.
KEEP TIGHTLY CLOSED WHEN IN OPERATION.
WARNING
FIT SEALING FITTING IN CONDUIT RUNS WITHIN 18 INCHES FROM ENCLOSURE.
EQUIPMENT MUST NOT BE INSTALLED WITH THE HORN FACING UPWARDS OF HORIZONTAL

ATTENTION
POUR REDUIRE LE RISQUE D'INFLAMMATION DES ATMOSPHÈRES DANGEREUSES:
COUPER L 'ALIMENTATION AVANT OUVERTURE.
CONSERVER FERMÉ PENDANT LE FONCIONNEMENT.
AVERTISSEMENT
CONDUITS DOIVENT ÊTRE SCELLÉS EN MOINS DE 18 POUCES.
ÉQUIPEMENT NE DOIT PAS ÊTRE INSTALLÉ AVEC LE KLAXON TOURNÉE VERS LE HAUT DE HORIZONTAL.



3) Ratings and Markings

The D1xS1 and D1xS2 Alarm Horns comply with the following standards for hazardous locations:

UL 1203
CAN/CSA C22.2 No. 25-1966

The D1xS1 and D1xS2 Alarm Horns also comply with the following standards for signaling equipment:

UL464
CSA C22.2 NO. 205-12

3.1 Class / Division Ratings for US & Canada

Class II Div 1	FG	T6	Ta -40°C to +70°C
Class III Div 1			Ta -40°C to +70°C

Installation must be carried out in compliance with the National Electric Code / Canadian Electric Code

3.2 Class / Zone ratings US & Canada

Zone 20 IIIB	T6	Ta -40°C to +70°C

Installation must be carried out in compliance with the National Electric Code / Canadian Electric Code

3.3 Ambient Temperature Range:

D1xS1-DC024-D / D1xS2-DC024-D / D1xS2-AC230-D:
-40ºC to +70ºC
D1xS1-AC230-D:
-40ºC to +70ºC for 110-120Vac 50/60Hz
-40ºC to +55ºC for 120-240Vac 50/60Hz

3.4 Ingress Protection Ratings

The product is rated for ingress protection as follows:

IP rating per EN60529:	IP66
Type rating per UL50E / NEMA250:	4 / 4X / 3R / 13

3.5 Electrical Ratings per UL Listing

Model No.	Nom. Voltage	Nom. rms current[1]	Voltage Range	Max. rms current[2]
D1xS1-DC024-D	24Vdc	217mA	10-30Vdc	270mA @ 18Vdc
D1xS1-AC230-D	115Vac 60Hz 230Vac 50Hz	77mA 53mA	110-240Vac 50/60Hz	82mA @ 110Vac 60Hz
D1xS2-DC024-D	24Vdc	924mA	10-30Vdc	1217mA @ 18Vdc
D1xS2-AC230-D	115Vac 60Hz 230Vac 50Hz	268mA 159mA	110-240Vac 50/60Hz	293mA @ 110Vac 60Hz

1) Nom. rms current draw at nom. voltage and worst case tone
2) Max. rms current draw at worst case voltage and tone

4) Installation

4.1 Safe Installation Requirements

The product must only be installed by suitably qualified personnel in accordance with the latest issues of the relevant standards.

The installation of the units must also be in accordance with the NEC / CEC and any local regulations and should only be carried out by a competent electrical engineer who has the necessary training.

For ambient temperatures over +50ºC the cable entry temperature may exceed +70ºC / the cable branching point may exceed 80ºC. Therefore suitable heat resisting cables and cable glands must be used, with a rated service temperature of at least 90ºC.

To maintain the ingress protection rating and mode of protection, the 2-off M20 and 1-off M20/NPT cable entries must be fitted with suitably rated cable entry and/or blanking devices during installation. If a high IP (Ingress Protection) rating is required then a suitable sealing washer must be fitted under the cable gland. A minimum ingress protection rating of IP54 must be maintained.

Only the flame proof cover is to be used for access to the enclosure for installation, service and maintenance.

Connections are to be made into the terminal blocks using solid or stranded wire, sizes 0.5-2.5mm^2 / AWG 20-14. Wire insulation needs to be stripped 6-7mm. Wires may be fitted securely with crimped ferrules. Terminal screws need to be tightened down with a tightening torque of 0.4 Nm / 3.5 Lb-in.

Earthing connections should be made to the Internal Earth point on the casting.

Check that the 'O' ring seal is in place between the two castings.

4.2 Mounting

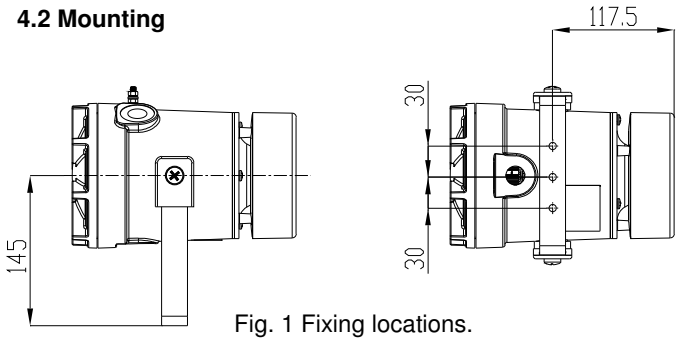


Fig. 1 Fixing locations.

The D1x Alarm Horn may be secured to any flat surface using the three 7mm fixing holes. The enclosure provides IP66 protection and is suitable for installation in exterior locations providing the cable entry is sealed.

4.3 Installation procedure

a. Secure the D1x alarm horn to a flat surface via the three 7mm fixing holes in the mounting bracket.

b. Remove the flameproof cover of the alarm horn by unscrewing it, taking care not to damage the flameproof threads in the process (Refer to section 5).

c. Fit an M20x1.5 suitably rated cable gland or conduit entry into the hole in the enclosure and connect the field wiring to the appropriate alarm horn terminals as shown in fig. 6 (AC) or fig 8. (DC). The power supply terminals are duplicated so that units may be connected in parallel. An end of line monitoring resistor may be fitted to DC units only (see section 12). If the second and third M20x1.5 and or NPT entries are not used, suitably rated stopping plugs must always be fitted.

d. Replace the flameproof cover of the loudspeaker, taking care not to damage the flameproof threads. Tighten fully.

4.4 Hornless Variants

The D1x Sounder is also available as a variant with no horn fitted in the factory. The Horn threaded nose portion has a fitment thread of 1-3/8" – 18 UNF (to BS1580 or ANSI B1.1). The customer is responsible for sourcing and correctly fitting a suitable horn that meets all of the relevant safety requirements.

5) Access to the Flameproof Enclosure

In order to connect the electrical supply cables to the alarm horn it is necessary to remove the flameproof cover to gain access to the flameproof chamber. This can be achieved by unscrewing the flameproof cover (counter-clockwise), taking extreme care not to damage the flameproof threads in the process.

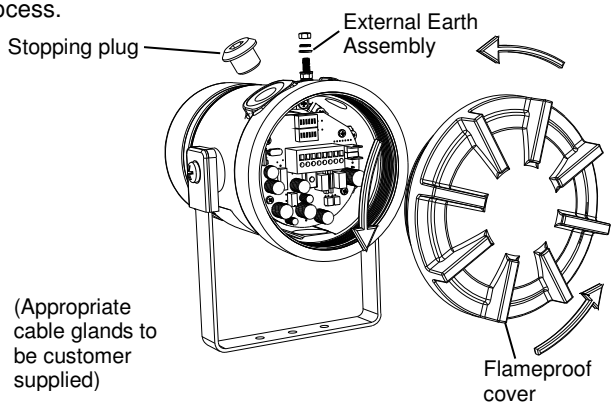
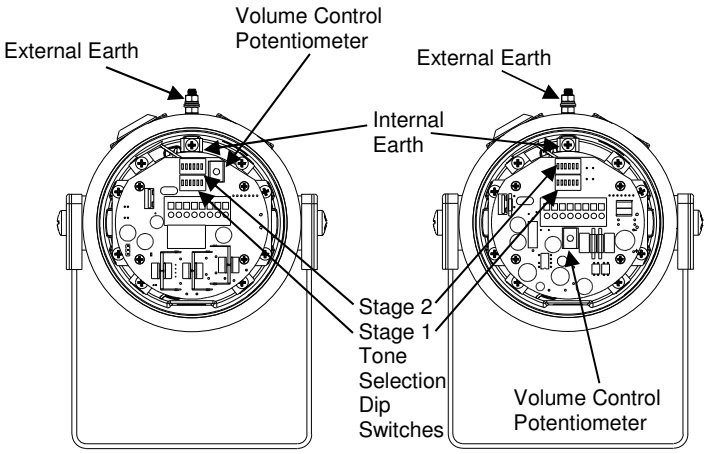


Fig. 2 Accessing the Flameproof Enclosure.

On completion of the cable wiring installation the flameproof threads should be inspected to ensure that they are clean and that they have not been damaged during installation. Also check that the 'O' ring seal is in place, on the thread diameter in contact with the flat face of the flameproof cover. When replacing the flameproof cover ensure that it is tightened fully.

6) Volume Control

The output level of the D1x alarm horn can be set by adjusting the volume control potentiometer (see Fig 3). For maximum output, set the potentiometer fully clockwise.



D1xS2AC / D1xS2DC / D1xS1DC / D1xS1AC

Fig. 3 Location of field controls

7) Tone Selection

The D1xS1 & D1xS2 units have 64 different tones that can be selected independently for the first and second stage alarms. The tones are selected by operation of the tone setting DIP switches 1 & 2 (see Fig. 3) on the PCB. The alarm horns can also be switched to sound the third and fourth stage alarm tones. The tone table (Table 1) shows the switch positions for the 64 tones on first and second stages and which tones are available for the third and fourth stages dependent on the Stage 1 DIP switch setting.

8) Stage Switching Polarity (DC Units Only)

The D1xS2 and D1xS1 DC alarm horns have the facility to use either +ve or –ve switching to change the tone to the second, third and fourth stages. For –ve switching connect the two headers on the pcb to the left-hand (marked –ve) and centre pins. For +ve switching connect the headers to the right hand (marked +ve) and the centre pins. (Refer to Fig. 4)

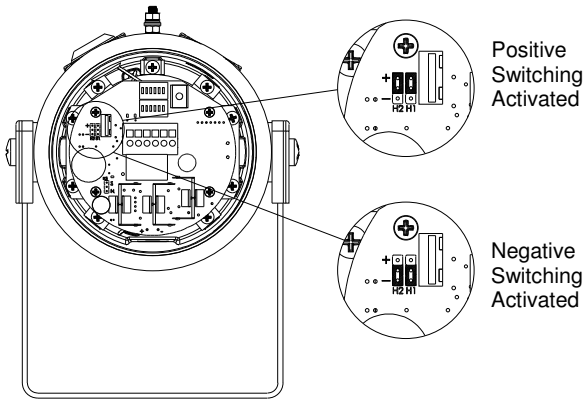


Fig. 4 Stage Switching Polarity

9) AC Wiring

9.1 Wiring Diagrams

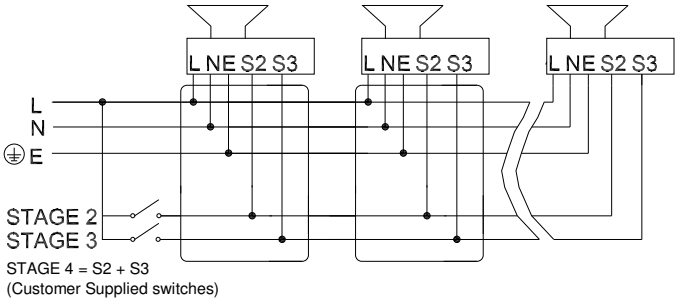


Fig 5a. D1xS1AC Simplified Block Diagram

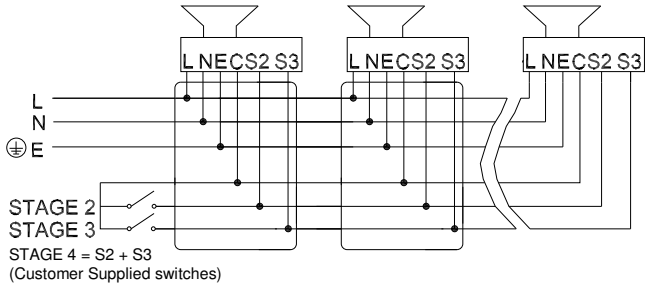


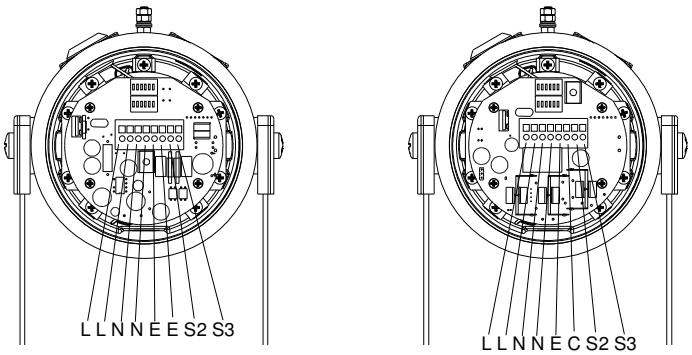
Fig 5b. D1xS2AC Simplified Block Diagram

9.2 Units First Stage Tones

Stage one (S1) operation: Simply connect the supply voltage to the L and N supply terminals, (see fig. 6).

9.3 AC Units Second, Third and Fourth Stage Tone Selection

To select the second, third and fourth stage tones on the D1x AC alarm horns.
Stage two (S2) operation: Power L and N, link the Common-C (D1xS2) or the Live-L (D1xS1) and S2 terminal.
Stage three (S3) operation: Power L and N, link the Common-C (D1xS2) or the Live-L (D1xS1) and S3 terminals.
Stage four (S4) operation: Power L and N, link the Common-C (D1xS2) or the Live-L (D1xS1) and both the S2 and S3 terminals.



D1xS1AC Terminals D1xS2AC Terminals

Fig. 6 AC Terminals

10) DC Wiring

10.1 Wiring Diagrams

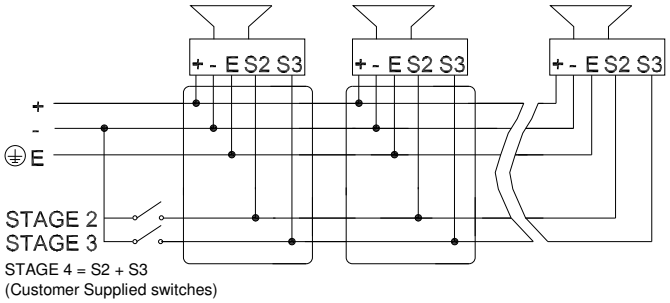


Fig. 7a DC Simplified Block Diagram (negative switching)

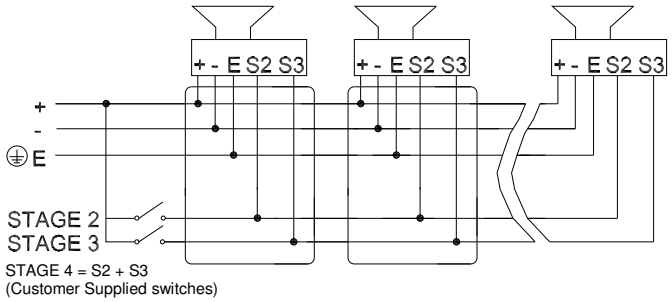


Fig. 7b DC Simplified Block Diagram (positive switching

10.2 Units First Stage Tones

Stage one (S1) operation: Simply connect the supply voltage to the + and - supply terminals, (see fig. 8).

10.3 DC Units Second, Third and Fourth Stage Tone Selection

For units set up for –ve switching (default setting):

Stage two (S2) operation: Power +ve and –ve, link a -ve supply line to the S2 terminal. Dip switch 2 alters stage 2 tone.
Stage three (S3) operation: Power +ve and –ve, link a -ve supply line to the S3 terminal. Dip switch 1 alters stage 3 tone.
Stage four (S4) operation: Power +ve and –ve, link a -ve supply line to both the S2 & S3 terminals. Dip switch 1 alters stage 4 tone.

For units set up for +ve switching (refer to 9.1):

Stage two (S2) operation: Power +ve and –ve, link a +ve supply line to the S2 terminal. Dip switch 2 alters stage 2 tone.
Stage three (S3) operation: Power +ve and –ve, link a +ve supply line to the S3 terminal. Dip switch 1 alters stage 3 tone.
Stage four (S4) operation: Power +ve and –ve, link a +ve supply line to both the S2 & S3 terminals. Dip switch 1 alters stage 4 tone.

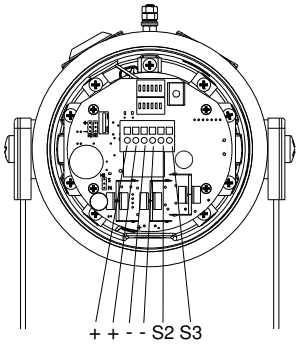


Fig. 8 DC Terminals

11) Earthing

The unit has both a primary internal and secondary external earth fixing point.

Internal earth connections should be made to the internal Earth terminal (see Fig. 3 and 4. It should be fitted to the internal earth point using a ring crimp terminal to secure the earth conductor.

In addition, external earth connections can be made to the M5 earth stud (see Fig. 2), using a ring crimp terminal to secure the earth conductor to the earth stud. The external earth crimp ring should be located between the two M5 plain washers provided and securely locked down with the M5 spring washer and M5 nut.

The earth conductor should be at least equal in size and rating to the incoming power conductors but at least a minimum of 0.82mm^2 / 18AWG in size.

12) End Of Line Monitoring (DC Units Only)

On D1xS1DC & D1xS2DC units, dc reverse line monitoring can be used if required. All DC alarm horns have a blocking diode fitted in their supply input lines. An end of line monitoring diode or an end of line monitoring resistor can be connected across the +ve and –ve terminals. If an end of line resistor is used it must have a minimum resistance value of 3k3 ohms and a minimum power rating of 0.5 watts or a minimum resistance value of 500 ohms and a minimum power rating of 2 watts.

The resistor must be connected directly across the +ve and -ve terminals as shown in the following drawing. The resistor leads should be kept as short as possible.

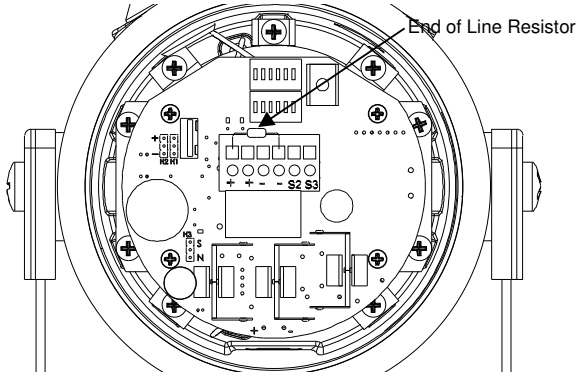
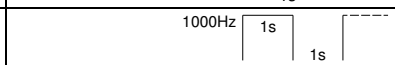
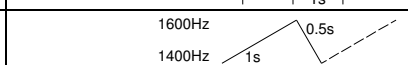
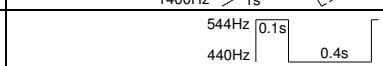
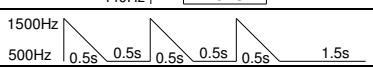
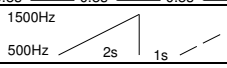
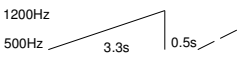
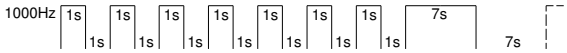
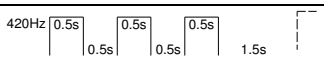
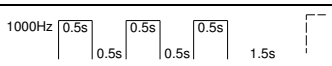
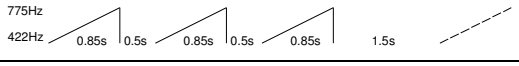
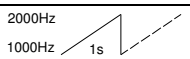
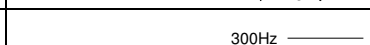
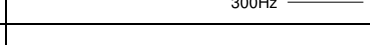
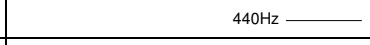
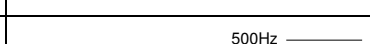
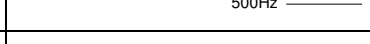
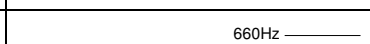
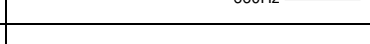
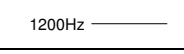
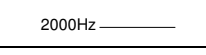
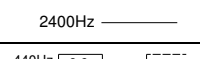
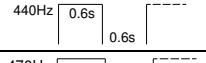
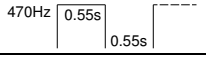
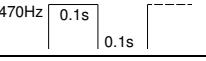
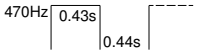
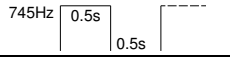
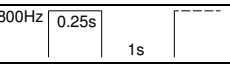
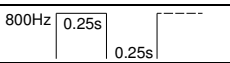
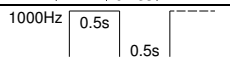
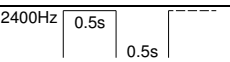
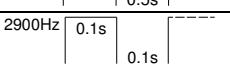
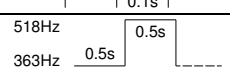
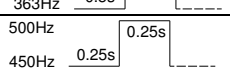
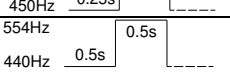
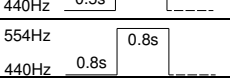
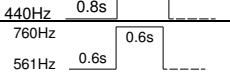
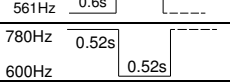
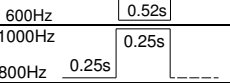
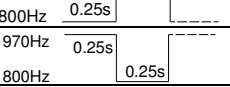
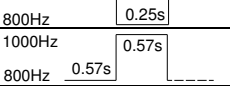
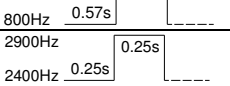
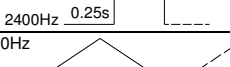
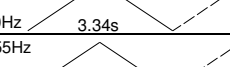
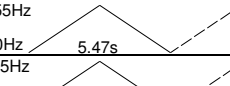
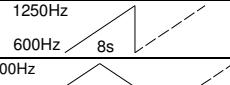
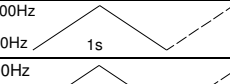
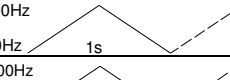
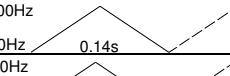
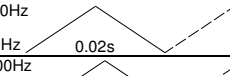
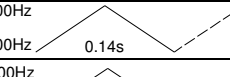
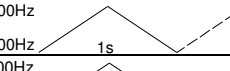
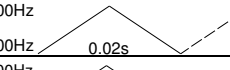
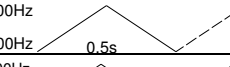
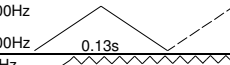
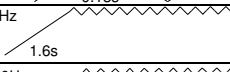
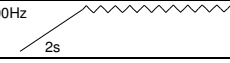
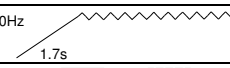


Fig. 9 End Of Line Resistor Placement

Tone Selection – To select the required first stage tone set the tone Set DIP switch 1 (6 way DIP see Fig 3) to the required tone setting shown in the table below. The table also shows the second stage tone can be set independently with the Stage 2 DIP switch to select the required tone. The 3rd and 4th stage tones are available if more than two tone output stages are required, they are set/linked via the first stage tone selection.

Stage 1 Set DIP Switch 1 Tone No	Tone Description	Tone Visual	Stage 1 & 2 DIP Switch Settings 1 2 3 4 5 6	Stage 2 Set DIP Switch 2 Tone (S2)	Stage 3 Set DIP Switch 1 Tone (S3)	Stage 4 Set DIP Switch 1 Tone (S2 + S3)
1	1000Hz PFEER Toxic Gas		0 0 0 0 0 0	1	2	44
2	1200/500Hz @ 1Hz DIN / PFEER P.T.A.P.		1 0 0 0 0 0	2	3	44
3	1000Hz @ 0.5Hz(1s on, 1s off) PFEER Gen. Alarm		0 1 0 0 0 0	3	2	44
4	1.4KHz-1.6KHz 1s, 1.6KHz-1.4KHz 0.5s NF C 48-265		1 1 0 0 0 0	4	24	1
5	544Hz(100mS)/440Hz (400mS) NF S 32-001		0 0 1 0 0 0	5	19	1
6	1500/500Hz - (0.5s on , 0.5s off) x3 + 1s gap AS4428		1 0 1 0 0 0	6	44	1
7	500-1500Hz Sweeping 2 sec on 1 sec off AS4428		0 1 1 0 0 0	7	44	1
8	500/1200Hz @ 0.26Hz(3.3s on, 0.5s off) Netherlands - NEN 2575		1 1 1 0 0 0	8	24	35
9	1000Hz (1s on, 1s off)x7 + (7s on, 1s off) IMO Code 1a		0 0 0 1 0 0	9	34	1
10	1000Hz (1s on, 1s off)x7 + (7s on, 1s off) IMO Code 1a		1 0 0 1 0 0	10	34	1
11	420Hz(0.5s on, 0.5s off)x3 + 1s gap ISO 8201 Temporal Pattern		0 1 0 1 0 0	11	1	8
12	1000Hz(0.5s on, 0.5s off)x3 + 1s gap ISO 8201 Temporal Pattern		1 1 0 1 0 0	12	1	8
13	422/775Hz - (0.85 on, 0.5 off) x3 + 1s gap NFPA - Temporal Coded		0 0 1 1 0 0	13	1	8
14	1000/2000Hz @ 1Hz Singapore		1 0 1 1 0 0	14	3	35
15	300Hz Continuous		0 1 1 1 0 0	15	24	35
16	440Hz Continuous		1 1 1 1 0 0	16	24	35
17	470Hz Continuous		0 0 0 0 1 0	17	24	35
18	500Hz Continuous IMO code 2 (Low)		1 0 0 0 1 0	18	24	35
19	554Hz Continuous		0 1 0 0 1 0	19	24	35
20	660Hz Continuous		1 1 0 0 1 0	20	24	35
21	800Hz IMO code 2 (High)		0 0 1 0 1 0	21	24	35
22	1200Hz Continuous		1 0 1 0 1 0	22	24	35
23	2000Hz Continuous		0 1 1 0 1 0	23	3	35
24	2400Hz Continuous		1 1 1 0 1 0	24	20	35
25	440 @0.83Hz (50 cycles/minute) Intermittent		0 0 0 1 1 0	25	44	8
26	470 @0.9Hz - 1.1s Intermittent		1 0 0 1 1 0	26	44	8
27	470Hz @5Hz - (5 cycles/second) Intermittent		0 1 0 1 1 0	27	44	8
28	544Hz @ 1.14Hz - 0.875s Intermittent		1 1 0 1 1 0	28	24	8
29	655Hz @ 0.875Hz Intermittent		0 0 1 1 1 0	29	44	8
30	660Hz @0.28Hz - 1.8sec on, 1.8sec off Intermittent		1 0 1 1 1 0	30	24	8
31	660Hz @3.34Hz - 150mS on, 150mS off Intermittent		0 1 1 1 1 0	31	24	8

32	745Hz @ 1Hz Intermittent		1 1 1 1 1 0	32	24	8
33	800Hz - 0.25sec on, 1 sec off Intermittent		0 0 0 0 0 1	33	24	8
34	800Hz @ 2Hz IMO code 3.a (High) Intermittent		1 0 0 0 0 1	34	24	8
35	1000Hz @ 1Hz Intermittent		0 1 0 0 0 1	35	24	8
36	2400Hz @ 1Hz Intermittent		1 1 0 0 0 1	36	24	8
37	2900Hz @ 5Hz Intermittent		0 0 1 0 0 1	37	24	8
38	363/518Hz @ 1Hz Alternating		1 0 1 0 0 1	38	8	19
39	450/500Hz @ 2Hz Alternating		0 1 1 0 0 1	39	8	19
40	554/440Hz @ 1Hz Alternating		1 1 1 0 0 1	40	24	19
41	554/440Hz @ 0.625Hz Alternating		0 0 0 1 0 1	41	8	19
42	561/760Hz @0.83Hz (50 cycles/minute) Alternating		1 0 0 1 0 1	42	8	19
43	780/600Hz @ 0.96Hz Alternating		0 1 0 1 0 1	43	8	19
44	800/1000Hz @ 2Hz Alternating		1 1 0 1 0 1	44	24	19
45	970/800Hz @ 2Hz Alternating		0 0 1 1 0 1	45	8	19
46	800/1000Hz @ 0.875Hz Alternating		1 0 1 1 0 1	46	24	19
47	2400/2900Hz @ 2Hz Alternating		0 1 1 1 0 1	47	24	19
48	500/1200Hz @ 0.3Hz Sweeping		1 1 1 1 0 1	48	24	12
49	560/1055Hz @ 0.18Hz Sweeping		0 0 0 0 1 1	49	24	12
50	560/1055Hz @ 3.3Hz Sweeping		1 0 0 0 1 1	50	24	12
51	600/1250Hz @ 0.125Hz Sweeping		0 1 0 0 1 1	51	24	12
52	660/1200Hz @ 1Hz Sweeping		1 1 0 0 1 1	52	24	12
53	800/1000Hz @ 1Hz Sweeping		0 0 1 0 1 1	53	24	12
54	800/1000Hz @ 7Hz Sweeping		1 0 1 0 1 1	54	24	12
55	800/1000Hz @ 50Hz Sweeping		0 1 1 0 1 1	55	24	12
56	2400/2900Hz @ 7Hz Sweeping		1 1 1 0 1 1	56	24	12
57	2400/2900Hz @ 1Hz Sweeping		0 0 0 1 1 1	57	24	12
58	2400/2900Hz @ 50Hz Sweeping		1 0 0 1 1 1	58	24	12
59	2500/3000Hz @ 2Hz Sweeping		0 1 0 1 1 1	59	24	12
60	2500/3000Hz @ 7.7Hz Sweeping		1 1 0 1 1 1	60	24	12
61	800Hz Motor Siren		0 0 1 1 1 1	61	24	12
62	1200Hz Motor Siren		1 0 1 1 1 1	62	24	12
63	2400Hz Motor Siren		0 1 1 1 1 1	63	24	12
64	Simulated Bell		1 1 1 1 1 1	64	21	12