STROBE CIRCUIT VOLTAGE DROP CALCULATIONS

POWER SUPPLY #	LOCATED IN	LOOP TYPE & No.	DEVICES: FA. BELL	DOOR HOLDER	WALL 15cd	MINI HORN	STROBES 15cd	STROBES 30cd	STROBES 75cd	STROBES 95cd	WIRE SIZE	WIRE DC RESIST. /1000'	TOTAL ALARM CURRENT	ONE-WAY LOOP LENGTH FROM POWER SUPPLY TO MIDDLE OF	TOTAL VD	VOLTAGE DROP	MINIMUM BATTERY SIZE	BATTERY SELECTED
			Alarm Current - I(a) (Amp)															
			0.03	0.02	0.043	0.022	0.041	0.063	0.111	0.134	AWG	OHMS	AMPS	FEET	VOLTS	%	AH	AH
R50		V1			2		4		2		12	1.93	0.472	150	0.273	1.14	SEE R50 BATTERY CALCS	
		V2			2		4		2		12	1.93	0.472	300	0.547	2.28		
		V3									12	1.93						
		V4									12	1.93						
											12	1.93					1.87	4.0
											12	1.93						
											12	1.93						
											12	1.93						

STROBE CIRCUIT VOLTAGE DROP CALCULATIONS

POWER SUPPLY #	LOCATED IN	LOOP TYPE & No.	DEVICES: FA. BELL	DOOR HOLDER	WALL 15cd	MINI HORN	STROBES 15cd	STROBES 30cd	STROBES 75cd	STROBES 95cd	WIRE SIZE	WIRE DC RESIST. /1000'	TOTAL ALARM CURRENT	ONE-WAY LOOP LENGTH FROM POWER SUPPLY TO MIDDLE OF	TOTAL VD	VOLTAGE DROP	MINIMUM BATTERY SIZE	BATTERY SELECTED
			Alarm Current - I(a) (Amp)															
			0.03	0.02	0.043	0.022	0.041	0.063	0.111	0.134	AWG	OHMS	AMPS	FEET	VOLTS	%	AH	AH
DPM-K3		V1			3		2		2		12	1.93	0.433	150	0.251	1.04	SEE DPM-K3 BATTERY CALCS	
		V2			3		2		2		12	1.93	0.433	480	0.802	3.34		
		V3									12	1.93						
		V4									12	1.93						
											12	1.93					1.87	4.0
											12	1.93						
											12	1.93						
											12	1.93						

FORMULAS USED FOR CALCULATIONS:

FORMULA FOR BATTERY SIZING:
FOR FACP/FAPS/DPM -- 24 HOURS STANDBY & 15 MIN IN ALARM:
AMP HOUR = 1.20 [(24 HOURS X I(S)) + (15/60 HOUR X I(A))]

WHERE,
1.20 = BATTERY DERATING VALUE
I(S) = TOTAL SUPERVISORY CURRENT (0 FOR NOTIFICATION DEVICES AND 48 mA FOR FCPS-24)
I(A) = TOTAL ALARM CURRENT

FORMULA FOR VOLTAGE DROP CALCULATIONS

TOTAL DC RESISTANCE = # OF WIRES X Rdc/1000 X ONE-WAY LOOP LENGTH FROM POWER SUPPLY TO MIDDLE OF LOAD

TOTAL VD = TOTAL DC RESISTANCE X TOTAL ALARM CURRENT

MINIMUM VOLTAGE AT DEVICES = 20.4V -- TOTAL VD
20.4V = MINIMUM VOLTAGE AT END OF USEFUL BATTERY LIFE (85% OF 24VDC)

NOTE:
THE MANUFACTURER'S OPERATING VOLTAGE IS BETWEEN 16VDC AND 33 VDC (FOR 24VDC NOMINAL)

Application Drawing

APP-02
0102R2

Field Wiring Guidelines

Wire Type:

The speaker circuits of most voice evacuation systems will typically be classified as power limited wiring. As such, these speaker circuits can be run with other fire alarm wiring without ill effects.

No special cabling is required for the speaker circuits. Standard FPL or FPLP wire is sufficient. Twisted pair or shielding twisted pair wiring is not necessary.

There is one exception, however. Certain addressable systems may generate extraneous noise from their addressable loop, and cannot be run using shielded cable. In this case, shielding of the evacuation speaker circuit will help to eliminate noise picked up by and heard in speakers during standby operation, and possible interference with the addressable loop.

Wire Gauge:

Generally, #18 AWG will be adequate for speaker circuits. The only time that heavier wire is needed is when load is high, and wire runs are long. But remember, it never hurts to go with heavier wire. So if a #16 or #14 AWG pair is being pulled for strobes, it is often easier and less costly to pull the same wire for the evacuation speaker circuits.

The table below illustrates typical wire lengths for specific wire gauge and speaker load:*

At 25VRMS Output:

Power	#18 AWG	#16AWG	#14 AWG	#12AWG
10W	1,900	3,050	4,850	7,700
15W	1,280	2,030	3,230	5,140
25W	760	1,220	1,930	3,080

At 70VRMS Output:

Power	#18 AWG	#16AWG	#14 AWG	#12AWG
10W	15,200	24,200	38,360	61,100
15W	10,130	16,130	25,570	40,730
25W	6,080	9,680	15,340	24,440

* This table assumes that there is an even distribution of the speaker load on the speaker circuit, and that a 20% drop at the last device is allowable. If an even distribution of load is not the case, reduce all wire runs by 1/2.

1 SPEAKER CIRCUIT WIRING GUIDELINES

NOT TO SCALE

R50 AMPLIFIER
SPEAKER CIRCUIT OPERATING VOLTAGE = 25V RMS
SPEAKER CIRCUIT A1 LOAD = 11.5 WATTS A1
APPROXIMATE LENGTH OF SPEAKER CIRCUIT A1 = 615 FEET
REFER TO SPEAKER CIRCUIT WIRING GUIDELINES. A MAXIMUM SPEAKER CIRCUIT LENGTH OF 2,030 FEET IS ALLOWED FOR #16 AWG CONDUCTORS AT A 15W LOAD.

R50 AMPLIFIER
SPEAKER CIRCUIT OPERATING VOLTAGE = 25V RMS
SPEAKER CIRCUIT A2 LOAD = 7.25 WATTS A2
APPROXIMATE LENGTH OF SPEAKER CIRCUIT A2 = 684 FEET
REFER TO SPEAKER CIRCUIT WIRING GUIDELINES. A MAXIMUM SPEAKER CIRCUIT LENGTH OF 3,050 FEET IS ALLOWED FOR #16 AWG CONDUCTORS AT A 10W LOAD.

R50 AMPLIFIER
SPEAKER CIRCUIT OPERATING VOLTAGE = 25V RMS
SPEAKER CIRCUIT A3 LOAD = 5.25 WATTS A3
APPROXIMATE LENGTH OF SPEAKER CIRCUIT A3 = 838 FEET
REFER TO SPEAKER CIRCUIT WIRING GUIDELINES. A MAXIMUM SPEAKER CIRCUIT LENGTH OF 3,050 FEET IS ALLOWED FOR #16 AWG CONDUCTORS AT A 10W LOAD.

2 SPEAKER CIRCUIT WATTAGE AND CIRCUIT LENGTH INFORMATION

NOT TO SCALE

OWENS PRIMARY

"FACP" POWER & BATTERY CALCULATION

DEVICE / PANEL	PANEL: STAND-BY (mA)	PANEL: ALARM (mA)	FACP: QUANTITY	FACP: STAND-BY (mA)	FACP: ALARM (mA)
FIRE ALARM CONTROL PANEL	120	120	1	120	120
LCD-160 (BACKLIGHT OFF)	75	100	1	75	100
ACPS-610	130	130	1	130	130
KEYBOARD DISPLAY	220	220	1	220	220
UDACT-2	52	87	1	52	87
ADDRESSABLE RELAY MODULE	0.485	6.5	4	1.94	26
SLC LOOP		200	5		1000
DVC-EM	300	300	1	300	300
DVC-XD	60	60	1	60	60
DAA2-7525	400	500	1	400	500
SMOKE DETECTORS	0.2	4.5	42	8.4	189
HEAT DETECTORS	0.2	4.5	46	9.2	207
LCM-320	130	130	1	130	130
LEM-320	100	100	1	100	100
VESDA SYSTEM	8	8	2	16	16
SMOKE DETECTORS (SEPARATE PERMIT)	0.2	4.5	264	52.8	1188
HEAT DETECTORS (SEPARATE PERMIT)	0.2	4.5	257	51.4	1156.5
TOTALS (AMPS):				I(s) 1.727	I(a) 5.530
Amp Hour:				51.39	
Battery to be provided -				55.0	

BCSD OWENS PRIMARY()

"R50" POWER & BATTERY CALCULATION

DEVICE / PANEL	PANEL: STAND-BY (mA)	PANEL: ALARM (mA)	FACP: QUANTITY	FACP: STAND-BY (mA)	FACP: ALARM (mA)
DISTRIBUTED POWER MODULE	65	145	1	65	145
SPEAKER/STROBE INTERIOR CEILING 75cd		111	4		444
SPEAKER/STROBE INTERIOR CEILING 30cd		63			
SPEAKER/STROBE INTERIOR CEILING 15cd		41	8		328
SPEAKER/STROBE INTERIOR WALL MOUNT 15cd		43	4		172
TOTALS (AMPS):				I(s) 0.065	I(a) 1.089
Amp Hour:				2.20	
Battery to be provided -				7.0	

BCSD OWENS PRIMARY()

"DPM-K3" POWER & BATTERY CALCULATION

DEVICE / PANEL	PANEL: STAND-BY (mA)	PANEL: ALARM (mA)	FACP: QUANTITY	FACP: STAND-BY (mA)	FACP: ALARM (mA)
DISTRIBUTED POWER MODULE	65	145	1	65	145
SPEAKER/STROBE INTERIOR CEILING 75cd		111	4		444
SPEAKER/STROBE INTERIOR CEILING 30cd		63			
SPEAKER/STROBE INTERIOR CEILING 15cd		41	4		164
SPEAKER/STROBE INTERIOR WALL MOUNT 15cd		43	6		258
TOTALS (AMPS):				I(s) 0.065	I(a) 1.011
Amp Hour:				2.18	
Battery to be provided -				7.0	

REMOTE AMPLIFIER (R50)

DESCRIPTION	WATTAGE
A1	11.5W
A2	7.25W
A3	5.25W
A4	SPARE
TOTAL = 24W USED AMPLIFIER = 50W	

AGENCY INFORMATION:

AGENCY TRACKING NO. 63321-356
FILE NO. 15-6

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
OFFICE OF REGULATION SERVICES
03-120240
AC FLS SS
DATE JAN 0 2 2020

SEAL

REVISIONS

NO.	DATE SUBMITTED	DATE APPROVED	DESCRIPTION

CONSULTANT

FERRANTI ENGINEERING
CONSULTING
ELECTRICAL ENGINEERS
1211 MARICOPA HWY,
SUITE 250
OJAI, CA 93023
(805) 705-4772
DALEFERRANTI@LIVE.COM

REGISTERED PROFESSIONAL ENGINEER
DALE FERRANTI
EXP. 06/30/21
ELECTRICAL
STATE OF CALIFORNIA

PRIME CONSULTANT

IBI
ARCHITECTURE
PLANNING
San Luis Obispo
4119 Broad Street, Suite 210
San Luis Obispo, CA 93401
805.546.0433
fax: 805.546.0504
ibigroup.com

BAKERSFIELD CITY SCHOOL DISTRICT

BESSIE OWENS E.S. KINDERGARTEN MODULAR BUILDINGS
815 POTOMAC AVE, BAKERSFIELD, CA 93307

OPSC or OSHPD PROJ. NO:	N/A
PROJECT NO:	118932
DRAWN BY:	V.Z.
CHK'D BY:	D.F.
ISSUE DATE:	10/29/2019

SHEET TITLE

FIRE ALARM VOLTAGE DROP AND BATTERY CALCULATIONS

SHEET NUMBER

E303

CONSTRUCTION DOCUMENTS