

Appendix A: Supply Calculations

Supply Calculations	Page	3
• <i>Overview</i>		3
• <i>AC Branch Circuit</i>		3
• <i>Main Power Supply</i>		4
• <i>Calculating the System Current Draw</i>		6
• <i>Selecting and Locating Batteries</i>		12

Supply Calculations

Overview

This appendix contains instructions and tables for calculating power supply currents in alarm and standby conditions. This is a four step process, consisting of the following:

1. Calculating the total amount of AC branch circuit current required to operate the system.
2. Calculating the power supply load current for non-fire and fire alarm conditions and calculating the secondary (battery) load.
3. Calculating the size of batteries required to support the system if an AC power loss occurs.
4. Selecting the proper batteries for your system.

AC Branch Circuit

This control panel requires connection to a separate dedicated AC branch circuit (120 VAC for IFC-200 and 220/240 VAC for IFC-200E), which must be labeled **FIRE ALARM**. This branch circuit must connect to the line side of the main power feed of the protected premises. No other equipment may be powered from the fire alarm branch circuit. The branch circuit wire must run continuously, without any disconnect devices, from the power source to the fire alarm control panel. Overcurrent protection for this circuit must comply with Article 760 of the National Electrical Codes as well as local codes. Use 14 AWG wire with 600 volt insulation for this branch circuit.

Use Table 1 and Table 2 to determine the total amount of current, in AC amperes (A), that must be supplied to the system.

Table 1: 120 VAC Branch Circuit Requirements

Device Type	Number of Devices		Current Draw (A)		Total Current per Device
IFC-200	1	X	3.0	=	3.0
AVPS-24	[]	X	1.0	=	
Sum Column for AC Branch Current Required				=	A

Table 2: 220/240 VAC Branch Circuit Requirements

Device Type	Number of Devices		Current Draw (A)		Total Current per Device
IFC-200E	1	X	1.5	=	1.5
AVPS-24E	[]	X	0.05	=	
Sum Column for AC Branch Current Required				=	A

**Main Power
Supply**

The control panel’s main power supply can supply a total of 5.0A in alarm and 1.0A in standby (non-alarm condition). The current available for powering external devices, however, is subject to lower limits as shown in Figure 1 and Figure 2.

**Current
Limitations in
Standby**

Current for operating an external device in standby (non-alarm) is subject to the following limitations:

- 1. Non-resettable power (TB1, Terminals 3 and 4) and resettable power (TB1, Terminals 5 and 6) are limited to a combined total of 0.5A. Using Table 4 Calculation Column 1, verify that the combined subtotal of rows 4 and 5 is less than 0.5A.
- 2. The total power supply load is limited to 1.0A. Using Table 4, verify that the total of Calculation Column 1 is less than 1.0A.

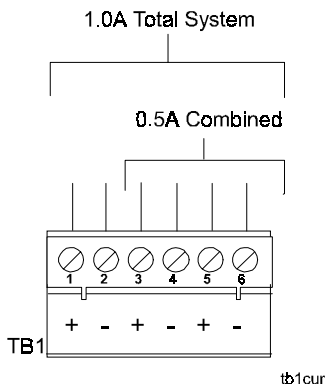


Figure 1: TB1 Standby Current Limitations

Current Limitations in Alarm--System Operation on Primary Power

Current for operating external devices in alarm is subject to the following limitations:

1. High ripple power (TB1, Terminals 1 and 2) is limited to 1.5A. Using Table 4 Calculation Column 2, verify that the subtotal of Row 3 is less than 1.5A.
2. Non-resettable power (TB1, Terminals 3 and 4) and resettable power (TB1, Terminals 5 and 6) are limited to a combined total of 0.5A. Using Table 4 Calculation Column 2, verify that the subtotal of Rows 4 and 5 combined is less than 0.5A.
3. The maximum load on NAC #1 (TB1, Terminals 1 and 2) cannot exceed 2.5A. Using Table 4 Calculation Column 2, verify that the subtotal of Row 6 is less than 2.5 A.
4. The maximum combined load on NAC #2, NAC #3, and NAC #4 (TB2, Terminals 3-8) cannot exceed 2.5A. Using Table 4 Calculation Column 2, verify that the subtotal of Row 7, 8, or 9 is less than 2.5A.
5. The total power supply load is limited to 5.0A. Using Table 4, verify that the subtotal for Calculation Column 2 is less than 5.0A.

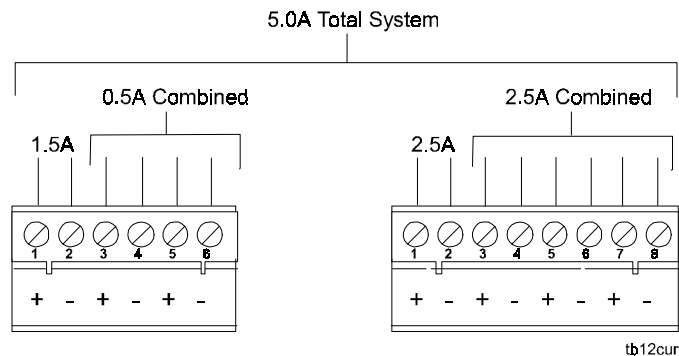


Figure 2: TB1 and TB2 Alarm Current Limitations

Calculating the System Current Draw

Overview

The control panel must be able to power all internal and external devices continuously during the non-fire alarm condition. To calculate the non-fire alarm load on the system power supply when primary power is applied, use Calculation Column 1 in Table 4. The control panel must support a larger load current during a fire alarm condition. To calculate the fire alarm load on the power supply, use Calculation Column 2 in Table 4. The secondary power source (batteries) must be able to power the system during a primary power loss. To calculate the non-fire alarm load on the secondary power source, use Calculation Column 3 in Table 4.

When calculating current draw and battery size, note the following:

- Primary refers to the main power source for the control panel.
- Secondary refers to the control panel's backup batteries.
- All currents are given in amperes (A). Table 3 shows how to convert milliamperes and microamperes to full amperes.

Table 3: Converting to Full Amperes

To Convert . . .	Multiply	Example
Milliamperes (mA) to amperes (A)	$\text{mA} \times 0.001$	$3 \text{ mA} \times 0.001 = 0.003 \text{ A}$
Microamperes (μA) to amperes (A)	$\mu\text{A} \times 0.000001$	$300 \mu\text{A} \times 0.000001 = 0.0003 \text{ A}$

**Calculating
System Current
Draws (Table 4)**

Use Table 4 to calculate current draws as follows.

1. Enter the quantity of devices in all three columns.
2. Enter the current draw where required. Refer to the *Device Compatibility Technical Bulletin, LIT-445180*, for compatible devices and their current draw.
3. Calculate the current draws for each in all columns.
4. Sum the total current for each column.
5. Copy the totals from column 2 and column 3 to Table 5.

Figure 3 shows the types of current that you enter into Table 4.

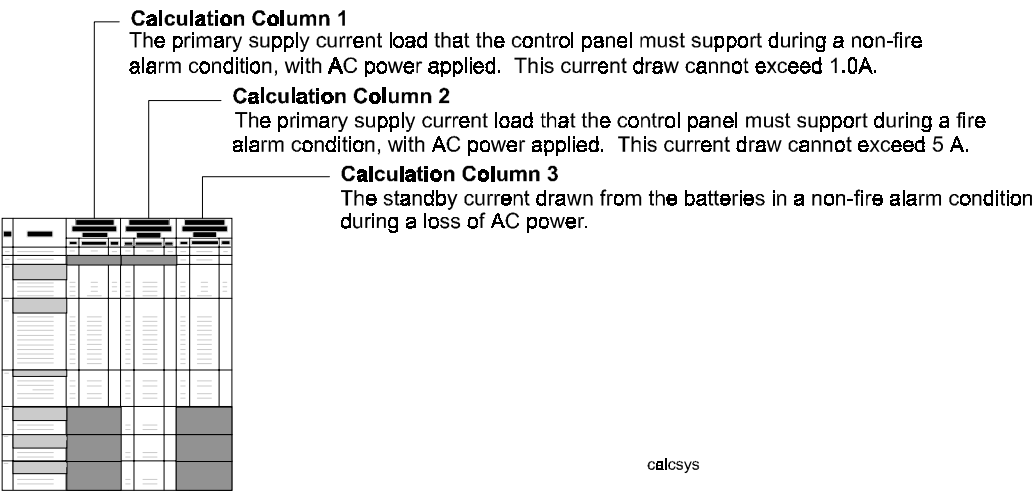


Figure 3: Calculating the System Current Draws

Table 4 contains three columns for calculating current draws. For each column, calculate the current and enter the total (in amperes) in the bottom row. When finished, copy the totals from Calculation Column 2 and Calculation Column 3 to Table 5.

Table 4: System Current Draw Calculations

Row	Category	Calculation Column 1 Primary, Non-Fire Alarm Current (A)			Calculation Column 2 Primary, Fire Alarm Current (A)			Calculation Column 3 Secondary, Non-Fire Alarm Current (A)		
		Qty	x [Current Draw] =	Total	Qty	x [Current Draw] =	Total	Qty	x [Current Draw] =	Total
1	Basic System	N/A	N/A	N/A	N/A	N/A	N/A	1	x [0.100] =	0.10
2	AVPS-24							[]	x [0.009] =	
3	<i>High Ripple Power</i>									
	<i>TB1 Terminals 1 and 2</i>									
	Notification Appliances via M5x0CJ	N/A	N/A	N/A	[]	x [] =		N/A	N/A	N/A
	Notification Appliances via M5x0CJ	N/A	N/A	N/A	[]	x [] =		N/A	N/A	N/A
	Releasing Devices via M5x0CJ	N/A	N/A	N/A	[]	x [] =		N/A	N/A	N/A
	Other Compatible Devices 1	[]	x [] =		[]	x [] =		[]	x [] =	
4	<i>Non-resettable Power</i>									
	<i>TB1 Terminals 3 and 4</i>									
	AFM-16AT/AFM-32A Series	[]	x [0.040] =		[]	x [0.056] =		[]	x [0.040] =	
	ACM-16AT/ACM-32A Series	[]	x [0.040] =		[]	x [0.056] =		[]	x [0.040] =	
	AEM-16AT/AEM-32A Series	[]	x [0.002] =		[]	x [0.018] =		[]	x [0.002] =	
	AFM-16A	[]	x [0.025] =		[]	x [0.065] =		[]	x [0.025] =	
	LCD-80, LCD-80TM ²	[]	x [0.100] =		[]	x [0.100] =		[]	x [0.050] =	
	ACM-8R	[]	x [] =		[]	x [] =		[]	x [] =	
	LDM	[]	x [] =		[]	x [] =		[]	x [] =	
	UDACT Communicator	[]	x [0.040] =		[]	x [0.100] =		[]	x [0.040] =	
	Other Compatible Devices	[]	x [] =		[]	x [] =		[]	x [] =	
5	<i>Resettable Power</i>									
	Four-wire Smoke Detector	[]	x [] =		[]	x [] =		[]	x [] =	
	Two-wire Smoke Detector	[]	x [] =		[]	x [] =		[]	x [] =	
	Connected to M502MJ									
Continued on next page . . .										

Row (Cont.)	Category	Calculation Column 1 Primary, Non-fire Alarm Current (A)			Calculation Column 2 Primary, Fire Alarm Current (A)			Calculation Column 3 Secondary, Non-fire Alarm Current (A)		
	A77-716B Relay	[]	x [0.020] =		[]	x [0.020] =		[]	x [0.020] =	
	Other Compatible Devices ¹	[]	x [] =		[]	x [] =		[]	x [] =	
6	NAC 1 ¹									
	TB2 Terminals 1 and 2									
	Notification Appliance				[]	x [] =				
	Releasing Solenoid				[]	x [] =				
7	NAC 2 ¹									
	TB2 Terminals 3 and 4									
	Notification Appliance				[]	x [] =				
	Releasing Solenoid				[]	x [] =				
8	NAC 3 ^{1,3}									
	TB2 Terminals 5 and 6									
	Notification Appliance				[]	x [] =				
	Releasing Solenoid				[]	x [] =				
9	NAC 4 ^{1,3}									
	TB2 Terminals 7 and 8									
	Notification Appliance				[]	x [] =				
	Releasing Solenoid				[]	x [] =				
10	SLC Loop									
	TB6 Terminals 3-6									
	2x51J, 1x51J, 5551J, and 2251THJ	[]	x [0.00020] =		[]	x [0.00020] =		[]	x [0.00020] =	
	M500MJ, M501MJ, M500CJ, BGX-101L	[]	x [0.00030] =		[]	x [0.00043] =		[]	x [0.00030] =	
	M510CJ	[]	x [0.00030] =		[]	x [0.00030] =		[]	x [0.00030] =	
	M502MJ	[]	x [] =		[]	x [] =		[]	x [] =	
	B601BH	[]	x [0.00100] =		[]	x [0.00100] =		[]	x [0.00100] =	
	B501BHJ (Horn in Base)	[]	x [0.00100] =		[]	x [0.01500] =		[]	x [0.00100] =	
	DH500J, DH502J	[]	x [] =		[]	x [] =		[]	x [] =	
	M500XJ	[]	x [0.00045] =		[]	x [0.00045] =		[]	x [0.00045] =	
Continued on next page . . .										

Row (Cont.)	Category	Calculation Column 1 Primary, Non-Fire Alarm Current (A)			Calculation Column 2 Primary, Fire Alarm Current (A)			Calculation Column 3 Secondary, Non-Fire Alarm Current (A)		
11	Optional Modules									
	RTM-8 ⁴	[]	x [0.0010] =		[]	x [0.0160] =		[]	x [0.0010] =	
	4XTM	[]	x [0.0110] =		[]	x [0.0020] =		[]	x [0.0110] =	
	Municipal Box	N/A	N/A		[]	x [] =		N/A	N/A	
	Reverse Polarity Outputs Used	[]	x [0.0050] =		[]	x [0.0050] =		[]	x [0.0050] =	
12	Sum Each Column for Totals	Primary Non-alarm: (1.0A maximum)			Primary Alarm: (5.0A maximum)			Secondary Alarm:		

1

Refer to the *Device Compatibility Technical Bulletin, LIT-445180*, for compatible devices and their current draws.

2

For non-English language systems, the LCD-80TM (Terminal mode) standby current is 0.100A.

3

Do not enter current for NAC 3 and NAC 4 in this table if powering these circuits from an AVPS-24. For more information on the AVPS-24, refer to *Appendix J: AVPS-24 Power Expansion* of this manual.

4

The RTM-8 alarm current is based on all eight alarm relays being activated. The alarm current can be reduced by 0.019A for each zone (between Zone 1 and Zone 8) that is not used by the system.

Calculating Battery Size Needed

Use Table 5 to calculate the total Standby and Alarm loads in Ampere-Hours (AH). This total load determines the battery size (in AH), required to support the control panel under the loss of AC power. Complete Table 5 as follows:

1. Enter the totals from Table 4 Calculations Column 2 and 3 where shown.
2. Enter the NFPA Standby and Alarm times (refer to *NFPA Battery Requirements* below.)
3. Calculate the Ampere-Hours for Standby and Alarm; then, sum the Standby and Alarm Ampere-Hours.
4. Multiply the sum by the derating factor of 1.2 to get the proper battery size (in AH).
5. Write the ampere-hour requirements on the Protected Premises label located inside the cabinet door.

Table 5: Total Secondary Power Requirements (@ 24 VDC)

Secondary Standby Load (Total from Table 4 Calculation Column 3) []	X	Required Standby Time (24 or 60 hours) []	=	AH
Primary Alarm Load (Total from Table 4 Calculation Column 2) []	X	Required Standby Time (For 5 minutes, enter 0.084, for 10 minutes, enter 0.168) []	=	AH
AVPS-24 Alarm Load (if using AVPS-24, enter 3.0A) []	X	Required Alarm Time (For 5 minutes, enter 0.084, for 10 minutes, enter 0.168) x []		AH
Sum Column for Ampere Hours =				AH
Multiply the derating factor (1.2)				x 1.2
Total Ampere Hours Required =				AH

NFPA Battery Requirements

- NFPA 72-1993 Local and NFPA 72-1993 Remote Station Fire Alarm Systems require **24 hours** of standby power followed by **5 minutes** in alarm.
- NFPA 72-1993 Central Station, NFPA 72-1993 Auxiliary, and NFPA 72-1993 Remote Station require **60 hours** of standby power followed by **5 minutes** in alarm. Batteries installed in a system powered by a generator need to provide at least four hours of standby power.
- NFPA 12, 12A, 12B require **24 hours** plus **5 minutes** activation. The total ampere hours required cannot exceed 17 AH with an internal charger.

**Selecting and
Locating
Batteries**

Select batteries that meet or exceed the total ampere hours calculated (from Table 5). The control panel can charge batteries in the 7 AH to 17 AH range. Table 6 contains information, such as the battery size, and location, for the batteries required to power the control panel if an AC power loss occurs.

Note: 15 AH to 17 AH batteries require the BB-17 or other UL Listed external battery cabinet.

Table 6: Battery Size and Location

Battery Size	Voltage Rating	Number Required	Part Number	Location
7 AH	12 volts	Two	PS-1270	In Panel
12 AH	12 volts	Two	PS-12120	
17 AH	12 volts	Two	PS-12170	BB-17 Battery Box



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