SIEMENS

L-858 Low VA
Taxiway & Runway Signs

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Record of Changes

Page	Rev	Description	EC No.	Checked	Approved	Date
A1 6-15	A	Added note. Revised figures.	NA	EP	ED	
1-3 to 1-6 4-1, 4-2	B	Revised diagrams. Revised lamp transformer description.	NA	EP	ED	
1-11 3-1	C	Revised Table 1-4. Revised Section 3.	NA	EP	ED	
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5-5	E	Added metric units and cautionary note to use correct frangible coupling size with sign.	NA	EP	WT	
4-1, 4-2, 6-3 to 6-9, 6-12, 6-15, 6-15.1	F	Deleted reference to Sylvania lamp part numbers. New flange and module end assembly. Revised 3- and 5-step wiring diagram.	NA	EP	ED	
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Products of Siemens Airfield Solutions manufacture are guaranteed against mechanical, electrical, and physical defects (excluding lamps) for a period of one year from the date of installation or a maximum of two years from the date of shipment and are guaranteed to be merchantable and fit for the ordinary purposes for which such products are made.

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This manual could contain technical inaccuracies or typographical errors. Siemens Airfield Solutions reserves the right to revise this manual from time to time in the contents thereof without obligation of Siemens Airfield Solutions to notify any person of such revision or change.

Details and values given in this manual are average values and have been compiled with care. They are not binding, however, and Siemens Airfield Solutions disclaims any liability for damages or detriments suffered as a result of reliance on the information given herein or the use of products, processes or equipment to which this manual refers. No warranty is made that the use of the information or of the products, processes or equipment to which this manual refers will not infringe any third party's patents or rights. The information given does not release the buyer from making their own experiments and tests.

Section 1
Safety

1. Introduction

This section contains general safety instructions for using your Siemens Airfield Solutions equipment. Some safety instructions may not apply to the equipment in this manual. Task- and equipment-specific warnings are included in other sections of this manual where appropriate. Note all warnings and follow all instructions carefully. Failure to do so may result in personal injury, death, or property damage.

To use this equipment safely,

- refer to the FAA Advisory Circular AC 150/5340-26, *Maintenance of Airport Visual Aids Facilities*, for instructions on safety precautions.
- observe all safety regulations. To avoid injuries, always remove power prior to making any wire connections and touching any parts. Refer to FAA Advisory Circular AC 150/5340-26.
- read and become familiar with the general safety instructions provided in this section of the manual before installing, operating, maintaining, or repairing this equipment.
- read and carefully follow the instructions given throughout this manual for performing specific tasks and working with specific equipment.
- store this manual within easy reach of personnel installing, operating, maintaining, or repairing this equipment.
- follow all applicable safety procedures required by your company, industry standards, and government or other regulatory agencies.
- obtain and read Material Safety Data Sheets (MSDS) for all materials used.

2. Safety Symbols

Become familiar with the safety symbols presented in this section. These symbols will alert you to safety hazards and conditions that may result in personal injury, death, or property and equipment damage.

WARNING: Failure to observe this warning may result in personal injury, death, or equipment damage.

WARNING: Risk of electrical shock. Failure to observe this warning may result in personal injury, death, or equipment damage.

2. Safety Symbols *(contd.)*

WARNING: Disconnect equipment from line voltage. Failure to observe this warning may result in personal injury, death, or equipment damage.

WARNING: Wear safety goggles. Failure to observe may result in serious injury.

CAUTION: Failure to observe may result in equipment damage.

3. Qualified Personnel

The term *qualified personnel* is defined here as individuals who thoroughly understand the equipment and its safe operation, maintenance, and repair. Qualified personnel are physically capable of performing the required tasks, familiar with all relevant safety rules and regulations and have been trained to safely install, operate, maintain, and repair the equipment. It is the responsibility of the company operating this equipment to see that its personnel meet these requirements.

4. Intended Use

WARNING: Use of this equipment in ways other than described in this manual may result in personal injury, death, or property and equipment damage. Use this equipment only as described in this manual.

Siemens Airfield Solutions cannot be responsible for injuries or damages resulting from nonstandard, unintended applications of its equipment. This equipment is designed and intended only for the purpose described in this manual. Uses not described in this manual are considered unintended uses and may result in serious personal injury, death, or property damage. Unintended uses may result from taking the following actions:

- making changes to equipment that have not been recommended or described in this manual or using parts that are not genuine Siemens Airfield Solutions replacement parts
- failing to make sure that auxiliary equipment complies with approval agency requirements, local codes, and all applicable safety standards
- using materials or auxiliary equipment that are inappropriate or incompatible with your Siemens Airfield Solutions equipment
- allowing unqualified personnel to perform any task

5. Installation

Read the installation section of all system component manuals before installing your equipment. A thorough understanding of system components and their requirements will help you install the system safely and efficiently.

WARNING: Failure to follow these safety procedures can result in personal injury or death.

- Allow only qualified personnel to install Siemens Airfield Solutions and auxiliary equipment. Use only approved equipment. Using unapproved equipment in an approved system may void agency approvals.
- Make sure all equipment is rated and approved for the environment in which you are using it.
- Follow all instructions for installing components and accessories.
- Install all electrical connections to local code.
- Use only electrical wire of sufficient gauge and insulation to handle the rated current demand. All wiring must meet local codes.
- Route electrical wiring along a protected path. Make sure they will not be damaged by moving equipment.
- Protect components from damage, wear, and harsh environment conditions.
- Allow ample room for maintenance, panel accessibility, and cover removal.
- Protect equipment with safety devices as specified by applicable safety regulations.
- If safety devices must be removed for installation, install them immediately after the work is completed and check them for proper functioning.

6. Operation

Only qualified personnel, physically capable of operating the equipment and with no impairments in their judgment or reaction times, should operate this equipment.

Read all system component manuals before operating this equipment. A thorough understanding of system components and their operation will help you operate the system safely and efficiently.

6. Operation *(contd.)*

- Before starting this equipment, check all safety interlocks, fire-detection systems, and protective devices such as panels and covers. Make sure all devices are fully functional. Do not operate the system if these devices are not working properly. Do not deactivate or bypass automatic safety interlocks or locked-out electrical disconnects or pneumatic valves.
- Never operate equipment with a known malfunction.
- Do not attempt to operate or service electrical equipment if standing water is present.
- Use this equipment only in the environments for which it is rated. Do not operate this equipment in humid, flammable, or explosive environments unless it has been rated for safe operation in these environments.
- Never touch exposed electrical connections on equipment while the power is ON.

7. Action in the Event of a System or Component Malfunction

Do not operate a system that contains malfunctioning components. If a component malfunctions, turn the system OFF immediately.

- Disconnect and lock out electrical power.
- Allow only qualified personnel to make repairs. Repair or replace the malfunctioning component according to instructions provided in its manual.

8. Maintenance and Repair

Allow only qualified personnel to perform maintenance, troubleshooting, and repair tasks. Only persons who are properly trained and familiar with Siemens Airfield Solutions equipment are permitted to service this equipment.

- Always use safety devices when working on this equipment.
- Follow the recommended maintenance procedures in your equipment manuals.
- Do not service or adjust any equipment unless another person trained in first aid and CPR is present.
- Connect all disconnected equipment ground cables and wires after servicing equipment. Ground all conductive equipment.
- Use only approved Siemens Airfield Solutions replacement parts. Using unapproved parts or making unapproved modifications to equipment may void agency approvals and create safety hazards.

8. Maintenance and Repair
(contd.)

- Check interlock systems periodically to ensure their effectiveness.
- Do not attempt to service electrical equipment if standing water is present. Use caution when servicing electrical equipment in a high-humidity environment.
- Use tools with insulated handles when working with electrical equipment.

Section 2
Description

1. Introduction

See Figure 2-1. This section describes L-858 low VA runway and taxiway signs referred to in Table 2-1.

NOTE: Figure 2-1 shows a Size 1, one-module sign with two legs. Sizes 3, 4, and 5 have three legs.

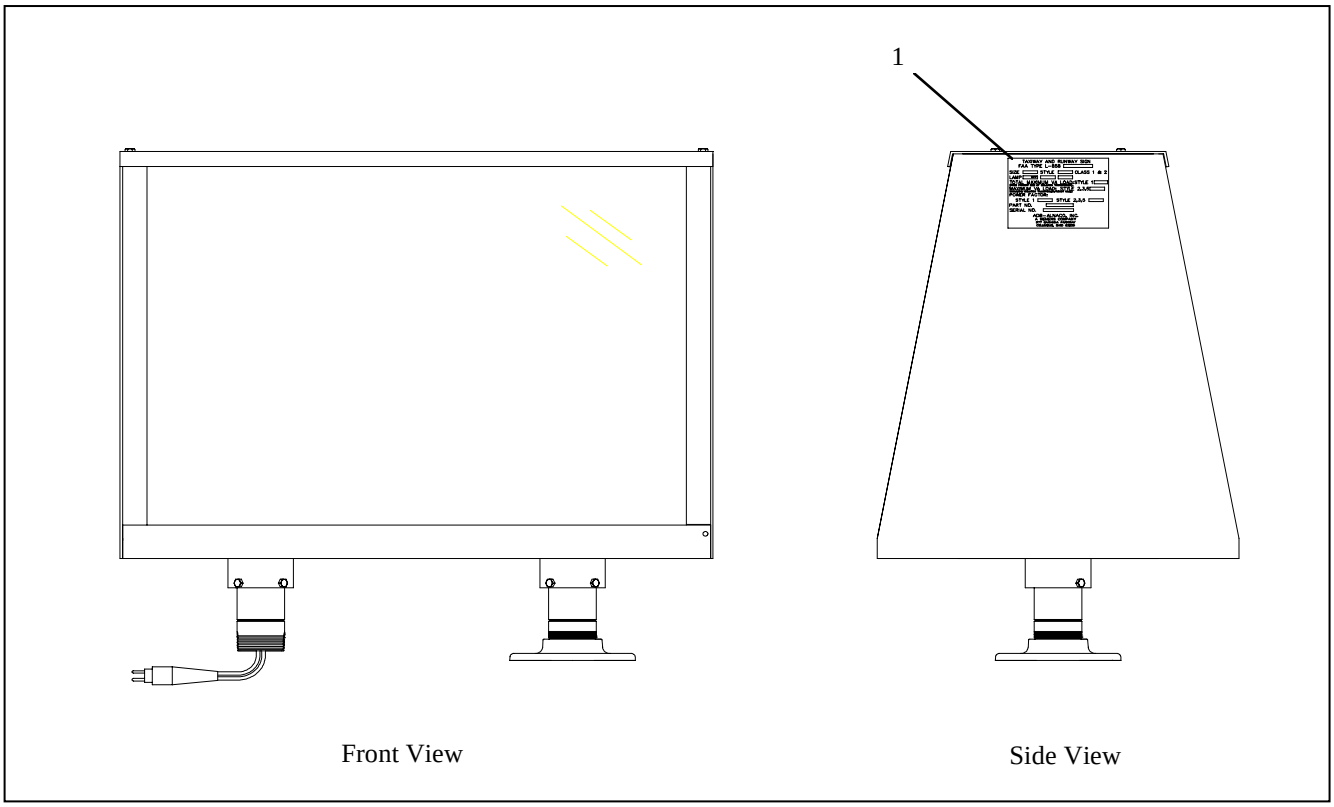

Figure 2-1. L-858 Low VA Sign (1 Module) with Nameplate (1)

Table 2-1. L-858 Low VA Signs

Sign Type	Purpose	Legend Color	Background Color
L-858Y	Taxiway Direction, Destination, & Boundary	Black	Yellow
L-858R	Mandatory Sign	White	Red
L-858B	Runway Distance Remaining	White	Black
L-858L	Runway or Taxiway Location	Yellow	Black

1. Introduction *(contd.)*

The Siemens Airfield Solutions L-858 low VA runway and taxiway signs are used on airports

- to guide pilots of aircraft to destinations in accordance with FAA AC 150/5340-18C
- to identify holding positions, intersecting runways and taxiways
- to prohibit entry into a particular area
- to provide runway distance remaining information to pilots during takeoff and landing operations

With the exception of the location panel, the basic sign module accommodates two characters and can be single- or double-faced. The location panel is a single- or double-module panel, depending on the legend. Location panel legends are never mixed with other messages, for example, mandatory or informational, on the same module.

The signs are available in all FAA classifications of various lengths depending on the number of modules combined. Each sign is furnished complete with lamp(s), connecting leads, legend panels, brightness control transformer(s), and mounting assemblies designed for installation on concrete pads or metal stakes.

NOTE: Incandescent lamps are standard for low VA signs. Quartz lamps are optional.

2. Theory of Operation

The sign regulator PCB provides constant current and brightness to the lamps regardless of the type (3-step or 5-step) of constant current regulator (CCR) used. With the sign regulator PCB, the isolation transformer operates at maximum power and efficiency, and maintains sign illumination per FAA specifications. Without the PCB, the lamp current will be directly proportional to the CCR current. This will cause the sign illumination to decrease below FAA minimums at lower CCR current steps.

3. L-858 Low VA Signs: Required Equipment

Refer to Table 2-2 for required equipment that is supplied. Refer to Table 2-3 for required equipment that is not supplied.

Table 2-2. Required Equipment Supplied

Description	Quantity
L-858 sign	1
Instruction manual	2 per order
Frangible couplings per module	2-3
Floor flanges	1 or 2 (less power leg)
Mounting hardware	As required

Table 2-3. Required Equipment Not Supplied

Description	Quantity
L-867 base, with blank cover and gasket or base plate	1
L-828 constant current regulator	1
L-830 isolation transformer	1
L-824 cable	As required
Connectors	As required
Anchor bolts (two 1/2–13 bolts per flange foot)	As required
Anti-seize compound/petroleum jelly	As required

4. Specifications

This subsection provides specifications for L-858 low VA signs.

Rated Lamp Life

Rated lamp life at 6.6 A is 1000 hours. Since the 30 W lamp is run at 6.2 A, actual lamp life may be up to 4400 hours. Since the 45 W lamp is run at 6.0 A, actual lamp life may be up to 10,000 hours.

Construction

Structure is fabricated from aluminum sheet and aluminum extrusions. All mounting hardware is stainless steel.

Visibility

Sign type is discernible at nighttime up to a distance of 800 feet (243.84 m). Average luminance is 10–30 ft-lamberts (34.26–102.78 candelas per square meter) on all types and styles.

Style

Refer to Table 2-4 for sign Style.

Table 2-4. Sign Style

Style	Power Source	Lamp Wattage (W)	
2	4.8–6.6 A (3-step CCR)	30, 45	A
3	2.8–6.6 A (5-step CCR)	30, 45	A
3	8.5–20 A (5-step CCR) with 20 A/6.6 A L-830	30, 45	B

NOTE A: 45 W not submitted for ETL certification test but is built to conform to all aspects of the FAA specification.
NOTE B: 30 and 45 W not submitted for ETL certification test but are built to conform to all aspects of the FAA specification.

Class

Refer to Table 2-5 for sign Class.

Table 2-5. Sign Class

Class	Operating Temperature Range (Celsius)	Operating Temperature Range (Fahrenheit)
1	-20 to +55 °C	-4 to +131 °F
2	-55 to +55 °C	-67 to +131 °F

NOTE: All Siemens Airfield Solutions signs meet Class 2 requirements.

Conditions for Continuous Outdoor Use

The L-858 low VA sign is designed for continuous outdoor use under the conditions presented below for operating temperature range, wind, and rain.

Operating Temperature Range

-55 to +55 °C (-67 to +131 °F)

Wind

Withstands [225 mph (362.1 kph)] [0.9 psi (6205.28 N/m^2)]. Frangible couplings fail before reaching 270 mph (434.5 kph) (1.3 psi) (8963.19 N/m^2).

Rain

The L-858 low VA sign is designed for exposure to driving rains.

Sign Classification

Refer to Table 2-6 for sign classification.

Table 2-6. Sign Classification

Sign Type	Sign Size	Sign Face Height in. (mm)	Legend Height in. (mm)	Style Numbers	Class Numbers	Overall Mounting Height in. (mm)
L-858Y/R/L	1	18 (457.2)	12 (304.8)	2, 3	1, 2	24–30 (609.6–762)
L-858Y/R/L	2	24 (609.6)	15 (381)	2, 3	1, 2	30–36 (762–914.4)
L-858Y/R/L	3	30 (762)	18 (457.2)	2, 3	1, 2	36–42 (914.4–1066.8)
L-858B	4	48 (1219.2)	40 (1016)	2, 3	1, 2	54–60 (1371.6–1524)
L-858B	5	30 (762)	25 (635)	2, 3	1, 2	36–42 (914.4–1066.8)

NOTE: Signs can be supplied with either 6.6 A incandescent or 6.6 A quartz lamps.

Number of Lamps Per Module (Styles 2 and 3)

Refer to Table 2-7 for number of lamps per module.

Table 2-7. Number of Lamps Per Module

Sign Size	45 W Lamps Required	30 W Lamps Required
1	1 per module	1 per module
2	2 per module	2 per module
3	2 per module	2 per module
4	4 only	4 only
5	2 only	2 only

Modular Combination Lengths

Refer to Table 2-8 for modular combination lengths.

Table 2-8. Modular Combination Lengths

Sign Size	1 Module in. (mm)	2 Modules in. (mm)	3 Modules in. (mm)	4 Modules in. (mm)
1	29.5 (749.3)	59 (1498.6)	88.5 (2247.9)	118 (2997.2)
2	36.06 (915.9)	72.12 (1831.9)	108.18 (2747.8)	144.25 (3664)
3	42.5 (1079.5)	85 (2159)	127.5 (3238.5)	170 (4318)
4	48 (1219.2)	Not applicable	Not applicable	Not applicable
5	42.5 (1079.5)	Not applicable	Not applicable	Not applicable

NOTE: The table above refers to Siemens Airfield Solutions modular combination lengths. Siemens Airfield Solutions signs are equal to or less than FAA maximum allowable lengths.

Frangibility

All signs sustain a static load of 0.9 psi (6205.28 N/m^2) uniformly [225 mph (362.1 kph) wind] over the entire surface of the sign and break over before reaching 1.3 psi (8963.19 N/m^2) [270 mph (434.5 kph) wind].

Weight

Refer to Table 2-9 for sign weight.

Table 2-9. Sign Weight

Sign Size	lb per Module (Approximate)	kg per Module (Approximate)
1	48	21.77
2	65	29.48
3	80	36.29
4	132	59.87
5	80	36.29

Dimensions

See Figure 2-2. This subsection describes the dimensions for the L-858 low VA signs.

NOTE: L-858 low VA signs have five sizes. Figure 2-2 shows a Size 1 two-module L-858 low VA sign. Size 1 signs have one lamp per module. Size 2 signs have two lamps per module. Refer to Tables 2-10 and 2-11 for the Size 1 and Size 2 dimensions for all modules.

NOTE: Figure 2-2 is for dimension purposes only. Internal parts may differ according to Size and number of modules.

NOTE: In all dimensions tables below, dimension D is the distance between each leg of the same module. Dimension E is the distance between from the leg of one module to the leg of a second module. Dimension E is not applicable to one-module signs.

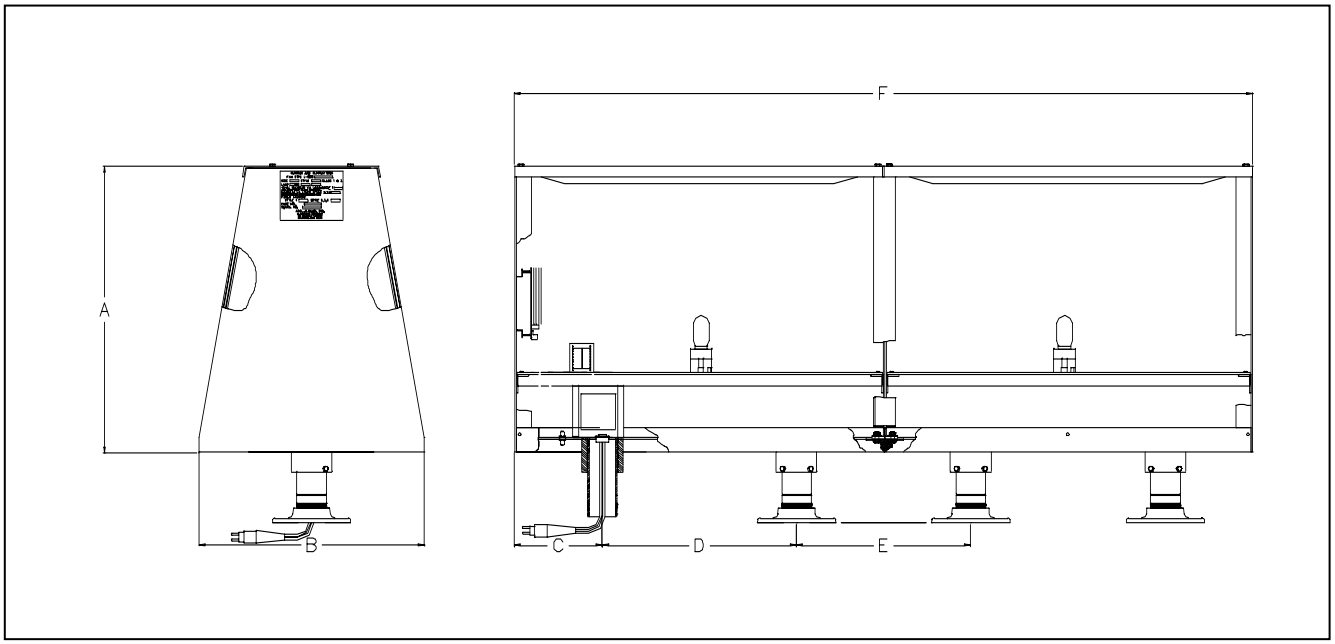

Figure 2-2. L-858 Low VA Sign Dimensions (Size 1, Two-Module)

Table 2-10. L-858 Low VA Size 1 Sign Dimensions

Sign Size	A in. (mm)	B in. (mm)	C in. (mm)	D in. (mm)	E in. (mm)	F in. (mm)
Size 1, 1-Module	22.63 (574.8)	18 (457.2)	7 (177.8)	15.51 (393.95)	Not applicable	29.50 (749.3)
Size 1, 2 Module	22.63 (574.8)	18 (457.2)	7 (177.8)	15.51 (393.95)	13.9 (353)	59 (1498.6)
Size 1, 3-Module	22.63 (574.8)	18 (457.2)	7 (177.8)	15.51 (393.95)	13.9 (353)	88.5 (2250)
Size 1, 4-Module	22.63 (574.8)	18 (457.2)	7 (177.8)	15.51 (393.95)	13.9 (353)	118 (3000)

Dimensions *(contd.)*

Table 2-11. L-858 Low VA Size 2 Sign Dimensions

Sign Size	A in. (mm)	B in. (mm)	C in. (mm)	D in. (mm)	E in. (mm)	F in. (mm)
Size 2, 1-Module	28.13 (714.5)	20 (508)	8.62 (218.95)	18.812 (477.82)	Not applicable	36.06 (915.92)
Size 2, 2 Module	28.13 (714.5)	20 (508)	8.62 (218.95)	18.812 (477.82)	17.16 (435.86)	72.12 (1830)
Size 2, 3-Module	28.13 (714.5)	20 (508)	8.62 (218.95)	18.812 (477.82)	17.16 (435.86)	108.18 (2750)
Size 2, 4-Module	28.13 (714.5)	20 (508)	8.62 (218.95)	18.812 (477.82)	17.16 (435.86)	144.25 (3660)

Figure 2-3 shows the Size 3 two-module L-858 low VA sign. Refer to Table 2-12 for Size 3 dimensions for all modules.

NOTE: Figure 2-3 is for dimension purposes only. Internal parts may differ according to Size and number of modules.

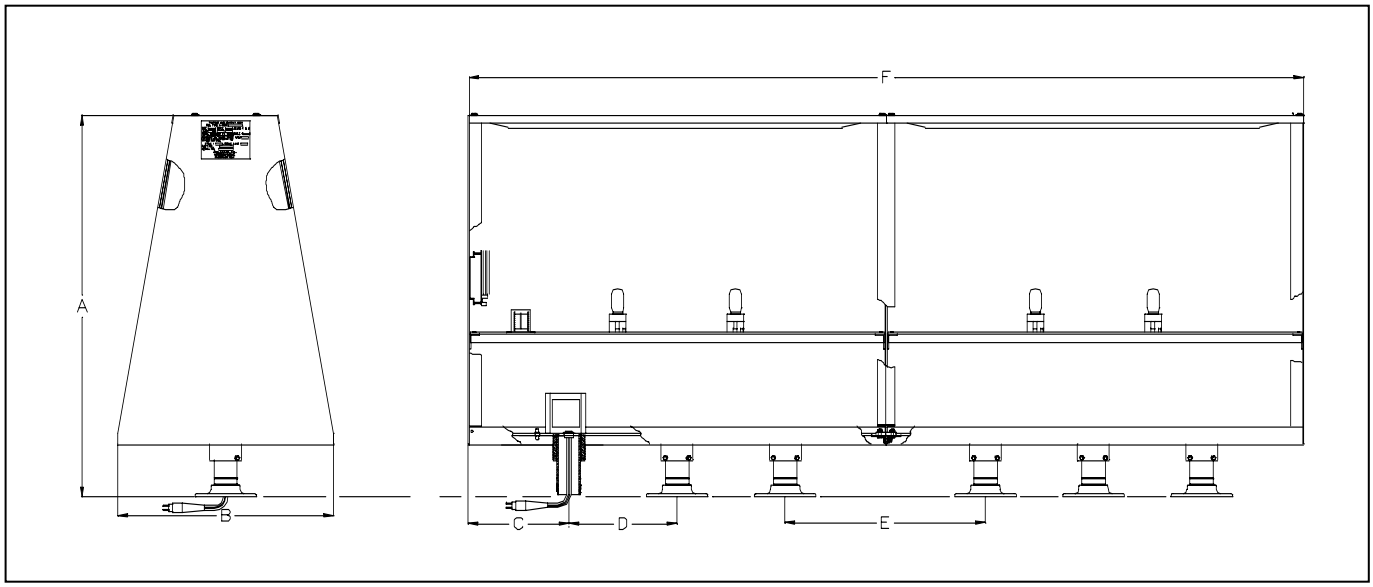

Figure 2-3. L-858 Low VA Sign Dimensions (Size 3, Two-Module)

Dimensions *(contd.)*

Table 2-12. L-858 Low VA Size 3 Sign Dimensions

Sign Size	A in. (mm)	B in. (mm)	C in. (mm)	D in. (mm)	E in. (mm)	F in. (mm)
Size 3, 1-Module	33.88 (860.55)	22 (558.8)	10.23 (259.84)	11 (279.4)	Not applicable	42.50 (1080)
Size 3, 2 Module	33.88 (860.55)	22 (558.8)	10.23 (259.84)	11 (279.4)	20.39 (517.91)	85.12 (2160)
Size 3, 3-Module	33.88 (860.55)	22 (558.8)	10.23 (259.84)	11 (279.4)	20.39 (517.91)	127.68 (3240)
Size 3, 4-Module	33.88 (860.55)	22 (558.8)	10.23 (259.84)	11 (279.4)	20.39 (517.91)	170.25 (4320)

Figure 2-4 shows the Size 4 L-858 low VA sign. Refer to Table 2-13 for Size 4 dimensions.

NOTE: Figure 2-4 is for dimension purposes only. Internal parts may differ according to Size and number of modules.

Dimensions *(contd.)*

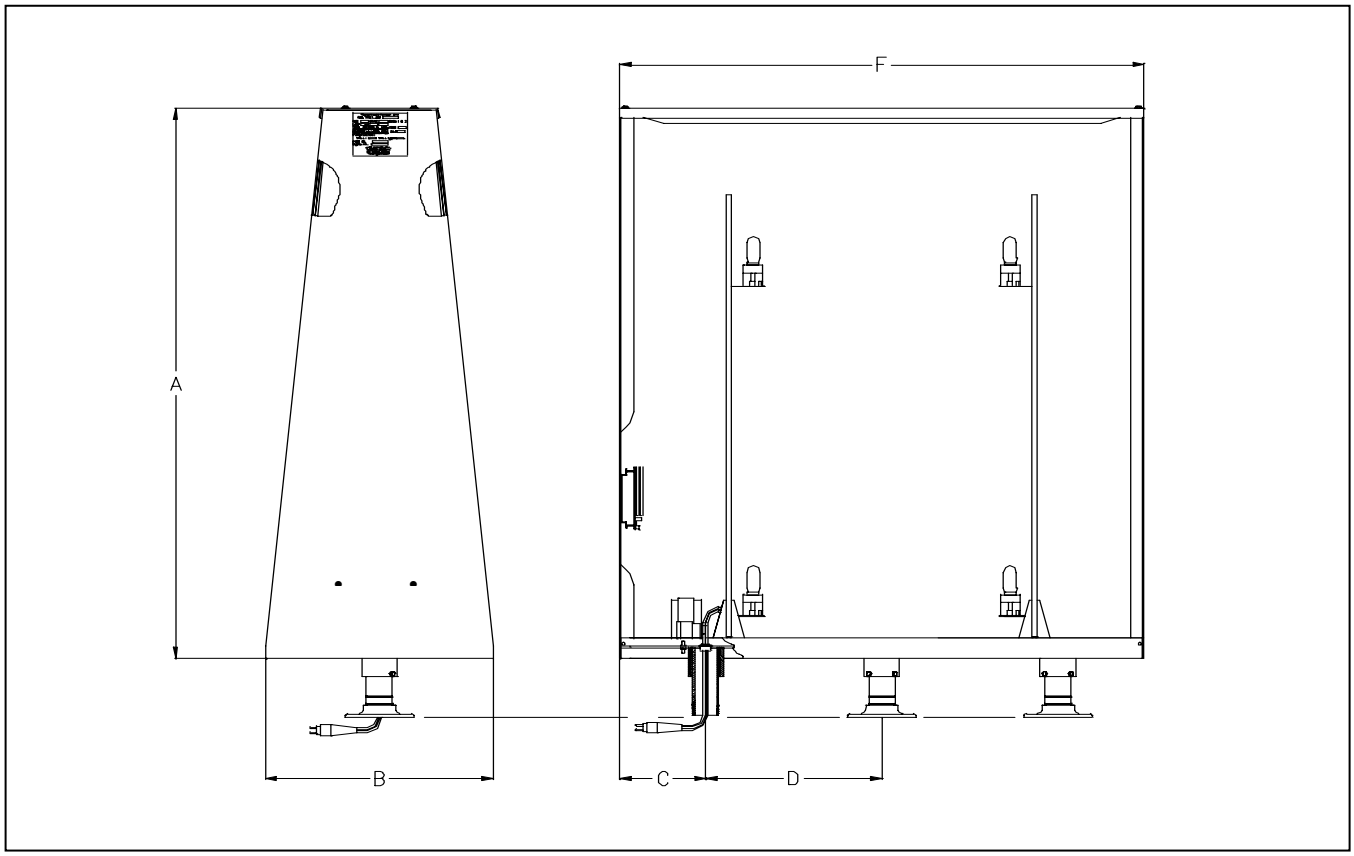

Figure 2-4. L-858 Low VA Sign Dimensions (Size 4)

Table 2-13. L-858 Low VA Size 4 Sign Dimensions

Sign Size	A in. (mm)	B in. (mm)	C in. (mm)	D in. (mm)	E in. (mm)	F in. (mm)
Size 4, 1-Module	50 (127)	20 (508)	7.87 (199.9)	16.125 (409.58)	Not applicable	48 (1220)

Dimensions *(contd.)*

Figure 2-5 shows the Size 5 L-858 low VA sign. Refer to Table 2-14 for Size 5 dimensions.

NOTE: Figure 2-5 is for dimension purposes only. Internal parts may differ according to Size and number of modules.

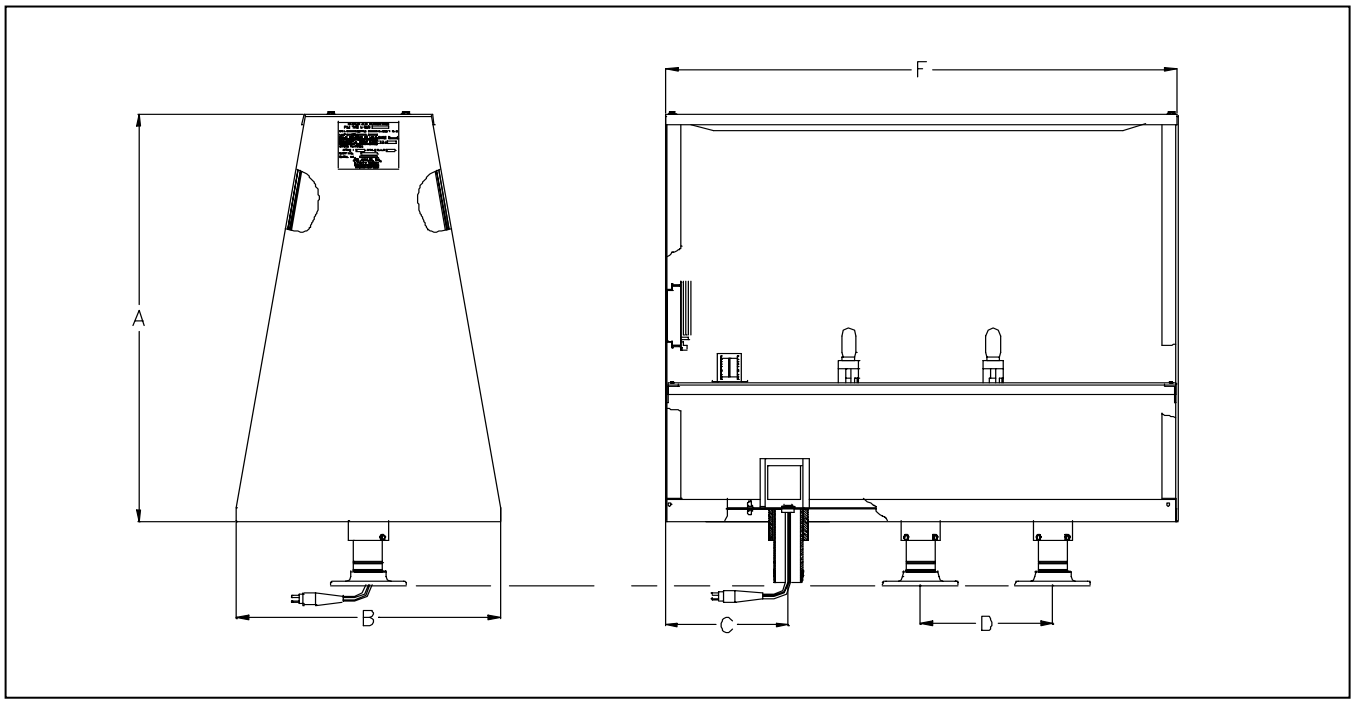

Figure 2-5. L-858 Low VA Sign Dimensions (Size 5)

Table 2-14. L-858 Low VA Size 5 Sign Dimensions

Sign Size	A in. (mm)	B in. (mm)	C in. (mm)	D in. (mm)	E in. (mm)	F in. (mm)
Size 5, 1-Module	33.88 (860.55)	22 (558.8)	10.23 (259.84)	11 (279.4)	Not applicable	42.5 (1080)

Sign Power Factor and Total VA Load

Refer to Tables 2-15 through 2-20 for the total VA load. Refer to Tables 2-10 and 2-11 for total nonsign VA load. See Figure 2-1 for the nameplate containing electrical load specifications.

NOTE: In Tables 2-15 through 2-20, the number for the total VA load imposed on CCR represents the actual load imposed on the regulator and accounts for power factor and load imposed by the L-830 transformer. Use this number and the nonsign VA load number in Tables 2-16 and 2-17 when calculating regulator wattage to be used. You cannot determine this number by totaling nominal lamp wattage.

NOTE: For Tables 2-18, 2-19, and 2-20, 45 W lamps, Sizes 1 through 5 are not submitted for ETL certification test but are built to conform to all aspects of the FAA specification.

Table 2-15. 30 W Lamps (Size 1)

Sign Size	Number of Modules	3-Step Transformer	5-Step Transformer	Number of 30 W Lamps	Sign Power Factor	Total Volt-Amp (VA) Load
1	1	100 W	200 W	1	0.97	70.7
1	2	200 W	200 W	2	0.98	92
1	3	200 W	300 W	3	0.97	115
1	4	200 W	300 W	4	0.96	142

Table 2-16. 30 W Lamps (Size 2)

Sign Size	Number of Modules	3-Step Transformer	5-Step Transformer	Number of 30 W Lamps	Sign Power Factor	Total Volt-Amp (VA) Load
2	1	200 W	200 W	2	0.98	92
2	2	200 W	300 W	4	0.96	142
2	3	300 W	500 W	6	0.96	199
2	4	500 W	500 W	8	0.97	260

Table 2-17. 30 W Lamps (Sizes 3, 4, 5)

Sign Size	Number of Modules	3-Step Transformer	5-Step Transformer	Number of 30 W Lamps	Sign Power Factor	Total Volt-Amp (VA) Load
3	1	200 W	200 W	2	0.98	92
3	2	200 W	300 W	4	0.96	142
3	3	300 W	500 W	6	0.96	199
3	4	500 W	500 W	8	0.97	260
4	1	200 W	300 W	4	0.96	142
5	1	200 W	200 W	2	0.98	92

Sign Power Factor and Total VA Load *(contd.)*

Table 2-18. 45 W Lamps (Size 1)

Sign Size	Number of Modules	3-Step Transformer	5-Step Transformer	Number of 45 W Lamps	Sign Power Factor	Total Volt-Amp (VA) Load
1	1	200 W	200 W	1	0.97	80
1	2	200 W	300 W	2	0.98	122
1	3	300 W	300 W	3	0.97	158
1	4	300 W	500 W	4	0.98	201

Table 2-19. 45 W Lamps (Size 2)

Sign Size	Number of Modules	3-Step Transformer	5-Step Transformer	Number of 45 W Lamps	Sign Power Factor	Total Volt-Amp (VA) Load
2	1	200 W	300 W	2	0.98	122
2	2	300 W	500 W	4	0.98	201
2	3	500 W	Two 300 W	6	0.97	265
2	4	Two 300 W	One 500 W One 300 W	8	0.97	342

Table 2-20. 45 W Lamps (Sizes 3, 4, 5)

Sign Size	Number of Modules	3-Step Transformer	5-Step Transformer	Number of 45 W Lamps	Sign Power Factor	Total Volt-Amp (VA) Load
3	1	200 W	300 W	2	0.98	122
3	2	300 W	500 W	4	0.98	201
3	3	500 W	Two 300 W	6	0.97	265
3	4	Two 300 W	One 500 W One 300 W	8	0.97	342
4	1	300 W	500 W	4	0.98	213
5	1	200 W	300 W	2	0.98	122

Sign Power Factor and Total VA Load *(contd.)*

NOTE: In Table 2-21, select KVA greater than or equal to the nonsign load (edge lights, cable losses, etc.) from the left-hand column.

NOTE: Read across Table 2-21 to KVA greater than or equal to the low VA sign load. Numbers for low VA sign load are show in KVA. Required CCR rating is shown at the top of the column.

Table 2-21: Three-Step Circuit CCR Selection Table

Nonsign Load (KVA)	4 KW	7.5 KW	10 KW	15 KW	20 KW	30 KW	50 KW	70 KW
0.5	2.71	5.25	7.07	10.71	14.34	21.61		
1	2.50	5.05	6.86	10.50	14.14	21.41		
1.5	2.30	4.84	6.66	10.30	13.93	21.21	50 and 70 KW units are 5-step, 20 A only.	
2	2.00	4.64	6.46	10.10	13.73	21.00		
2.5	1.50	4.43	6.25	9.89	13.53	20.80		
3	1.00	4.23	6.05	9.69	13.32	20.59		
3.5	0.50	4.00	5.85	9.48	13.12	20.39		
4	0.00	3.50	5.64	9.28	12.91	20.19		
4.5	-	3.00	5.44	9.08	12.71	19.98		
5	-	2.50	5.00	8.87	12.51	19.78		
5.5	-	2.00	4.50	8.67	12.30	19.58		
6	-	1.50	4.00	8.47	12.10	19.37		
6.5	-	1.00	3.50	8.26	11.90	19.17		
7	-	0.50	3.00	8.00	11.69	18.97		
7.5	-	0.00	2.50	7.50	11.49	18.76		
8	-	-	2.00	7.00	11.29	18.56		
8.5	-	-	1.50	6.50	11.08	18.35		
9	-	-	1.00	6.00	10.88	18.15		
9.5	-	-	0.50	5.50	10.50	17.95		
10	-	-	0.00	5.00	10.00	17.74		
11	-	-	-	4.00	9.00	17.34		
12	-	-	-	3.00	8.00	16.93		
13	-	-	-	2.00	7.00	16.52		
14	-	-	-	1.00	6.00	16.00		
15	-	-	-	0.00	5.00	15.00		
16	-	-	-	-	4.00	14.00		
17	-	-	-	-	3.00	13.00		
18	-	-	-	-	2.00	12.00		
19	-	-	-	-	1.00	11.00		
20	-	-	-	-	0.00	10.00		
22	-	-	-	-	-	8.00		
24	-	-	-	-	-	6.00		
26	-	-	-	-	-	4.00		
28	-	-	-	-	-	2.00		
30	-	-	-	-	-	0.00		
35								
40			50 and 70 KW units are 5-step, 20 A only.					
45								
50								
55								
60								
65								
70								

Sign Power Factor and Total VA Load *(contd.)*

NOTE: In Table 2-22, select KVA greater than or equal to the nonsign load (edge lights, cable losses, etc.) in the left-hand column.

NOTE: Read across Table 2-22 to KVA greater than or equal to the low VA sign load. Numbers for low VA sign load are show in KVA. Required CCR rating is shown at the top of the column.

NOTE: In Table 2-22, the shaded area is provided for information only. Most 5-step circuits will not fall in this area.

Sign Power Factor and Total VA Load *(contd.)*

Table 2-22: Five-Step Circuit CCR Selection Table

Nonsign Load (KVA)	4 KW	7..5 KW	10 KW	15 KW	20 KW	30 KW	50 KW	70 KW
0.5	1.65	3.14	4.20	6.32	8.44	12.68	21.17	29.65
1	1.61	3.09	4.15	6.28	8.39	12.64	21.12	29.61
1.5	1.56	3.05	4.11	6.23	8.35	12059	21.08	29.56
2	1.52	3.00	4.06	6.19	8.31	12.55	21.03	29.52
2.5	1.47	2.96	4.02	6.14	8.26	12.50	20.99	29.47
3	1.00	2.91	3.97	6.10	8.22	12.46	20.95	29.43
3.5	0.50	2.87	3.93	6.05	8.17	12.41	20.90	29.38
4	0.00	2.82	3.89	6.01	8.13	12.37	20.86	29.34
4.5	-	2.78	3.84	5.96	8.08	12.33	20.81	29.30
5	-	2.50	3.80	5.92	8.04	12.28	20.77	29.25
5.5	-	2.00	3.75	5.87	7.99	12.24	20.72	29.21
6	-	1.50	3.71	5.83	7.95	12.19	20.68	29.16
6.5	-	1.00	3.50	5.79	7.90	12.15	20.63	29.12
7	-	0.50	3.00	5.74	7.86	12.10	20.59	29.07
7.5	-	0.00	2.50	5.70	7.82	12.06	20.54	29.03
8	-	-	2.00	5.65	7.77	12.01	20.50	28.98
8.5	-	-	1.50	5.61	7.73	11.97	20.46	28.94
9	-	-	1.00	5.56	7.68	11.92	20.41	28.89
9.5	-	-	0.50	5.50	7.64	11.88	20.37	28.85
10	-	-	0.00	5.00	7.59	11.84	20.32	28.81
11	-	-	-	4.00	7.50	11.75	20.23	28.72
12	-	-	-	3.00	7.41	11.66	20.14	28.63
13	-	-	-	2.00	7.00	11.57	20.05	28.54
14	-	-	-	1.00	6.00	11.48	19.97	28.45
15	-	-	-	0.00	5.00	11.39	19.88	28.36
16	-	-	-	-	4.00	11.30	19.79	28.27
17	-	-	-	-	3.00	11.21	19.70	28.18
18	-	-	-	-	2.00	11.12	19.61	28.00
19	-	-	-	-	1.00	11.00	19.52	27.91
20	-	-	-	-	0.00	10.00	19.43	27.74
22	-	-	-	-	-	8.00	19.25	27.56
24	-	-	-	-	-	6.00	19.07	27.38
26	-	-	-	-	-	4.00	18.90	27.20
28	-	-	-	-	-	2.00	18.72	27.02
30	-	-	-	-	-	0.00	18.54	26.58
35	-	-	-	-	-	-	15.00	26.13
40	-	-	-	-	-	-	10.00	25.00
45	-	-	-	-	-	-	5.00	20.00
50	-	-	-	-	-	-	0.00	15.00
55	-	-	-	-	-	-	-	10.00
60	-	-	-	-	-	-	-	5.00
65	-	-	-	-	-	-	-	0.00
70	-	-	-	-	-	-	-	

Section 3 Installation

WARNING: Allow only qualified personnel to perform the following tasks. Observe and follow the safety instructions in this document and all other related documentation.

1. Introduction

This section provides instructions for installing L-858 low VA taxiway and runway signs. Refer to the airport project plans and specifications for the specific installation instructions and FAA AC 150/5340-18C.

2. Unpacking

The equipment is shipped ready for installation. Handle equipment very carefully to prevent component damage. Unpack the carton upon receipt and check the contents and their condition. Note any exterior damage to the carton that might lead to detection of equipment damage.

If you note any damage to any equipment, file a claim with the carrier immediately. The carrier may need to inspect the equipment.

3. Cordset Installation

This subsection provides information for installing cordsets. It includes sign installation kit reference numbers for three power leg cordset installation locations and mounting configurations.

Cordset Installation Reference Numbers

See Figure 3-1 for the sign installation kit reference numbers for all power leg cordset locations. See Figures 3-2 through 3-7 for sign installation kit reference numbers for special cordset locations.

Cordset Installation
Reference Numbers *(contd.)*

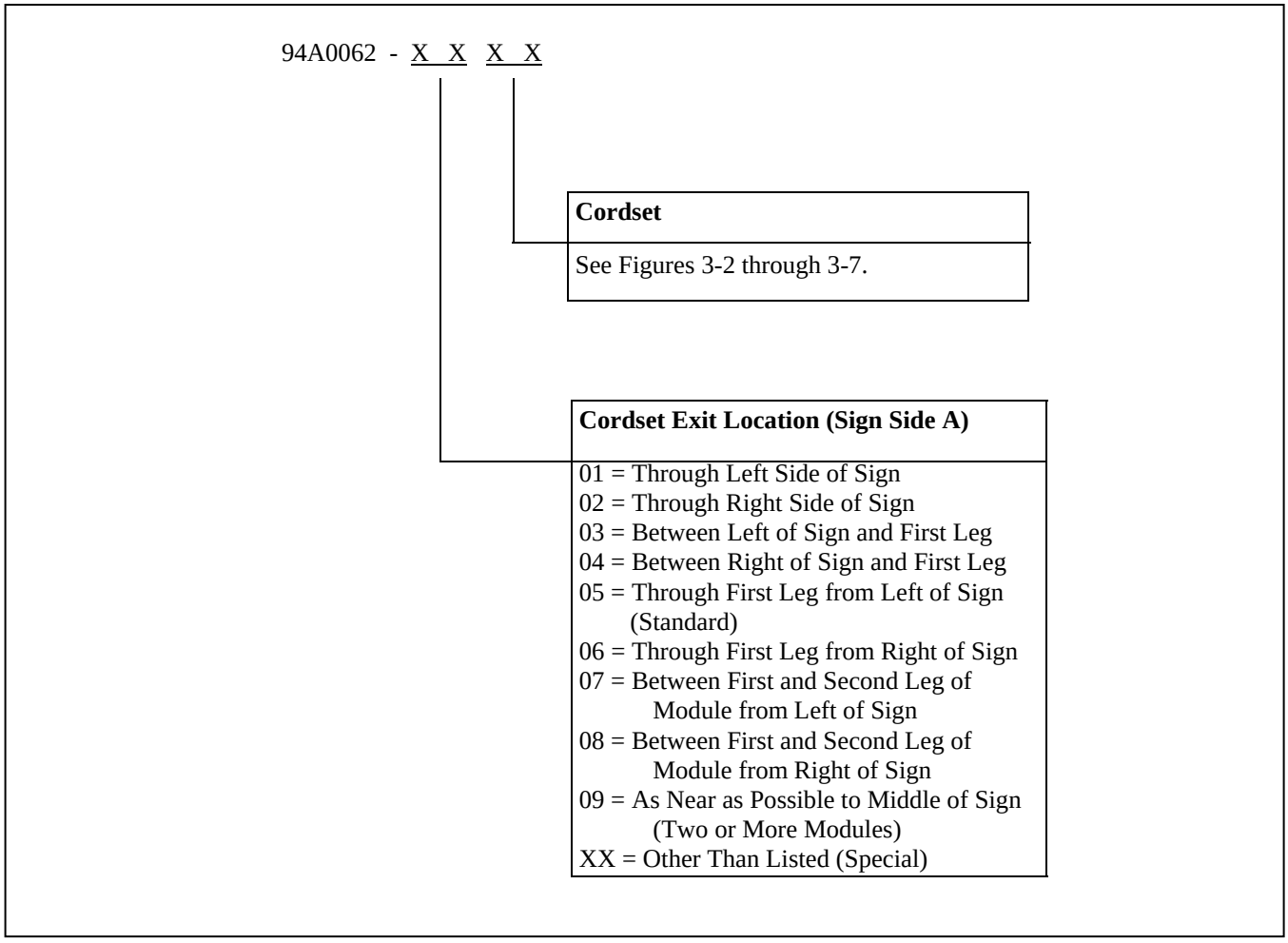

Figure 3-1. L-858 Installation Reference Numbers

Cordset Exit Location #1

Figures 3-2 shows the cordset part numbers for cordset location #1. Figure 3-3 shows the exit location for the cordset. The outdoor cordset exits the sign for 94A0062-03XX only. Other exit locations are possible and may be selected by entering the two-digit location number in the sign kit installation reference number. Refer to Table 3-1 for installation part numbers.

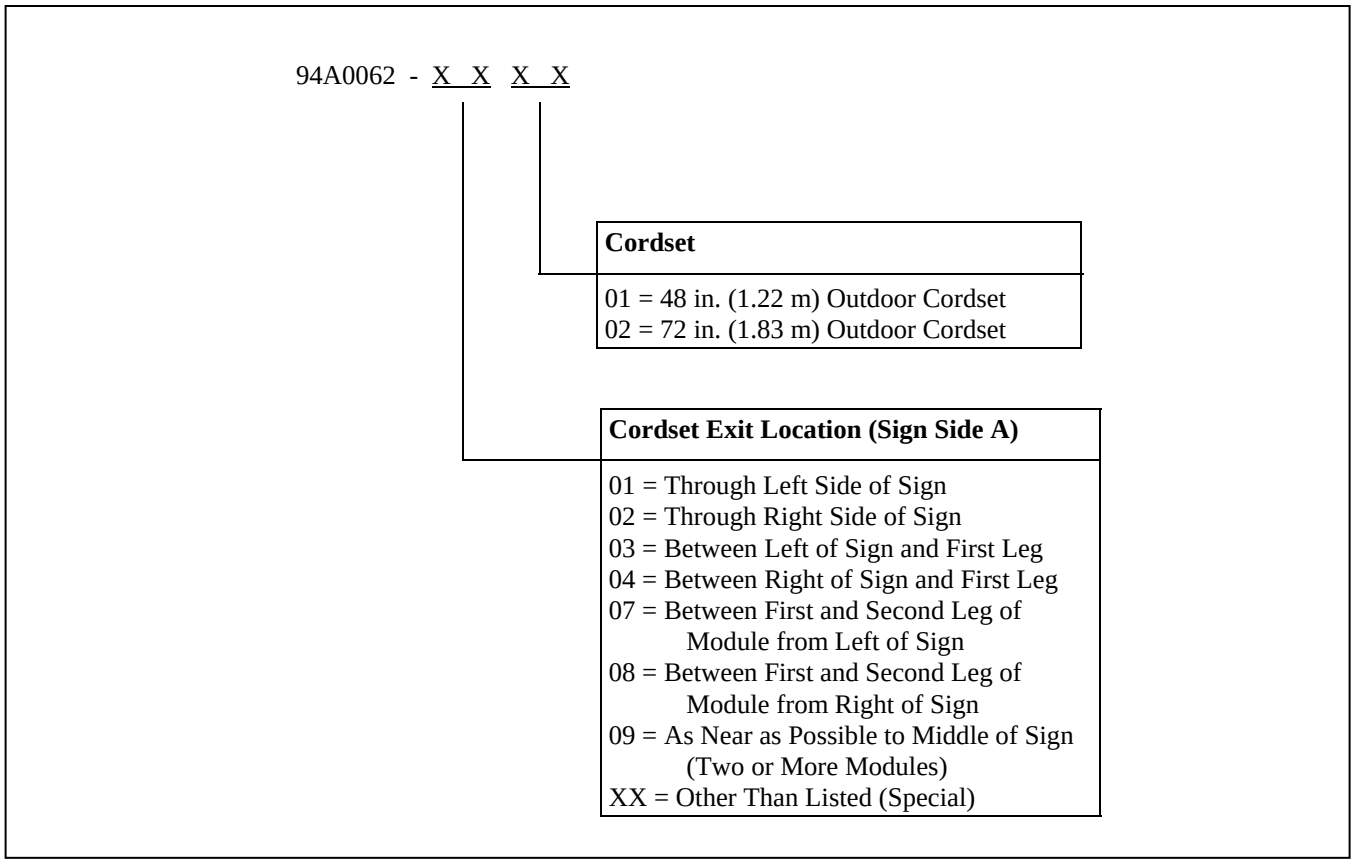

Figure 3-2. Cordset Location #1 Part Numbers

Cordset Exit Location #1 *(contd.)*

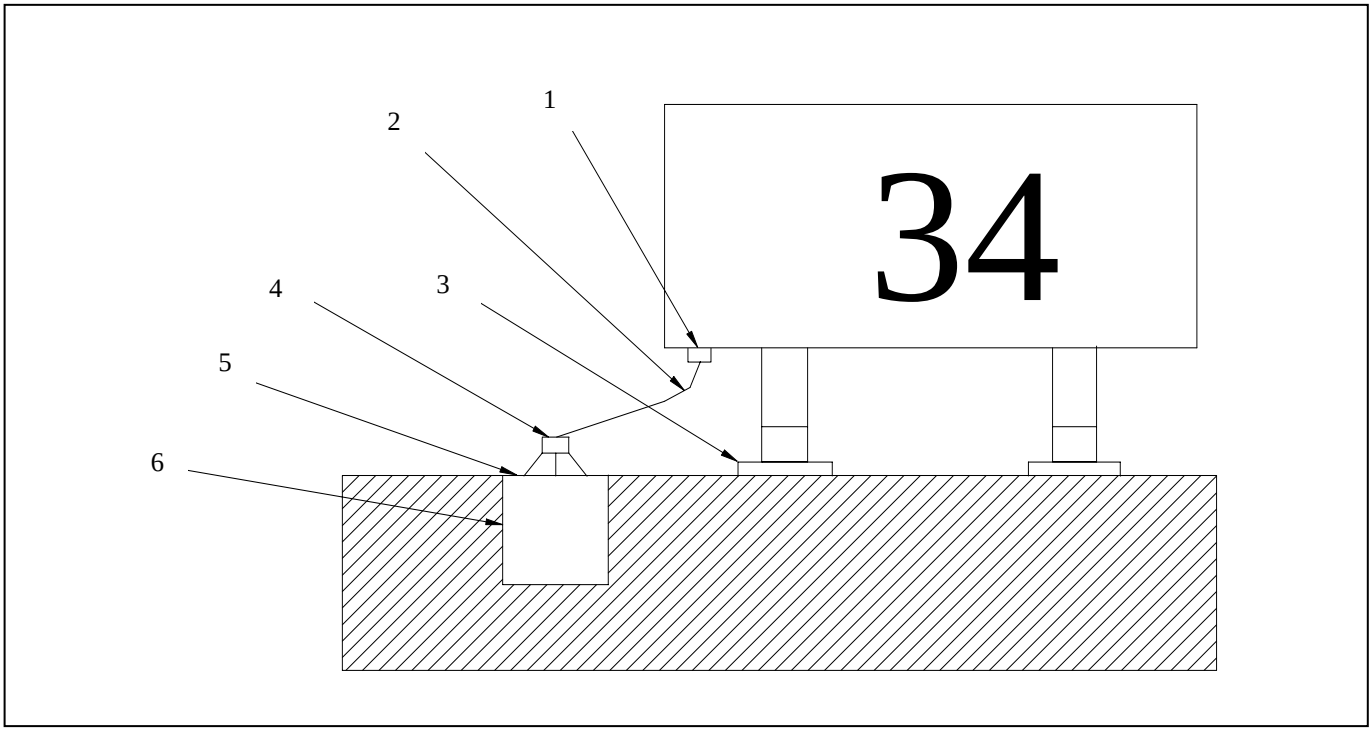

Figure 3-3. Cordset Location #1 (Nontypical)

1. Strain Relief
2. Outdoor Cordset
3. Floor Flange
4. Connector Plug
5. L-867 Base Plate
6. L-867 Base

Table 3-1. Cordset Location #1 Parts

Item	Description	Supplier	Part Number	Note
1	Strain relief	Siemens Airfield Solutions	70A0091	
2	15-in. (381-mm) outdoor cordset	Siemens Airfield Solutions	Not applicable	A
3	Floor flange	Siemens Airfield Solutions	62B0107-2	B
4	Connector plug	Siemens Airfield Solutions	63B0550	
5	2-in. (50.8-mm) L-867 base plate	Siemens Airfield Solutions	1932	B
6	12 x 24 in. (304.8 x 609.6 mm) L-867 base	Siemens Airfield Solutions	2124	B
NOTE A: Fifteen inches (381 mm) of cordset length is used for interior connections in sign. Refer to *Cordsets and Extension Cords* in this section for cordsets available if different cordset length is required. NOTE B: Requires a separate line item on purchase order.				

Cordset Exit Location #2

Figure 3-4 shows the cordset part numbers for cordset location #1. Figure 3-5 shows the exit location for the cordset. The outdoor cordset exits the sign for 94A0062-03XX only. Other exit locations are possible and may be selected by entering the two-digit location number in the sign kit installation reference number. Refer to Table 3-2 for installation part numbers. Refer to Table 3-3 for flexible conduit connectors.

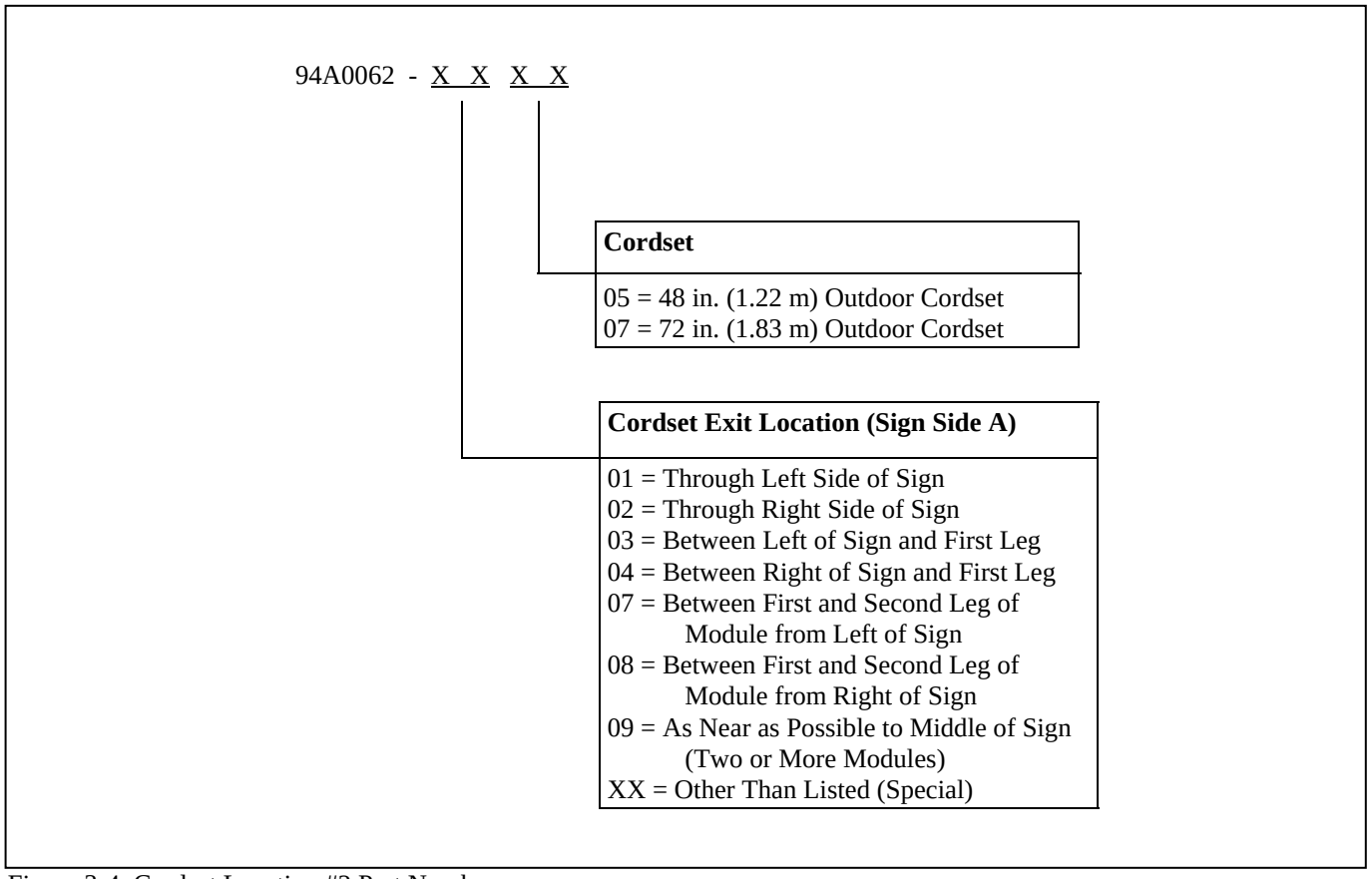

Figure 3-4. Cordset Location #2 Part Numbers

Cordset Exit Location #2 *(contd.)*

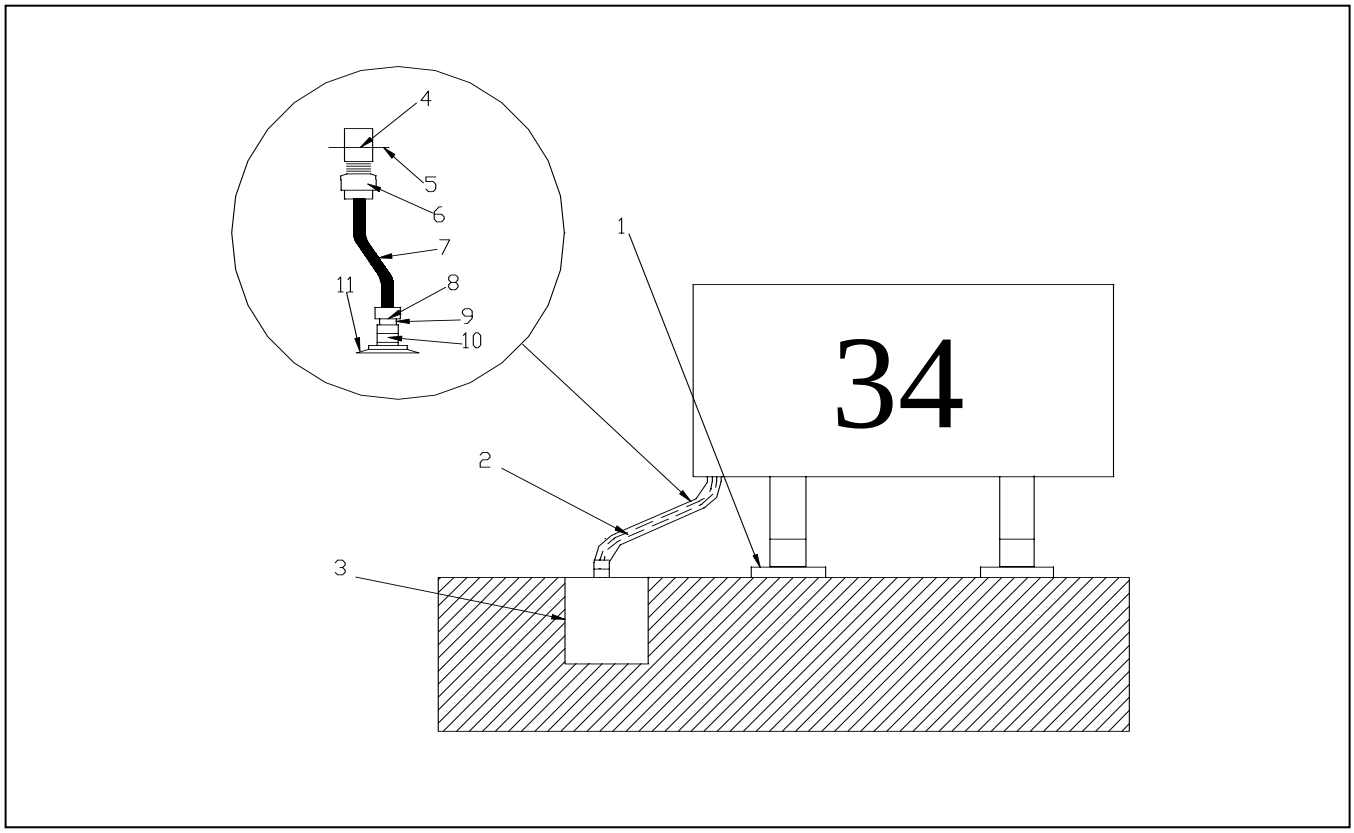

Figure 3-5. Cordset Location #2 (Nontypical)

1. Floor Flange
2. L-823 Cordset
3. L-867 Base
4. Nipple Hole (Standard)
5. Sign
6. Flexible Conduit Male Connector
7. Flexible Conduit
8. Flexible Conduit Male Connector
9. Hex Reducer Bushing
10. Frangible Coupling
11. Base Plate

Table 3-2. Cordset Location #2 Parts

Item	Description	Supplier	Part Number	Note
1	Floor flange	Siemens Airfield Solutions	62B0107-2	C
2	15-in. (381-mm) Outdoor Cordset	Siemens Airfield Solutions	Not applicable	B
3	12 x 24 in. (304.8 x 609.6 mm) L-867 base	Siemens Airfield Solutions	2124	C
7	Flexible conduit	Contractor	Not applicable	A
10	Frangible coupling	Siemens Airfield Solutions	62B0499	
11	2 in. (50.8 mm) L-867 base plate	Siemens Airfield Solutions	1932	C

NOTE A: Refer to Table 3-3 for flexible conduit connectors.
NOTE B: Refer to *Cordsets and Extension Cords* in this section for cordsets available if different cordset length is required.
NOTE C: Requires a separate line item on purchase order.

Table 3-3. Flexible Conduit Connectors

Item	Description	Supplier
4	3/4-inch (44.45 mm) diameter hole	Siemens Airfield Solutions
6	1/4 inch (31.75 mm) flexible conduit male connector	Others
7	1/4 inch (31.75 mm) flexible conduit	Others
8	1/4 inch (31.75 mm) flexible conduit male connector	Others
9	1-1/2 x 1-1/4-in. (38.1 x 31.75-mm) hex reducer bushing	Contractor

Cordset Exit Location #3

Figure 3-6 shows the cordset part numbers for cordset location #3. Figure 3-7 shows the exit location for the cordset. The L-823 cordset exits the sign for 94A0062-05XX only. Other exit locations are possible and may be selected by entering the two-digit location number in the sign kit installation reference number. Refer to Table 3-4 for installation part numbers.

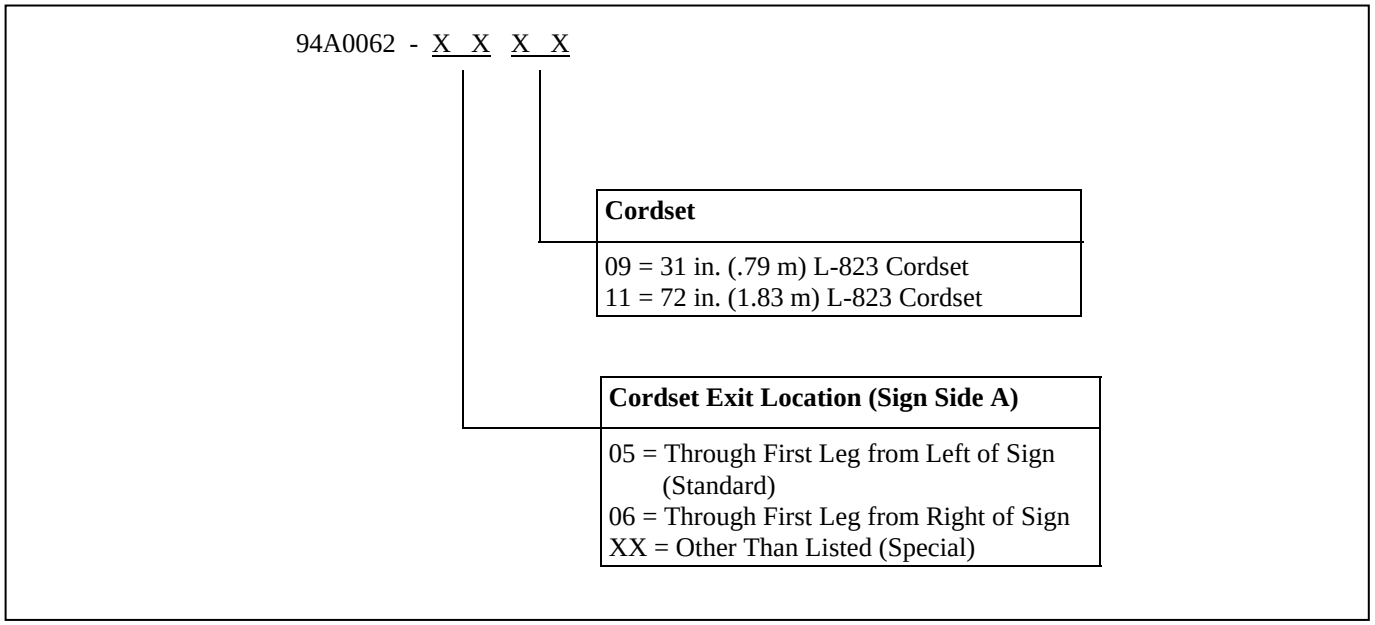

Figure 3-6. Cordset Location #3 Part Numbers

Cordset Exit Location #3 *(contd.)*

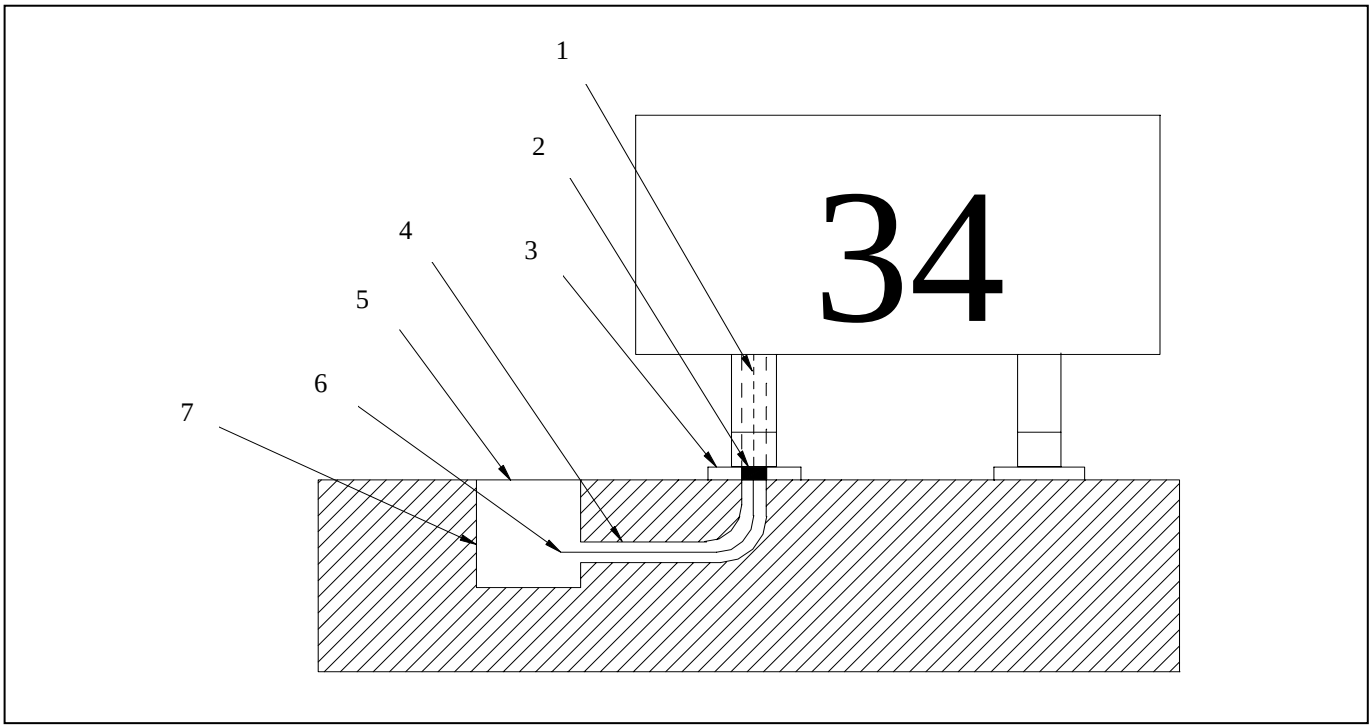

Figure 3-7. Cordset Location #3 (Standard)

1. L-823 Cordset
2. Cable Clamp
3. Floor Flange
4. Rigid Conduit
5. L-867 Blank Cover Plate with Gasket
6. Extension Cord
7. L-867 Base

Table 3-4. Cordset Location #3 Parts

Item	Description	Supplier	Part Number	Note
1	L-823 outdoor cordset	Siemens Airfield Solutions	Not applicable	A
2	Cable clamp	Siemens Airfield Solutions	63A0563	B
3	Floor flange	Siemens Airfield Solutions	62B0107-2	B
4	2-in. (50.8 mm) rigid conduit	Siemens Airfield Solutions	Not applicable	
5	3/8 inch (9.53 mm) thick base plate	Siemens Airfield Solutions	1000-6	
6	8-foot (2.44 m) extension cord	Siemens Airfield Solutions	73A0109-8	C
7	12 x 24 in. (304.8 x 609.6 mm) L-867 base	Siemens Airfield Solutions	2124	B
NS	Gasket	Siemens Airfield Solutions	2052	B, D

NOTE A: Fifteen inches (381 mm) of cordset length is used for interior connections in sign.
NOTE B: Requires a separate line item on purchase order.
NOTE C: Refer to *Cordsets and Extension Cords* in this section for extension cords available if different extension cord length is required.
NOTE D: Gasket is sold separately.

Cordset and Extension Cords

See Figure 3-8. Refer to Table 3-5 for cordset and extension cord types. Refer to Table 3-6 for cordset and cord parts.

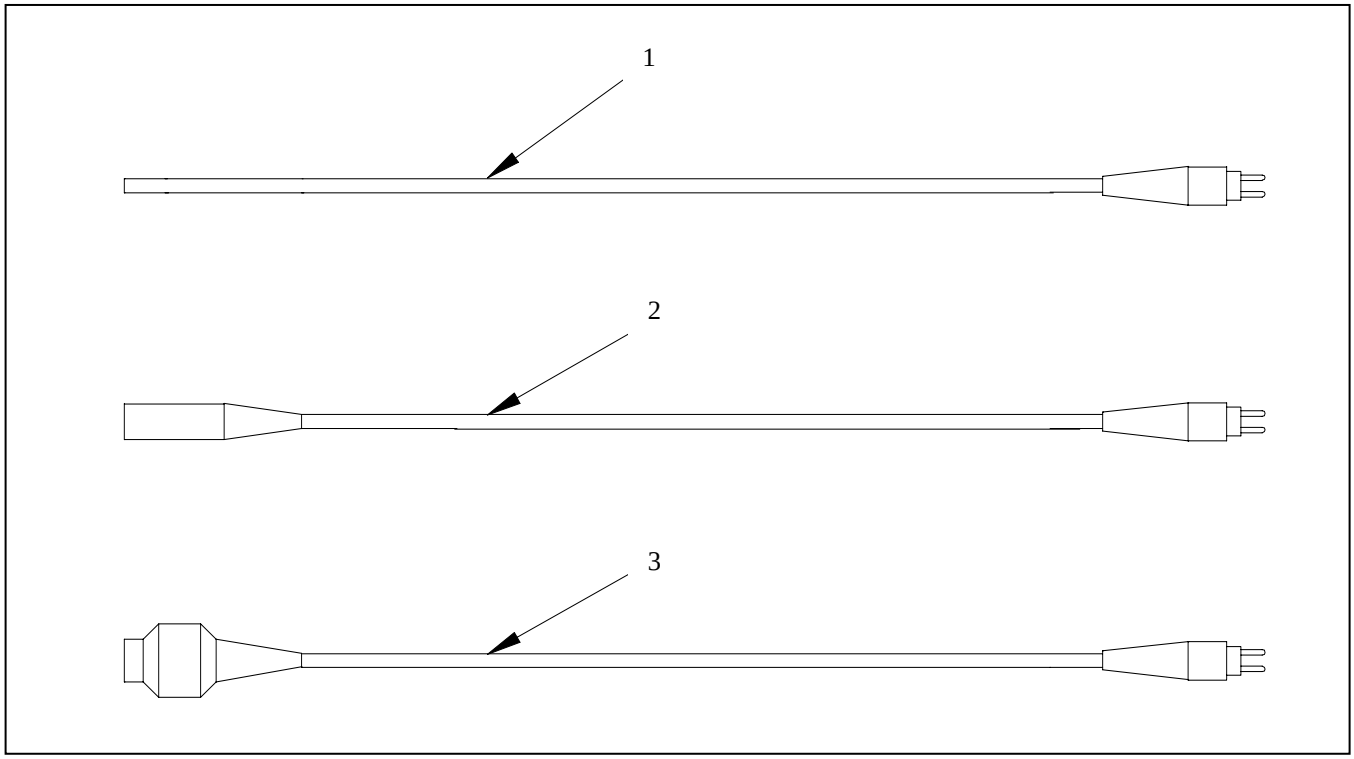

Figure 3-8. L-823 Cordset and Extension Cords

Table 3-5. Cordset and Extension Cord Length

Type	Part Number	Receptacle Style	Plug Style	Standard Length	Wire
1	73A0107-X	Not applicable	Type 1L, Class A, Style 1	4 ft (1.22 mm) 6 ft (1.83 mm)	16/2
2	73A0108-X	1L, Class A, Style 7	Type 1L, Class A, Style 1	8 ft (2.44 mm)	16/2
3	73A0109-X	1L, Class A, Style 7	Type 1L, Class A, Style 1	8 ft (2.44 mm)	16/2

Cordset and Extension Cords
(contd.)

Table 3-6. Cordset and Extension Cord Parts

Item	Description	Part Number	Note
1	L-823 cordset, 16/2 wire Cordset, standard size 4 ft (1.22 mm) Cordset, standard size 6 ft (1.83 mm)	 73A0107-48 73A0107-72	A, B
2	L-823 cordset extension cord, 16/2 wire, standard size 8 ft (2.44 mm)	73A0108-8	A, C
3	L-823 cordset extension cord, 16/2 wire, standard size 8 ft (2.44 mm)	73A0109-8	A, D

NOTE A: Other sizes require special order.

NOTE B: Fifteen inches (381 mm) of cordset length is required for internal sign connections. Usable exterior cordset length is equal to the cordset length minus 15 inches.

NOTE C: Receptacle may be connected to plug on 73A0107-X, 73A0109-8 cordset, or standard 31-inch (787.4 mm) L-823 cordset.

NOTE D: Receptacle must be connected to plug on, Plug Type II, Class A, Style 1, supplied with the sign.

4. Installation

WARNING: Signs must be grounded to a true earth ground. Failure to observe this warning may result in personal injury, death, or equipment damage.

General Guidelines

When installing signs, follow the guidelines below.

- Mount the signs on a concrete slab, concrete pedestals, or angle-iron stakes.
- Do not allow concrete edges or stakes to protrude above grade.
- Provide power to the signs through breakaway cable connectors installed within the frangible coupling portion of the sign's mounting legs.
- Install auxiliary equipment, such as isolation transformers, in a light base embedded in the ground.

Overall Mounting Height

Install signs so that the overall height above the surrounding ground of the sign assembly, including mounting supports, does not exceed heights given in Table 3-7 and the clearances of aircraft wings as specified in AC 150/5340-18C. The sign must provide 12 inches (304.8 mm) of clearance between the top of the sign and any part of the most critical aircraft using, or expected to use, the airport when the aircraft's wheels are at the pavement edge.

Overall Mounting Height
(contd.)

Table 3-7. Overall Mounting Height

Sign Size	Overall Mounting Height in.	Overall Mounting Height mm
1	24–30	609.6–762
2	30–36	762–914.4
3	36–42	914.4–1066.88
4	54–60	1371.6–1524
5	36–42	914.4–1066.88

Sign Orientation

When orienting signs, follow the guidelines below.

- Orient the sign so that the face is perpendicular to the centerline of the taxiway or runway.
- For special situations where visibility would be improved, cant single-sided signs. Refer to FAA AC 150/5340-18C for the correct orientation.
- For signs identifying an instrument landing system (ILS) critical area, coordinate the location and orientation with the local FAA airway facilities personnel, and schedule installation with periodic ILS flight checks to ensure that signs do not cause interference with the ILS electronic signal.

Sign Distance from Pavement Edge

Refer to Table 3-8 for the distance of signs from the pavement edge. Refer to AC 150/5340-18C for more information on the location of different types of taxiway signs.

Table 3-8. Recommended Sign Distance from Pavement Edge

Sign Size	Distance from Pavement ft	Distance from Pavement m
1	10–20	3.048–6.096
2	25–35	7.62–10.668
3	35–60	10.668–18.228
4	50–75	15.24–22.86
5	20–35	6.096–10.668

Sign Installation on Concrete Pad

This subsection provides procedures for pouring a concrete pad and installing the sign onto the pad.

Concrete Pouring

To pour a concrete pad, perform the following procedure:

1. Determine the sign size and module.

2. Pour the concrete pad according to the following requirements:

   - a minimum of 30 inches (762 mm) wide, extending 14 inches (355.6 mm) beyond the end of the supports

   - a minimum of 4 inches (101.6 mm) deep, extending below the frost line to prevent frost heave

   - reinforced to meet load requirements and/or crack load

3. Install a minimum of one 12-inch (304.8-mm) L-867 power base according to the following guidelines:

   - Install the base close to the sign in or near the concrete pad to provide easy access to the L-830 isolation transformer.

   - When installing the base in the concrete pad, hold the L-867 base firmly in place during construction of the pad so that the upper surface of the base flange is level within ± 2 degrees and not more than 3/8 inch (9.525 mm) above the concrete surface.

   - All other bearing surfaces on the pad for additional flange supports should be kept in the same horizontal plane as the L-867 base flange.

Sign Mounting

NOTE: Signs up to four modules are totally assembled at the factory and are ready for direct installation.

Sign Mounting *(contd.)*

To mount the sign onto the concrete pad, perform the following procedure:

1. Before the concrete sets, install two 1/2–13 anchor bolts into the concrete pad. The bolts should be equally spaced on a 4.75-inch-(120.65-mm-) diameter bolt circle, 180 degrees apart for each foot. Bolts should be located perpendicular to the sign face.

   NOTE: A customer-supplied setting fixture is recommended to hold the bolts in position while the concrete sets.

   NOTE: Anchor bolts must be a minimum of 1.25 inches (31.75 mm) above the top surface of the concrete pad to attach the flange.

   NOTE: Hilti quick bolts are recommended for installing the flanges after the concrete sets.

2. Install the floor flange and mounting base plate (if used) on the anchor bolts.

3. Lubricate the threads of the frangible coupling with petroleum jelly or anti-seize compound.

4. Screw the frangible couplings into the floor flanges.

   NOTE: If the male L-823 connector is routed through a leg, slide the frangible coupling over the male connector and insert into the female connector in the base plate, and then screw the frangible coupling into the base plate.

CAUTION: Sign frangible couplings are uniquely designed for use on the sign size stamped on the coupling and can only be used for that particular size sign. Before installing frangible couplings, make sure the sign size on couplings matches the size sign on which they are to be installed.

CAUTION: If you wrench-tighten the frangible coupling, make sure to place the wrench below the frangible groove. Placing the wrench at the top of the coupling may crack or break the coupling.

Sign Mounting *(contd.)*

5. Mount the sign on the frangible coupling and adjust the hub screws against the frangible coupling so that the sign is level.

   NOTE: The larger the sign, the more important for parts such as flanges to concrete and coupling to flanges to be at a 90 degree angle.

CAUTION: Be careful not to crush the couplings by overly tightening the hub screws against the couplings.

6. Connect an AWG 12 (minimum) ground wire to the earth ground lug inside the sign. Refer to *Wiring* in this section.

WARNING: Lock out power before making any electrical connections. Failure to observe this warning may result in personal injury, death, or equipment damage.

7. Install optional tether (if used) to sign and anchor bolt. Refer to *Optional Tethers* in this section.

8. Plug the cordset into the sign and the transformer.

9. Reinstall the panels (if removed) and the top lid (if removed). Refer to the *Repair* section for more information on installing the lid.

Stake Mounting

NOTE: Stake mounting is recommended for Size 1 sign only.

To install a stake, perform the following procedure:

1. Install angle-iron stakes in 6-inch- (152.4-mm-) diameter holes at a depth of 30 inches (762 mm).

CAUTION: Do not drive stakes. Driving stakes may damage the stake and cause sign misalignment. Refer to FAA specification AC 150/5340-24.

2. Pour concrete in the holes (6 x 6 x 12 in., minimum) (152.4 x 152.4 x 304.8 mm) to create a concrete anchor for the stakes.

3. Make electrical connections as required and backfill around the stake with compacted earth passing a 1-inch (25.4-mm) sieve.

Stake Mounting *(contd.)*

4. Make sure the top of the metal hub that is attached to the stake is even or not more than 1/2 inch (12.7 mm) above the finished grade and the stake is a maximum of 1/2 degree of vertical.

5. Screw the frangible coupling into the hub. Mount the sign onto the coupling.

Wiring

Refer to the *Wiring Schematics* section for wiring diagrams.

When installing cable, follow the guidelines below.

- Install all cable for direct earth burial or for placement in a duct according to Item 108 or Item 110 of AC 150/5370-10 as appropriate.

- Operate the signs as a part of a series 6.6 amp (or 20 amp) lighting system. The signs are connected into the series circuit by means of L-830 isolation transformers. If installation is to be independent of other lighting circuits, use current edition of AC 150/5340-24, *Runway and Taxiway Edge Lighting System*, for system reference and material needs.

Earth Ground Lug

WARNING: Signs must be grounded to true earth ground. Failure to observe this warning may result in personal injury, death, or equipment damage.

Attach the earth ground lug. The earth ground lug is located on the inside frame of the sign to permit easy connection of an AWG 12 (minimum) earth ground wire to the sign.

Series Circuit Connection

Connect the male L-823 cable connector(s) from the sign to the secondary lead(s) of the appropriate L-830 isolation transformer(s).

Optional Tethers

See Figure 3-9. Install one tether (2) per sign or as specified in the airport plans and specifications. Location of the tether is determined at the time that the sales order is taken.

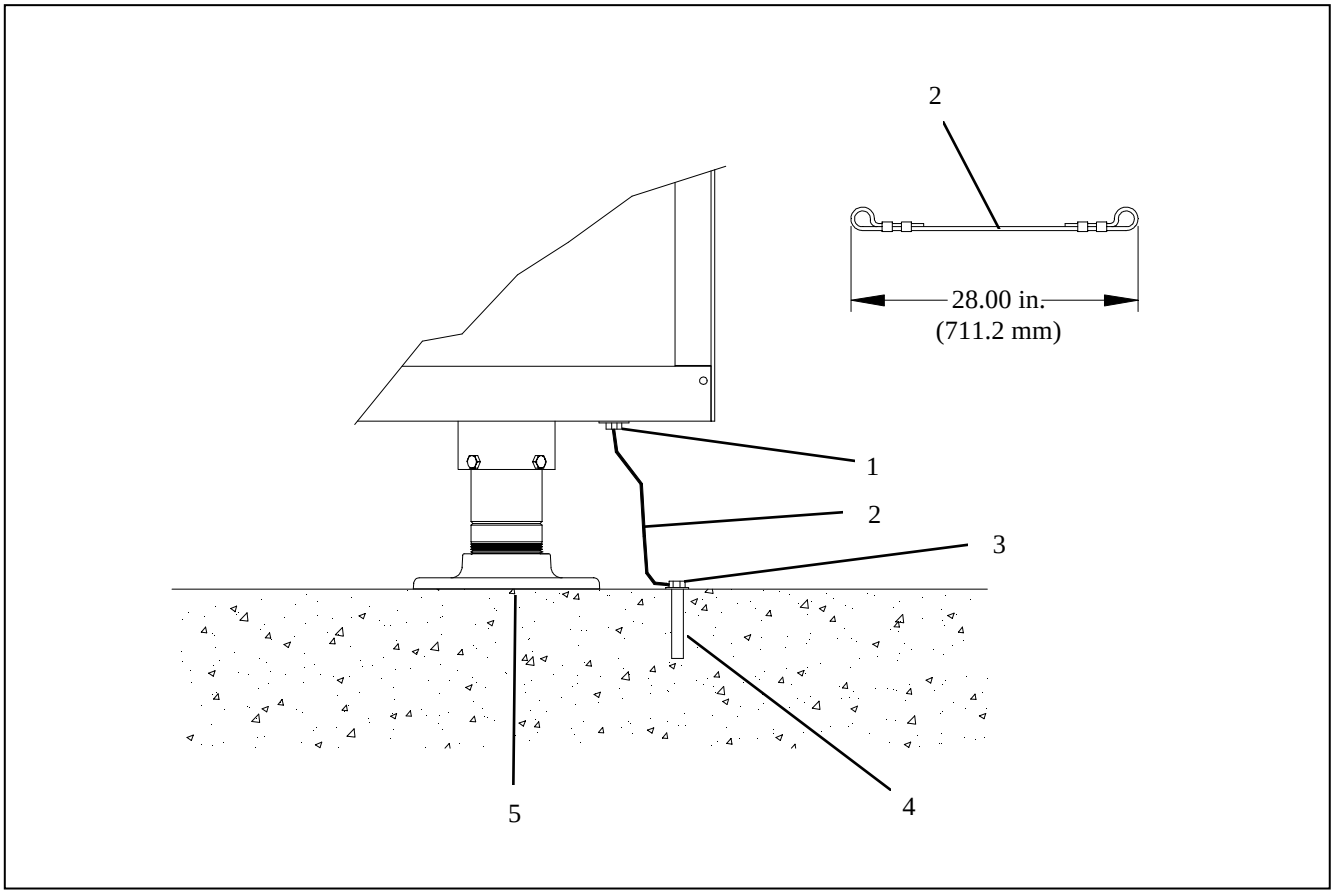

Figure 3-9. Installing Optional Tether

1. Mounting Hardware Inserted into Drain Hole on Sign Base
2. Tether
3. Mounting Hardware Attached to Expansion Anchor
4. Expansion Anchor for Bolt
5. Concrete Pad

Optional Tethers *(contd.)*

NOTE: In the tether installation procedure below, the customer supplies the mounting hardware to attach one end of the tether to the concrete pad. The customer also supplies the expansion anchor for the bolt. The supplier provides the mounting hardware to be installed on the sign base.

To attach a tether, perform the following procedure:

1. Unscrew the 3/8-inch nut from the 3/8–16 x 2-inch bolt on the tether. Remove the nut, 3/8-inch lockwasher, and 3/8-inch flatwasher from the bolt. Leave the second 3/8-inch flatwasher on the bolt.

2. Insert the bolt with flatwasher through the bottom side of the drain hole located on the sign base (1).

3. Install the flatwasher, lockwasher, and nut on the bolt and tighten securely to the sign base.

4. Install the customer-supplied mounting hardware to attach the tether to the expansion anchor (4) on the concrete pad (5).

NOTE: To attach a tether to a stake-mounted sign, attach one end of the tether to the bolt in the sign base and the other end to the stake or a rod securely anchored in the ground.

Optional L-830 Series Wiring

Refer to Tables 2-15 through 2-20 in *Specifications* in the *Description* section. The following discussion applies only to a 4-module sign, Size 2 and Size 3.

When a multiple-module sign installation requires a 500 W isolation transformer, you may use two lower-wattage L-830s instead if they are series-wired and provided the total wattage of the transformers equals the wattage of the transformer they are replacing. For example, you can replace the 500 W transformer with two series-wired 300 W and 200 W L-830 transformers.

If the sign installation results in two cordsets exiting a sign cordset, you can eliminate one cordset by series wiring the L-830s and connecting the primary 3- or 5-step sign transformer leads in series as required for single cordset installations.

NOTE: Before installing the L-830 series wire kit, verify that transformers are in phase.

See Figure 3-10. When installing the L-830 series wire kit (2), connect the jumper wire (4) to the large pin of one style 4 plug kit connector and the small pin of the other connector (5, 6). Refer to *L-830 Series Wire Kit Parts List* in the *Parts* section for part numbers.

Optional L-830 Series Wiring
(contd.)

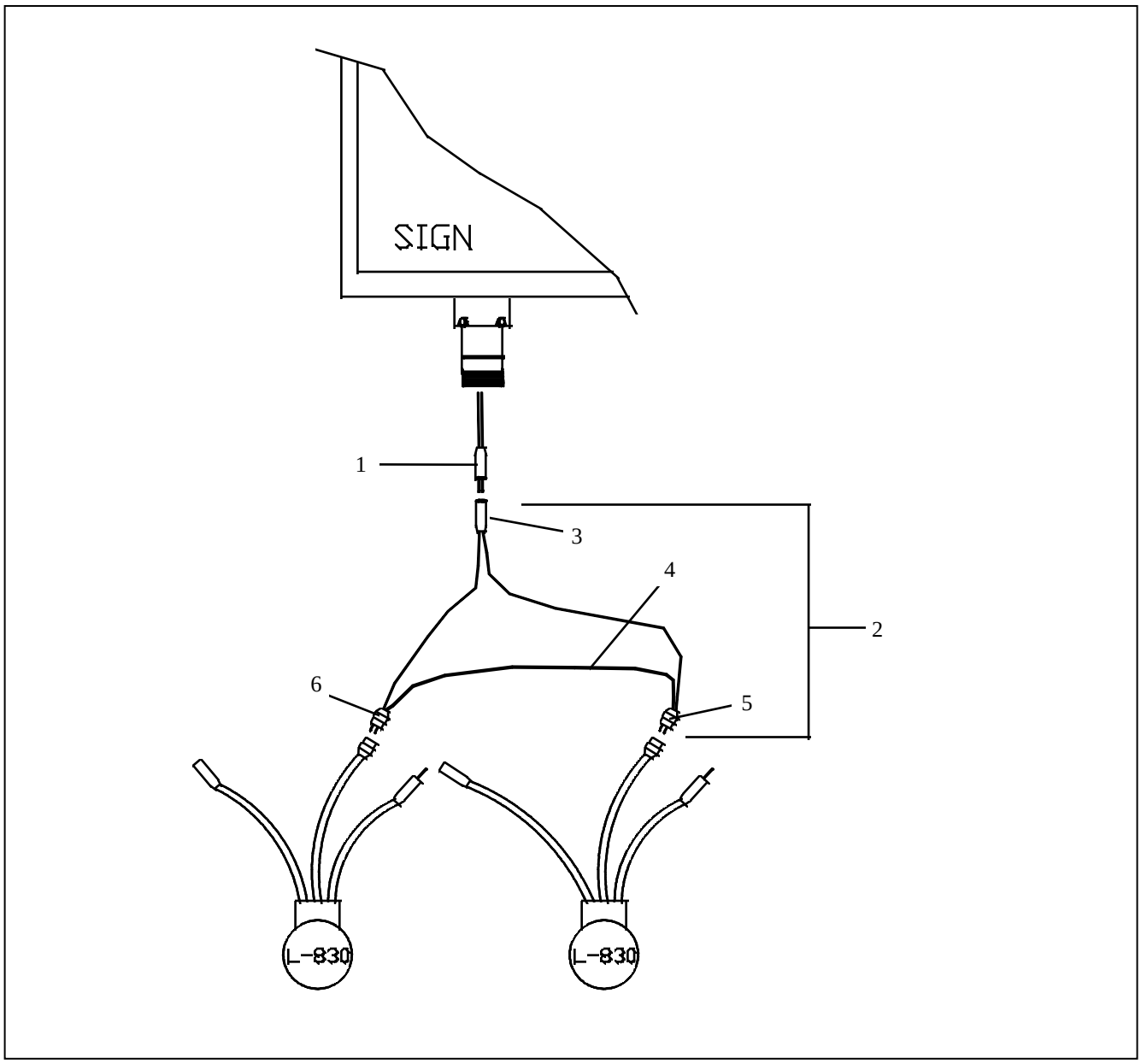

Figure 3-10. Installing Optional L-830 Series Wiring

1. Cordset
2. L-830 Series Wire Kit
3. Style 11 Receptacle Kit
4. Jumper Wire
5. Connector #1 of Style 4 Plug Kit
6. Connector #2 of Style 4 Plug Kit

Section 4
Maintenance

1. Introduction

This section provides preventive maintenance for L-858 low VA signs.

2. Maintenance Schedule

To keep the L-858 low VA taxiway and runway signs operating efficiently, follow a preventive maintenance schedule. Refer to Table 4-1.

Table 4-1. L-858 Low VA Sign Maintenance

Interval	Maintenance Task	Action
Daily	Check for burned-out lamps.	Replace burned-out lamps. Check circuit operation.
Monthly	Check for dirty panels. . Check for vegetation covering panel.	Clean with mild soap and water. Remove vegetation.
Semi-Annually	Check for loose wire connections. Check for cracked or deteriorated wire.	Tighten wires. Replace wire.
Annually	Check for paint flaking off. Check for panels yellowing. Check for deteriorated gaskets.	Repaint. Clean with Formula 409 or similar cleaning agent. Replace gaskets.

Section 5
Troubleshooting

WARNING: Allow only qualified personnel to perform the following tasks. Observe and follow the safety instructions in this document and all other related documentation.

WARNING: Always remove input power to a sign before making any wiring connections. Failure to observe this warning may result in personal injury, death, or equipment damage.

1. Introduction

This section provides the following troubleshooting information:

- initial check list
- brightness control devices
- brightness adjustment procedure
- sign regulator board LED diagnostics
- troubleshooting table and flow charts

This section covers only the most common problems that you may encounter. If you cannot solve the problem with the information given here, contact your local Siemens Airfield Solutions representative for help.

2. Initial Check List

The following is an initial check list if the sign fails to operate or operates improperly.

- Check for loose wire connections inside the sign.
- Check that the primary leads of the L-830 transformer are plugged into the series lighting circuit and that the secondary lead is plugged into the sign.
- Check to make sure the correct L-830 transformer is used for the sign. Refer to Tables 2-15 through 2-20 for required transformer wattage.
- Check to make sure the correct lamp transformer is installed inside the sign. Refer to the *Parts* section for transformer part numbers.

3. Brightness Control Devices

This subsection describes brightness-control transformers and the sign regulator PCB to help you make sign brightness adjustments. Refer to *Brightness Adjustment Procedure* in this section.

Brightness-Control Transformers

NOTE: Siemens Airfield Solutions has set the tap on the 3- and 5-step transformers at the nominal position at the factory. You should normally not have to adjust these transformers.

Three- and five-step brightness-control transformers are installed in the L-858 sign

- to meet illumination requirements.
- to operate in series circuit lighting systems to maintain the current at the standards referred to in Table 5-1. This provides the most ideal brightness for the signs and extends lamp life.

Table 5-1. Transformer Brightness Control Standards

Transformer	Lamp Current	Wattage	Primary Ampere Range	Note
3-step	6.2 A	30 W	4.8–6.6	
3-step	6.0 A	45 W	4.8–6.6	A
5-step	6.2 A	30 W	2.8–6.6 or 8.5–20	
5-step	6.0 A	45 W	2.8–6.6 or 8.5–20	A
NOTE A: Not submitted for ETL certification test but are built to conform to all aspects of the FAA specification.				

Sign Regulator PCB

See Figure 6-1 in the *Repair* section for the location of the PC board. A PC board is installed in the signs in series circuit lighting systems to maintain the current at the standards referred to in Table 5-1. See the *Wiring Schematics* section for sign regulator board PCB wiring connections.

NOTE: See Figure 5-1. The lamp transformer XF2 wire connects to TB2 (1). The lamp transformer XF1 wire connects to TB1 (7). See also Figures 8-1 and 8-2 in the *Wiring Schematics* section.

Sign Regulator PCB *(contd.)*

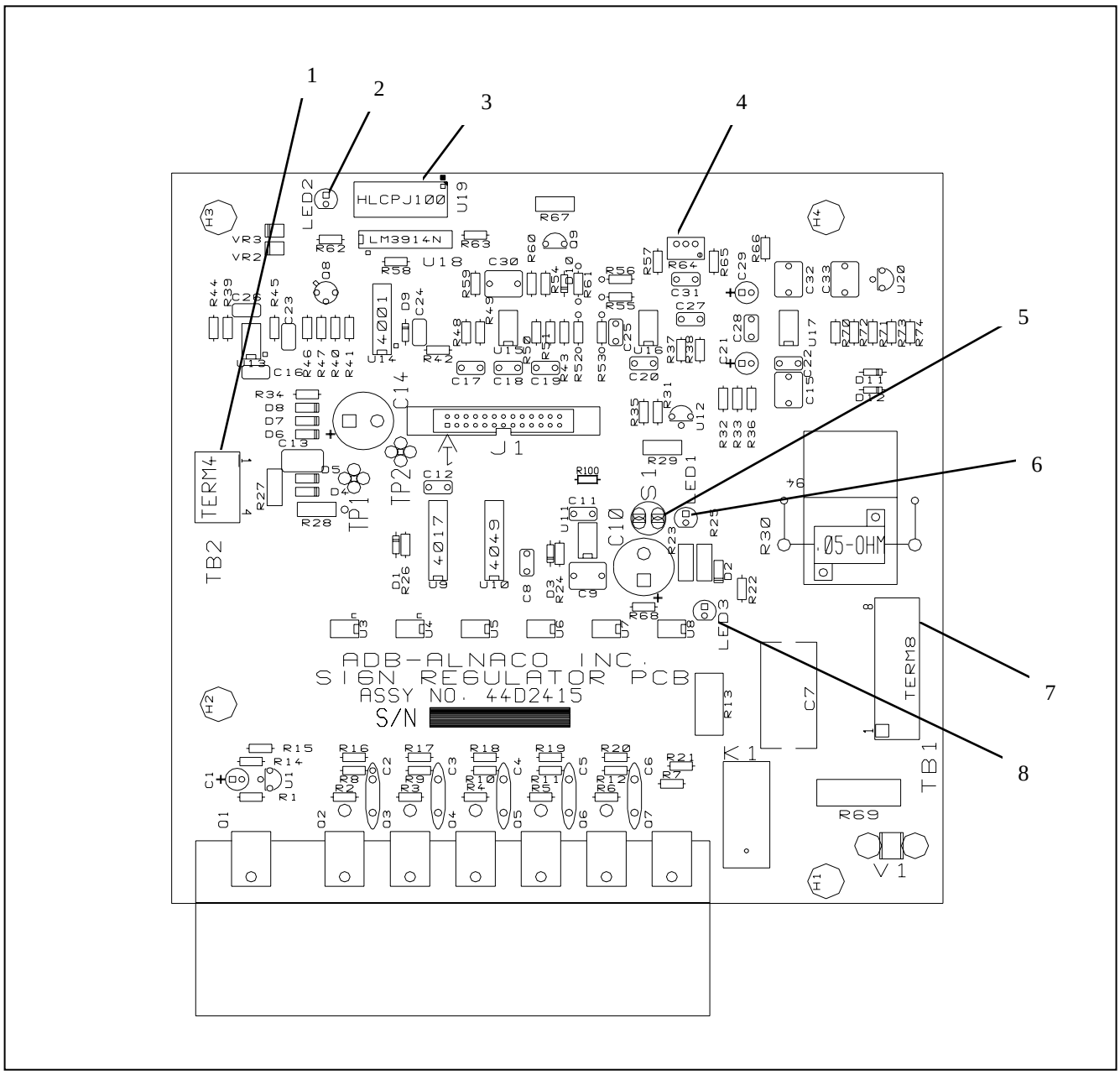

Figure 5-1. Sign Regulator PCB

1. TB2
2. Red LED #2
3. Bar Graph LED Display
4. Reference Potentiometer R64
5. Reset Switch S1
6. Green LED #1
7. TB1
8. Red LED #3

4. Sign Regulator Board LED Diagnostics

This subsection provides information about normal operations and troubleshooting when you test the sign regulator board.

Diagnostic Testing

To do diagnostic testing on the sign regulator board, perform the following procedure:

1. See Figure 5-1. Connect the wire connector from power supply transformer XF2 to TB2 (1). See also Figures 8-1 and 8-2 in the *Wiring Schematics* section.

2. Connect the wire connector from power supply transformer XF1 to TB1 (7).

CCR Current Range

The sign regulator board is designed for a constant current regulator (CCR) functioning within the FAA output current specifications. If the CCR is misadjusted, the sign regulator PCB will not compensate for the misadjustment. Refer to Tables 5-2 and 5-3 for the allowable CCR current range.

Table 5-2. Three-Step Transformer Allowable Current Range

3-Step Transformer	Nominal Output Current	Allowable Current Range
B100	6.6 A	6.4–6.7 A
B30	5.5 A	5.33–5.67 A
B10	4.8 A	4.55–4.94 A

Table 5-3. Five-Step Transformer Allowable Current Range

5-Step Transformer	Nominal Output Current	Allowable Current Range
B5	6.6 A	6.4–6.7 A
B4	5.2 A	5.04–5.36 A
B3	4.1 A	3.98–4.22 A
B2	3.4 A	3.3–3.5 A
B1	2.8 A	2.72–2.88 A

LED #1

Diagnostic testing on LED #1 helps determine

- if a supply voltage of 15 Vdc is present
- if the relay is operational

NOTE: The relay provides an audible click and green LED #1 brightens up the second time after power-up. If no click occurs, the relay contacts are stuck.

Upon power up of the sign regulator PC board, you should notice the green LED #1 perform as follows:

1. See Figure 5-1. After a few seconds, the green LED #1 (6) should immediately turn on bright. This occurs because capacitor C10 is initially discharged (0 Vdc).
2. LED #1 goes very dim or completely out. This occurs because the voltage on C10 increases to 15 Vdc (fully charged). This voltage can be measured on test point J1-23.
3. LED #1 immediately brightens again and stays bright. This occurs because when C10 is fully charged, the startup reset timer fires, taking one side of the relay to ground reference and loading capacitor C10. Capacitor C10 then discharges.

   NOTE: You should hear an audible relay click at the beginning of Step 3.

Bar Graph LED Display

See Figure 5-1. In normal operation of the bar graph LED display (3), one or two of the middle four LEDs of the bar graph display should be lit. If they are not lit, the board is not operating properly.

When the brightness step changes, the position of the lit bar graph LEDs will change. The tolerance band is the inner four LEDs. If the bar graph LEDs are lit outside this band, the board is not operating properly.

LED #2

See Figure 5-1. The red LED #2 (2) is an over-range for the bar graph display.

LED #3

See Figure 5-1. The red LED #3 (8) illuminates when you activate the shorting device. The shorting device provides protection to the regulator PCB in case an incorrect CCR output current or a lamp failure occurs. Refer to *CCR Current Range* in this section for correct CCR output current if LED #3 does not illuminate.

Reference Potentiometer R64

See Figure 5-1. Use the reference potentiometer R64 (4) to center the thresholds of the over-and under-current capacitors. When you adjust reference potentiometer R64, the voltage is pushed slightly above and below 8 volts. The two middle LEDs on the bar graph will light when 8 volts is present at test point J1-12.

5. Brightness Adjustment Procedure

This subsection provides information to adjust the brightness level of 3- or 5-step series signs.

To adjust the brightness level of the 3- or 5-step series sign, perform the following procedure:

1. Connect the low VA sign regulator PCB to a CCR.
2. Turn on the regulator to the highest step (6.6 A).

   NOTE: Make sure the functions in Table 5-4 have the correct status.

Table 5-4. PCB Status

Function	Status
LED #3	Off
LED #2	Off
LED #1	On
Lamp	On

3. Adjust the reference potentiometer R64 so that the lamp pulses and the bar LED U19 pulses.
4. Adjust the reference potentiometer R64 so that on U19 the two middle LEDs are on.

   NOTE: The PCB lamp output should measure approximately 6.2 A.

5. Step down through steps on the regulator, making sure the following occur:

   - The lamp stays at the same intensity.
   - The sign lamp output stays close to 6.2 A.
   - The lit LEDs on U19 stay close to the middle.

6. Troubleshooting Procedures

This subsection provides troubleshooting procedures. Refer to Table 5-5. See Figures 5-2 through 5-4 for troubleshooting flow charts.

Table 5-5. L-858 Low VA Sign Troubleshooting

Problem	Possible Cause	Corrective Action
1. All lamps out	Sign shorting device not working	Press and release reset switch S1 on sign regulator PCB to reset sign's shorting device.
	Loose wire connections inside sign	Tighten or replace wires.
	Lamps burned out	Replace lamps.
	Bar graph display not centered	Adjust potentiometer R64 on sign regulator PCB so that the two middle LEDs on the bar graph U19 are lit.
	PCB inoperative	Refer to *Sign regulator PCB inoperative* in this table.
2. Sign regulator PCB inoperative	Power supply inadequate	Replace power supply transformer.
	Relay startup circuit shorted out	Replace and align sign regulator PCB.
	Reset timer failure	Replace and align sign regulator PCB.
	Overcurrent present on lamp	Replace and align sign regulator PCB.
	Incorrect power input	Correct power input.
		Replace and align sign regulator PCB.
		Replace lamp and press reset switch S1 to reset sign regulator PCB.
		Call Siemens Airfield Solutions customer service.
3. Signs too bright or too dim	CCR's output current not within FAA specifications	Adjust CCR's output current so that it is within FAA specifications.
	Bar graph display not centered	Adjust potentiometer R64 on sign regulator PCB so that the two middle LEDs on the bar graph U19 are lit.
	PCB inoperative	Refer to *Sign regulator PCB inoperative* in this table.

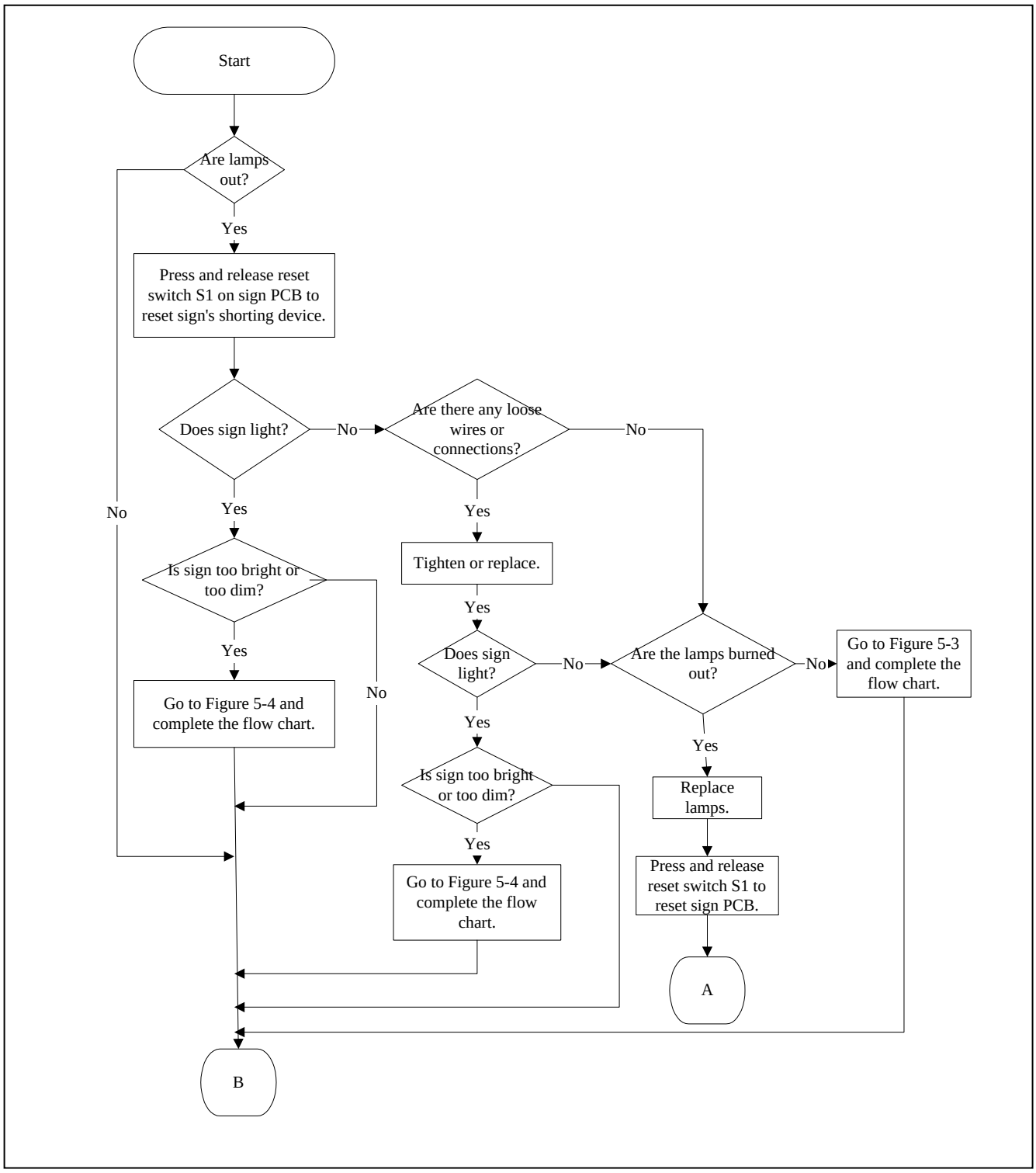

Figure 5-2. All Lamps Out (1 of 2)

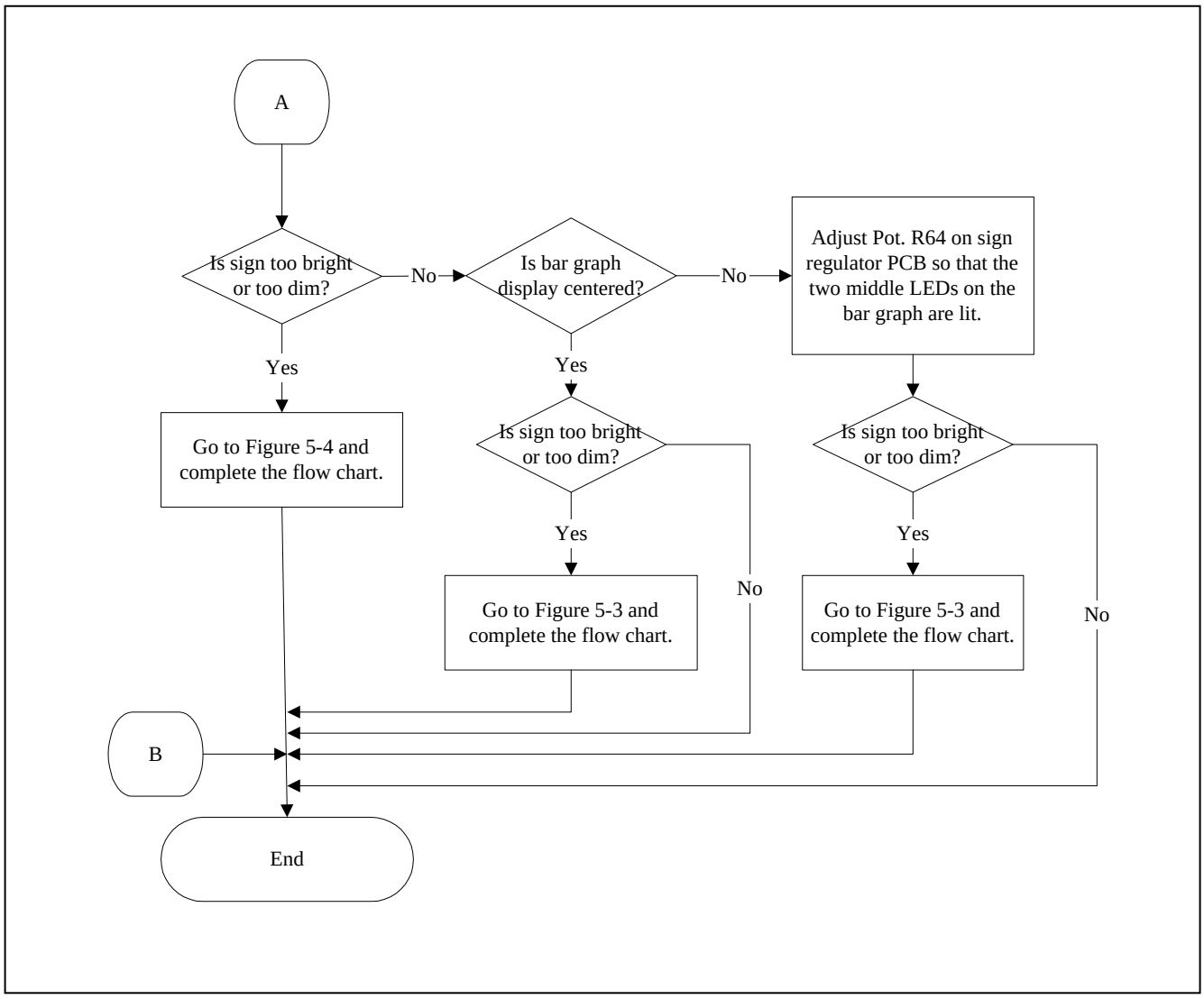

Figure 5-2. All Lamps Out (2 of 2)

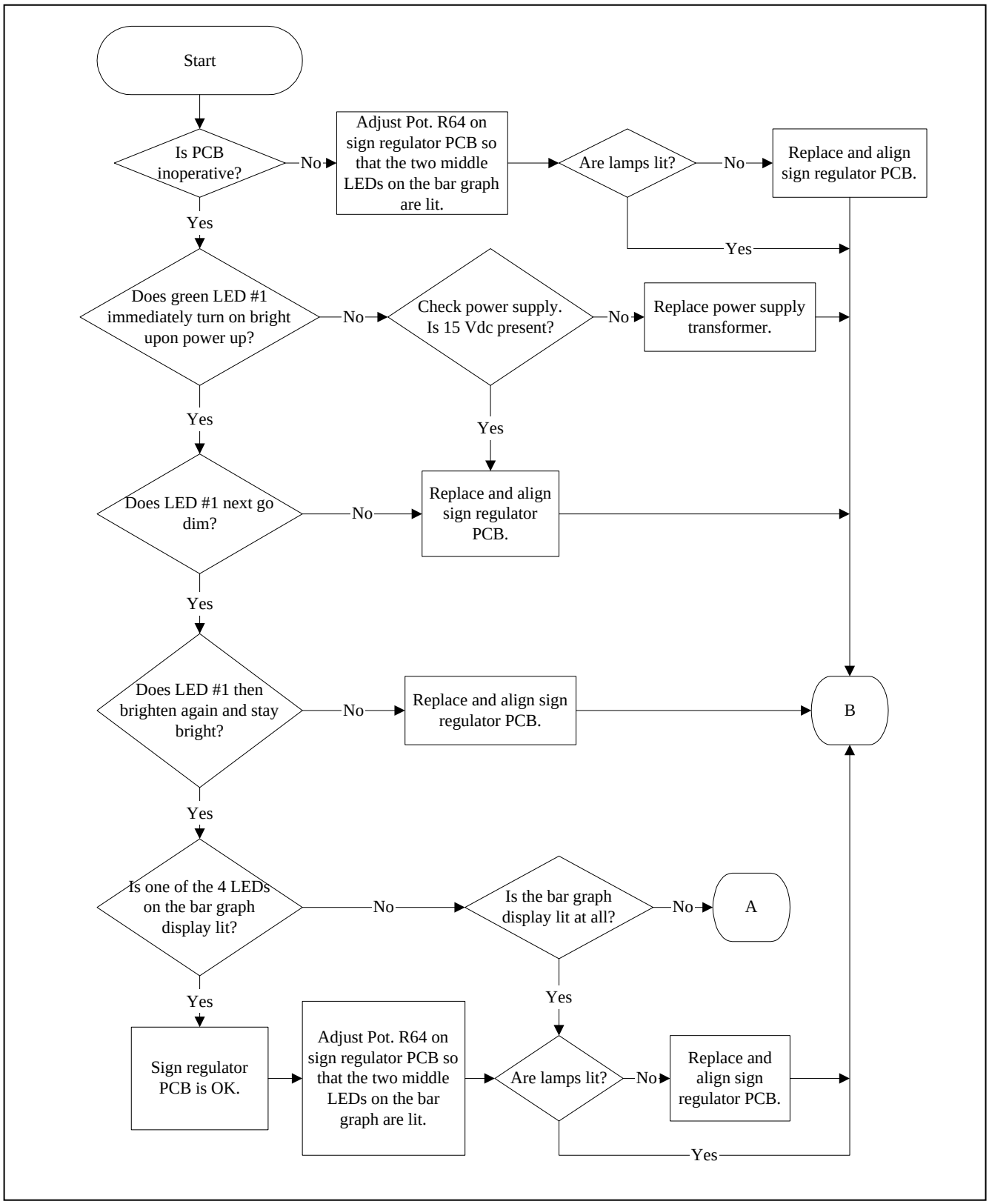

Figure 5-3. Sign Regulator PCB Inoperative (1 of 2)

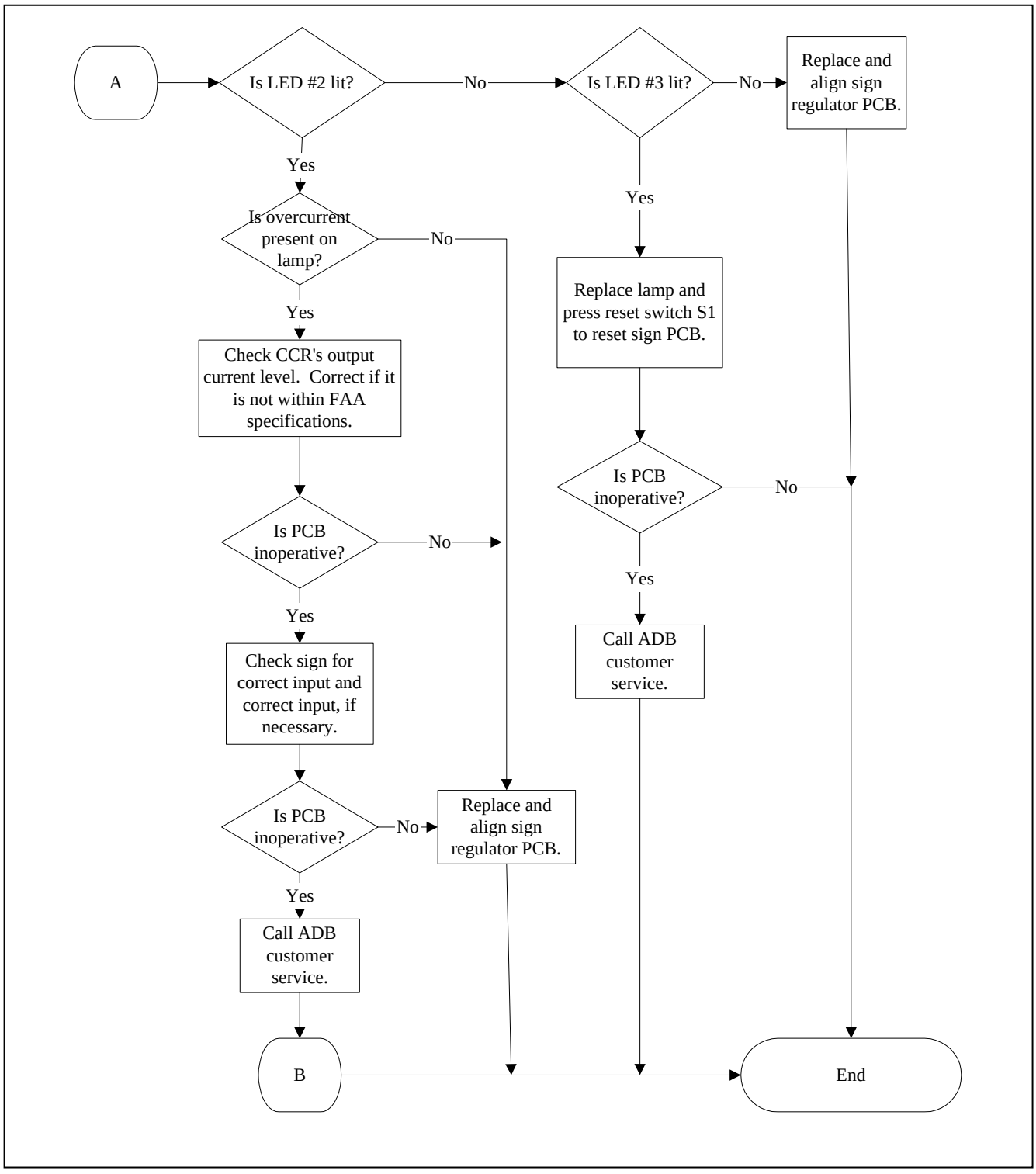

Figure 5-3. Sign Regulator PCB Inoperative (2 of 2)

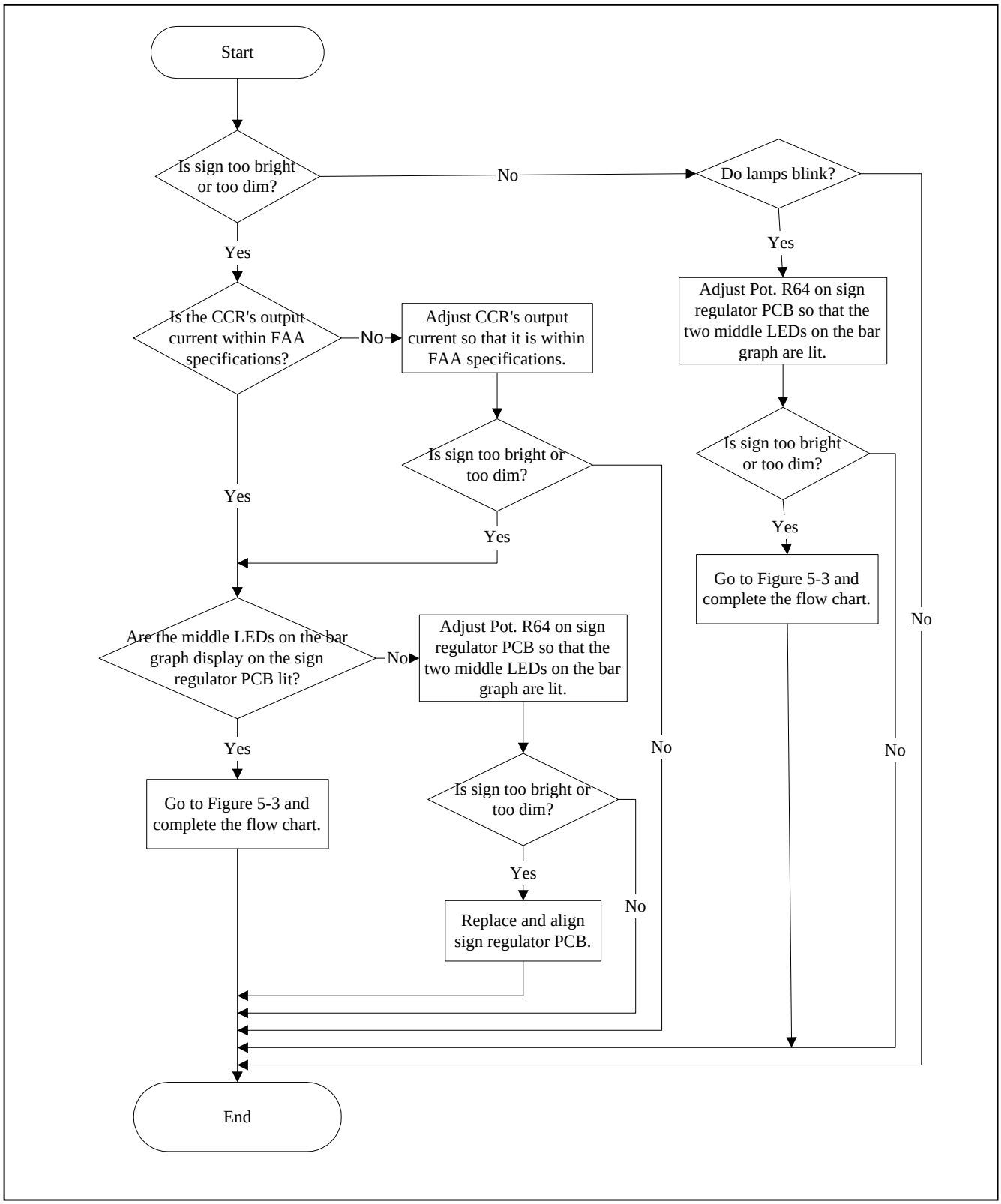

Figure 5-4. Signs Too Bright or Too Dim

Section 6
Repair

WARNING: Allow only qualified personnel to perform the following tasks. Observe and follow the safety instructions in this document and all other related documentation.

1. Introduction

This section provides procedures for replacing lamps and sign regulator PCBs.

2. Lamp Replacement

WARNING: Turn off the power to the sign before replacing lamps. Failure to observe this warning may result in personal injury, death, or equipment damage.

To replace lamp(s), perform the following procedure:

1. Turn off the power to the sign.

2. See Figure 6-1. Remove the hex screws (2) on the top lid (1) and remove the top lid from the sign. For a Size 4 sign, remove a panel (3) by sliding it upwards to gain access to the lamps.

2. Lamp Replacement *(contd.)*

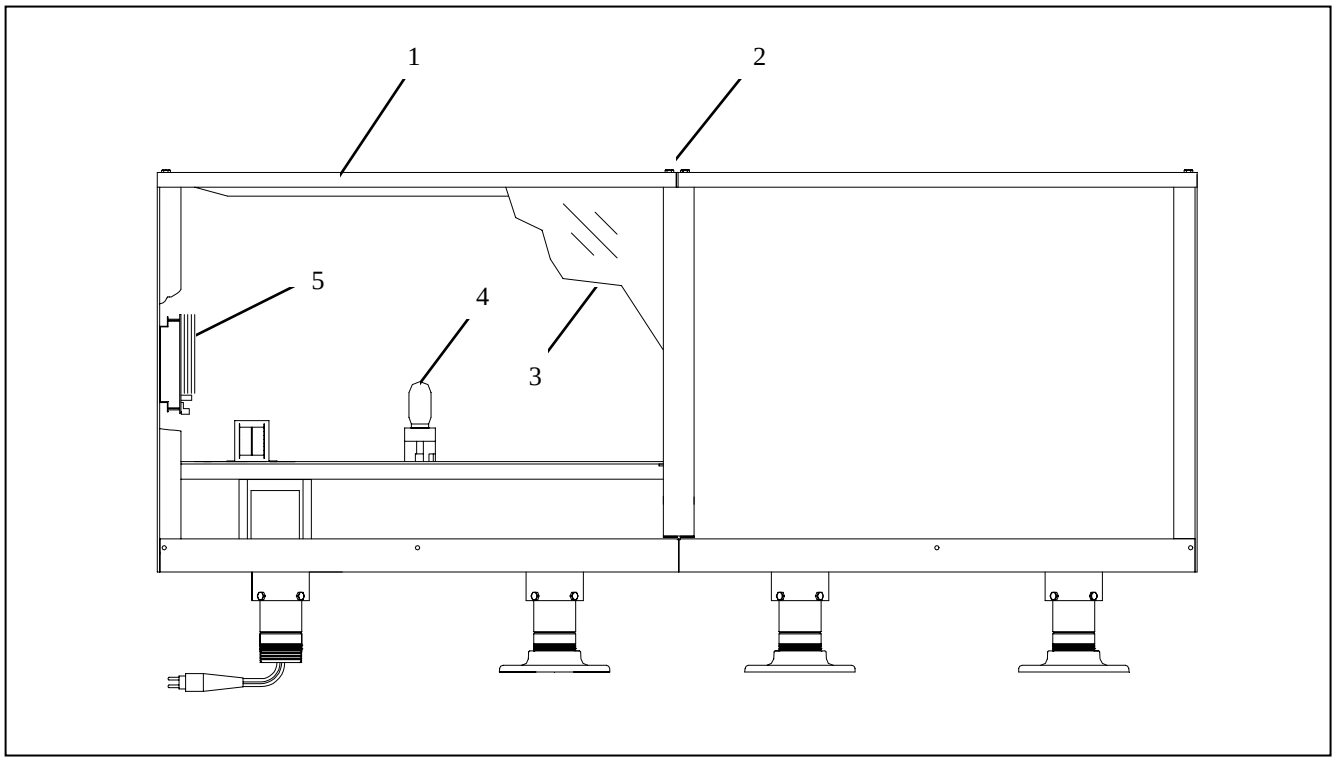

Figure 6-1. Lamp Replacement

1. Top Lid
2. Hex Screw
3. Panel
4. Lamp
5. PC Board

3. Remove the lamp (4) from the socket. For a 6.6 A incandescent lamp, press down on the lamp and turn the lamp 90 degrees counterclockwise; for a 6.6 A quartz lamp, pull up on the lamp.

4. Install the replacement lamp by reversing the removal procedure.

5. Turn on the sign.

6. See Figure 5-1. Reset the sign regulator PCB by pressing the reset switch S1 (5) on the regulator PCB. See Figure 6-1 for the location of the PCB (5).

CAUTION: Do not reset the sign regulator PCB by unplugging the terminal block connections. Damage to the sign regulator PCB may result.

2. Lamp Replacement *(contd.)*

7. See Figure 6-2. Reinstall lid(s). Begin top lid (1) installation for multiple modules by tightening the hex screws for the top lid located near or at the center of the sign (2). Finger tighten the four hex screws located in the lid.

   NOTE: All Size 3, Size 4, and Size 5 signs have three legs per module. All Size 1 and Size 2 signs have two legs per module.

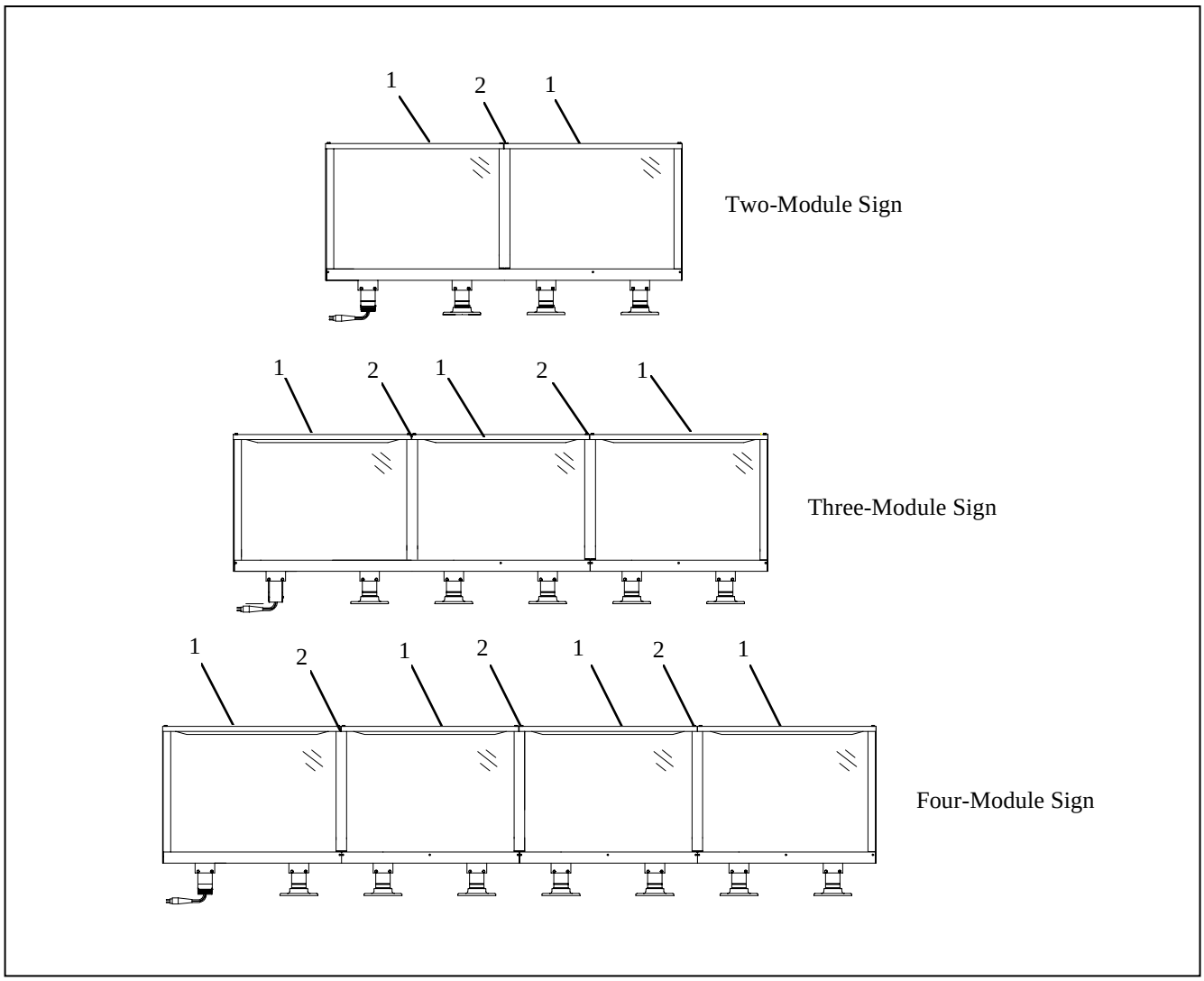

Figure 6-2. Reinstalling Lids for Multiple Module Signs

1. Lid 2. Center Module Hex Screws

2. Lamp Replacement *(contd.)*

8. Install successive lids by working outwards from the center module. After you have installed all lids and screws, tighten all hex screws with wrench.

3. Sign Regulator PCB Replacement

WARNING: Lock out power to the sign before making any electrical connections or changes to the sign regulator PCB. Failure to observe this warning may result in personal injury, death, or equipment damage.

To replace a sign regulator PCB, perform the following procedure:

1. Turn off the power to the sign.
2. See Figure 6-1. Remove hex screws (2) on the top lid (1) and remove the top lid from the sign. For a Size 4 sign, remove a panel (3) by sliding it upward to gain access to the PC board (5).
3. Pull off the wire terminal plug(s) and remove the PC board from standoffs.
4. Install the replacement PC board by reversing the removal procedure.
5. See Figure 6-2. Reinstall lid(s). Begin top lid (1) installation for multiple modules by tightening the hex screws for the top lid located near or at the center of the sign (2).
6. Finger tighten the four hex screws located in the lid.
7. Install successive lids by working outwards.
8. After you have installed all lids and screws, tighten all hex screws with wrench.

Section 7
Parts

1. Introduction

To order parts, call Siemens Airfield Solutions Customer Service or your local Siemens Airfield Solutions representative. Use this five-column parts list, and the accompanying illustration, to describe and locate parts correctly.

2. Using the Illustrated Parts List

This subsection describes how to use the illustrated parts list covered later in this section. It does not provide the actual parts list.

The Item column numbers correspond to the numbers that identify parts in illustrations following each parts list. NS (not shown) indicates that a listed part is not illustrated.

The Description column gives the part name, as well as its dimensions and other characteristics when appropriate. Indentions show the relationships between assemblies, subassemblies, and parts.

The Part Number column gives the Siemens Airfield Solutions part number.

Item	Description	Part Number	Quantity	Note
S1	Assembly	xxxxxxxx	1	A
NS	Part	xxxxxxxx	1	
H1	Part or Assembly			
	Part/Assembly for option 1	xxxxxxxx	2	
	Part/Assembly for option 2	xxxxxxxx	2	
T1	Assembly	xxxxxxxx	1	
	• Part	xxxxxxxx	1	
	• Part	xxxxxxxx	2	
NOTE A				

The Quantity column contains the quantity required per unit, assembly, or subassembly. The code AR (As Required) is used if the part number is a bulk item ordered in quantities or if the quantity per assembly depends on the product version or model.

The Note column contains letters that refer to notes at the end of each parts list. Notes contain special ordering or product/part version information.

3. L-858 Low VA Sign Part Numbering System

Figure 7-1 shows how to determine the part number for a particular L-858 low VA sign module.

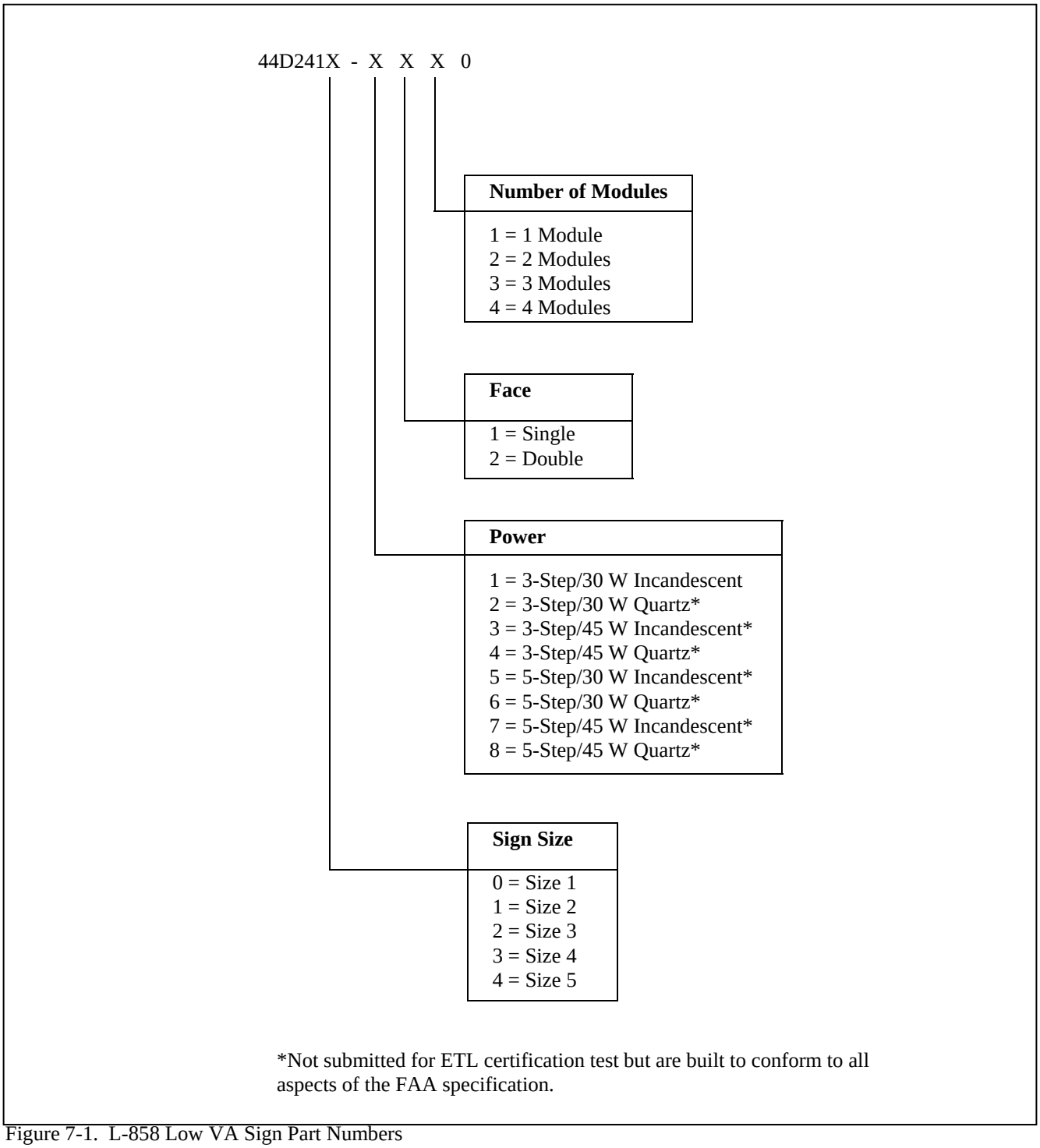

Figure 7-1. L-858 Low VA Sign Part Numbers

4. L-858 Low VA Sign Parts List

See Figures 7-2 and 7-3.

NOTE: Figure 7-2 refers to Size 1, Size 2, Size 3, and Size 5 signs. Figure 7-2 shows a multiple-module sign. Figure 7-2 also applies to one-module signs. Size 5 is always one module. Figure 7-3 refers to Size 4 signs.

NOTE: Refer to *Cordset Installation* in the *Installation* section for cordset installation part numbers.

Item	Description	Part Number	Quantity	Note
PCB1	Sign regulator PCB assembly	44D2415-0000	1	
LA1	Lamp socket		See note.	A
	6.6 A incandescent (Bryant #3743)	49A0002		
	6.6 A quartz (Sylvania TP29A)	49A0032		
LA1	Lamp		See note.	A
	6.6 A, 30 W incandescent (Phillips #24300-6)	48A0006		
	6.6 A, 30 W quartz (Osram #55041)	48A0085		
	6.6 A, 45 W incandescent (Phillips #243196)	48A0007		
	6.6 A, 45 W quartz (Osram #55048)	48A0083		
T1	Transformer		1	
	3-step, 6.6 A (four 45 W or eight 30 W lamps maximum)	35A0436		
	3-step, 6.6 A (eight 45 W lamps maximum)	35A0437		
	5-step, 6.6 A (four 45 W or eight 30 W lamps maximum)	35A0434		
	5-step, 6.6 A (eight 45 W lamps maximum)	35A0435		
T2	Power supply transformer	35A0433	1	
M3	Frangible coupling			B
	Size 1	62B0580-1	2	
	Size 2	62B0580-2	2	
	Size 3	62B0580-3	3	
	Size 4	62B0580-4	3	
	Size 5	62B0580-3	3	
NS	Base plate	1932	1	
M2	Floor flange	62B0107-2	1 or 2	
GND1	Ground lug	72A0010	1	
H1	Wire grommet	63A0042-4	1	
H3	Snap bushing	63B0385-67	1	

NOTE A: Quantity is 1 or 2 per module.

NOTE B: Sign size is stamped on frangible couplings.

NS: Not Shown.

Item	Description	Part Number	Quantity	Note
A4	Legend panel assembly		See note.	A, B
	Sign Size 1	44C2005-1		
	Sign Size 2	44C2005-2		
	Sign Size 3	44C2005-3		
	Sign Size 4	44C2005-4		
	Sign Size 5	44C2005-3		
A2	Blank legend panel assembly		See note.	B, C
	Sign Size 1	44C1050-1S		
	Sign Size 2	44C1050-2S		
	Sign Size 3	44C1050-3S		
	Sign Size 4	44C1050-4S		
	Sign Size 5	44C1050-3S		
H2	Gasket (end)	63A0374-1	1 or 2	
A5	Gasket	63A0374-3	0 or 1	
A6	Module connector		0 to 3	
	Module connector, Size 1	63A0386-1		
	Module connector, Size 2	63A0386-2		
	Module connector, Size 3	63A0386-3		

NOTE A: Quantity is 1 or 2 per module.

NOTE B: Quantity is per customer request.

NOTE C: Quantity is 0 to 2 per module.

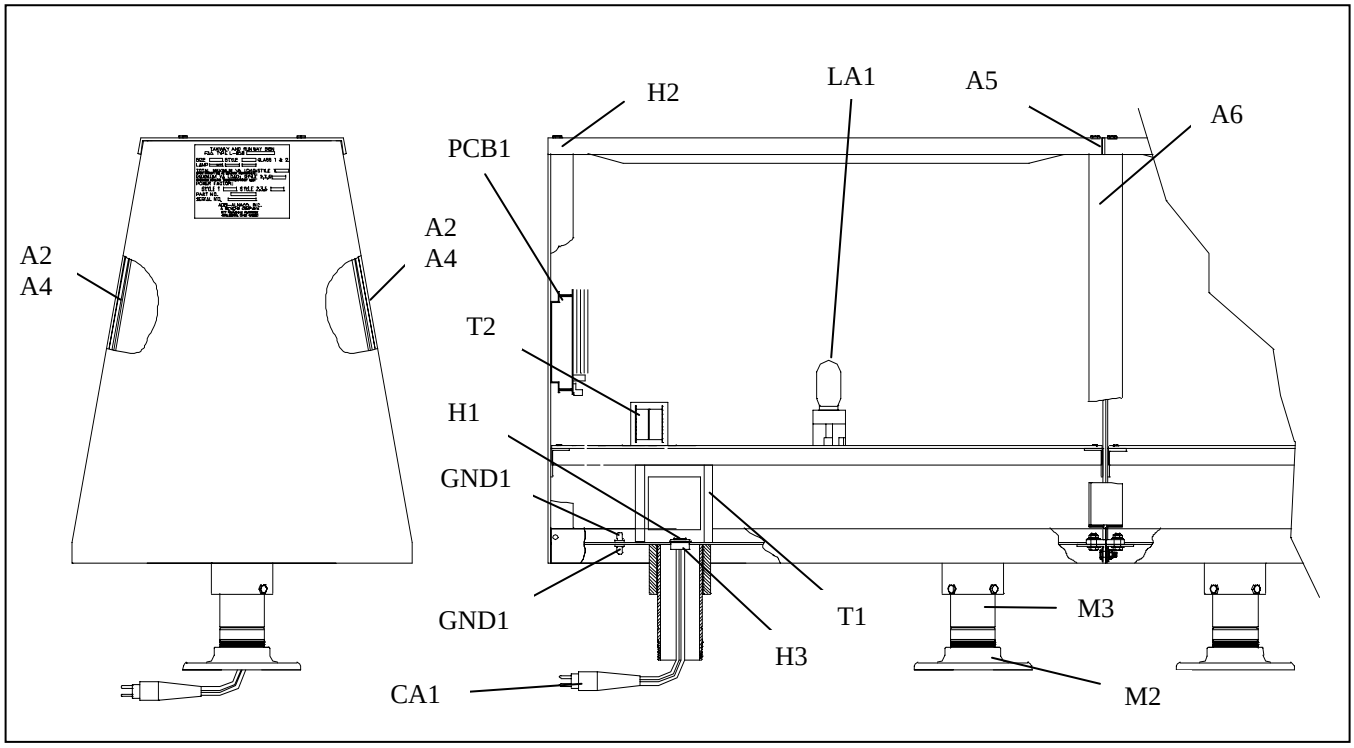

Figure 7-2. Cross-Sectional View of Low VA Sign Module Assembly (Sizes 1, 2, 3, Multiple Modules)

4. L-858 Low VA Sign Parts List *(contd.)*

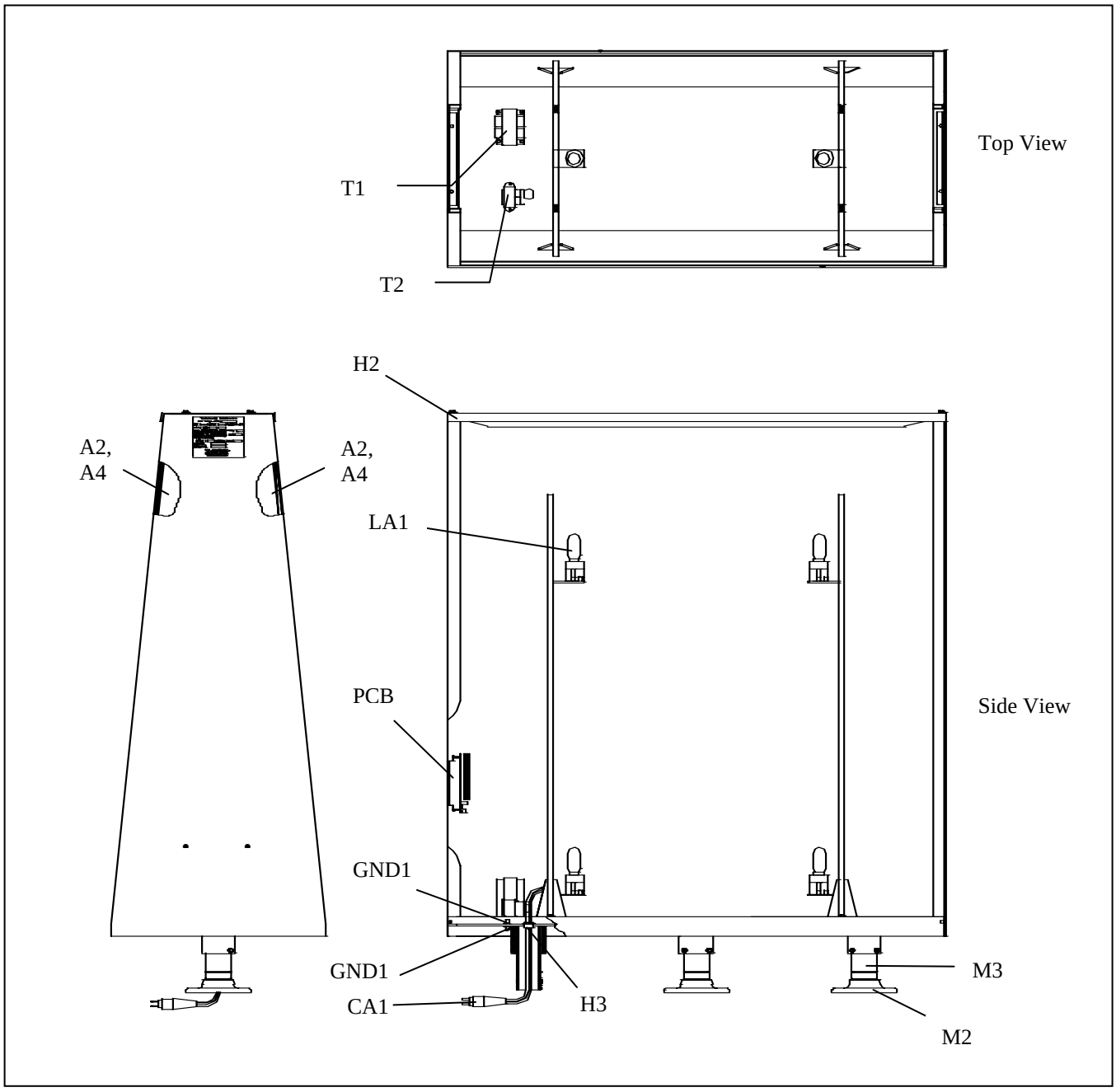

Figure 7-3. Sign Module Assembly (Size 4)

5. Optional Parts

See Figures 7-2 and 7-3.

Item	Description	Part Number	Quantity	Note
A2	Blank legend panel assembly		See note.	A
	Sign Size 1	44C1050-1S		
	Sign Size 2	44C1050-2S		
	Sign Size 3	44C1050-3S		
	Sign Size 4	44C1050-4S		
	Sign Size 5	44C1050-3S		
CA1	L-823 cordset	73A0009-31	1	
NS	Connector plug (used with outdoor cable)	63B0550		
NS	Tether assembly (1 per sign)		AR	
	Tether, 28 in.	94A0054		
	Tether, 38 in.	94A0054-1		
NS	L-867 base (12 in. diameter x 24 in. height) (304.8 x 609.6 mm)	2124	1	
NS	L-867 extension (Size B, Class 1, 3 in. (76.2 mm) deep)	2007	1	
NS	L-867 base plate (without hub, 3/8 in. (9.525 mm) thick steel)	1000-6	1	B
NS	L-867 base plate (without hub, 1/4 in. (6.35 mm) thick steel)	1000-4	1	B
NS	Angle-iron stake	44B1092	1	
NS	Black touch-up paint (12 oz (0.355 liters) spray can)	95A0012	AR	

NOTE A: Quantity is 0 or 1 per module.

NOTE B: For remote-mounted L-867 base.

NS: Not Shown.

AR: As Required.

6. Recommended Spare Parts

See Figures 7-2 and 7-3.

NOTE: Recommended quantity is dependent upon the number of signs.

Item	Description	Part Number	Quantity	Note
LA1	Lamp socket		See note.	A
	6.6 A incandescent (Bryant #3743)	49A0002		
	6.6 A quartz (Sylvania TP29A)	49A0032		
LA1	Lamp		See note.	A
	6.6 A, 30 W incandescent (Phillips #24300-6)	48A0006		
	6.6 A, 30 W quartz (Osram #55041)	48A0085		
	6.6 A, 45 W incandescent (Phillips #243196)	48A0007		
	6.6 A, 45 W quartz (Osram #55048)	48A0083		
T1	Transformer		1	
	3-Step, 6.6 A (four 45 W or eight 30 W lamps maximum)	35A0436		
	3-Step, 6.6 A (eight 45 W lamps maximum)	35A0437		
	5-Step, 6.6 A (four 45 W or eight 30 W lamps maximum)	35A0434		
	5-Step, 6.6 A (eight 45 W lamps maximum)	35A0435		
T2	Power supply transformer	35A0433	1	
PCB1	Sign regulator PCB	44D2415-0000	1	
M3	Frangible coupling			B
	Size 1	62B0580-1	2 per module	
	Size 2	62B0580-2	2 per module	
	Size 3	62B0580-3	3 per module	
	Size 4	62B0580-4	3 per module	
	Size 5	62B0580-3	3 per module	

NOTE A: Quantity is 1 or 2 per module.

NOTE B: All couplings are stamped with sign size per FAA specifications.

NS: Not Shown.

7. L-830 Series Wire Kit Parts List

See Figure 3-2 in *Optional L-830 Series Wiring* in the *Description* section.

Item	Description	Part Number	Quantity	Note
2	L-830 series wire kit	94A0173	1	
3	Style 11 receptacle kit	70A0046	1	
4	Jumper wire	89A0154	6 feet	
5	Style 4 plug kit	70A0045	2	

Section 8
Wiring Schematics

1. Introduction

This section provides wiring schematics for the 5-step and 3-step sign regulator PCB wiring connections.

2. Wiring Schematics

See Figure 8-1 for the 5-step sign regulator PCB wiring connections. See Figure 8-2 for the 3-step sign regulator PCB wiring connections.

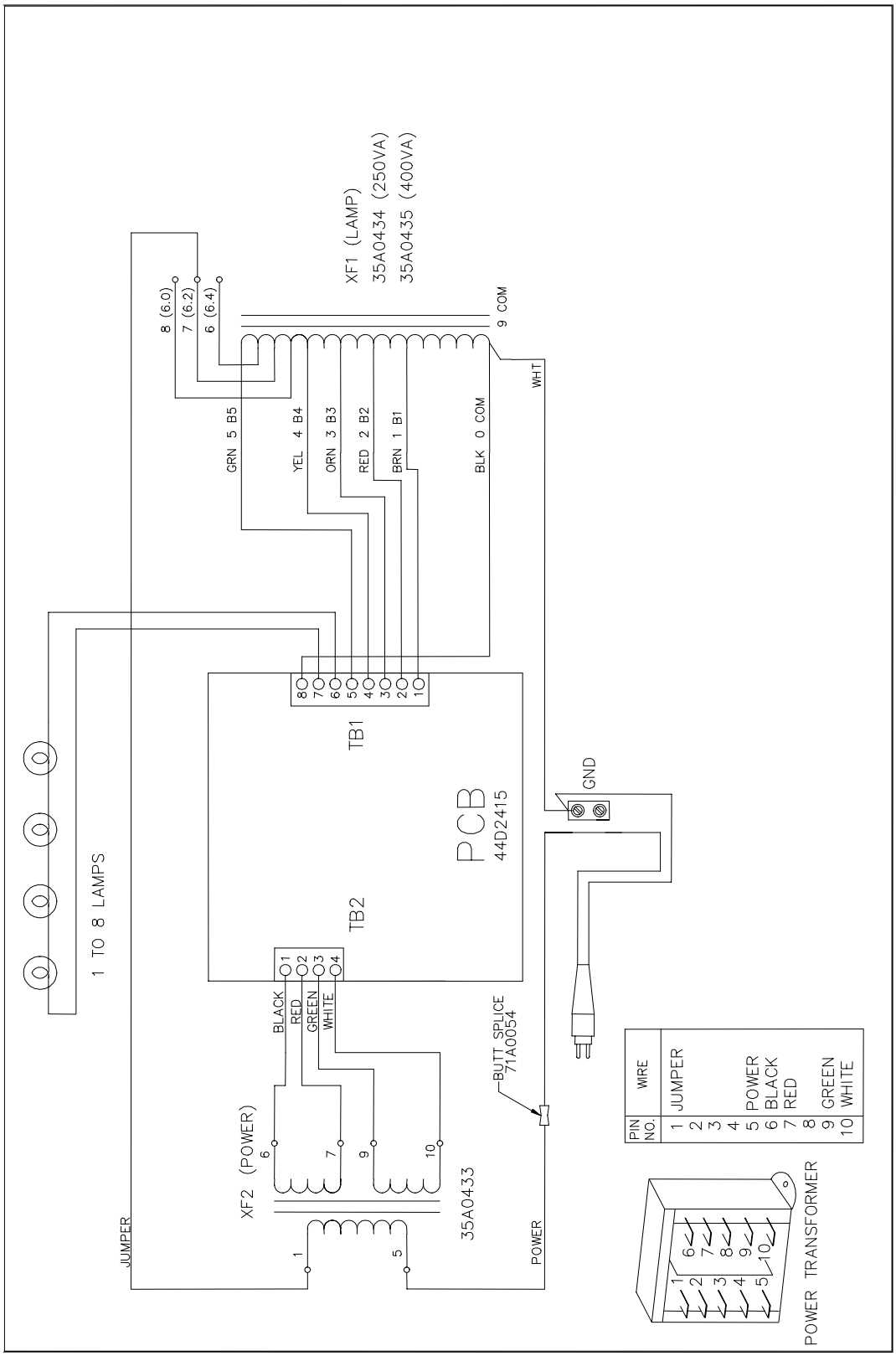

Figure 8-1. Five-Step Sign Regulator PCB Wiring Connections

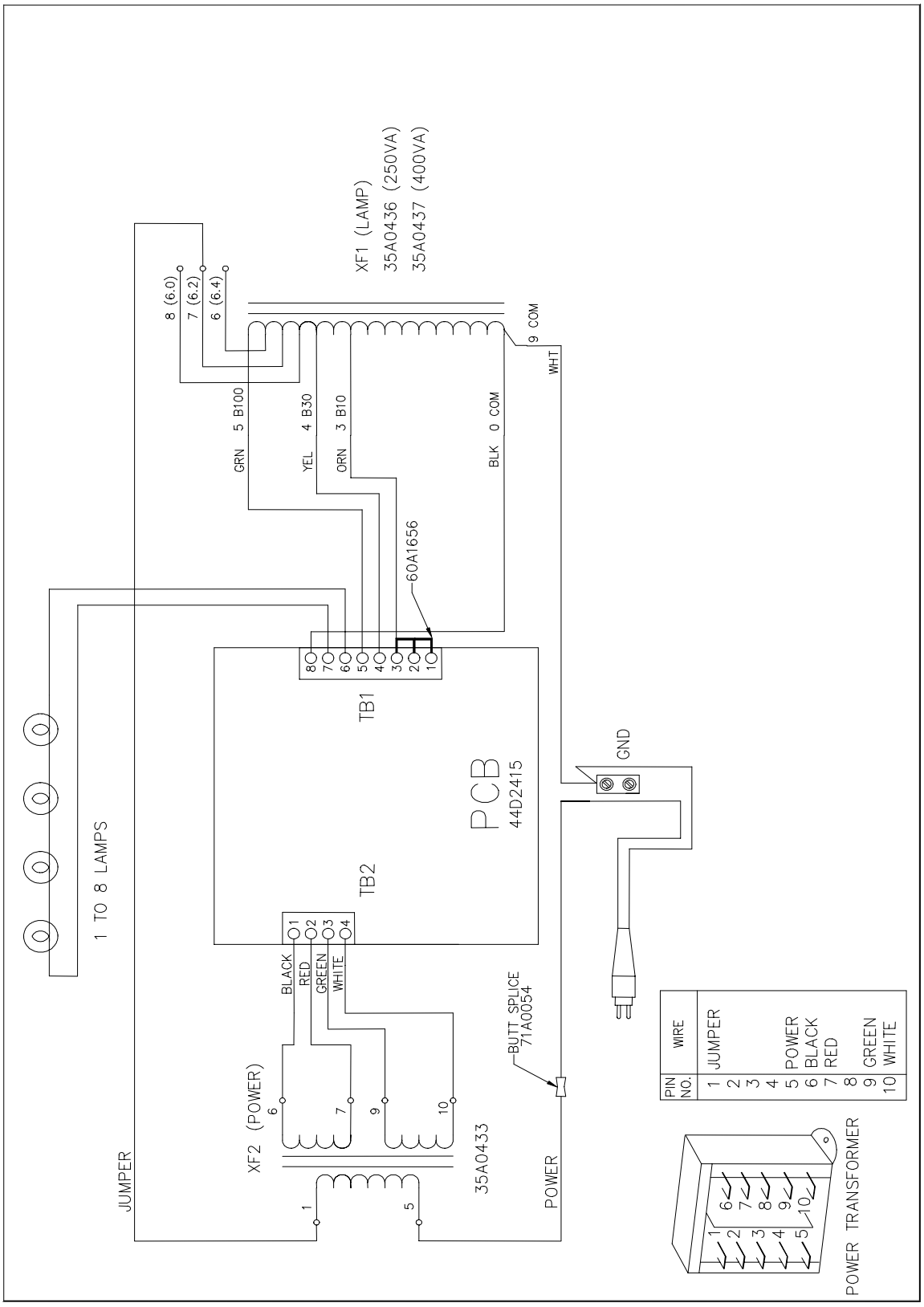

Figure 8-2. Three-Step Sign Regulator PCB Wiring Connections