SPICE™ Hardware Guide

a guide to installing and using SPICE hardware

littlefeet™

Out there.

ZERO
contents

APPENDIX B   unit specifications   **67**

about Littlefeet, Inc.

Littlefeet Inc., based in San Diego, California, provides wireless telecommunications equipment for operators around the world. We are a dynamically growing company with regional offices in the U.S. and the Asia-Pacific region. For more information, visit www.littlefeet-inc.com.

about this documentation

This documentation is intended for use by field personnel involved in installing and maintaining SPICE hardware. This version discusses the 1.5 release of SPICE hardware. Familiarity with industry-standard installation, maintenance, and tools is assumed.

SPICE documentation includes the *SPICE Hardware Guide*, *SPICE Software Guide*, and the Quick Start pamphlets included with each unit and with the OMC.

note	Important notes are separated from the text.

CAUTION ⚠	**Cautions are also separated from the text. Be sure to follow all cautions and warnings, as failure to do so may result in injury to yourself or to others, or in damage to the unit.**

Lists of operations are also separated from the text.

list of operations	page
operation name . . . . page number of operation	

Ideally, a base station would provide coverage that tapers off uniformly (A, Figure 1). Variations in propagation make the actual coverage irregular (B, Figure 1). This leads to dropped calls due to excessive interference and low signal strength.
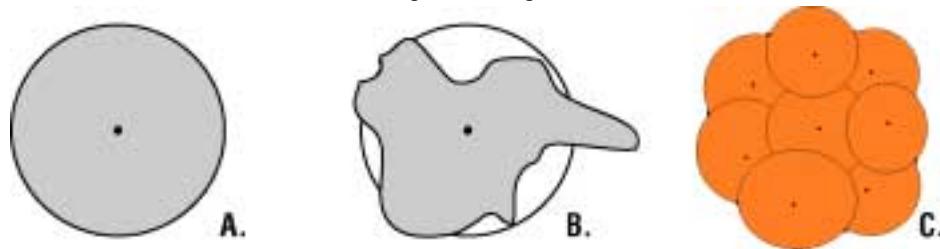
figure 1. ideal versus actual coverage

Littlefeet provides a way for base stations to communicate with mobiles using low-power SPICE units. SPICE handle the coverage functions of a traditional base station. The units have smaller footprints, and can be configured to provide more uniform coverage (C, Figure 1) by adjusting parameters such as the height of each unit's antenna and the RF output of each unit.

The SPICE system is transparent to the GSM network.

concepts and terminology

The following concepts and terms are used in this chapter:

bSPICE™ Base SPICE; unit that directly couples to an existing BTS.

cSPICE™ Coverage SPICE; unit that provides RF to the coverage area.

OMC-SPICE SPICE Operation and Maintenance Center.

SPICE Small Profile Intelligent Coverage Element. SPICE also refers to a network of SPICE units maintained by a central operations system.

SST SPICE Support Tool; software tool used for field configuration and maintenance of SPICE units.

system components

A sample cell area of Littlefeet's SPICE system is shown in Figure 2. Note that F1 and F2 represent a set of frequencies, and that the BTS should not be broadcasting to air for the cell area.
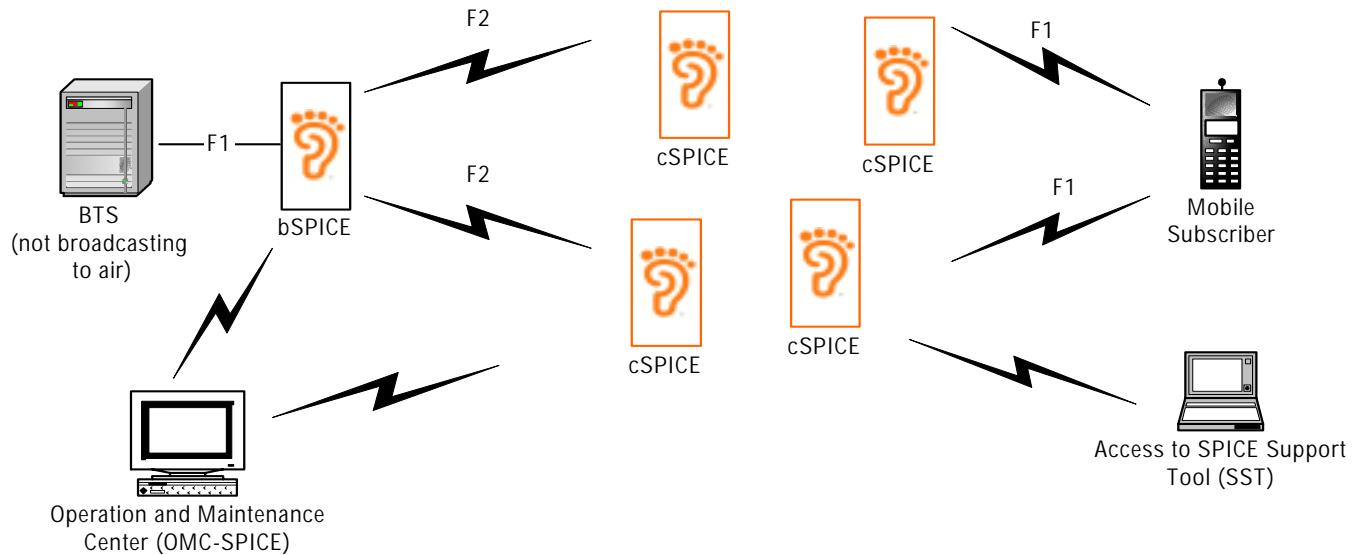
figure 2. overview of SPICE

On the downlink path, the Base SPICE (bSPICE) translates signals from a BTS (F1) and broadcasts the signals on a set of link frequencies (F2). The Coverage SPICE (cSPICE) units receive the signals from the bSPICE and broadcast to the coverage area on the original set of coverage frequencies (F1).

The opposite translations occur on the uplink path. The cSPICE units receive signals from mobile subscribers, translate them to the link frequency, and send the signals to the bSPICE. The bSPICE translates these signals to the original coverage frequency and sends them to the BTS.

SPICE units are controlled over an in-system wireless link from an Operation and Maintenance Center SPICE (OMC-SPICE) unit, which is colocated with the existing network's OMC. Monitoring and control functions are performed over a wireless modem, which is an integral part of SPICE units. Alarms on SPICE units are reported over the wireless modem to the OMC.

Field configuration and maintenance is performed with the SPICE Support Tool (SST), which can be accessed using a laptop or other personal computer via wireless modem or an Ethernet port. In addition, remote software download is available from the SST and the OMC.

The SST and the OMC are able to view and modify system parameters that make up the Management Information Base (MIB). These parameters can be modified from the OMC and/or SST. These include basic functions such as link and coverage frequencies and output power.

This chapter details requirements for the safe installation and use of SPICE units. The safety of the unit, of the technicians working on the unit, and of the general public is addressed.

CAUTION	Make sure you read, understand, and observe the cautions and warnings described in this chapter as well as those found elsewhere in this documentation and on the unit itself.

SPICE units transmit and receive signals via RF (radio frequency) energy. Handle SPICE units using the same consideration due cellular phones.

concepts and terminology

EiRP
Effective Isotropic Radiated Power. The total of the RF output power of a device plus the gain of the antenna used, minus the cable loss.

electrostatic discharge
A discharge of static electricity. Static electricity is a buildup of excess electrical charge.

RF
Radio Frequency. A portion of the electromagnetic spectrum used to transmit and receive radio signals.

RF exposure

Many studies have been performed regarding exposure to RF energy. Although all studies to date have been inconclusive as to the effects of RF exposure and human health, there is still some public concern. Since SPICE units operate at lower power than conventional base stations, there is less exposure to radiation.

A number of documents are available detailing potential health risks due to RF exposure, many of which are available on the Internet. One such website is the U.S. Federal Communications Commission (FCC) RF safety website: **www.fcc.gov/oet/rfsafety**.

levels

CAUTION

!

Important: To comply with FCC RF exposure compliance requirements, the following antenna installation and device operating configurations must be satisfied.

When the unit is operational and the channels are enabled (broadcasting), technicians should maintain an 18-inch (45 cm) distance from the cSPICE, and the general public should maintain 39 inches (1 m). Safe distances from bSPICE units when they are active depend upon the antenna used, and therefore vary by site. Conservative estimates in front of a link antenna with the recommended gain is 15 inches (37 cm) for technicians and 33 inches (83 cm) for the general public.

Keep these distances in mind when installing a SPICE unit, and make sure to maintain a safe distance. These are distances directly in front of the antenna. Prolonged exposure within the minimum safe distance should be avoided. Since this standard is for prolonged exposures, brief exposures to higher fields may not cause harm.

If there is public access to the unit within the minimum safe distance, access must be limited to the minimum safe distance or the area must be posted.

interference

Most, but not all, electronic devices are shielded from RF radiation. People with pacemakers, hearing aids, medical and other electronic devices should be aware of the possibility of a SPICE unit interfering with the function of those devices. Note that these cautions are the same as those applicable to handsets.

CAUTION

!

Exercise special caution if you have a pacemaker and are installing SPICE units. Ask your physician about the type of pacemaker and its degree of shielding from RF radiation. Do not install SPICE units without your physician's approval (as for a handset).

unit safety

In order to properly maintain a SPICE unit, follow the guidelines described below. Any failure to do so may void any warranties.

water

Do not expose the interior of the unit to water. Make sure that the service hatch (cSPICE) or door (bSPICE) is completely closed after installing or servicing the unit. Never remove the front cover from the cSPICE.

If the unit is accidentally exposed to water, disconnect the unit from power immediately. Return the unit to Littlefeet, as there are no user-serviceable parts within the unit, and there is a possibility that the water has damaged the unit's components.

CAUTION ⚠	If the interior of the unit has been exposed to water, do not attempt to fix it. Disconnect the unit from power immediately and return it to Littlefeet. Do not reconnect the unit to power, even when it has dried. To contact Littlefeet, see "contact information" on page 51.

electrostatic discharge

The interior of the unit is sensitive to electrostatic shock. Do not touch the interior of the unit, as handling the interior of the unit may result in damage to the unit from electrostatic discharge (ESD) if proper precautions are not taken.

CAUTION ⚠	Do not touch the interior of the unit. If you are changing the batteries or the SIM, use an earth (grounding) strap.
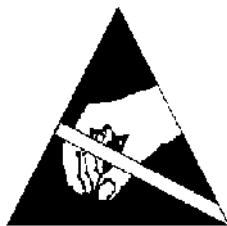
figure 3. ESD warning symbol

lightning

If a SPICE unit is struck by lightning, disconnect the unit from power as soon as it is safe to do so, uninstall it and return it to Littlefeet.

Lightning strikes can also travel through power cables from remote areas and damage the unit internally. If you suspect that this has happened and the unit is malfunctioning, do not attempt to fix it yourself; disconnect the unit from power and return it to Littlefeet.

grounding

Always make sure that the external power supply is properly grounded. Never plug the power supply into a two-pronged (non-grounded) outlet or use a two-conductor extension cable unless safety ground is attached to the stud on the power supply chassis. Failure to do so may result in a buildup of excess charge which may damage the unit or cause a potentially hazardous situation.

The chassis of the unit must be grounded.

heights

Do not drop the unit, external power supply, or any equipment being used to install the unit (installation hardware, mounting bracket, etc.). Dropping the unit will damage the unit and may harm anyone standing under the unit. Establish a safety zone around an installation site to eliminate the possibility of someone standing or passing underneath a unit that is being installed.

If the unit or power supply has fallen, do not open or attempt to fix the unit, as damage may have occurred to the antennas and/or connectors. Seal the unit and return it to Littlefeet, with a note describing how the damage was caused.

CAUTION

!

Do not open a damaged unit. Certain components are potentially hazardous when their seals have been broken. Observe and follow any warning labels on the unit.

clearances

SPICE units should not be installed near power lines. The installer should follow guidelines called out in the National Electrical Safety Code Handbook (C2-1997) Section 23, or the appropriate national or local safety codes regarding clearances that must be maintained between the SPICE antenna and any overhead or adjacent power lines or equipment.

servicing the unit

The only user-serviceable parts inside a SPICE unit are the wireless modem and the battery pack. Always wear a grounding (earth) strap when servicing the unit.

CAUTION ⚠	Do not remove the front cover of the cSPICE unit. Open the service hatch on the bottom of the unit when servicing the cSPICE. There are no user-serviceable parts under the main cover of the cSPICE, and removing this cover will void any warranties.

CAUTION ⚠	Do not attempt to fix any unit components other than the modem (replacing the SIM) and battery pack (replacing the batteries). Refer to the installation documentation for details. Return the unit to Littlefeet for replacement if it is not functioning correctly. To contact Littlefeet, see "contact information" on page 51.

wireless modem

The only operation that you will need to perform on the wireless modem is the installation of the SIM card (see "maintenance" on page 37). Do not attempt to fix or replace the modem if it is malfunctioning; return the entire unit to Littlefeet.

battery pack

SPICE units are equipped with replaceable battery packs. To change cSPICE batteries, see "replace cSPICE batteries" on page 43; for bSPICE, see "replace bSPICE batteries" on page 44.

Before changing the batteries, read all the instructions and cautionary markings. Disconnect the unit from power for a minimum of five minutes before changing the batteries.

CAUTION ⚠	If the battery charger is not operational, do not attempt to fix or replace it; return the entire unit to Littlefeet.

Since the batteries used in SPICE units are rechargeable, they must be disposed of properly. **Do not incinerate the batteries.** Instructions on proper battery disposal can be found by contacting the battery manufacturer (see "contact information" on page 51).

power

Details on safe practices while installing power supplies are found in the installation chapter (see "installing SPICE" on page 13). While servicing a SPICE unit, be aware that electricity is flowing to the unit if the unit is connected to power.

CAUTION ⚠	Dangerous voltages are found inside the external power supply. Do not open the cover of the external power supply; contact Littlefeet if it is not functioning properly. Check that the mains power has correct fusing and that the circuit breaker is not open.

installation safety notes

The following safety concerns must be taken into account when installing SPICE units.

CAUTION

⚠️

SPICE units must be installed by carefully following the installation documentation and by noting the safety concerns described here. Failure to do so may result in harm to the unit, installer, or general public. Littlefeet is not responsible for any damages caused by improper installation.

orientation

The cSPICE must be installed right-side up, never upside-down, on its side, or on its back or front (Figure 4). Note that the coverage antennas are on the top of the unit when it is correctly installed.

Incorrect

Incorrect
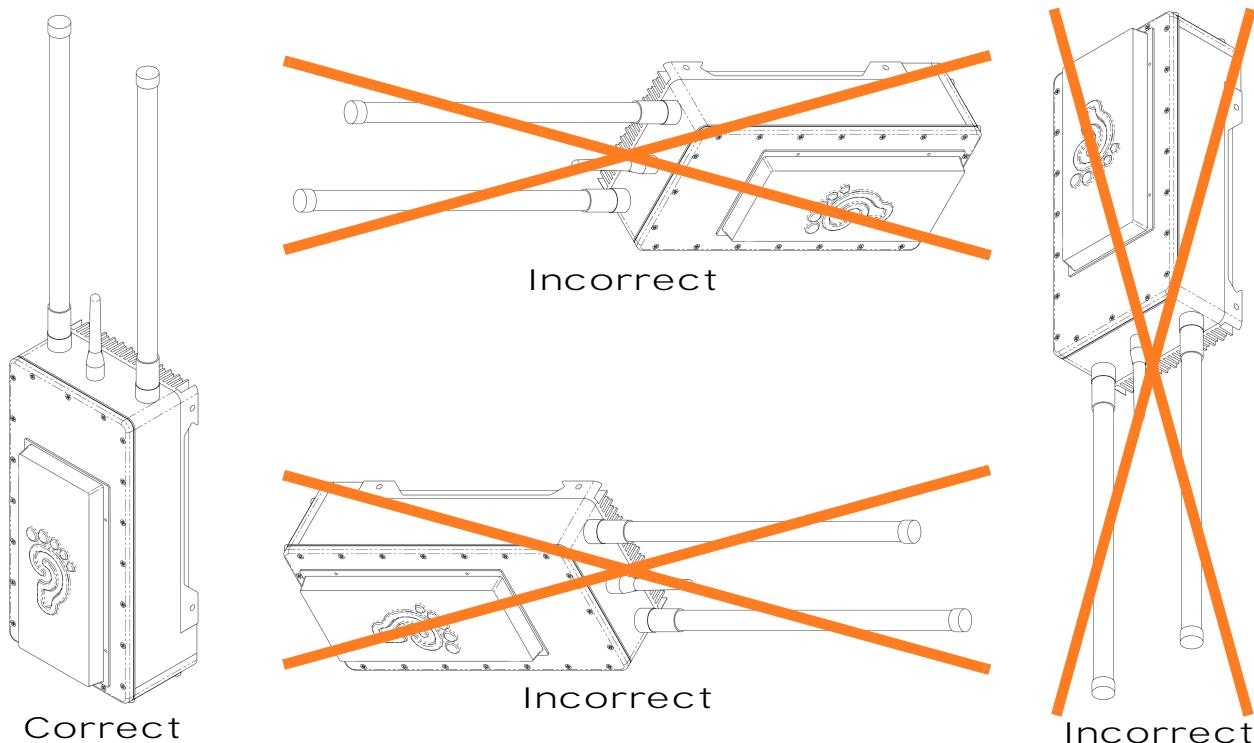
Correct

Incorrect

figure 4. correctly and incorrectly installed cSPICE units

siting

Do not install SPICE units in areas where **any** of the following conditions apply:

- In or near a potentially explosive atmosphere, such as a fuel or chemical transfer or storage facility, or an area containing chemicals or particles (grain, dust or metal powders).
- At any location where it is not possible to properly install the unit (for example, if there is not enough room to install the unit right-side up).
- At any location where the unit may be covered with water (for example, on a low pole in an area where flooding may occur).

- In an area where the ambient temperature is excessively high (for example, near smelting equipment).

- Near an area where blasting caps are used.

- Where overhead power lines will come within 3 to 6 feet (0.9 to 1.8 m) of antennas (depending on line voltage - check local codes).

- In or near an area where the SPICE unit could cause interference with equipment sensitive to RF radiation, such as hospitals or other areas where people may have pacemakers.

- At a location where lightning strikes are frequent.

- At any location where the unit may be exposed to fire.

- At a location where the public may have access to the unit within the minimum safe distance.

- Anywhere you would not be permitted to use a cellular phone.

general precautions

In addition to the other precautions listed in this and other chapters, note and follow the following precautions.

CAUTION

Do not incinerate or crush units, as the batteries may explode and/or hazardous substances may be released. Contact Littlefeet for proper disposal instructions.

Do not attempt to service the inside of the unit, other than replacing batteries or the modem's SIM card.

Do not operate the unit if the antenna has been damaged.

The external power supply has double-pole/neutral fusing.

Note and follow any warnings, cautions, or instructions written on or in the unit, or in any other documentation.

This chapter describes how to install a SPICE unit at a predetermined location. You will need the configuration information from the Installation Form.

note

Units to be installed must already have a data-enabled Subscriber Identity Module (SIM) card inserted into the internal modem. To install the SIM, see "replace SIM card" on page 42, or the Quick Start guide that accompanies new units.

CAUTION

SPICE units must be properly connected to earth ground. See the safety chapter (page 5) for other cautions.

See Appendix A for installation checklists.

concepts and terminology

The following concepts and terms are used in this chapter:

Coverage Antenna

The antenna on a cSPICE unit that broadcasts and receives on the coverage frequency.

H-BTS

Hub-BTS; the BTS used as a donor for the bSPICE signal.

Link Antenna

The antenna connected to a bSPICE or a cSPICE that broadcasts and receives on the link frequency.

installation overview

Radio planning and site selection are not addressed in this manual, nor are software operations.

note	This chapter assumes that the site for the unit has already been determined.

Once a site has been chosen and a power supply obtained and properly installed, mount the bracket and hang the SPICE unit. Check the power supply and connect it to the unit.

On the bSPICE, the external link antenna will need to be installed separately and aligned toward the coverage area. You can also use an existing H-BTS antenna.

For cSPICE units, antenna alignment will usually be needed to maximize the link signal strength from the bSPICE, or to minimize an interfering signal. Align the link antenna so that the unit receives the maximum possible RF input from the bSPICE (in a greenfield deployment) or from the BTS (in existing networks).

installation equipment

In order to install the SPICE unit, you will need the following, provided by Littlefeet (see "contact information" on page 51):

1. *SPICE Hardware Guide*
2. SPICE unit, including coverage antennas if the unit is a cSPICE
3. Littlefeet external power supply, a 3-conductor high-voltage 52 inch (132 cm) cable [either Cable Assembly 020150 (North America) or Cable Assembly 020150-02 (International)], and 12-pin low-voltage 52 inch (132 cm) cable
4. Mounting hardware and bracket for pole or wall
5. Mounting M8 bolts for cSPICE or M10 nuts for bSPICE, split lock and flat washers
6. If connecting the unit directly to a DC source, use optional DC power cord with pigtail (part number 020230)
7. Pole installation mounting kit, with two straps for the unit and one for the power supply. The provided banding is 36 inches (91.4 cm) long (part number 170044); 72-inch (182.8 cm) banding is also available from Littlefeet (part number 170043).
8. Security hex bit to access cSPICE service hatch (Littlefeet part number 170048, Tamper Pruf part number 61170)
9. Link antenna alignment equipment: either the peaking port cable (part number 020226) or adapter (part number 380086), and voltmeter

The following equipment is also recommended for the installation of the unit, but is not provided by Littlefeet:

10. Data-enabled SIM card installed in the unit's internal modem
11. Assorted hand tools (#2 Phillips screwdriver, 8" crescent wrench, wire cutters, needle-nose pliers, torque wrench with socket wrenches, other site-specific tools)
12. Coaxial cabling and appropriate connectors if the unit is a bSPICE
13. External link antenna if the unit is a bSPICE
14. Four M6 or 1/4"-28 bolts with flat and lock washers for wall-mounting power supply, four M12 or 1/2"-20 bolts with flat and lock washers for wall-mounting bSPICE or cSPICE units

If you are going to program the unit using the SST, you will also need configuration information, the *SPICE Software Guide*, and a laptop computer (as described in the *SPICE Software Guide*). Use the installation form to transfer information you need from and to the network operations center.

installing bSPICE

The bSPICE unit will usually be installed at the site of the existing BTS. To install the bSPICE unit, perform the following steps:
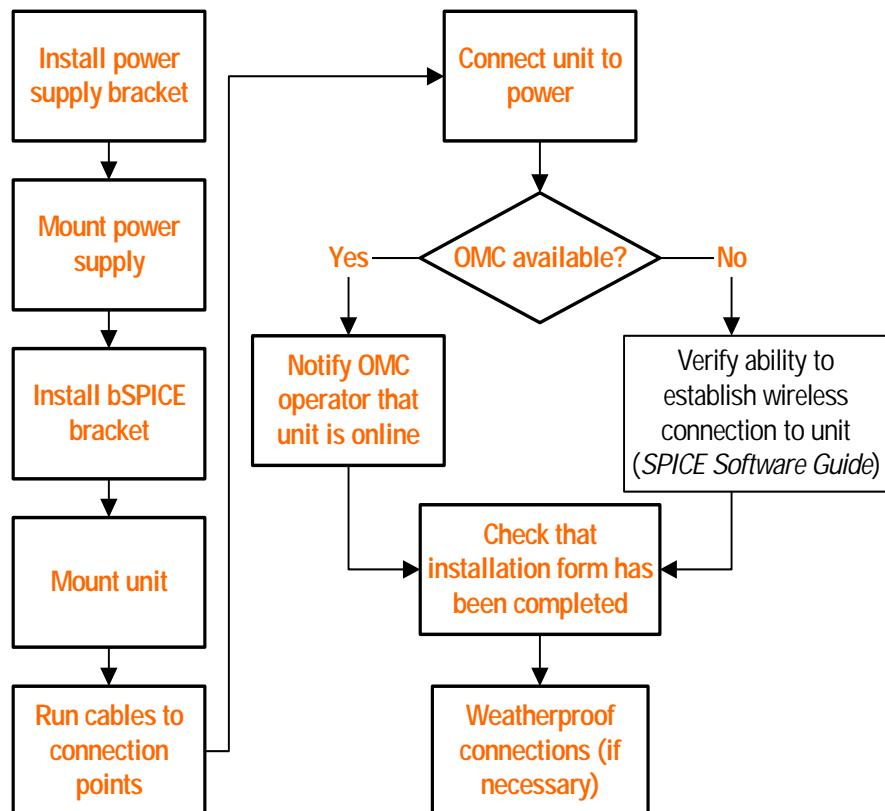
figure 5. bSPICE installation flowchart

figure 6. bSPICE unit

install power supply

The bSPICE uses an external power supply provided with the unit. The bSPICE can also be directly connected to the existing BTS power supply/battery backup system, allowing for use of the battery backup in the event of a power disruption.

Littlefeet-supplied power supply

Table 1 contains specifications for the power supply provided with the unit (PS0001E). Power supplies must also meet safety regulations for the country in which the unit is to be installed.

table 1. Littlefeet power supply specifications

Parameter	Minimum	Maximum	Comment
Input to Power Supply	100 V AC	240 V AC	The input to the power supply automatically adjusts to the supplied voltage (no jumping required).
Input current		2.5 A	
Weight	3 kg (7 lbs)		
Dimensions	160W x 260L x 90D (mm) [6.3W x 10.24L x 3.55D (in)]		
Operating temperature	-33º C (-22º F)	55º C (131º F)	
Output from Power Supply - Voltage	28 V DC		The input is non-polarized and fully-floating.
Output from Power Supply - Watts		130 W	
Frequency of input to Power Supply	50 Hz	60 Hz	Single-phase

CAUTION

⚠

The enclosure will reach the operating temperature of the power supply, which may cause a burn. Handle the power supply and enclosure with caution once it is connected to power.

An external disconnect device (such as a circuit breaker) must be included in the path between the power supply and mains (Figure 7). The power cable is 52 inches (132 cm) long.
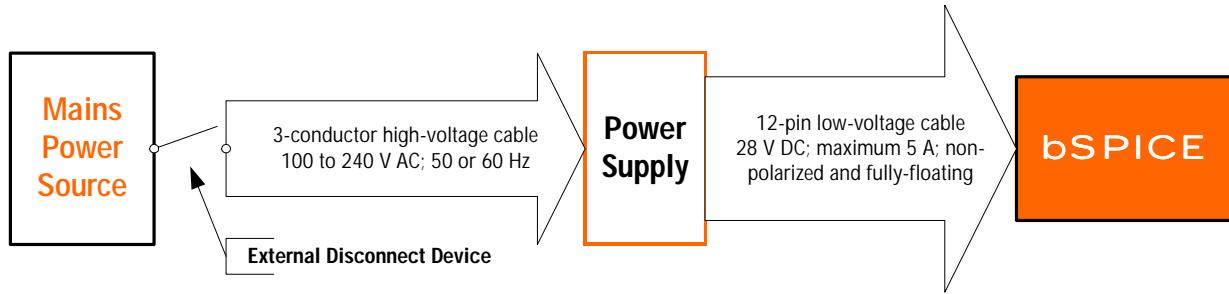
figure 7. power supply connections

The power supply must have 2 inches (5 cm) above the top and along the sides to allow for heat dissipation and 6 inches (15.2 cm) below to allow for power connections (Figure 8).

figure 8. power supply mounting clearances

Insert the banding provided (Item 7, page 15) into the top slots on the power supply bracket such that the power connectors are oriented downward (on the bottom of the power supply). If longer banding is needed, contact Littlefeet.

figure 9. power supply bracket slot

Mount the power supply (Figure 10) bracket. Tighten the banding to 600 in-lbs (67.8 N-m). Hang the power supply on the bracket and attach it using 35 in-lbs (3.95 N-m) of torque. For details on using banding, see "banding details" on page 64.

The power supply can also be wall-mounted according to applicable local and national building codes. See Figure 51, "power supply," on page 61 for a mounting diagram.

If required, connect the grounding lug on the bottom of the power supply to earth ground using at least 16-gauge wire (or as required according to applicable local or national codes), tightened to 25 in-lbs (2.8 N-m).

figure 10. power supply installation and connectors

CAUTION

⚠

Dangerous voltages are present inside the power supply. Do not remove the cover of the power supply.

other power source (DC)

The bSPICE can be connected directly to an external DC source that is 20 to 56 V, non-polarized, and 3 to 6 A. Use the optional low-voltage 12-pin power connector with pigtail wires (Item 6, page 15) to connect to the DC power source.

mount the unit

bSPICE mounting varies from site to site. Make sure that the bSPICE is installed such that it will not fall or be damaged. It is recommended that the bSPICE be installed in close proximity to the BTS (cable loss must be less than 10 dB).

CAUTION

⚠

For an outdoor installation, the bSPICE must be mounted such that the connectors are on the bottom of the unit. The modem antenna will be on the top of the unit (Figure 12).

The bSPICE must have 6 inches (15.2 cm) above the top of the unit to allow for the modem antenna, 6 inches (15.2 cm) below the unit to allow for interconnects and DC power connection, and 16 inches (40.6 cm) to the left side and in front of the unit to allow for opening the unit door (Figure 11).

figure 11. bSPICE mounting clearances

Correct   **Incorrect**   **Incorrect**

Incorrect
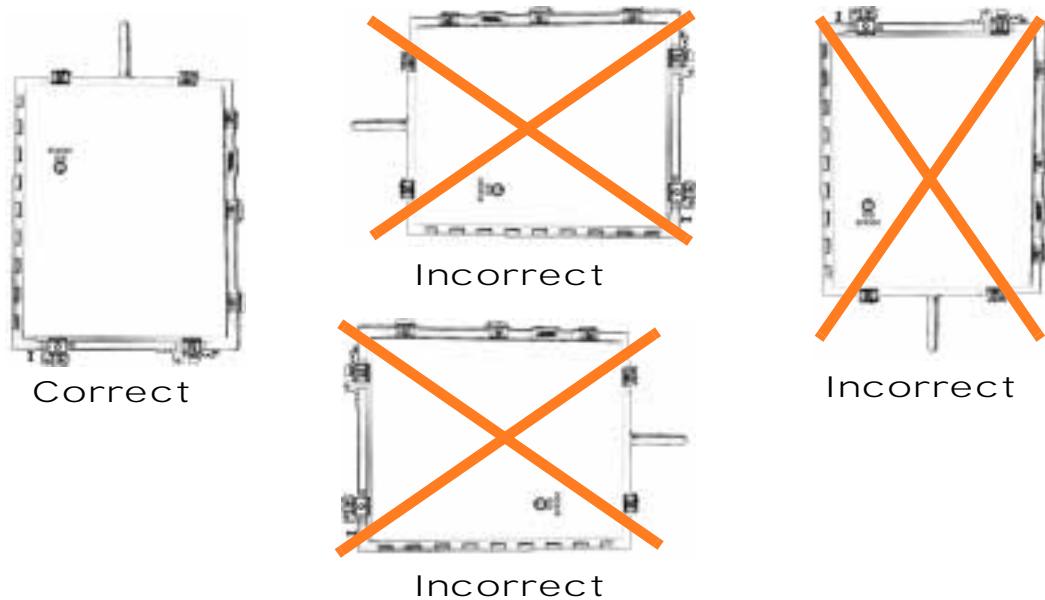
figure 12. bSPICE mounting orientation
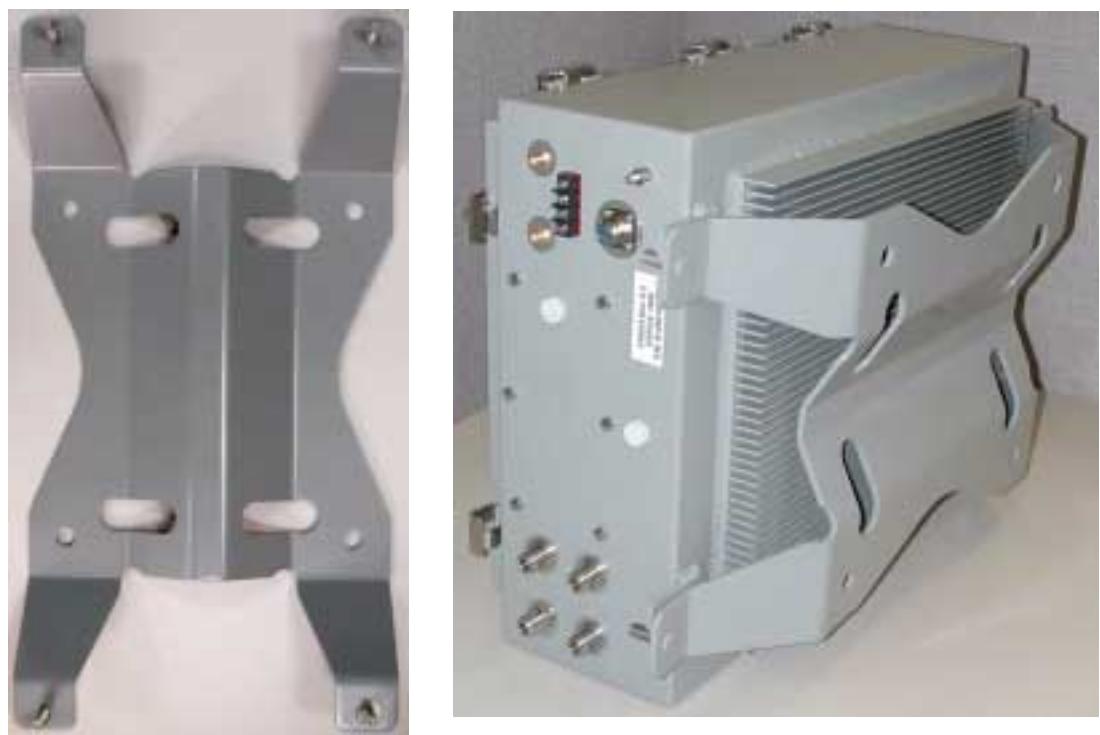
figure 13. bSPICE with mounting bracket

For pole mounting, secure the bracket on the pole using the two banding straps provided. For details on using banding, see "banding details" on page 64.

figure 14. mounted bSPICE bracket

Tighten the banding to 600 in-lbs (67.8 N-m). If longer banding is needed, contact Littlefeet. If the unit is to be mounted to a wall, consult local building codes for installation requirements. The bSPICE overall weight is 40 lbs. (18kg).

Line up the bSPICE with the four threaded rods on the bracket. Tighten the M10 nuts provided with the bSPICE onto the threaded rods (arrows in Figure 15) on each of the four corners of the bracket to 50 in-lbs (5.6 N-m).
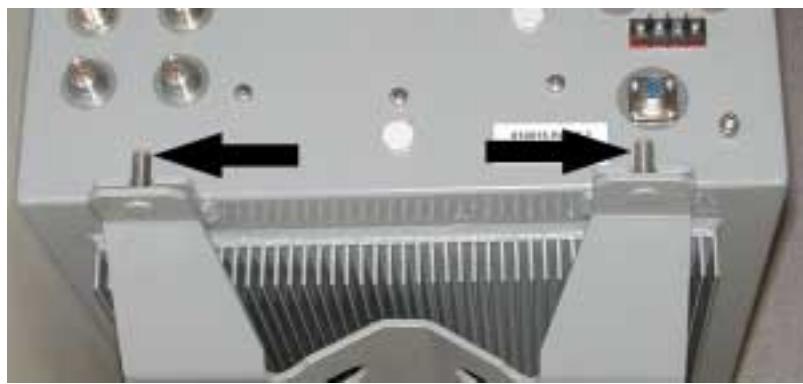
figure 15. bracket mounting bolts

figure 16. bracket mounting detail - top (left) and bottom (right)

run cables

Run cables from the bSPICE to the BTS and to the link antenna. If the installation is taking place within a greenfield deployment, you can connect the cables. Halt/disable the BTS sector while connecting RF cables to the bSPICE. The type of connections used between the bSPICE and the BTS will vary according to the type of BTS used. The RF connectors on the bSPICE are N-type female connectors.

Make the bSPICE to BTS and link antenna cable to bSPICE connections using 12 to 15 in-lbs (1.4 to 1.7 N-m) of force. The cable loss must be less than 10 dB. Terminate unused connectors with a 50 Ω load. If desired, connect the alarm relay to the BTS. Use 10 in-lbs (1.1 N-m) of torque on the 440 screws on the relay.

If you are installing the bSPICE in an existing network, make sure that the connectors available are the correct size and type. The connections will be made when the unit is commissioned.

connect power

If you are using the external power supply provided with the unit, connect the unit (Figure 18) to the external power supply using the connector shown in Figure 17. Do not force the connector. The power connectors are snap-lock.

figure 17. power cable connector

figure 18. bSPICE connections

Connect the power cable from the external power supply to mains power. The colors and meanings of the wires in the cable are given in Table 2.

CAUTION	Dangerous voltages are present inside the external power supply. Do not remove the power supply cover. Also note that the power supply enclosure may be extremely hot.
	The power supply must be connected to the power source in accordance with local codes.

note	The power supply has double-pole/neutral fusing.

CAUTION	The green and yellow safety ground wire from the power supply cable MUST be connected to earth ground, or the power supply ground stud may be used to provide safety ground connection. If the ground stud is used, it must be connected using 25 in-lbs (2.8 N-m) of force.
	An external disconnect device must be provided at time of installation in a readily accessible location. Consult NEC (National Electrical Code) or appropriate national or local Electrical Code for requirements. The disconnect device is not provided by Littlefeet.

table 2. power cable wires - power supply to mains (3-conductor)

Wire color	Meaning
Blue	Neutral
Brown	Line
Green and Yellow	Ground

The unit is active once the power is connected. Check that the LED (light) on the front of the unit illuminates.

existing DC power source

If you are using an existing DC power source, connect the power cable from the power source to the unit (Table 3).

table 3. power cable wires - unit to DC source (12-pin)

Wire color	Meaning
Black	Return
White	Positive
Green	Ground

The unit is active once the power is connected. Check that the LED (light) on the front of the unit illuminates.

notify OMC

Call the OMC operator and ask the operator to dial into the unit. After a successful call, the bSPICE is on-line. If the OMC is not available, call the unit using a laptop computer equipped with a wireless modem as described in the *SPICE Software Guide*.

Make sure that the installation form is completed.

weatherproof

Weatherproof all connections that are in locations where they may be exposed to the elements, if necessary. All connectors on the bSPICE and power supply are designed to be watertight, and do not need further weatherproofing.

installing cSPICE

In order to align the cSPICE link antenna, the bSPICE (greenfield deployment) or BTS (existing network) must be radiating. In addition, the data-enabled SIM card must have been previously installed in the wireless modem. To install the cSPICE unit, perform the following steps (Figure 19):
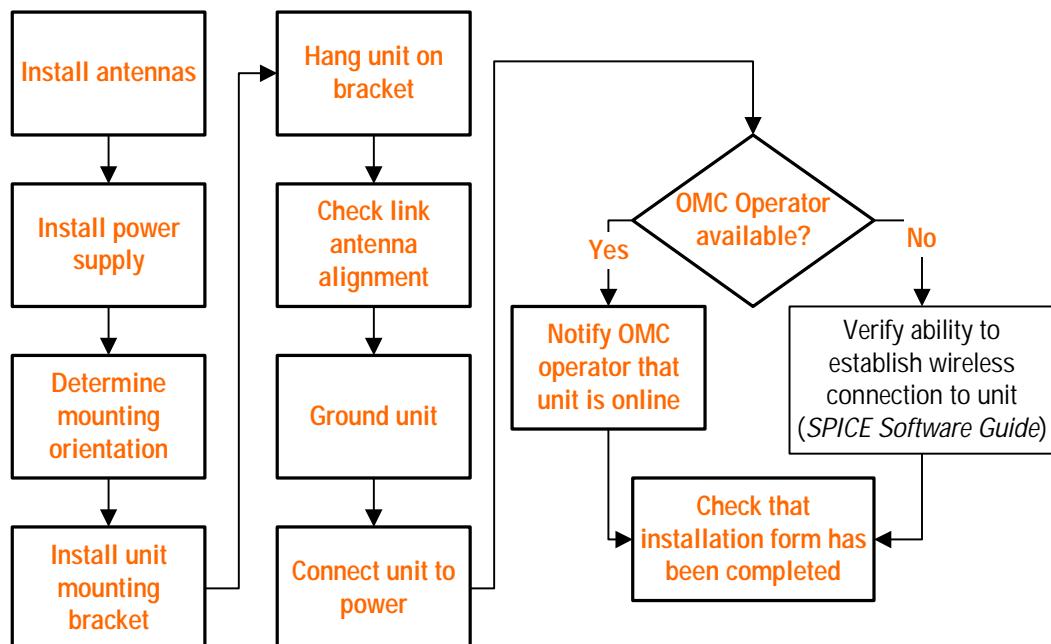
figure 19. cSPICE installation flowchart

CAUTION   Do not handle the unit by the antennas.

figure 20. cSPICE components

install antennas

Install the antennas included with the unit. Attach the antennas onto the connectors on the top of the unit (Figure 21). Tighten the connectors to 60 in-lbs (6.8 N-m). Do not overtorque the connectors.

If only one antenna is provided, attach the single antenna to the connector. There will be a cover over the unused hole.

figure 21. antenna installation

Once the connectors are in place, slide the connector cover over the connector. Figure 22 shows the installed antennas.

figure 22. installed antennas

customer-supplied antennas

cSPICE units can also use customer-supplied antennas. Both link and coverage ports have Voltage Standing Wave Ratios (VSWRs) of better than 2:1 in the downlink and uplink frequency range. Customer-supplied antennas can have up to 2:1 VSWR in the downlink and uplink frequency ranges. Antenna isolation must be equal to or greater than that specified for the standard antennas (see "cSPICE antenna specifications" on page 69).

Any customer-supplied antennas must meet applicable safety codes, be properly installed, and have the proper weatherproof connectors. If the gain of a customer-supplied antenna is higher than that of standard cSPICE antennas (see "cSPICE antenna specifications" on page 69), the RF safety must be evaluated.

install power supply

Install the power supply as described in the bSPICE installation. The cSPICE connections are shown in Figure 23. Wire colors are given in Table 2 on page 25.

If required, connect the grounding lug on the bottom of the power supply to earth ground using at least 16-gauge wire (or as required according to applicable local or national codes). Tighten the connection using 25 in-lbs (2.8 N-m) of force.

| Mains Power Source | → | 3-conductor high-voltage cable 100 to 240 V AC; 50 to 60 Hz | → | Power Supply | → | 12-pin low-voltage cable 28 V DC; maximum 5 Amps; non-polarized and fully-floating | → | cSPICE |

External Disconnect Device
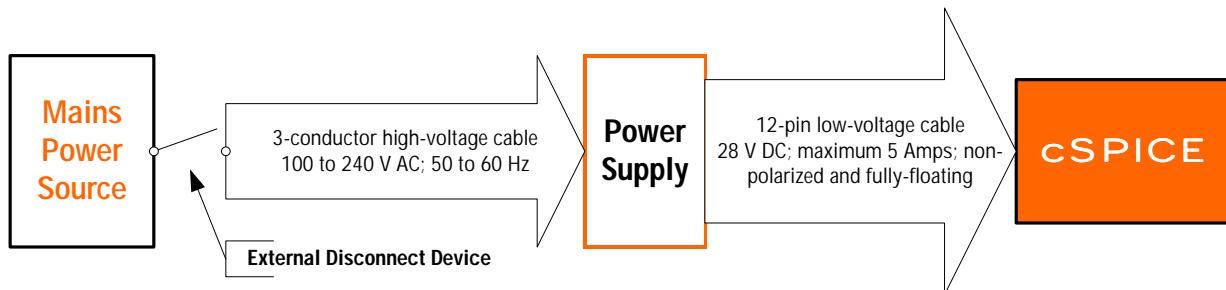
figure 23. cSPICE power supply connections

determine link antenna orientation

The link antenna is found on the front of the cSPICE. Use a compass or other tool to determine the direction of the bSPICE from the cSPICE site.

If the bracket cannot be mounted so the unit is facing the bSPICE signal, remove the link antenna from the front of the unit and mount it remotely.

note The best signal is not always directly from the bSPICE direction. You will need to check the antenna alignment (see page 34).

mount the unit

To mount the unit, first mount the bracket where the unit is to be located, using the orientation determined above. Mounting clearances must be at least three inches (7.8 cm) above the coverage antennas (to allow for removal of antennas) and 12 inches (30.5 cm) below the unit (for service hatch access and DC power cable connection) (Figure 24). The front of the unit (in front of the link antenna) must be completely free of obstructions.

figure 24. cSPICE mounting clearances

The bracket must be mounted so that the arrow on the bracket is pointing up (Figure 25).

figure 25. arrow on cSPICE bracket

The cSPICE must be installed right-side up, never upside-down, on its side, or on its back or front (Figure 26). Note that the coverage antennas are on the top of the unit when it is correctly installed.
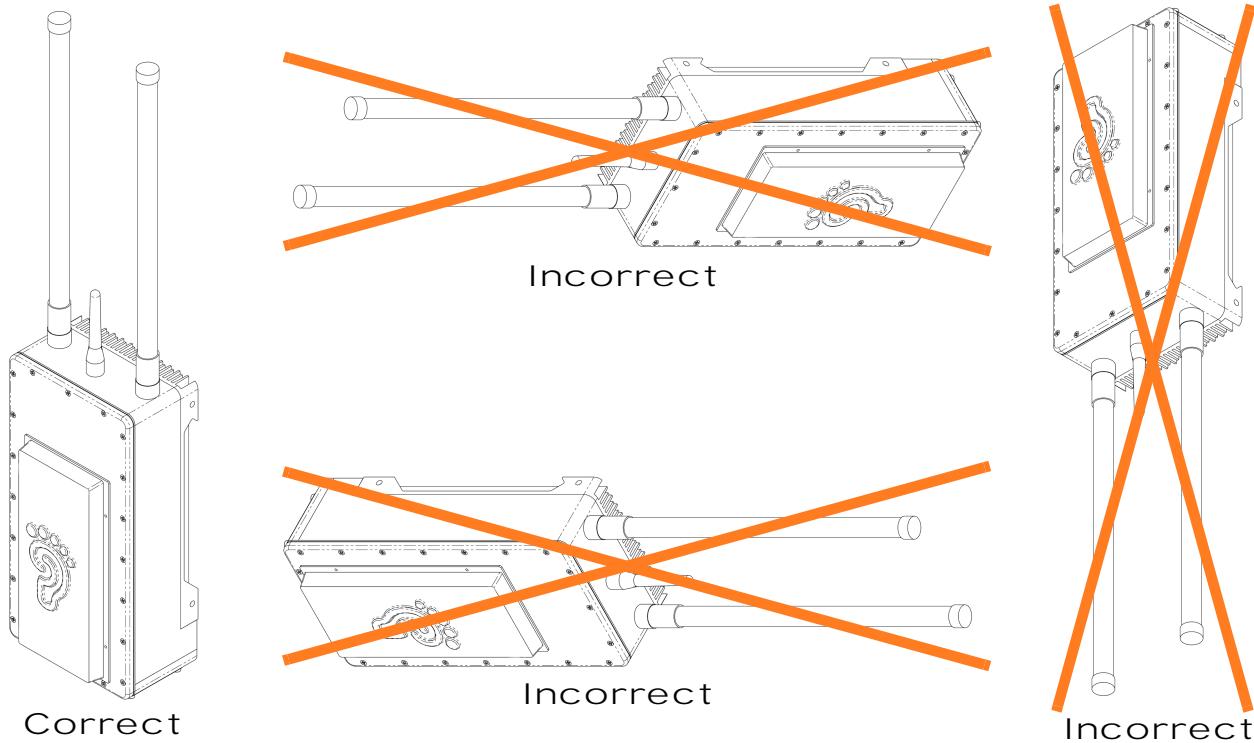
figure 26. correctly and incorrectly installed cSPICE units

note   Make sure to mount the bracket so that the unit is roughly facing the bSPICE as described above. Line-of-sight to the bSPICE is not required. Do not attach the bracket tightly until you have checked the link antenna alignment (page 34).

For light, telephone, or utility poles, the bracket can be mounted using the banding provided (Item 7, page 15) (Figure 28). If longer banding is needed, contact Littlefeet. Attach the pole mount bracket using bands through both the top and bottom slots (Item 4, page 15). For details on using banding, see "banding details" on page 64.

figure 27. large pole bracket - back

Tripods or poles with a diameter of two to five inches (5 to 12.7 cm) can be mounted using the small bracket provided with the unit in combination with the large bracket for the cSPICE (Figure 28). If longer banding is needed, contact Littlefeet. Run the banding through one side of the small bracket, then both holes in the large bracket. Hold the brackets in place around the pole, then run the banding through the second hole in the small bracket. For details on using banding, see "banding details" on page 64.
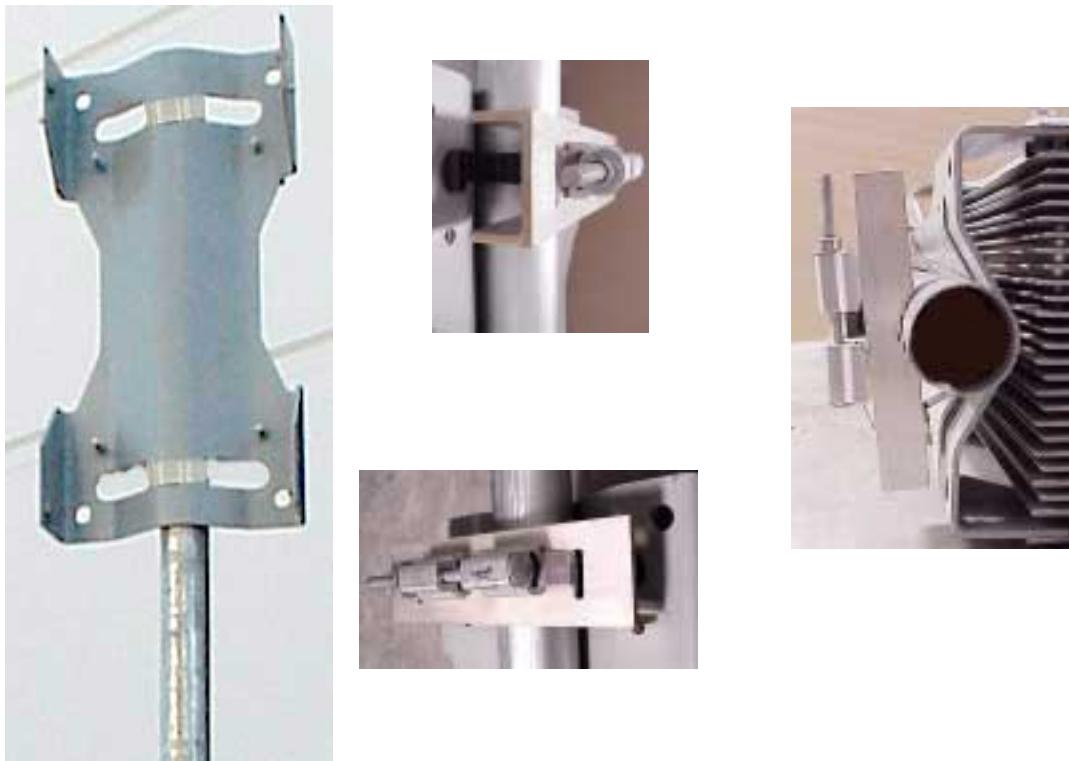
figure 28. small pole bracket - front, back, and top

The mounting plate can also be attached directly to a flat surface such as a wall (Figure 29). Consult local building codes for installation requirements.

figure 29. wall bracket

Hang the unit on the bracket's hanging studs (white arrow in Figure 31) and line up the holes in the side of the unit with the holes in the bracket (black arrows in Figure 31). Secure the unit on

the bracket by inserting an M8 bolt (Item 5, page 15), lock washer, and flat washer (Figure 30) into each of the four the holes and torquing to 40 in-lbs (4.5 N-m).

figure 30. bolts and washers (top) and hanging studs (bottom)

note	The unit weighs 19 kg (42 lbs). Use caution when mounting the unit.

figure 31. hole alignment

figure 32. cSPICE installed on a wall (left) and pole (right)

check alignment

Link antenna alignment adjustment will usually be needed to maximize the link signal strength from the bSPICE (greenfield deployment) or BTS (existing network), or to minimize an interfering signal. The installation must also meet the antenna isolation requirements.

Remove the cover from the peaking port on the bottom of the cSPICE (Figure 33). The peaking port is a BNC connector. Connect a voltmeter to the port (using Item 9, page 15). Set the voltmeter to DC input, range 0 to 5 Volts. Rotate the unit until the highest signal is received. Replace the peaking port cover.

figure 33. cSPICE connectors

You can also check the alignment using a spectrum analyzer or test handset. Detach the link antenna connector from the bottom of the unit and connect it to a spectrum analyzer. You will need an N-type connector (male). Set the spectrum analyzer or handset to the frequency broadcast by the BTS/bSPICE and rotate the unit until the highest signal is received. Reattach the antenna output to the unit using 60 in-lbs (6.8 N-m) of torque.

note   If no signal from the BTS/bSPICE is detected, check that the BTS/bSPICE system is operational. If the BTS/bSPICE system is operational and the cSPICE is still not receiving a signal, you may have to relocate the cSPICE.

Using the SST, run the antenna isolation test described in the *SPICE Software Guide*. If the test fails, reorient the unit until the test passes. If no orientation can be found such that the test passes, you may need to find another site.

note   If the bracket is not tightly attached to the mounting surface, tighten it once the link antenna alignment is verified and the antenna isolation is sufficient. Tighten the banding to 600 in-lbs (67.8 N-m).

ground unit

Connect the ground lug on the cSPICE (Figure 33) to earth ground, using 16-gauge wire, at a minimum (check local and national codes for grounding requirements). It must be connected using 25 in-lbs (2.8 N-m) of force.

connect power

Connect the unit to the power supply as described in the bSPICE installation (see "connect power" on page 23). The power connectors are snap-lock.

CAUTION	The power supply must be connected to the power source in accordance with local codes.
⚠	Connect the power cord to the mains power and check that the LED indicator illuminates (Figure 33).

note	If there is extra cabling between the cSPICE and the power supply, coil the extra wire near the power supply rather than near the cSPICE unit.

notify OMC

Call the OMC operator and ask the operator to dial into the unit. After a successful call, the cSPICE is on-line. If the OMC is not available, call the unit using a laptop computer equipped with a wireless modem as described in the *SPICE Software Guide*.

Make sure that the installation form is completed.

This chapter describes how to maintain SPICE units. You will need to have a copy of the *SPICE Software Guide* in order to perform many of the operations described in this chapter.

CAUTION

⚠️

If the unit or power supply has fallen and/or rattles when moved, do not open or attempt to fix the unit, as damage may have occurred to the antennas and/or connectors. Seal the unit and return it to Littlefeet, with a note describing how the damage was caused.

Figure 34 shows the cSPICE through the service hatch. Figure 35 shows the inside of the bSPICE.
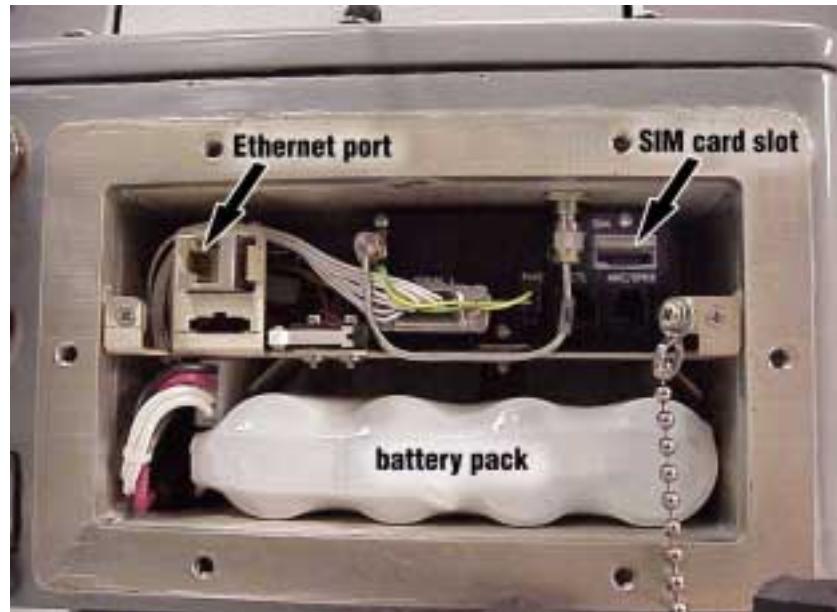
figure 34. cSPICE service hatch

note   You will need a security hex bit (Item 8, page 15) to open the cSPICE service hatch.
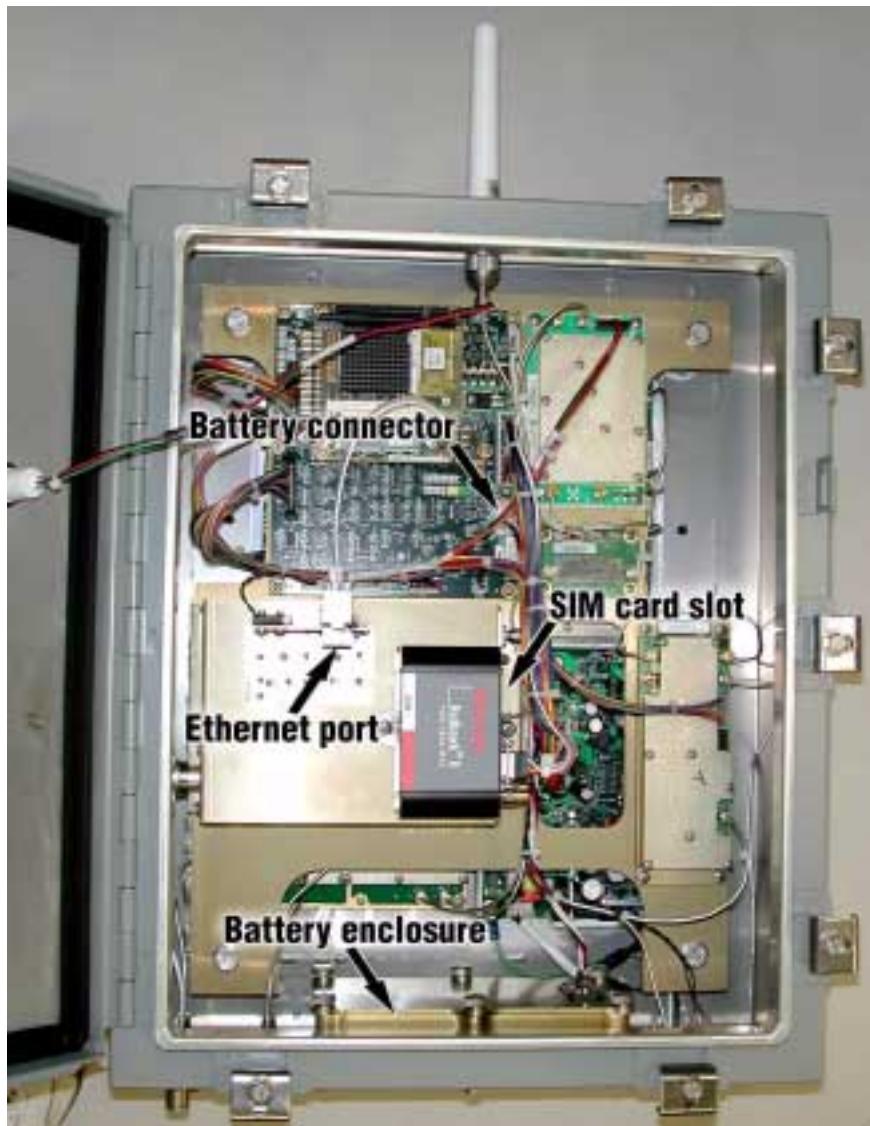
figure 35. bSPICE unit

operation overview

Table 4 gives a brief description of the steps needed to perform the operations detailed in this documentation. For torque specifications, cautions, and additional information, see the reference listed in the **Details** column.

table 4. operations

Operation	Steps	Details
connect laptop to the unit	1. open the unit's service hatch (cSPICE) or door (bSPICE) 2. connect Ethernet cable to laptop and unit's Ethernet port 3. follow SST instructions detailed in *SPICE Software Guide* 4. disconnect Ethernet cable from unit and laptop 5. close the unit's service hatch or door	page 41
replace SIM card	1. open the unit's service hatch (cSPICE) or door (bSPICE) 2. remove the old SIM 3. insert the new SIM 4. close the unit's service hatch or door	page 42
replace cSPICE batteries	1. disconnect power 2. open the unit's service hatch 3. disconnect the fuse from the fuse holder 4. remove old batteries 5. install new batteries 6. reconnect the fuse and fuse holder 7. check that alarm is cleared 8. replace unit service hatch 9. reconnect power 10. properly dispose of old batteries	page 43
replace bSPICE batteries	1. disconnect power 2. open the unit's door 3. remove service door from inside bSPICE 4. disconnect fuse from the fuse holder 5. remove old batteries 6. install new batteries 7. replace service door 8. close unit door 9. reconnect unit to power 10. check that alarm is cleared 11. properly dispose of old batteries	page 44

table 4. operations

Operation	Steps	Details
replace external power supply	1. disconnect power to power supply 2. break circuit (if circuit breaker available) 3. disconnect cables 4. remove power supply from bracket (if pole-mounted) or power supply and bracket from wall (wall-mounted) 5. install new power supply 6. reconnect power to unit 7. close circuit (if circuit was opened)	page 46
replace cSPICE coverage antennas	1. disconnect power to unit 2. remove old antennas 3. install new antennas, sliding cover over connectors 4. reconnect power	page 47
replace cSPICE link antenna	1. disconnect power to unit 2. remove old antenna 3. install new antenna 4. reconnect power	page 48

connect laptop to the unit

The SST is software that is resident on SPICE units. When you call a SPICE unit, the SST answers. Laptops are usually used to access the SST.

---

note   Always wear a grounding (earth) strap when accessing the interior of the unit.

Ethernet connection

To connect to the SST using the Ethernet connection, you will need to access the cSPICE service hatch or the bSPICE door. You will also need a straight-through (standard) Ethernet cable, and an Ethernet card installed on your laptop. Your laptop must be configured as detailed in the *SPICE Software Guide*.

Plug one end of the Ethernet cable into your laptop, and the other into the Ethernet port inside the unit (Figure 34, page 37 shows the cSPICE port; Figure 36 shows the bSPICE port).
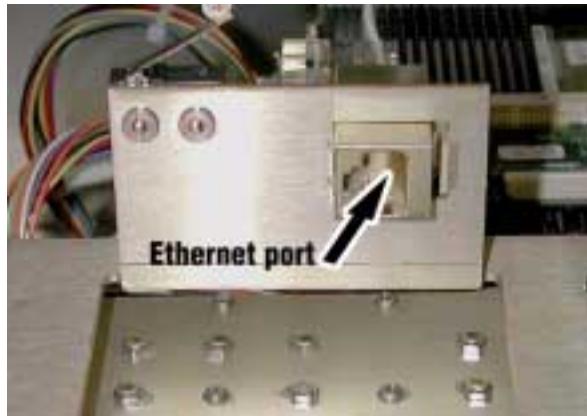
figure 36. bSPICE Ethernet port

Once your laptop is connected to the unit, follow the instructions for using the SST in the *SPICE Software Guide*.

When done, disconnect your Ethernet cable. Close the bSPICE door, torquing the screws to 30 in-lbs (3.4 N-m), or the cSPICE service hatch, torquing the screws to 25 in-lbs (2.8 N-m).

modem dial-in

Accessing the SST using the wireless modem is described in the *SPICE Software Guide*.

---

replace SIM card

The wireless modem that is integrated into SPICE units requires a data-enabled SIM card, which is not provided by Littlefeet. If the SIM needs to be replaced, follow the steps below.

note   Always wear a grounding (earth) strap when accessing the interior of the unit.

figure 37. SIM card slot detail

bSPICE

1. Open the door of the unit.
2. Remove the SIM in the modem (Figure 38) using needle-nose pliers.
3. Replace the old SIM with a new data-enabled SIM, as shown on the drawing on the modem. Lift the SIM card above the bump on the SIM card slot (Figure 37).
4. Check that the modem light is not flashing. If the light on the modem is flashing, try re-inserting the SIM.
5. Close and secure the unit's door, torquing to 30 in-lbs (3.4 N-m).

figure 38. bSPICE SIM card slot

cSPICE

1. Open the service hatch of the unit.
2. Remove the SIM in the modem (Figure 34, page 37) using needle-nose pliers.
3. Replace the old SIM with a new data-enabled SIM, as shown on the drawing on the modem. Lift the SIM card above the bump on the SIM card slot (Figure 37).
4. Check that the modem light is not flashing. If the light on the modem is flashing, try re-inserting the SIM.
5. Close and secure the unit's service hatch, torquing to 25 in-lbs (2.8 N-m).

replace cSPICE batteries

To replace the battery pack on a cSPICE unit, first open the service hatch on the bottom of the unit (Figure 34, page 37).

note	Always wear a grounding (earth) strap when accessing the interior of the unit.

Disconnect the battery charger fuse from the fuse holder. Remove the old batteries and install the new batteries.

figure 39. battery pack with fuse and connector

note	The replacement batteries must be the same type and rating of the original batteries. Contact Littlefeet for proper replacement batteries (Figure 47, page 49).

Reconnect the fuse and fuse holder.

note	The unit will be unavailable for maintenance for two to five minutes while the unit reboots.

Access the SST using your laptop and check that the battery alarm is no longer present. See the *SPICE Software Guide* for details. If the alarm persists, replace the unit.

CAUTION ⚠️	Be sure to properly dispose of the old batteries. Contact the battery manufacturer, Hawker Energy, for instructions (Table 5 on page 51).

Close the service hatch. Torque down the hatch hardware to 25 in-lbs (2.8 N-m) to maintain watertight seal.

replace bSPICE batteries

To replace the battery pack on a bSPICE unit, first disconnect power to the unit. Open the unit's door, then open the service door inside the bSPICE. You may need an offset screwdriver to open the compartment.

note   Always wear a grounding (earth) strap when accessing the interior of the unit.

figure 40. battery enclosure

Disconnect the fuse from the fuse holder. Remove the old batteries and install the new batteries.
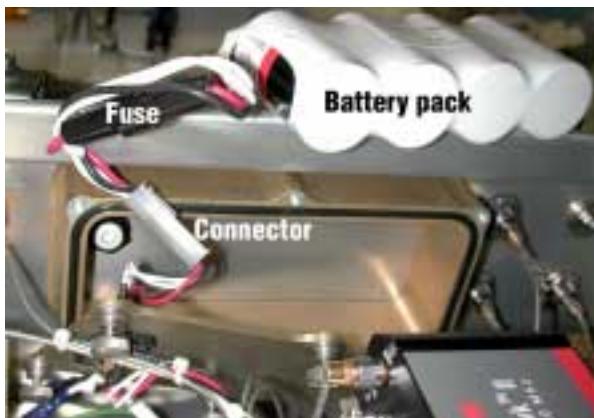
figure 41. internal battery pack

note   The replacement batteries must be the same type and rating of the original batteries. Consult the factory for proper replacement batteries (Figure 48, page 50).

Reconnect the fuse and fuse holder. Put the batteries into the enclosure, taking care to not damage the connector. Make sure that the gasket around the battery enclosure is in place.

figure 42. replacing battery pack

| **note** | The unit will be unavailable for maintenance for two to five minutes while the unit reboots. |

| **CAUTION** ⚠ | Be sure to properly dispose of the old batteries. Follow the manufacturer's instructions for disposal. |

figure 43. replaced battery

Replace the service door (Figure 40), torque down the screws to 25 in-lbs (2.8 N-m), close the unit door, torque down the screws to 30 in-lbs (3.4 N-m), and reconnect power to the bSPICE.

Access the SST using your laptop and check that the battery alarm is no longer present. See the *SPICE Software Guide* for details. If the alarm persists, replace the unit.

replace external power supply

To replace the external power supply to a SPICE unit, first disconnect the power to the unit. If an external disconnect device is used, break the circuit to the unit.

Disconnect the power cables going into the power supply from the mains power and then from the unit.

figure 44. disconnecting cables

If the power supply is pole-mounted, remove the power supply from the mounting bracket and mount the new power supply on the bracket. Torque the screws to 35 in-lbs (3.9 N-m).

If the power supply is wall-mounted, remove the power supply and mounting bracket from the wall, and mount the new power supply and bracket in its place. Make sure that the mounting is secure.

Reconnect the power to the unit.

note The unit will be unavailable for maintenance for two to five minutes while the unit reboots.

replace cSPICE coverage antennas

To replace the cSPICE coverage antennas, first disconnect the power to the unit.

Remove the old antennas and install the new antennas, as described on page 27. Torque the connectors to 60 in-lbs (6.8 N-m). Make sure to slide the connector covers over the connectors to protect the connectors.

figure 45. coverage antenna replacement

Reconnect the power to the unit.

note   The unit will be unavailable for maintenance for two to five minutes while the unit reboots.

replace cSPICE link antenna

To replace the cSPICE link antenna, first disconnect the power to the unit. Remove the old antenna by removing the four screws that hold the antenna onto the unit. Install the new antenna and replace the screws, torquing to 18 in-lbs (2.0 N-m).

figure 46. link antenna screws

Reconnect the power to the unit.

note   The unit will be unavailable for maintenance for two to five minutes while the unit reboots.

field-replaceable units

All field-replaceable units (FRUs) are listed in this section. Most parts are available from Littlefeet (see Table 5 on page 51 for contact information).

cSPICE FRUs

figure 47. cSPICE FRUs
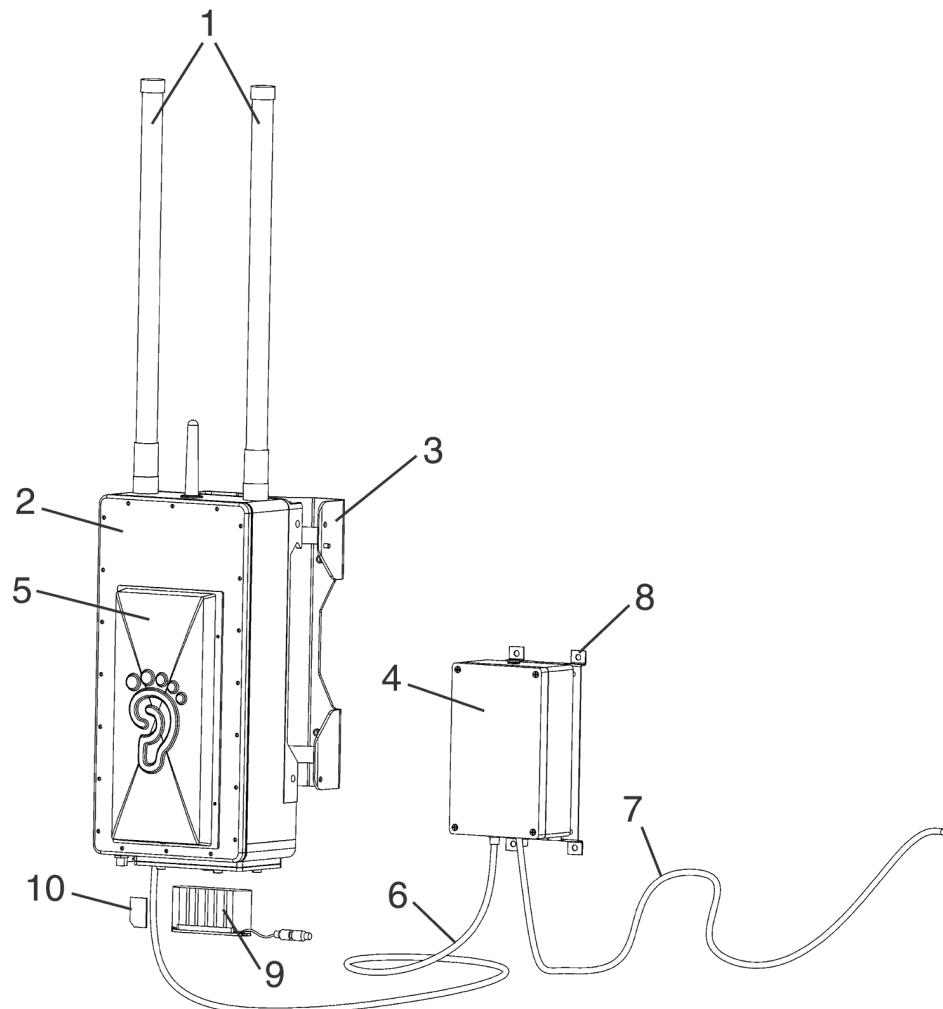
1. coverage antenna
2. cSPICE main module
3. cSPICE universal mounting bracket
4. external power supply main module
5. link antenna
6. DC power cable, cSPICE to power supply, 52 in (132 cm)
7. AC power cable, power supply to mains, 52 in (132 cm)
8. power supply mounting bracket
9. rechargeable battery pack assembly including fuse

bSPICE FRUs
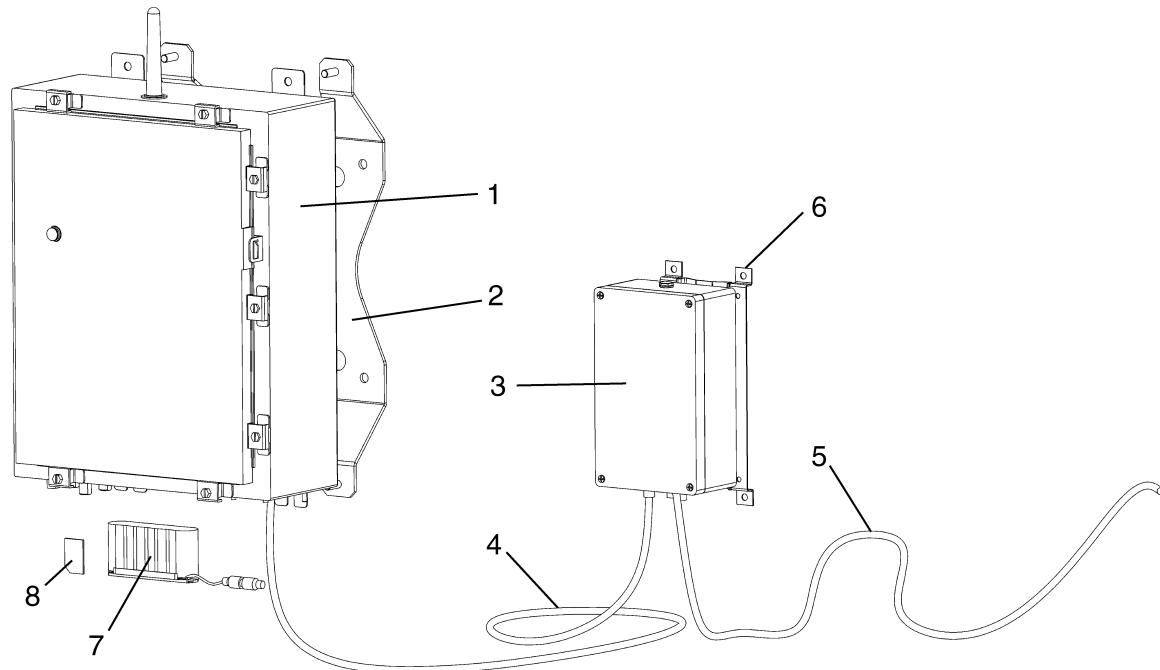
1. bSPICE main module
2. bSPICE universal mounting bracket
3. external power supply main module
4. DC power cable, bSPICE to power supply, 52 in (132 cm)
5. AC power cable, power supply to mains, 52 in (132 cm)

6. power supply mounting bracket
7. rechargeable battery pack assembly including fuse
8. SIM card (not supplied by Littlefeet)
9. Optional DC cable for direct connection from DC power source to bSPICE (not shown)

figure 48. bSPICE FRUs

contact information

When contacting Littlefeet customer support, please have the following information:

- serial number and part number (if available)
- urgency of the issue
- your contact information

Table 5 contains contact information for companies that supply equipment that relates to SPICE. Use the internet address to obtain contact information for your specific location, as many of these companies have international offices.

table 5. contact information

Company	Products	Address	Telephone number
Littlefeet	SPICE units, ancillary equipment, and documentation	13000 Gregg Street Poway, CA 92064 858.375.6400 www.littlefeet-inc.com SPICESupport@littlefeet-inc.com	Customer Support: U.S.: 888.595.9444 Int'l: +1 858.375.6443
Aluma-Form®	banding for bracket installation on poles; part number BAB 3836 for 36-inch (91.4 cm), BAB-3872 for 72-inch (182.8 cm).	ALUMA-FORM® 3625 Old Getwell Road P.O. Box 18555 Memphis, TN 38181-0555 www.dixieanchor.com info@alumaform.com	Phone: +1 901.362.0100 Fax: +1 901.794.9515 Dixie Fax: 901.375.3399
Hawker Energy	cSPICE and bSPICE internal battery pack (Cyclon D-cell battery pack)	617 N. Ridgeview Dr. Warrensburg, Missouri 64093-9301 USA www.hawker.invensys.com	U.S.: 800.964.2837 Int'l: +1 660.429.2165
Tamper Pruf	Tamper-proof security hex bit 5/32″, part number 61170	8808 Sommerset Blvd. Paramount CA 90723 www.tamper-pruf-screws.com Info@Tamper-Pruf-Screws.com	Phone: +1 562.531.9340 Fax: +1 562.531.2464
Pomona® Electronics	Connector to test link level, BNC (male) with molded strain relief to Minigrabber® test clips, Model 5187	1500 E. Ninth Street Pomona, CA 91766 www.pomonaelectronics.com	Phone: +1 909.469.2900
McMaster-Carr	Connector to test link level, BNC adapter (male) to banana jack, 6704K12	Various offices throughout the U.S. www.mcmaster.com	Atlanta: +1 404.346.7000 Chicago: +1 630.833.0300 Cleveland: +1 330.995.5500 Los Angeles: +1 562.692.591 New York: +1 732.329.3200

AC	∿	Alternating Current
AGC		Automatic Gain Control. This cSPICE-only feature adjusts the uplink gain to maintain the power-versus-time profile over the AGC range.
Alarm		Notification that a fault has occurred.
ALC		Automatic Level Control
BCCH		Broadcast Control CHannel
BSIC		Base Station Identity Code
bSPICE		SPICE variant for direct coupling to the BTS. Broadcasts the signal from the BTS on a set of link frequencies.
BSS		Base Station System
BTS		Base Transceiver Station
Cell Area		An area that contains a single bSPICE and its corresponding cSPICEs, defined by common link frequencies.
Channel		The RF carrier assigned to a specific frequency (not a traffic channel timeslot); one of the four RF paths within a SPICE unit.
Coverage		The subscriber's coverage area provided by cSPICE.
Coverage Frequency		The frequency used by the BTS to communicate with the mobile subscribers.
cSPICE		SPICE variant for broadcasting to the coverage area. Receives signals from a bSPICE on a set of link frequencies and broadcasts on a set of coverage frequencies.
dBi		Gain (of an antenna) relative to an isotropic radiator.
DC	⎓	Direct Current
DL		Downlink; radio path from BTS to subscriber.

SIX: glossary

ETSI	European Telecommunications Standards Institute
GPS	Global Positioning System
GSM	Global System for Mobile Communications
HBTS	Host BTS; the BTS used as the RF input for a bSPICE.
IP Address	Internet Protocol Address; a unique identifier for a specific computer on a network.
Link	The radio path between the bSPICE and cSPICE.
Link Frequency	The frequency used for communication between bSPICE and cSPICE units.
LV	Low Voltage
MS	Mobile Station
MTBF	Mean Time Between Failure
OMC	Operation and Maintenance Center
OMC-SPICE	SPICE Network Management System.
PLL	Phase Lock Loop
RSSI	Received Signal Strength Indicator
RF	Radio Frequency
RTFM	Read The Fine Manual
RX	Receiver (radio)
RxLev	Received Signal Level
RxQual	Received Signal Quality
SIM	Subscriber Identity Module
SPICE	Small Profile Intelligent Coverage Element; also refers to a network of SPICE units.
SST	SPICE Support Tool; the tool used for field maintenance of SPICE units.
TRX	Transceiver
TX	Transmitter (radio)
UL	Uplink; radio path from subscriber to BTS.
UPS	Uninterruptible Power Supply

Other symbols found on Littlefeet products:

Protective conductor terminal

Frame or chassis terminal

Caution (refer to accompanying documents)

This appendix summarizes the steps that must be taken in order to install a SPICE unit, from taking it out of the box to integrating it into the network. It is assumed that:

❑ Sites and settings (channel numbers, power levels) for units have already been chosen and entered in the Installation Form.

❑ The OMC is already set up (see the Quick Start Guide that accompanies the OMC).

❑ You have obtained and configured a laptop to be used as an SST (see the chapter on SST basics and setup in the *SPICE Software Guide*).

unpacking unit

The first step is to unpack and check the unit. Follow the steps in the Quick Start Guide that accompanies the unit.

Tools and equipment needed:

❑ SPICE Quick Start Guide for unit

❑ Power source

❑ RF coverage (to check the unit's modem)

❑ Laptop to access the SST

❑ Data-enabled SIM card for built-in modem

installing unit

After transporting the unit to the location where it is to be installed, you will install the unit. Follow the steps in the chapter four.

Tools and equipment needed:

❑ Equipment listed in chapter four (unit, mounting bracket, etc.)

❑ Suitable location for unit

❑ Appropriate power source

programming/commissioning unit

After installing the unit, you will need to program it so that it knows which frequencies to use, etc. You can also commission the unit prior to installation. Follow the steps in the chapter on using the SST in the *SPICE Software Guide.*

Tools and equipment needed:

❑ Laptop to access the SST
❑ Information from Installation Form

commissioning network

Once the unit is installed and operational, integrate it into the network using the OMC. Follow the steps in the chapter on using the OMC in the *SPICE Software Guide*.

Tools and equipment needed:

❑ OMC
❑ Information from Installation Form
❑ *SPICE Software Guide*

optimizing the network

Once the network is installed, drive test the SPICE network as you would a conventional network, but you can fine-tune each individual unit to optimize the network.

❑ Tools and equipment needed:
❑ Drive-test equipment
❑ Data logging and analysis equipment

maintaining the network

Maintain the network by monitoring alarms and optimizing as necessary.

Tools and equipment needed:

❑ OMC
❑ Laptop to access the SST
❑ *SPICE Software Guide* and *SPICE Hardware Guide*

cSPICE flowchart checklist

Use this checklist to indicate that the cSPICE has been installed according to the instructions contained in this documentation. Check off the boxes in the flowchart as you complete the steps.

```
┌─────────────┐      ┌─────────────┐
│Install      │ ───▶ │Hang unit on │
│antennas     │      │bracket      │
└─────────────┘      └─────────────┘
      │                    │
      ▼                    ▼
┌─────────────┐      ┌─────────────┐
│Install power│      │Check link   │
│supply       │      │antenna      │
│             │      │alignment    │
└─────────────┘      └─────────────┘
      │                    │
      ▼                    ▼
┌─────────────┐      ┌─────────────┐
│Determine    │      │Ground unit  │
│mounting     │      │             │
│orientation  │      │             │
└─────────────┘      └─────────────┘
      │                    │
      ▼                    ▼
┌─────────────┐      ┌─────────────┐
│Install unit │      │Connect unit │
│mounting     │      │to power     │
│bracket      │      │             │
└─────────────┘      └─────────────┘

        ◇ OMC Operator available?
   Yes ◀─────────────────▶ No

┌─────────────┐                 ┌──────────────────┐
│Notify OMC   │                 │Verify ability to │
│operator that│                 │establish wireless│
│unit is      │                 │connection to unit│
│online       │                 │(SPICE Software   │
│             │                 │Guide)            │
└─────────────┘                 └──────────────────┘
        │                              │
        ▼                              ▼
        ┌──────────────────┐
        │Check that        │
        │installation form │
        │has been completed│
        └──────────────────┘
```
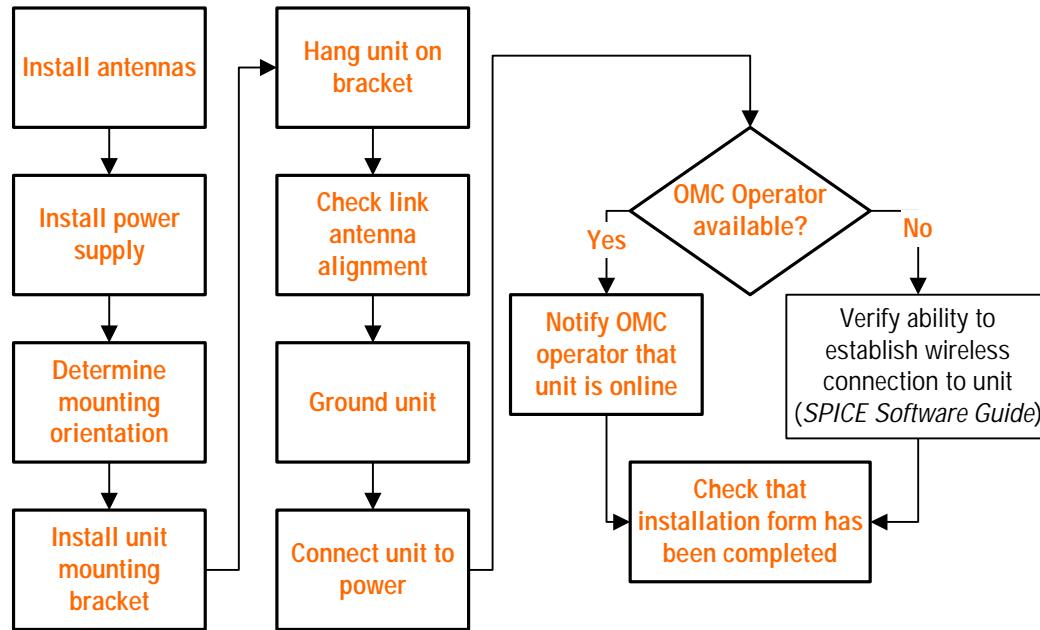
figure 49. cSPICE flowchart checklist

bSPICE flowchart checklist

Use this checklist to indicate that the bSPICE has been installed according to the instructions contained in this documentation. Check off the boxes in the flowchart as you complete the steps.

```
┌─────────────┐              ┌─────────────┐
│ Install power│              │Connect unit to│
│supply bracket│              │    power     │
└──────┬──────┘              └──────┬──────┘
       │                            │
       ▼                            ▼
┌─────────────┐          ◇──────────────────◇
│ Mount power │    Yes───◇  OMC available?   ◇───No
│   supply    │          ◇──────────────────◇
└──────┬──────┘           │                    │
       │                  ▼                    ▼
       ▼            ┌─────────────┐   ┌──────────────────┐
┌─────────────┐     │  Notify OMC │   │ Verify ability to │
│Install bSPICE│    │ operator that│   │ establish wireless│
│   bracket    │    │unit is online│   │ connection to unit│
└──────┬──────┘     └──────┬──────┘   │(SPICE Software Guide)│
       │                   │          └─────────┬────────┘
       ▼                   │                     │
┌─────────────┐            ▼          ┌──────────────────┐
│  Mount unit  │    ┌──────────────┐  │   Check that      │
│              │    │installation form has been completed│
└──────┬──────┘     └──────┬──────┘   
       │                   ▼
       ▼            ┌──────────────┐
┌─────────────┐     │ Weatherproof │
│ Run cables to│     │connections (if│
│  connection  │     │  necessary)  │
│    points    │     └──────────────┘
└─────────────┘
```
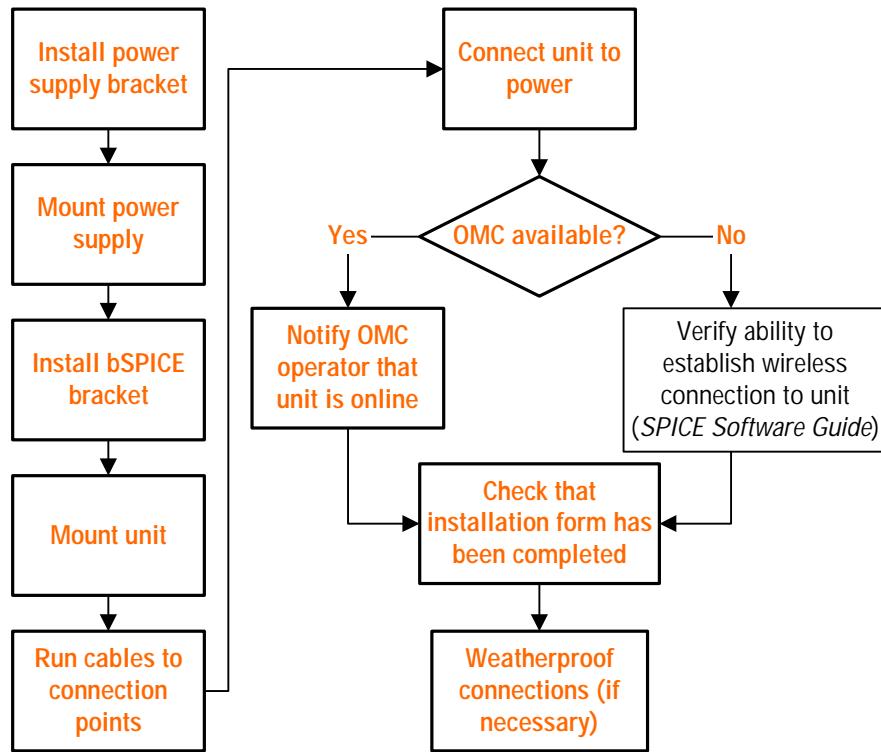
figure 50. bSPICE flowchart checklist

wall-mounting measurements

To wall-mount units, use the following diagrams to prepare the wall. The mounting holes in the power supply bracket are .350 inch (0.89 cm) in diameter, and M6 or 1/4-28 bolts with both flat and lock washers are recommended.


4.33
(11 cm)

11.40
(28.96 cm)
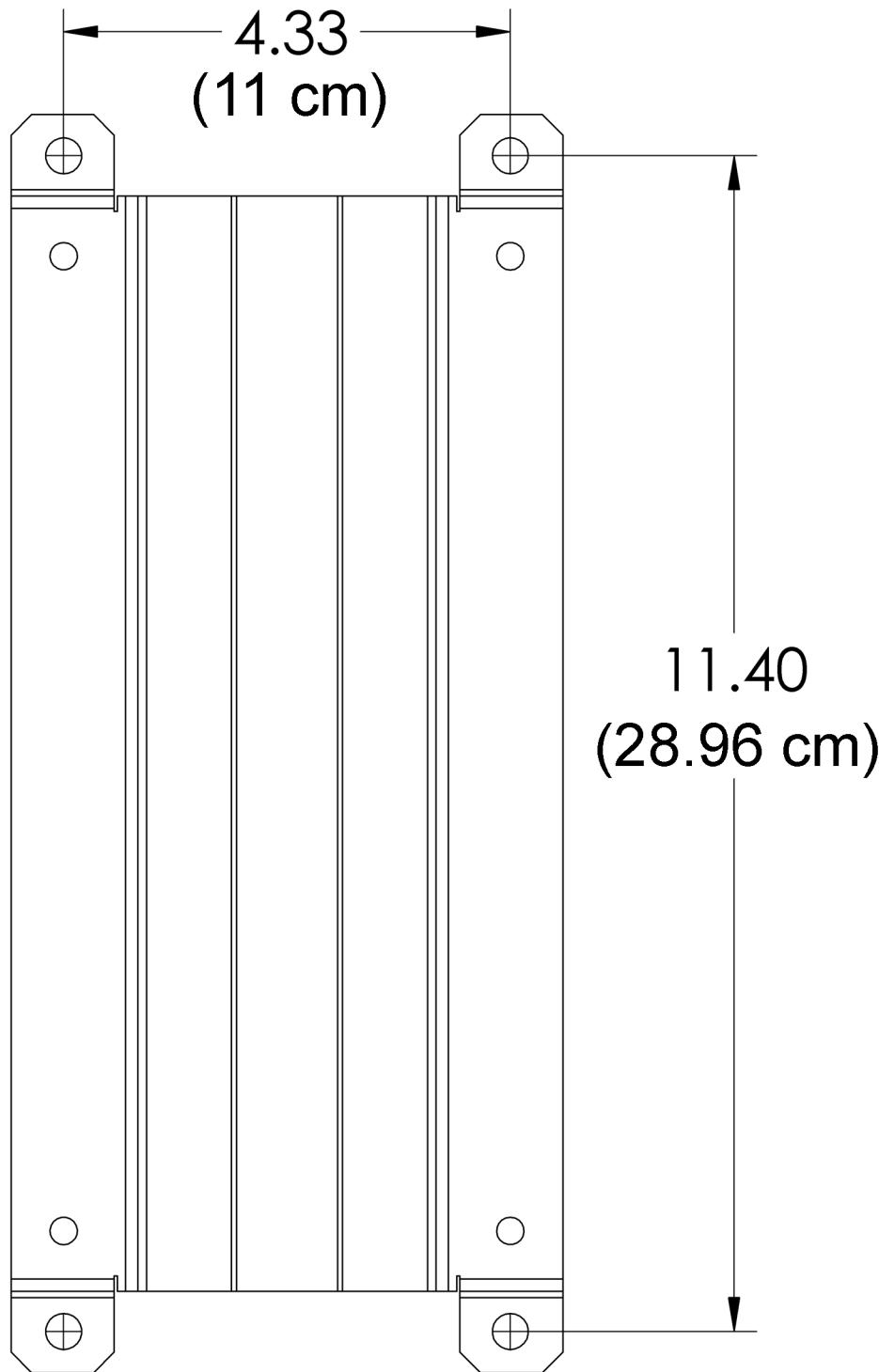
figure 51. power supply

The mounting holes in the bSPICE bracket are .625 inch (1.6 cm) in diameter, and M12 or 1/2-20 bolts with both flat and lock washers are recommended.
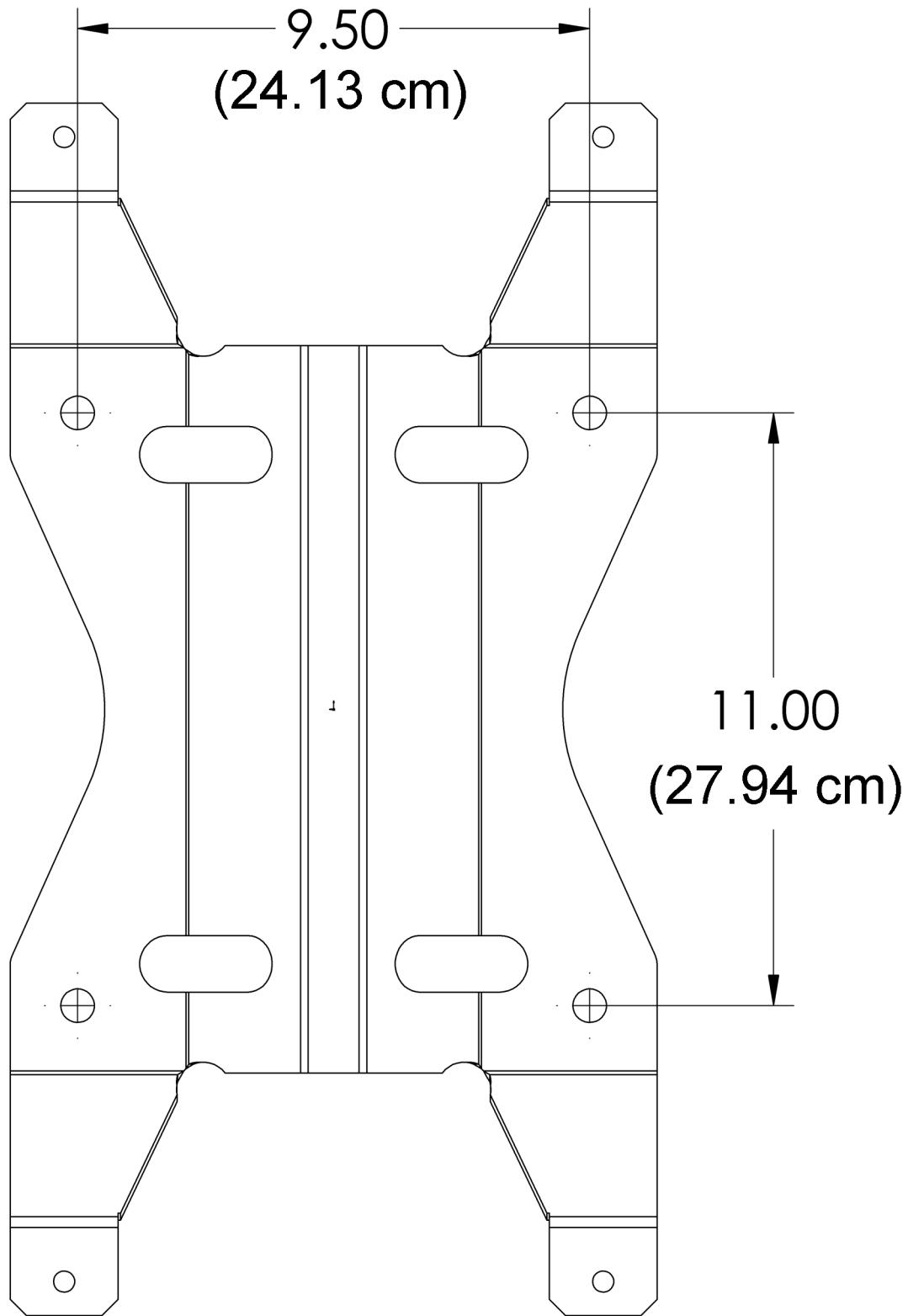

figure 52. bSPICE

The mounting holes in the cSPICE bracket are .625 inch (1.6 cm) in diameter, and M12 or 1/2-20 bolts with both flat and lock washers are recommended.
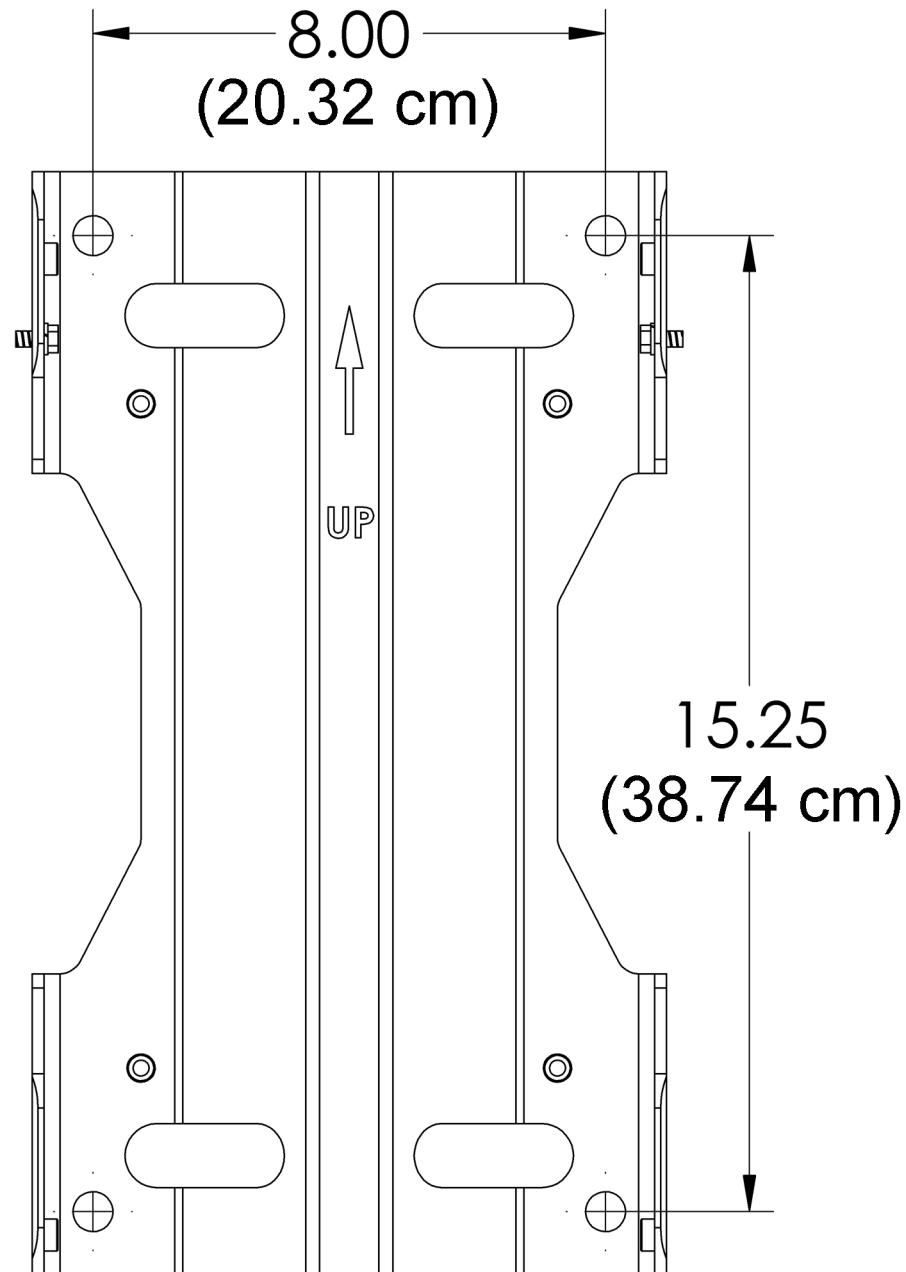

figure 53. cSPICE

banding details

This section contains details about using the banding provided with SPICE units and with the power supply.

The power supply includes one band. Two may be used, but the second band is not provided. SPICE units require two bands.

The band comes attached to the mounting hardware (Figure 54).

figure 54. band and mounting hardware

One end of the band is secured to the mounting (Figure 55).

figure 55. secured end - detail

Measure the distance around pole at the height of the installation. Cut the banding to the length of the pole plus 6 inches (15 cm) for the "tail" of the banding. If the banding is too short, contact Littlefeet for a longer strap.

Slide the band through the slots on the bracket, as detailed on page 19 for the power supply, page 21 for the bSPICE, or page 30 for the cSPICE (Figure 56). For small poles, slide the banding through one slot on the small bracket, then through both slots of the unit or power

supply bracket, then hold the banding and brackets around the pole and slide the banding through the second hole on the small bracket.

figure 56. banding through cSPICE bracket

Trim the banding if necessary (Figure 57). For installation on large poles, it is not necessary to trim the banding.

figure 57. trimmed banding for small pole

Slide the retainer over the end of the banding (Figure 58). Make sure that the chamfered end of the retainer is facing the loose end of the banding.

figure 58. banding through retainer

Bend the loose end of the banding around the retainer. Make the bend tight using a hammer (Figure 58).

figure 59. tighten the bend

Bend the banding so that the carriage bolt can connect the two retainers. Fasten the banding around the pole (Figure 60) using the nut provided. When tightened, there should still be a 1 inch (2.5 cm) adjustment gap between the retainers. Tighten the straps as directed.

figure 60. installed band

This appendix contains hardware specifications for bSPICE and cSPICE units.

note   The specifications listed in this appendix were current at the time of this document's publication. Contact Littlefeet for current specifications.

SPICE units meet the following international standards:

- CE

    Meets Radio and Telecommunication Terminal Equipment (RTTE) Directive
- Complies with FCC (Federal Communications Commission)

    Part 15

    Part 24
- Nationally Recognized Testing Laboratories (NRTL) to UL (Underwriters Laboratories) 1950

The power supply used by SPICE units is

- UL recognized or equivalent
- Complies with FCC Part 15
- CE

    Meets LV Directive

    Meets EMC Directive

specifications

SPICE units conform to ETSI EN 300 609-4, including the following:

- GSM conformance
- Spurious emissions
- Out-of-band gain
- Intermodulation attenuation
- Frequency error
- Phase error

table 6. SPICE channel specifications

Model	Link Frequency (F2)	Covg. Frequency (F1)	Channel Bandwidth	# GSM Channels
GSM 1800 release 1.5	1710 - 1785 MHz uplink 1805 - 1880 MHz downlink	1710 - 1785 MHz uplink 1805 - 1880 MHz downlink	200 kHz	2
GSM 1900 release 1.5	1850 - 1910 MHz uplink 1930 - 1990 MHz downlink	1850 - 1910 MHz uplink 1930 - 1990 MHz downlink	200 kHz	2

cSPICE specifications

table 7. cSPICE RF specifications

Parameter	Value	
Minimum frequency separation, link-to-link or coverage-to-coverage	600 KHz	
Minimum frequency separation between link and coverage	800 KHz	
Signal propagation delay	< 15 µs	
	Downlink	**Uplink**
Antenna combining options	2 channels on 2 antennas (2:2) 2 channels on 1 antenna (2:1)	2 channels on 1 antenna (2:1)
Output signal power range (measured at antenna port)	2:2 gives +10 to +29 dBm 2:1 gives +10 to +26 dBm	+26 dBm max.
Input signal power range	-91 to -16 dBm	-101 to -34 dBm

table 8. cSPICE antenna specifications

Parameter	Integrated antenna	External/remote antenna
Link antenna options	• Directional • Mounted on front panel of unit • 14 dBi gain • Horizontal beamwidth less than 40° • Vertical beamwidth greater than 15° • Vertical polarization	• Optional (not provided) • Connected via coaxial cable
Coverage antenna options	• Omnidirectional • Mounted on top of unit • 7 dBi gain • Vertical polarization	• Optional (not provided) • Connected via coaxial cable
Wireless modem antenna options	• Omnidirectional • Mounted on top of unit • 0 dBi gain • Vertical polarization	• Not applicable
Antenna isolation	link antenna to coverage antenna: > 60 dB coverage antenna to coverage antenna: > 20 dB	

table 9. cSPICE mechanical/electrical specifications

Parameter	Value
Power consumption	Less than 130 W
Input voltage	20 VDC to 56 VDC
Internal battery backup	Typical 15 minute alarm support
External power supply and battery backup options	All options include AC/DC converter, mains voltage input 100 VAC-240 VAC (50 or 60 Hz), 28 to 48 VDC output. Full battery backup options: • 0-hour (AC/DC converter only) • 2-hour • 4-hour
Dimensions (excluding antennas)	555H x 267W x 157D (mm) [21.9H x 10.5W x 6.2D (in)]
Weight	19 kg (42 lbs)
Temperature range: operating	-33°C to +55°C (-22°F to +131°F)
Temperature range: storage	-40°C to +70°C (-40°F to +158°F); 95% humidity, non-condensing
Shock and vibration	Meets ETS 300-019-1-4
RF antenna ports (all)	Return loss > 10dB, 50 Ω
Antenna connectors	N-type
Mounting options	Pole or wall/flat surface
Sealing class	IP66
Operations & maintenance access options	Local: Ethernet port Remote: GSM Wireless modem (circuit switched)
Bi-color LED indicator	Green: system ready Red: fault

bSPICE specifications

table 10. bSPICE RF specifications

Parameter	Value	
Minimum frequency separation, link-to-link or coverage-to-coverage	600 KHz	
Minimum frequency separation between link and coverage	800 KHz	
Signal propagation delay	< 5 µs	
	Downlink	**Uplink**
Output signal power range (measured at antenna port)	+23 dBm	-91 to -33 dBm
Input signal power range (per channel)	+0 to +44 dBm	-101 to -43 dBm

table 11. bSPICE antenna specifications

Parameter	Antenna
Link antenna	• Not provided • Connected via coaxial cable • Vertical polarization
Wireless modem antenna	• Coupled directly to BTS • External modem antenna

table 12. bSPICE mechanical/electrical specifications

Parameter	Value
Power consumption	Less than 130W
Input voltage	20 VDC - 56 VDC, non-polarized, floating.
Internal battery backup	15 minute alarm support
External power supply and battery backup options	All options include AC/DC converter, mains voltage input 100 VAC-240 VAC (50 or 60 Hz), 28 to 48 VDC output. Full battery backup options: • 0-hour (AC/DC converter only) • 2-hour • 4-hour
Dimensions (excluding antennas)	508H x 406W x 216D (mm) [20H x 16W x 8.5D (in)]
Weight	18 kg (40 lbs)
Temperature range: operating	-33°C to +55°C (-22°F to +131°F)
Temperature range: storage	-40°C to +70°C (-40°F to +158°F); 95% humidity, non-condensing
Shock and vibration	Meets ETS 300-019-1-4
RF antenna ports (all)	Return loss > 10dB, 50 Ω
BTS interface ports	• Two duplexed Tx/Rx ports, N-type • Rx only port, N-type
Link antenna port	2:1 combined (2 carriers/1 antenna), N-type
Downlink composite output monitor	SMA
Uplink composite input monitor	SMA

table 12. bSPICE mechanical/electrical specifications

Parameter	Value
Mounting options	Pole or wall/flat surface
Sealing class	IP66
Operations & maintenance access options	Local: Ethernet Port Remote: GSM Wireless modem (circuit switched)
Bi-color LED indicator	Green: system ready Red: fault
External alarm contact	Form C relay

SPICE configurations

cSPICE

models

GL1802C   GSM 1800 MHz two-channel cSPICE unit (rel. 1.5), universal mounting bracket, two integrated omnidirectional coverage antennas, integrated directional link antenna.

GL1902C   GSM 1900 MHz two-channel cSPICE unit (rel. 1.5), universal mounting bracket, two integrated omnidirectional coverage antennas, integrated directional link antenna.

external power supply options

PS0001E   External AC/DC power supply with universal mounting bracket; no RF battery backup.

PS0201E   External AC/DC power supply with universal mounting bracket and 2-hour RF battery backup.

PS0401E   External AC/DC power supply with universal mounting bracket and 4-hour RF battery backup.

bSPICE

models

GL1802B   GSM 1800 MHz two-channel bSPICE unit (rel. 1.5), universal mounting bracket.

GL1902B   GSM 1900 MHz two-channel bSPICE unit (rel. 1.5), universal mounting bracket.

external power supply options

PS0001E   External AC/DC power supply with universal mounting bracket; no RF battery backup.

PS0201E   External AC/DC power supply with universal mounting bracket and 2-hour RF battery backup.

PS0401E   External AC/DC power supply with universal mounting bracket and 4-hour RF battery backup.