

SOUTHERN AVIONICS COMPANY

MANUFACTURERS OF LOW FREQUENCY RADIOBEACONS AND ASSOCIATED PRODUCTS



SE Series Transmitter

SE250 Rack Mount

Digital Non-Directional Beacon

Installation and Setup Manual

Manual #SD433005

Revision H

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STANDARD LIMITED WARRANTY

Southern Avionics Company (hereinafter called SAC) warrants to the original Purchaser for a period of Twenty-Four (24) months from the date of shipment to the original Purchaser, that the goods sold under this warranty were at the time of the delivery, free from defects resulting from faulty material or workmanship.

This limited warranty is in lieu of all other representations and express warranties and is made for the benefit of the original purchaser only and is not made for the benefit of any party other than original Purchaser. All implied warranties existing under the law are hereby expressly negated; particularly, SAC hereby negates and disclaims the implied warranty of merchantability and implied warranty of fitness for a particular purpose.

This warranty applies only if the goods are submitted to normal use and service and does not apply if the goods are misused or mismatched with other goods such as antennas, couplers, or any other third party goods, which have not been approved by SAC in writing, for use with SAC equipment.

If Purchaser believes that these goods do not comply with the express warranty stated above, or any existing and applicable implied warranty which under the law cannot be disclaimed, or negated, as provided above, then Purchaser may request that SAC inspect such goods using the following contact information: telephone: +409-842-1717; fax: +409-842-2987; email: sales@southernavionics.com; or, by shipping the goods prepaid to SAC at 5055 Belmont Street, Beaumont, Texas, 77707 U.S.A. to the attention of Warranty Repair, within Sixty (60) days after Purchaser knows, or should have known, that the goods allegedly do not conform with the warranty.

Shipments must include written documentation specifying (a) Purchaser's name, address, telephone number and email address, (b) date of purchase, (c) Serial Number(s) of the equipment (d) location from which the goods were purchased, (e) location of the installation, and (f) description of the alleged nonconformity with the warranty.

If the goods are covered by this warranty and SAC's determines that they do not conform to the terms herein, SAC will repair or replace the goods and return them F.O.B. point of manufacture. In no event will SAC be obligated or required to remove the non-conforming goods from their place of installation and/or to install any replacement goods. All replacement goods are warranted to the extent provided herein for the remaining term of this warranty.

In the event purchaser chooses to commence an action for breach of warranty or breach of contract arising out of the sale of the goods pursuant to this invoice, the purchaser must commence such action within One (1) year after the course of action accrues. The remedy provided herein shall be the sole and exclusive remedy for breach of this warranty, for any breach of any implied warranty existing and applicable under the laws of the United States of America (to the extent that any such warranty has not been successfully negated and disclaimed hereinabove) and for any act of negligence or other tortuous act committed by SAC, and in no event shall SAC be liable to the Purchaser or any third party for any incidental, consequential or special damages resulting from any defect in the goods or any failure of the goods to conform with this warranty or any implied warranty existing and applicable under U.S. law (to the extent that any such implied warranty has not been successfully negated and disclaimed hereinabove.)

SD9SD001 Rev E



REPAIR POLICY

Southern Avionics Company (SAC) offers fault analysis, repair and refurbishment of SAC equipment performed by our factory-trained staff.

Items submitted for repair must be accompanied by an Return Merchandise Authorization (RMA) number which will enable us to address your request in the most efficient manner.

Contact our Technical Department to receive RMA before returning items to SAC.

Phone: +409-842-1717 ext. 107
Fax: +409-842-2987
Email: techdept@southernavionics.com

In order for us to process your repair order, the equipment sent for repair must include the following information:

- (a) RMA
- (b) Purchaser's name, address, telephone number and email address,
- (c) Serial Number of the equipment
- (d) location of the installation, and
- (e) detailed description of problem / reason for repair

Standard repair labor rate: \$150 USD per hour.

Minimum repair cost: \$150 USD.

Standard repair turnaround time: 14 days, excluding shipping time.

Turnaround time of less than 14 days will be subject to an expediting fee of \$50 USD per hour in addition to the standard repair labor rate.

SAC will notify the customer if we determine that the returned item cannot be economically repaired, or if it is more cost-effective to purchase a new item.

Items that we conclude cannot be repaired to meet our established standard of performance will be rejected and returned to the customer, upon request. Pads lifted from circuit boards or burned circuit boards are examples of non-repairable items.

Customer is responsible for all freight costs. SAC assumes no responsibility for any loss or damage of items sent for repair.

Repairs are guaranteed for 90 days after shipment. Warranty applies only to the actual repairs that were made and does not cover any subsequent equipment failures not associated with the previous repair.

SD9SD003 Rev D

SOUTHERN AVIONICS COMPANY






MANUFACTURERS OF LOW FREQUENCY RADIOBEACONS AND ASSOCIATED PRODUCTS



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Council Directive 1999/5/EC R&TTE Label

 <p>SOUTHERN AVIONICS COMPANY BEAUMONT, TEXAS, U.S.A. US: 1-800-648-6158 • INTL: +409-842-1717 www.southernavionics.com</p>		
RADIOBEACON TRANSMITTER		
SERIAL	_____	
	47-63 Hz 	
MODEL	100V-264V	38V-52V 
SE125 DUAL	6A	14.8A
SE250 DUAL	12.9A	14.8A
  1000		

This system is intended for use in professional environment by personnel fully conversant with its use and application. It should not be operated in close proximity to domestic electrical equipment.

This system is to be operated and maintained by skilled staff in strict accordance with the manufacturer's instructions. The use of service spares not recommended by the manufacturer may compromise the electromagnetic compatibility of the equipment.

It is the responsibility of the user to ensure that any external cabling, test leads, and/or other user supplied fixtures are designed, manufactured, and maintained in accordance with engineering practices appropriate for their intended use.



CE DECLARATION OF CONFORMITY

In accordance with the Council of the European Communities, Southern Avionics hereby declares Conformance of the product described below with the following Directives.

Reference: Notified Body Certificate 1000-1-1743P

Southern Avionics Company has demonstrated compliance with the Essential Requirements of Council Directive **1999/5/EC** on Radio Equipment and Telecommunications Terminal Equipment with specific requirements in the following areas:

2006/95/EC European Community Low voltage directive

EN 60950-1:2006

2004/108/EC EMC directive

EN 60945:2002, CISPR 16-1-1999, IEC 61000-4-2:1995, IEC 61000-4-3: 1995, IEC 61000-4-4: 1995, IEC 61000-4-5: 1995, IEC 61000-4-6: 1995, IEC 61000-4-11: 1994

Equipment Description:

This Declaration covers all Rack Mount versions of the SE125 and SE250 Series Non Directional Beacon Transmitters in the following frequency bands: Standard 190 kHz – 650 kHz, Medium 500 kHz – 1250 kHz and High 1500 kHz – 1800 kHz.

European Agent: Muirhead Avionics
 Mallory House
 Navigator Park
 Southall Lane, Southall
 Middlesex UB2 5NH - UK
 Tel: +44.2085.713422

Company Signatory:
Tim Hamilton P.E.

A handwritten signature in black ink that reads 'Tim Hamilton'. The signature is written in a cursive style and is positioned above a horizontal line.

Date: December 22, 2012

Director of Engineering
Southern Avionics Company
P.O. Box 5345
Beaumont, Texas, USA 77726-5345
409-842-1717(tel) 409-842-2987(fax)



Interoperability Declaration

SE Series Transmitter EC Declaration of Suitability for Use

Regulation Reference	Regulation (EC) No 552/2004 Of The European Parliament And Of The Council Of 10 March 2004 on the Interoperability of the European Air Traffic Management Network (The Interoperability Regulation)
Name & address of Manufacturer or Agent	<p>Southern Avionics Company 5050 Belmont Beaumont, Texas 77707</p> <p>Muirhead Avionics Mallory House Navigator Park Southall Lane, Southall Middlesex UB2 5NH - UK Tel: +44.2085.713422</p>
Description of the constituent	<p>Southern Avionics Company's SE series Transmitters with PC1000C/3, PC1000M/3, PC1000H/3 or PC3000 Antenna Tuning Units (ATU) and Remote Control Unit (RCU) have been designed and tested to operate as a standalone Non Directional radio Beacon system for airplane navigation as part of the Air Traffic Management network. The SE series Transmitter may also be used as an Inner or Outer Marker Beacon utilized during an aircraft's approach to land. This system has been designed to operate on land, offshore platforms or maritime vessels. The system develops an output power of 10-125 Watts (SE125) or 50-250 Watts (SE250) with a frequency range of 190kHz to 1250kHz and 1500kHz to 1800kHz. The system is intended to operate up to an Amplitude Modulation level of 100% while communicating an alpha numeric Morse Code identifier via on/off keying. The transmitter's input voltage requirements are 100-264VAC at 47-63Hz or 48VDC. The ATU's operating voltage, +12VDC, is provided by the SE Transmitter or local power supply. The RCU's input voltage requirement is +12VDC provided by a wall mounted power supply or a customer provided +12VDC backup.</p>



Self Declaration to Essential Requirements

Seamless Operation:

1. The SE Series Dual transmitter system features a completely redundant RF power, Monitor and Control structure. With dual Transmitter Control microprocessors and dual RF power sections there is always a secondary system in standby mode to assume operation should a failure occur in the primary system. A third microprocessor, the Master Control, serves as the system's user interface via a key pad, LCD and embedded Ethernet server. The Master Control also monitors the status of the primary transmitter and forces a shutdown and subsequent transfer under faulty conditions, which enables the secondary system to continue seamless operation.
2. The SE Series transmitter also features a DC power backup to provide seamless operation should the primary AC voltage source experience a brown out or lose power. A DC Auto Disconnect protects the external batteries should they reach a critically low value.

Safety:

1. The SE Series transmitter has been designed, manufactured and tested in order to offer a safe working environment in both normal and degraded modes of operation. This is primarily achieved through system design and manufacturing to the health and safety requirements contained in "Safety of information technology" IEC 60950:1999. Safety designs include proper grounding to reduce shock hazards, danger labels in appropriate areas and descriptions of hazards and warnings in the User's Manual.
2. Specifically the SE Series Transmitter was tested by Retlif Testing Laboratories per the requirements of the Low Voltage Directive 2006/95/EC. Under 2006/95/EC the SE Series Transmitter was reviewed to the safety requirements of EN 60950-1:2006 and EN 60945:2002.




EC DSU

Description of Procedure followed in order to declare suitability of use	<p>Self Declaration to Essential Requirements (continued)</p> <p>Environmental Constraints:</p> <ol style="list-style-type: none">1. The SE Series Transmitter meets or exceeds the requirements of 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment. Design and construction to the requirements of this directive minimizes or eliminates the concentration of lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls or polybrominated diphenyl ethers used in the SE Series Transmitter system.2. The SE Series Transmitter is intended to be used in ambient temperature conditions between -20 and +55 degrees Celsius.3. The SE Series Transmitter is intended to be used in a non condensing relative humidity environment with humidity ranging from 0 to 95%.4. The SE Series transmitter should not be used above 10,000 feet (3048 meters). <p>Principles governing the logical architecture of systems:</p> <ol style="list-style-type: none">1. The SE Series Transmitter system is designed on a fully redundant platform based on an architecture used by Southern Avionics Company, which has been sold in the EU for many years. As an option the SE Series design employs an embedded server using an Ethernet protocol for ease of local and remote interface via Ethernet or the Internet.
	<p>Principles governing the construction of systems:</p> <ol style="list-style-type: none">1. The SE Series Transmitter is designed to maximize modularity of critical printed circuit boards in both the Master Control and RF Transmitter sections. This concept allows the fastest upgrade of failed boards without the need for special tools. The design also affords high availability due to its solid-state design and full system redundancy.



EC DSU

Define the relevant provisions met by the constituent and in particular its conditions of use	<p>The SE Transmitter system meets or exceeds the engineering, spectrum and operational requirements defined in US Federal Communication Commission code of federal regulation 47 Part 2 and Part 87, US Federal Aviation Agency Regulations part 171, The Radio Regulation 2004, ICAO Annex 10 chapter 3.4 and UKCAA CAP 670 Part C Section 2. The SE system was tested to the Essential Requirements of Council Directive 1999/5/EC on Radio Equipment and Telecommunications Terminal Equipment. With respect to the protection of health and safety the SE system was tested to directive 2006/95/EC and 2004/108/EC. These test results can be seen in the Technical Construct File possessed by Muirhead Avionics, England which includes:</p> <ol style="list-style-type: none"> 1. Declaration of Conformity 2. Low Voltage Directive 2006/95/EC test results 3. EMC Directive 2004/108/EC test results 4. Spurious Harmonics and Occupied Bandwidth test results 5. ICAO statement of compliance / SE Series Factory Acceptance Test 6. CE Marking and labelling 7. Southern Avionics Company Quality Manual 8. SE series Technical Manual 9. SE250 series Setup Manual
Name & Address of Notified Body	<p>Retlif Testing Laboratories 795 Marconi Avenue Ronkonkoma, NY 11779 Date of Certificate Issue: December 22, 2012 Intended Use: Air Traffic Management Notified Body No.: 1000</p>
Identification of Signatory	<p>Tim Hamilton Director of Engineering</p>

Signed : 

Date: January 05, 2012

Change Control Record

Date	Section	Pages	Change
SE250 Rack Mount Installation and Setup SD433005 Rev C			
12-19-11	Warranty Section		Addition of CE Mark Addition of Declaration of Conformity
12-19-11	Section 1	1-9	Update ambient temperature
12-19-11	Section 1	1-15	Update weight tables
12-19-11	Section 1	1-16	Update SE250 Transmitter diagram (front view) SDF33030 Rev C
12-19-11	Section 1	1-17	Update SE250 Transmitter diagram (rear view) SDF33030 Rev C
12-19-11	Section 1	1-19	Addition of SE250 Transmitter Printed Circuit Board access diagram SDF33030 Rev C
12-19-11	Section 1	1-21 1-22	Remove 9F830103 (F2 & F3) from Bill of materials
12-19-11	Section 1	1-22	Remove 9S900005 (S2) from Bill of materials
12-19-11	Section 2	2-2	Update SE250 Rack mount rear enclosure dimensions SDF33030 Rev C
12-19-11	Section 3	3-2	Update SE250 System Ground SDF33030 Rev C
12-19-11	Section 3	3-3	Update Input current requirements table
12-19-11	Section 3	3-3 3-6	Update Warning tables
12-19-11	Section 3	3-4	Update SE250 Power I/O diagram SDF33030 Rev C
12-19-11	Section 3	3-5	Update system interconnect detail SDF33030 Rev C
12-19-11	Section 4	4-3	Update Warning tables
12-19-11	Section 4	4-5	Update Special Function 6 and Special Function 7
12-19-11	Section 6	6-5 6-8	Update Warning tables

Date	Section	Pages	Change
12-19-11	Section 6	6-6	Addition of "M" and "H" band jumper settings
12-19-11	Section 9	9-1 9-3 9-5 9-6	Update Warning tables
12-19-11	Section 9	9-7	Update Symmetrical T Antenna chart SDF20020 Rev E
12-19-11	Section 11	11-2	Update Warning tables
12-19-11	Section 11	11-3	Update Shelter Conduit Interface Diagram
12-19-11	Section 12	12-4	Update SE250 Optional Battery Charger SDE33072 Rev D
12-19-11	Section 12	12-9	Update SE250 Rack mount Ethernet to Land line Dial-Up SAF83303 Rev C
12-19-11	Section 12	12-16	Update SE250 Multi-Mode Ethernet to Fiber Optics Converter SAF83314 Rev C
12-19-11	Section 12	12-24	Update SE250 Leased Line Modem SAF83301 Rev E
12-19-11	Section 12	12-34	Update SE250 Ethernet Extender SAF83315 Rev E
SE250 Rack Mount Installation and Setup SD433005 Rev D			
2-1-12	Section 1	1-21	Update SE125 Transmitter 5A1 detail
2-1-12	Section 4	4-1	Update SE125 Transmitter 5A1 detail
2-1-12	Section 12	12-16	Update SE250 Multi-Mode Ethernet to Fiber Optics Converter SAF83303 Rev D
SE250 Rack Mount Installation and Setup SD433005 Rev E			
3-27-12	Section 1	1-23	Updated Bill of Materials to changed Battery Sense PCB part number to SLP45601
SE250 Rack Mount Installation and Setup SD433005 Rev F			
5-8-12	Section 5	5-3	Update Web GUI Main Window
5-8-12	Section 6	6-10	Update Transmitter Calibration Screen

Date	Section	Pages	Change
5-8-12	Section 6	6-22	Addition of Logging Firmware and Label Name list
SE250 Rack Mount Installation and Setup SD433005 Rev G - Skip			
SE250 Rack Mount Installation and Setup SD433005 Rev H			
8-21-12			Update Warranty page
8-21-12	Section 3	3-4	Update SE250 Power I/O diagram
8-21-12	Section 3	3-5	Update SE250 System Interconnect diagram
8-21-12	Section 9	9-2	Update PC3000 Coupler Access Panel diagram
8-21-12	Section 9	9-4	Update Coupler connection detail

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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: Electric shock hazard, high voltages capable of causing personal injury or death.



WARNING: Red lightning flash: High reactive voltages present capable of causing personal injury.

HIGH VOLTAGE



GENERAL WARNING: See Installation Manual before proceeding



CAUTION: Heat hazard – allow heated components to cool before handling



Alternating Current



Direct Current



Protective Earth conductor or connection



ON (power switch)



OFF (power switch)

ACRONYMS & ABBREVIATIONS

A	ampere
AC	alternating current
AGC	automatic gain control
AGL	above ground level
AM	amplitude modulation
ANT	antenna
ATU	antenna tuning unit
AUTO	automatic
AWG	American wire gauge
AWOS	automated weather observing system
BATCHG +/-	battery charger +/-
BTRY +/-	battery +/-
BNC	Bayonet Neill-Concelman
BOM	bill of materials
CARR	carrier
CD	compact disc
COM	communication
CONT	continuous
CPU	central processing unit
dBm	decibel referenced to 1 milliwatt
DMM	digital multi meter

DC	direct current
DCAD	DC automatic disconnect
DDS	direct digital synthesis
ESD	electrostatic discharge
FET	field effect transistor
FWD	forward
GND	ground
HV	high voltage
HZ	Hertz
ID	identifier
IDENT	identifier
I/O	input/output
LCD	liquid crystal display
LED	light emitting diode
LINE 1/ LINE 2	ac input voltage
LOTO	lock out/tag out
LV	low voltage
LVPS	low voltage power supply
MOD	modulation
MSEC	millisecond
MSK	minimum shift keyed
N/A	“not applicable, not available”
NDB	non-directional beacon
NVRAM	non-volatile random access memory

PA	power amplifier
PAI	power amplifier current
PC	personal computer
PCB	printed circuit board
PE GND	protective earth ground
PPM	parts per million
PWM	pulse width modulation
RAM	random access memory
REFL	reflected
RF	radio frequency
RG	radio grade
ROM	read only memory
RS	recommended standard
SAC	Southern Avionics Company
SE	current digital series transmitter
sd	shutdown
SPA	switching power amplifier
TX	transmit
V	“volts, voltage”
V _{AC}	alternating current voltage
V _{DC}	direct current voltage
V _{MAX}	maximum voltage
V _{MIN}	minimum voltage

V_{PP} volts peak-to-peak
 V_{SWR} voltage standing wave ratio

PREFACE

This document is intended to serve as a guide to the user in the installation and setup of Southern Avionics Company's (SAC) "SE Series" of Non-Directional Beacons (NDB).

Instructions for the installation of the transmitter system and coupler include suggested techniques for various mounting configurations of both the transmitter and the coupler, point to point interconnection instructions and diagrams for all associated cabling and wiring, recommended cable/wire selection, and optional solutions for preventing dust/water ingress at cable entry of coupler enclosure.

Additionally, a detailed step-by-step procedure is offered to guide the user through the Site Configuration, the checkout and calibration of the various operating parameters, and finally, placing the system in operation.

1 Introduction

The Southern Avionics SE250 is a dual configuration Non-Directional Beacon (NDB) comprised of two fully redundant 25 to 250 Watt carrier power Digital NDB transmitters with auto-transfer unit housed in a 19 inch rack cabinet for indoor installation.

The SE250 includes BITE, Direct Digital Synthesis (DDS), LCD display, membrane keypad and Remote Monitoring & Maintenance (RMM) using the provided Ethernet interface.

All user controls normally found on an analog transmitter are located on the front panel with two analog meters. A 40 character by 4 line LCD and power control keypad with numeric and functional membrane switches are provided for ease of data entry and control without the need of a computer.

Setup and control of the SE250 can also be performed using a personal computer (PC) or laptop connected locally or remotely using the Ethernet feature.

The Ethernet interface allows customers to control their Beacon from various points on their Local Area Network (LAN) or the World Wide Web.

Operators can access the transmitter's homepage simply by connecting a standard PC or laptop to the RJ45 jack on the SE transmitter. At the homepage the operator can monitor system parameters plus setup and control of the following:

- (DDS)-generated RF carrier and Audio Tone frequencies
- Morse Code Identifier
- Standard alarms, view and reset
- Monitor Enable/Disable
- Transfer criteria
- Power levels
- Modulation levels

An optional Remote Control Unit (RCU) is available which uses RS-485 communication lines between it and the transmitter. The RCU allows full monitoring and basic control of the transmitter from up to 4000ft (1220m) away.

1.1 General Specifications

- **Frequency Range** - Standard Band - continuously variable from 190 - 535 kHz.
- **Frequency Tolerance** - 5ppm standard (1ppm optional) Temperature Controlled Crystal Oscillator (TCXO)
- **RF Power Output** - 25 to 250 Watts RF Output Amplitude Modulated 0-95%; power and modulation level adjustable from local keypad
- **Central Processor** - Renesas M16C 16 bit processor operating at 20 MHz
- **Residual Noise and Hum Levels** - more than 40dB below 95% modulation
- **Spurious Emission** - using the matching antenna coupler, radiated harmonics are more than 70dB below the carrier
- **Modulation** - NON produces blank carrier with no modulation; A3E Amplitude Modulated voice carrier from audio input line; A2A continuous or keyed tone modulation available with internal 400 Hz or 1020 Hz tone ; Morse Code operation at a speed of 5-15 WPM. Modulation frequency is user-programmable at 400 Hz or 1020 Hz.
- **Power Amplification** - Class D using power MOSFETS
- **Audio Line Input** - balanced, 600 Ohms, -25 to 0dBm
- **Audio Distortion** - less than 1% @ 95% modulation
- **Antenna Connection** - Type N female output standard
- **Monitoring** - monitoring firmware will shutdown the primary transmitter and initiate a transfer to secondary under the following conditions:
 - loss of tone
 - continuous tone
 - reduced modulation level
 - reduced power output below 3dB
 - increased power output above 120%
 - VSWR rise above a preset level
 - loss of heartbeat pulse from Renesas processor
 - incorrect Morse code identification
- **Built-in Test Equipment (BITE)** - Front panel or remote monitoring (via Web Watch) of critical parameters within transmitter modules covers all stages of operation
- **Digital Display** - A LCD screen with white characters on a blue background

- **User Interface** - power control keypad with numeric and functional membrane switches for ease of data entry and control without the need of a computer
- **Metering** - dual front panel analog meters for forward and reflected power, modulation percentage, final PA voltage and current
- **Interface** - barrier block connections for AC/DC Voltage, Antenna tuning unit and Remote Control Unit (RCU). User can select RS-232 or RS485 for RCU communications.
- **RJ45 Ethernet Connection** - Ethernet can be configured either static IP address or server set using DHCP (TCP/IP or UDP). Full control and monitoring available through IP connection. Internal firmware supports Ethernet interface. No additional user software required.
- **Power Input** - 110-264 VAC +/- 15%, 47-63Hz, or 48VDC
- **Environmental** - ambient temperature -30°C to +55°C, relative humidity 100% non-condensing.

1.2 Model SE250 General Description

The SE series non-directional beacon is a microprocessor controlled Amplitude Modulated (AM) transmitter with output power adjustable from 25 - 250 Watts. The radio frequency (RF) section uses field effect transistor (FET) switching technology in the power amplifier (PA) and power control modulator (PCM) modules resulting in a highly efficient system.

The front control panel utilizes membrane switches and an easy to view 40 line by 4 character Liquid Crystal Display (LCD) with white characters on a blue background. Front panel controls include Carrier Frequency, Tone Frequency, Call Sign/Identifier, Output Power, Modulation Level, Main Transmitter select, Mode of Operation, Monitor Enable, and controls for monitoring critical transmitter parameters and test modes.

The Master Control and Transmitter Control sections utilize the Renesas M16C/29 microprocessor, which was designed specifically for efficient embedded systems. The Transmitter Control utilizes modern direct digital synthesis (DDS) technology to create the precision audio and radio frequencies needed by the RF section. Beacon operation is program controlled and monitored.

Using an Ethernet connection, the user has complete control of the SE transmitter. In addition, a personal computer (PC) running an Internet Browser and connected to the Transmitter's IP address can communicate with, configure and monitor the system.

All standard fault conditions such as Low Power, No-Tone, VSWR, and Continuous Tone are monitored. Additional fault conditions designed to protect the equipment are reported via an interrupt request (IRQ) to trigger an immediate response from the controller.

Other important system parameters such as PA current, PA voltage, AC and DC current and voltage, high voltage, and RF current are also monitored.

RF frequency is monitored with an independent counter which is correctable to near test equipment frequency accuracy. RF Power and Modulation percentage readings are also corrected to yield near test equipment quality measurements.

System configuration includes discreet control Morse Code entry as well a maximum of eight (8) character ID sequences. Dual system operation is available in a totally redundant system including two independent Transmitter Controllers, RF sections and Power Supplies.


Optional emergency battery power is supported with battery voltage and discharge current being monitored. The DC automatic disconnect (DCAD) feature, which protects the battery stack from excessive discharge, is user-selectable on or off.

Optional automated weather observing system (AWOS) voice operation is supported with automatic gain control (AGC) ensuring proper operation over a wide range of user inputs. Band pass filtering limits the audio output to satisfy Federal Communications Commission (FCC) bandwidth requirements.

The transmitter is provided in a 19 inch rack mountable configuration.

Qualifications: Transmitter is designed to meet applicable requirements of the International Civil Aviation Organization (ICAO), Federal Communications Commission (FCC), Federal Aviation Authority (FAA), Transport Canada, United Kingdom's Civil Aviation Authority (CAA), and the European Commission (CE).

1.3 SE Series Transmitter Specifications

	<p>Danger: Shock Hazard. Serious injury or death from electrical shock is possible when handling electrical power input wiring. Ensure AC and DC main breakers are open. Observe any applicable standards regarding Logout/Tagout (LOTO) procedures.</p>
---	---

1.3.1 Maximum Input Current Requirements

The maximum continuous AC and DC current requirements are tabulated in [Table 1-1](#). The main AC and DC power breakers selected should be rated accordingly and, in the case of the AC breaker, incorporate appropriate delay.

1.3.1.1 Transmitter current

The maximum current is based on both transmitters running simultaneously (AC only) at 250 Watts and 100% continuous modulation. Fault protection circuitry will shutdown the system if these are exceeded.

Table 1-1. Transmitter MAX Input Current Requirements (Amps)

SYSTEM	100-264 VAC	BATTERY (38-52 VDC) DC BACKUP NOT INTENDED FOR TEST MODE OPERATION
SE250	12.9A	14.8A

1.3.2 RF Specifications

- **Type of Emission** - NON, A2A, A3E (optional) or any combination; GID (with optional GPS beacon modulator)
- **Frequency Range** - continuously variable from 190 - 535 kHz
- **Frequency Stability** - better than 5ppm from -20°C to +70°C
- **RF Power Output** - continuously variable from 25 - 250 Watts
- **PA Efficiency** - better than 90%

- **Tone Modulation Frequency** - user-selectable 400 or 1020Hz
- **Tone Modulation Depth** - user definable from 0 - 95%; modulation tracks carrier power changes
- **Identification Keying** - any combination of Morse code letters or numerals (8 character maximum length)
- **Spurious Emission** - harmonics are more than 70dB below the 250 Watt carrier (measured at a dummy antenna)
- **Residual Noise and Hum Levels** - more than 40dB below 95% modulation

1.3.3 Transmitter Environment Tolerance

Continuous unattended operation in the following environments:

- ambient temperature, -30°C to +55°C
- relative humidity, 0-100% non-condensing
- operation up to 10,000ft (3050m)

1.3.4 Circuit Protection (hardware)

- input AC fuse
- input DC fuse
- ATU 12VDC fusing
- Power Control Modulator automatic over-current shutdown
- RF PA automatic over-current shutdown
- hardware triggered fault interrupts for

PAI_FAULT	Power amplifier over current
PWR_CTRL_I_OVLD	Power control current (overload)
MOD_SHTDN	Modulator shutdown
MOD_I_OVLD	Modulator current overload

1.3.5 Total Redundancy

- two independent transmitter sections with independent transmitter controller sections with separate power supplies
- Monitor Control communicates and controls both Transmitters via I²C bus
- automatic transferring

1.3.6 Active Monitoring and Control

Transmitter transfer shutdown conditions:

- loss of modulation (carrier only, duration = 30 sec)
- low modulation (<70%, duration = 30 sec)
- continuous modulation (no keying, duration = 30 sec)
- low power (50%, duration = 30 sec)
- high power (120%, duration = 30 sec)
- VSWR (>2.62:1, duration = 2 sec)
- under-temperature (<-30 °C, duration = 120 sec)
- over-temperature (>70 °C, duration = 120 sec)
- ID sequence error (immediate action)
- over/under-frequency (>100Hz, duration = 120 sec)

1.3.7 Passive Monitoring

- battery charge and discharge rates
- antenna current

1.3.8 Local PC Control

Local PC control is established using a Desktop or Laptop personal computer (PC) running Vista, XP or Windows 7 running an Internet browser connected to the Ethernet port located on the back panel of the SE Transmitter.

1.3.9 Master Control Panel

Displays the following without the need of a PC:

- selected transmitter
- RF forward power
- RF reflected power
- modulation percent
- PA voltage
- PA current
- RF frequency
- AF frequency
- power select status (transmitter activated)
- primary transmitter selected
- operational mode (Carrier/Ident/Continuous)
- shutdown alarms
- monitor disabled

Controls the following without the need of a PC:

- Transmitter selected for LCD display
- RF forward power, RF reflected power, or modulation % display
- PA voltage, PA temperature, or PA current display
- RF frequency or Tone frequency display
- primary transmitter selection
- operational mode (Carrier/Ident/Continuous) selection
- monitor functions (alarms) disable
- simultaneous test mode operation for both transmitters (dual only)

1.3.10 Remote Operation (optional)

- Allows full monitoring and basic control over the existing transmitter
- All readings at the transmitter are available at the RCU via RS-485 at a distance of up to 4,000ft (1,220m)

- Selection of Primary Transmitter can be made and the system Powered Up or Down. All Built-In Test Equipment data is displayed on the LCD screen
- Indications for Primary, Secondary and Fail are provided, as well as those for ICAO Annex 10 Chapter 3.4 shutdown requirements
- Power provided by external 12VDC wall-mounted power supply or customer's 12VDC source

1.3.11 AWOS Operation (optional A3E mode)

Optional PCB enabling external voice modulation and featuring:

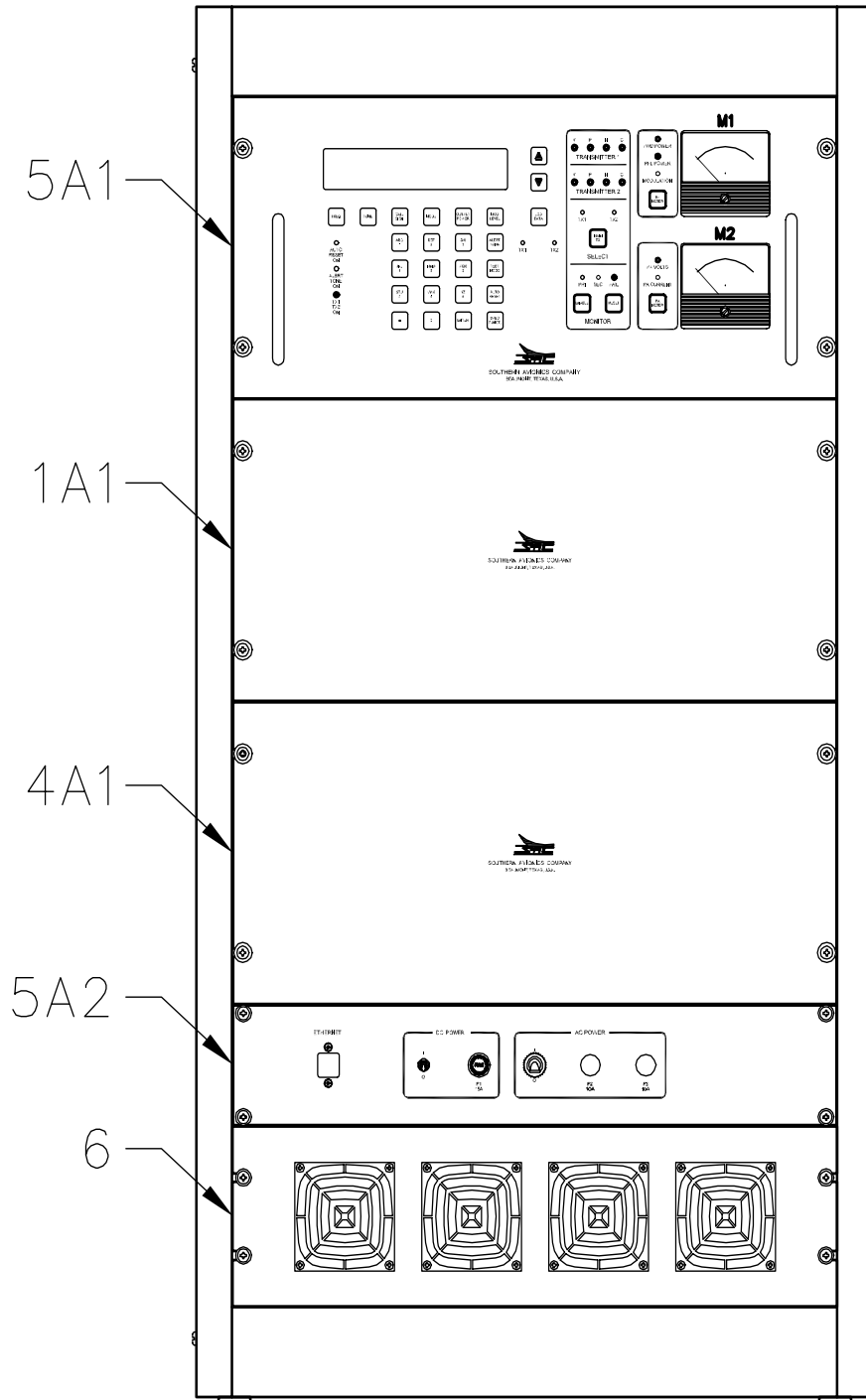
- automatic gain control (prevents over-modulation) capture, -30dBm to +5dBm
- automatic keyer tone modulation level reduction
- band pass filtering, 300 - 3000 Hz

nominal user input of -17dBm @ 600 Ohms for 95% modulation

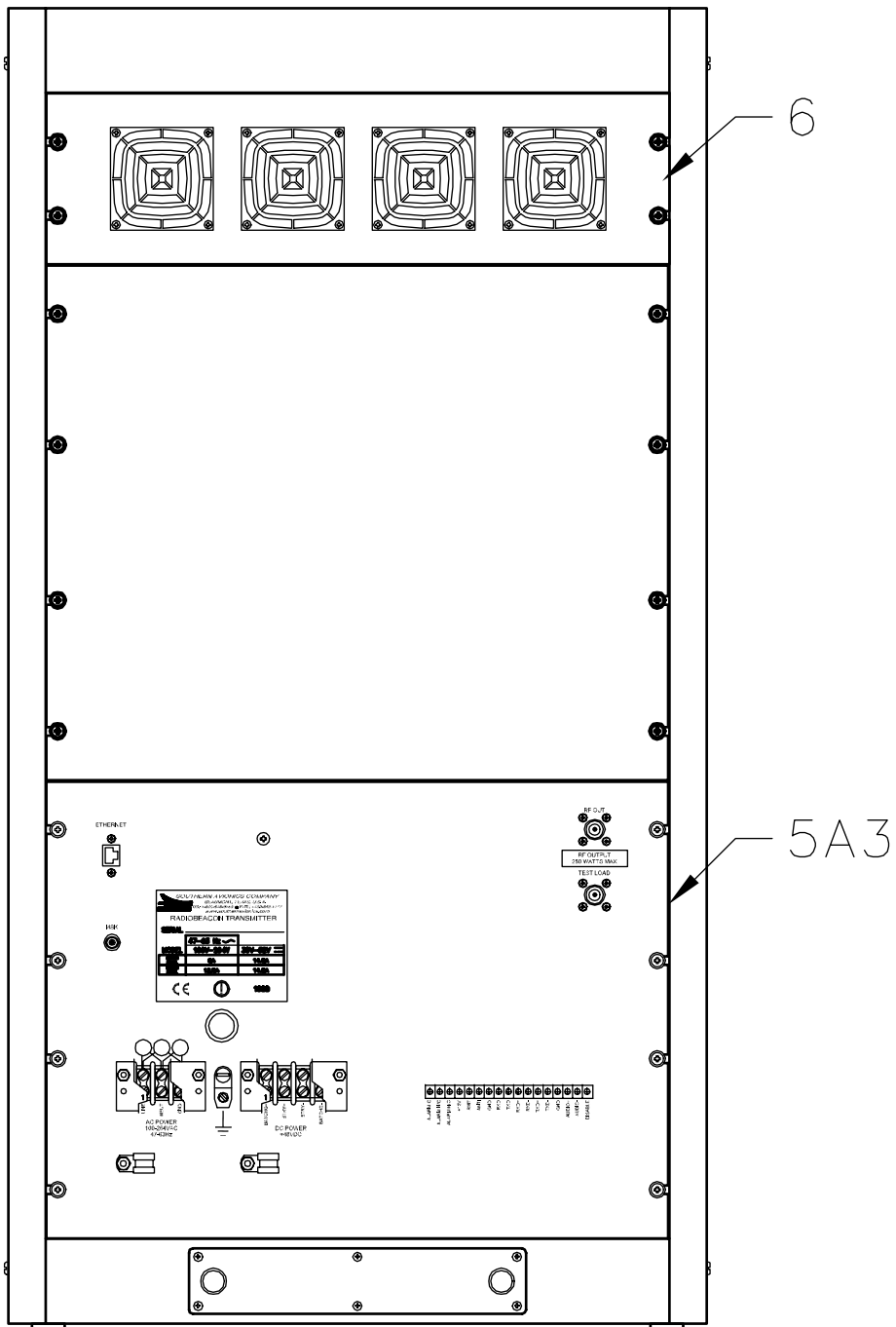
1.4 Equipment Weights

SE250 Dual Transmitter	(SLF33030)	173 lbs. (78kg)
PC3000 Antenna Coupler	(SLF20020)	39 lbs. (18kg)

1.5 Equipment Appearance



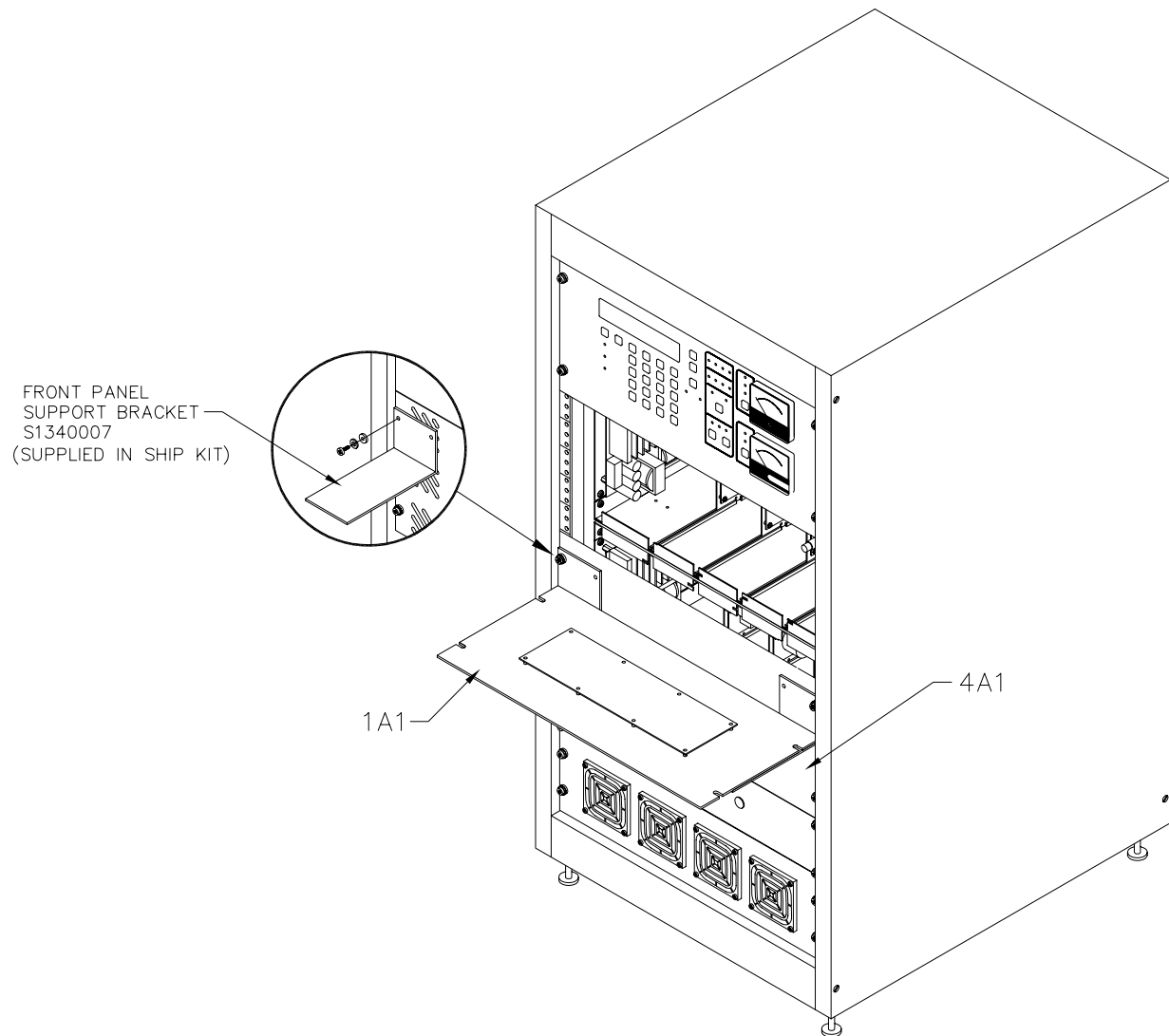
SDF34030 Rev C
Figure 1-1. SE250 Transmitter diagram (front view)



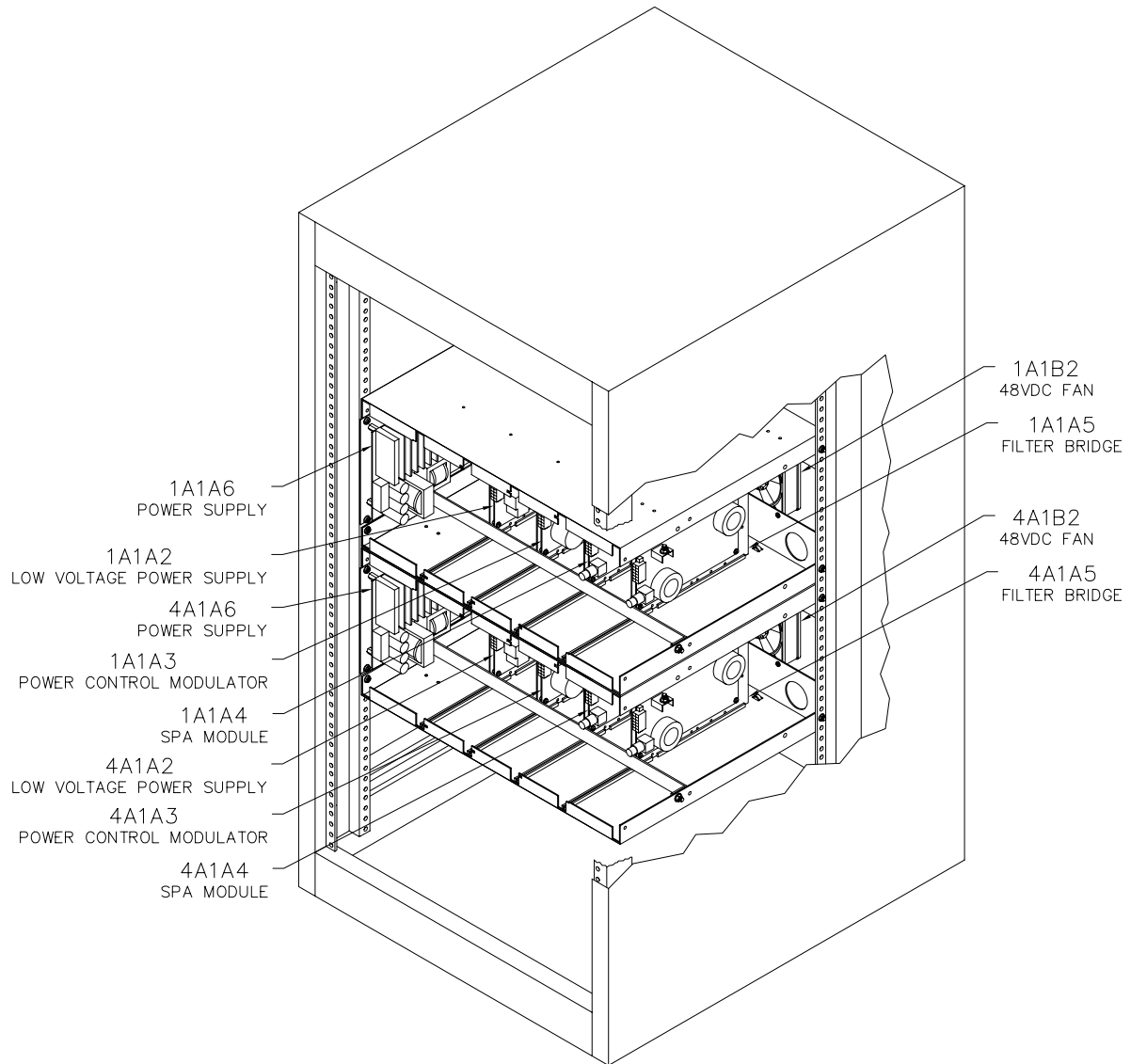
SDF33030 Rev C

Figure 1-2. SE250 Transmitter diagram (rear view)

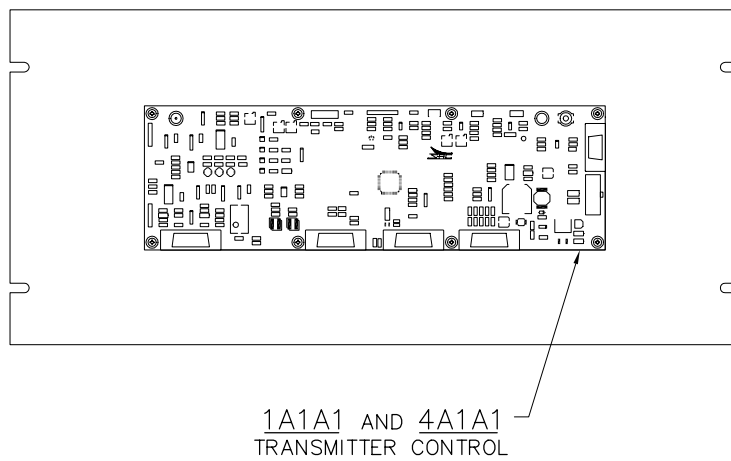
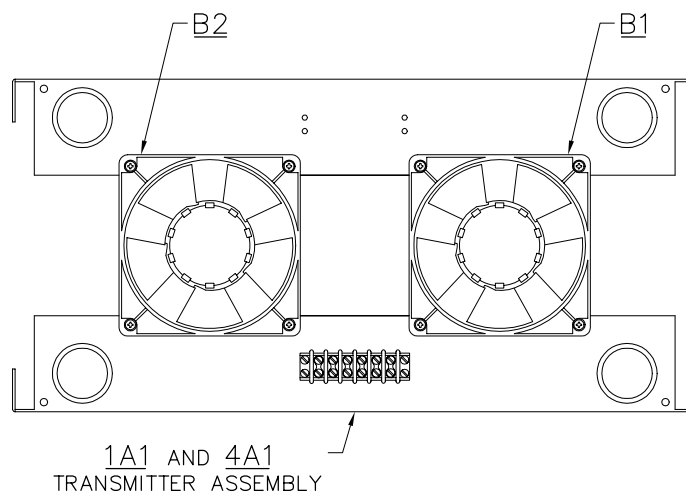
1.6 Equipment Interior Details



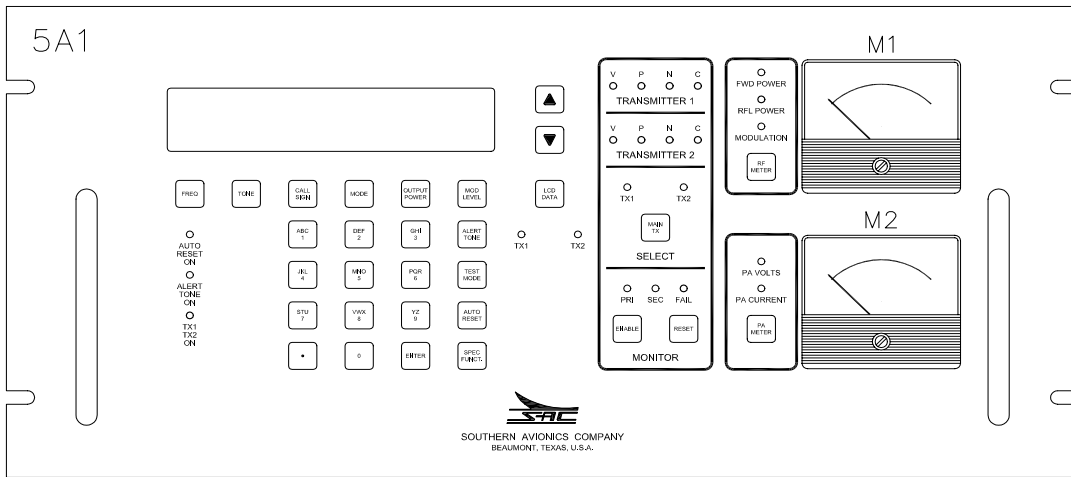
SDF33030 Rev C
Figure 1-3. SE250 Transmitter Printed Circuit Board access diagram



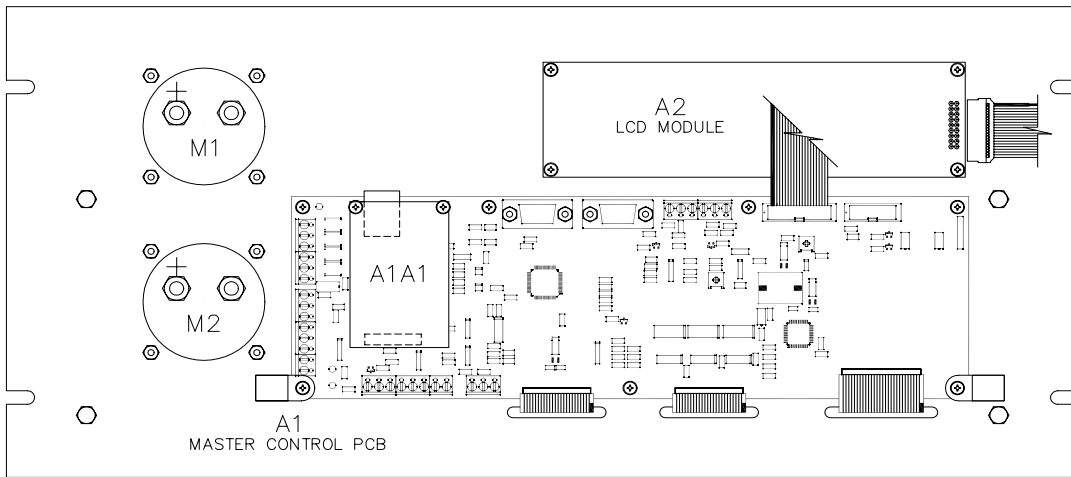
SDF33030 Rev C
Figure 1-4. SE25 Transmitter rack Detail



SDF33030 Rev C
Figure 1-5. SE250 Transmitter 1A1/4A1 Detail



EXTERIOR VIEW



INTERIOR VIEW

SDE33010 Rev B
Figure 1-6. SE250 Transmitter 5A1 Detail

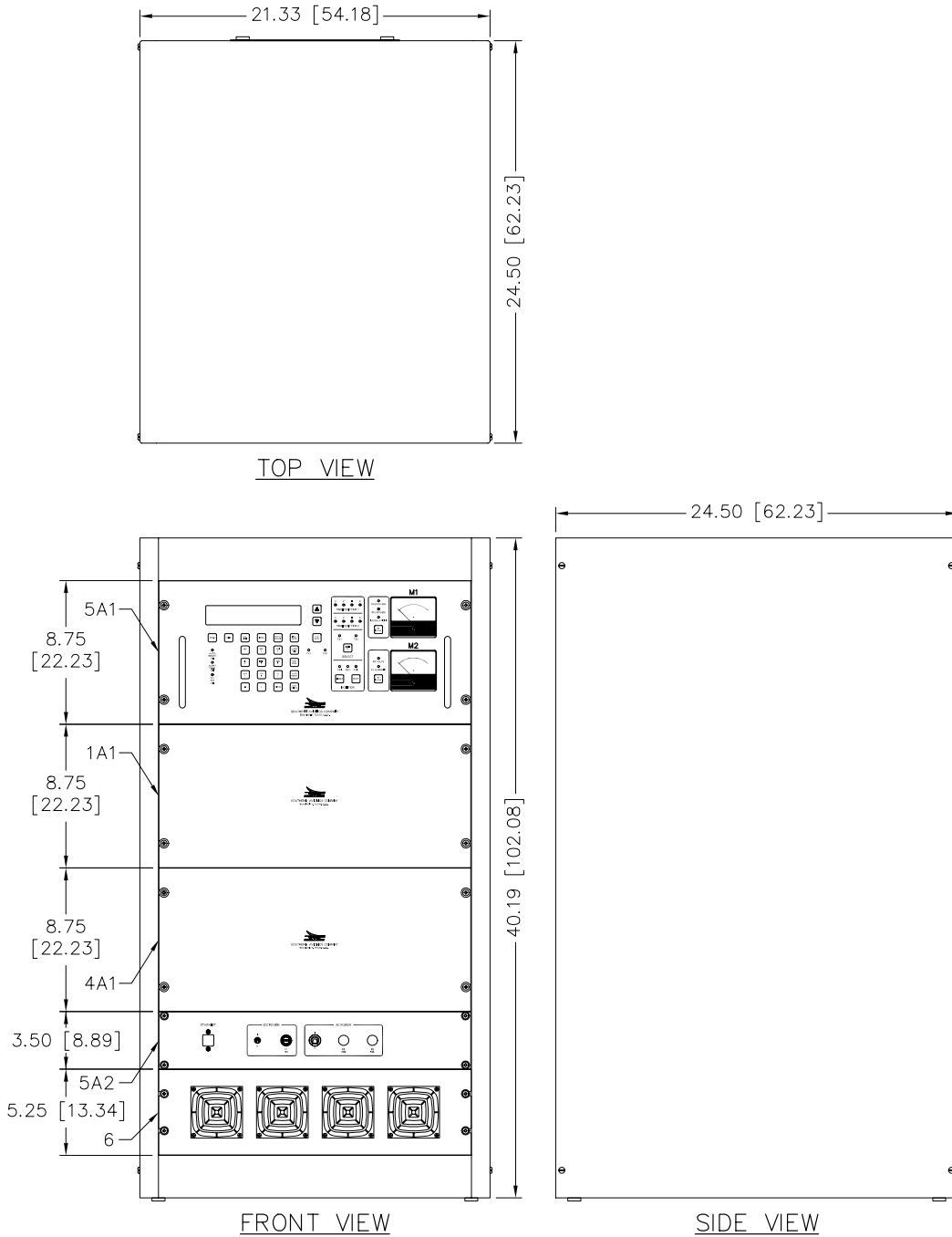
1.7 Parts list - SLF33030 Transmitter, SE250 Dual

REF DES	QTY	PART NO.	DESCRIPTION
A7	1	9S900033	SWITCH, ETHERNET 5-PORT
K1	1	9R190070	RELAY; SPDT, AUTOMOTIVE PLUG-IN 12V
K2	1	9R190070	RELAY; SPDT, AUTOMOTIVE PLUG-IN 12V
K3	1	9R190079	RELAY; POWER DPDT 12VDC FLANGE MOUNT
RV1	1	SLW10017	SURGE SURPRESSOR
RV2	1	SLW10017	SURGE SURPRESSOR
RV3	1	SLW10017	SURGE SURPRESSOR
1A1A1	1	SLP45500	TRANSMITTER CONTROL PRINTED CIRCUIT BOARD
1A1A2	1	SLE46400	LOW VOLTAGE POWER SUPPLY MODULE 250 WATT
1A1A3	1	SLE46100	POWER CONTROL MODULATOR MODULE
1A1A4	1	SLE46000	SWITCHING POWER AMPLIFIER MODULE
1A1A5	1	SLE46200	FILTER BRIDGE MODULE STANDARD BAND
1A1A6	1	9P690750	POWER SUPPLY, PSU-750
2	1		COUPLER
3	1		ANTENNA
4A1A1	1	SLP45500	TRANSMITTER CONTROL PRINTED CIRCUIT BOARD
4A1A2	1	SLE46400	LOW VOLTAGE POWER SUPPLY MODULE 250 WATT
4A1A3	1	SLE46100	POWER CONTROL MODULATOR MODULE
4A1A4	1	SLE46000	SWITCHING POWER AMPLIFIER MODULE
4A1A5	1	SLE46200	FILTER BRIDGE MODULE STANDARD BAND
4A1A6	1	9P690750	POWER SUPPLY, PSU-750
5A1	1	SLE33010	MASTER CONTROL PANEL
5A1A1	1	SLP43300	MASTER CONTROL PRINTED CIRCUIT BOARD
5A1A1A1	1	9C583005	CONVERTER; SERIAL TO ETHERNET
5A1A2	1	9L100000	LIQUID CRYSTAL DISPLAY MODULE
5A1M1	1	9M190009	METER; 2.5IN, 0-1 MADC RF POWER
5A1M2	1	9M190028	METER; 2.5IN, 0-1MA, PA
5A2F1	1	9F830150	FUSE, 15 AMP, 250V, ABC FAST ACTING TYPE
5A2S1	1	9S901004	SWITCH, SPDT PC
5A3	1	SLE33080	POWER CONTROL PANEL

REF DES	QTY	PART NO.	DESCRIPTION
5S3A1	1	SLP45601	BATTERY SENSE POWER CONTROL
5S3A2	1	SLP46700	AUDIO I/O PRINTED CIRCUIT BOARD
	1	9F340005	FAN FILTER ASSY
	1	SLK33002	KIT, HARDWARE/INSTALLATION SE250
		SLF83301	SE SERIES LEASED LINE MODEM SE SERIES (OPTIONAL)
		SLF83303	SE, E-NET, TO SC MM FIBER OPTICS CONVERTER, 2 KM (OPTIONAL)
		SLF83304	RADIO LINK, E-NET to 5.8GHz, 4.5km (OPTIONAL)
		SLF83308	SE, E-NET TO SC SM FIBER OPTIC, CONVERTER, 20KM (OPTIONAL)
		SLF83314	SE SERIES ETHERNET TO LAND LINE DIALUP (OPTIONAL)
		SLF83315	ETHERNET EXTENDER MODEM (OPTIONAL)
		SLE33090	ASSEMBY, REMOTE CONTROL PANEL

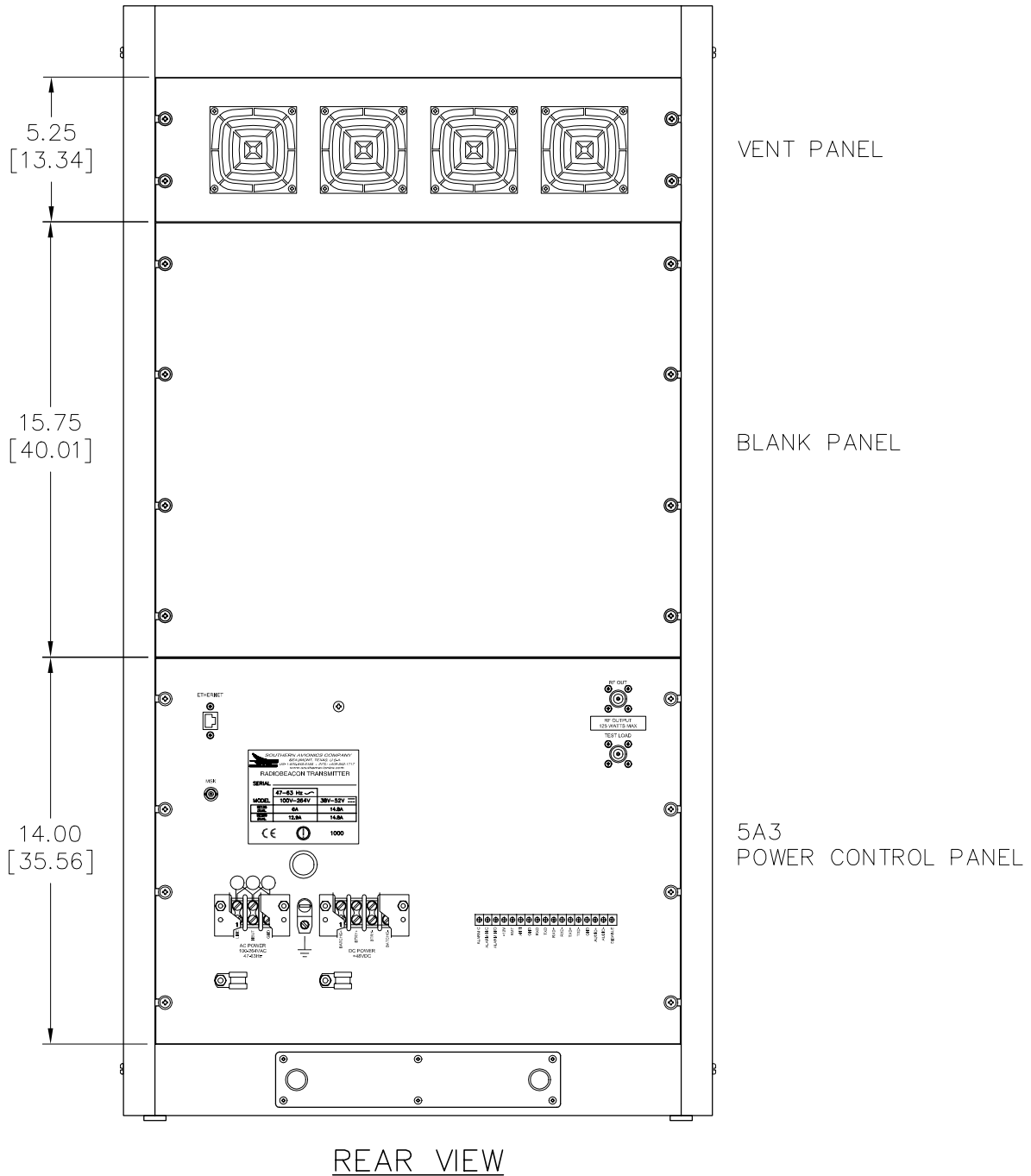
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2 Equipment Dimensions and Mounting Configurations

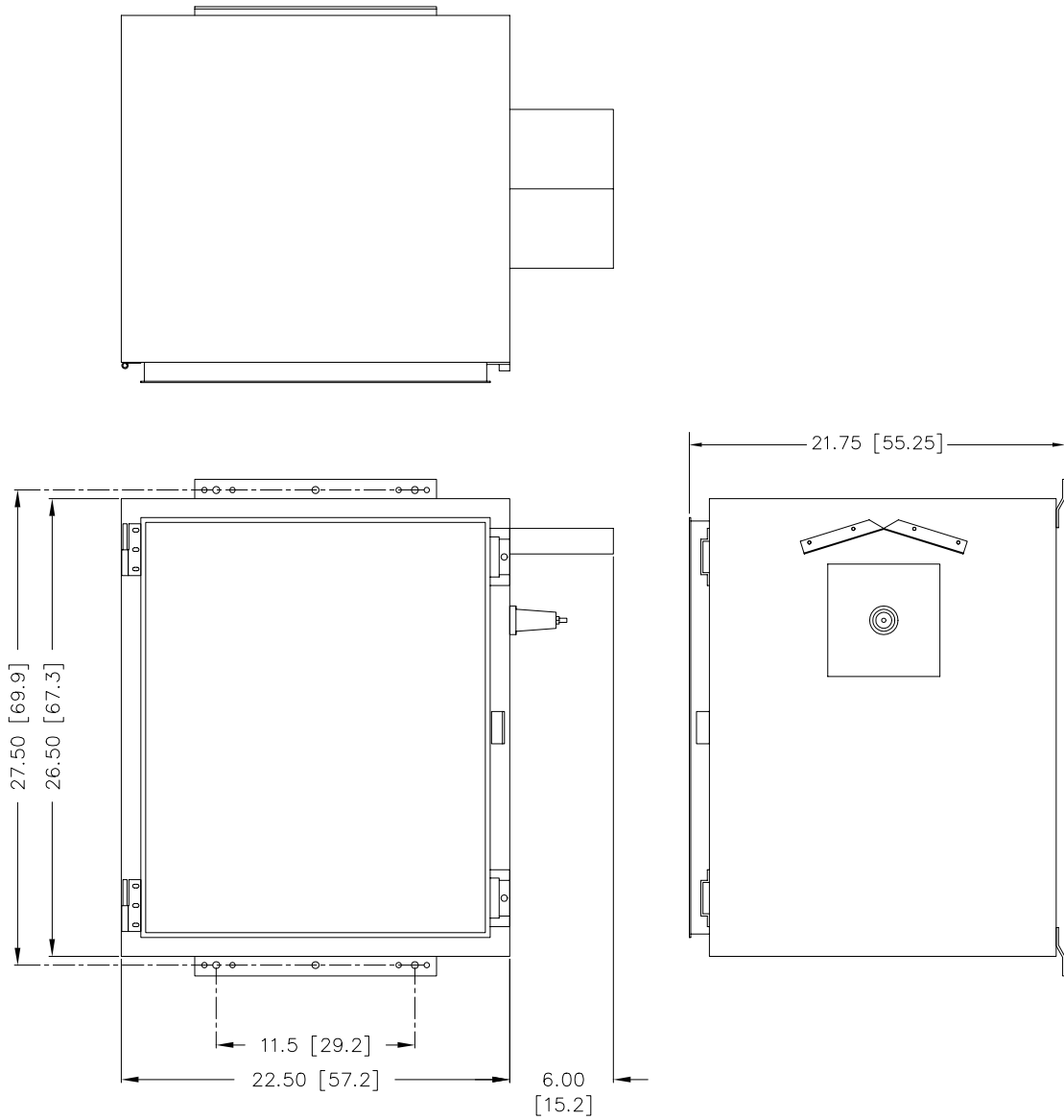


SDF33030 Rev C

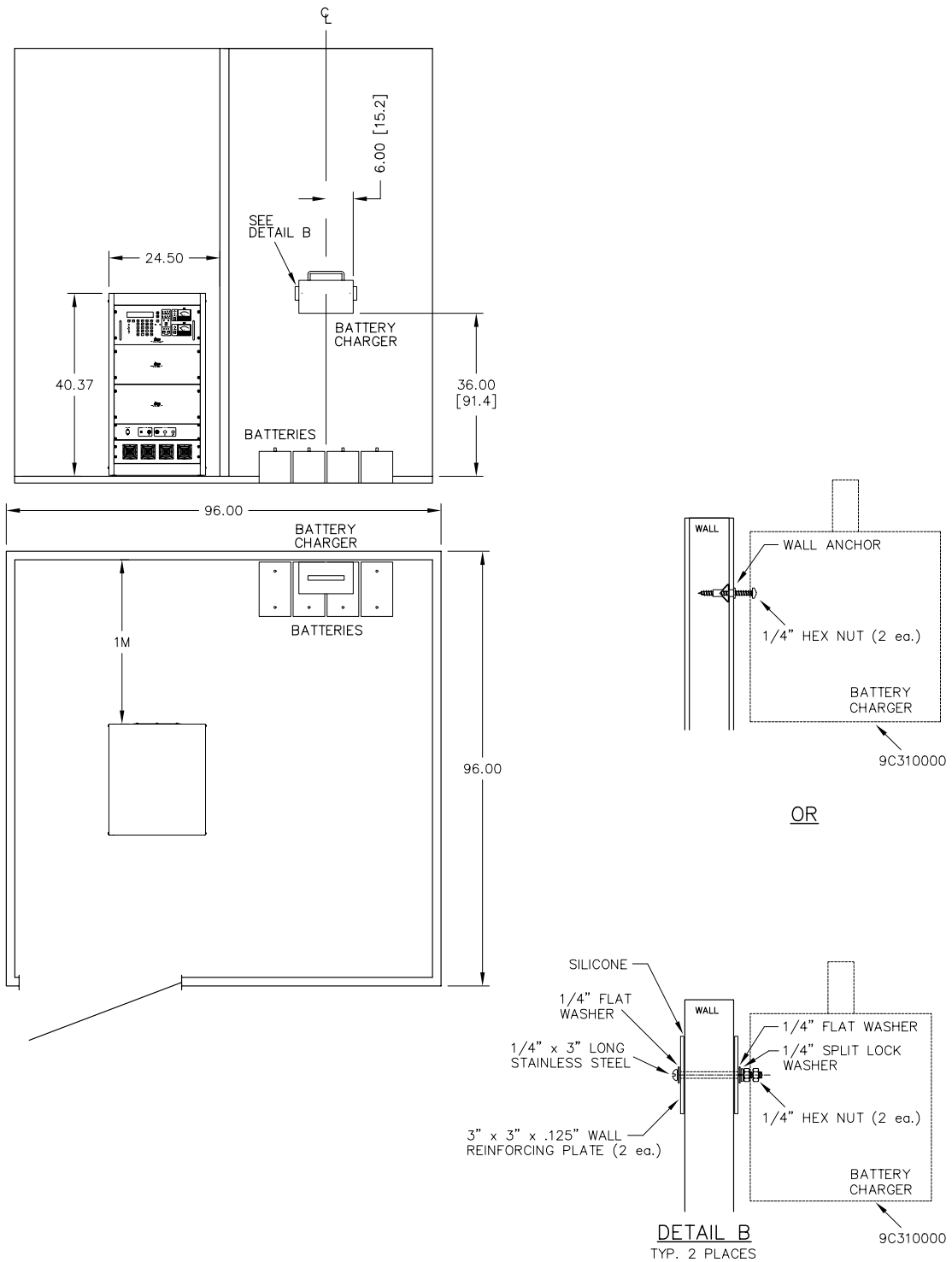
Figure 2-1. SE250 Rack mount front enclosure dimensions



SDF33030 Rev C
Figure 2-2. SE250 Rack mount rear enclosure dimensions



SDE20022 Rev A
Figure 2-3. PC3000 Coupler Dimensions



SDF33030 Rev C
Figure 2-4. SE250 Transmitter Mounted in Shelter

3 Cable/Wire Selection, Routing and Connection

3.1 Gaining Access to the Power and I/O Terminal Blocks

Requirements not supplied in Installation/ship kit.

1 - 11/32" nut driver (6") to remove terminal block covers for TB1 and TB2

1 - #2 Phillips head screwdriver (6") to loosen hardware on TB1, TB2 and TB3

The Ship kit is a part of the SE250 and contains the following:

1 - Alignment tool - 9A460000

1 - 50' Cable - SLW33011

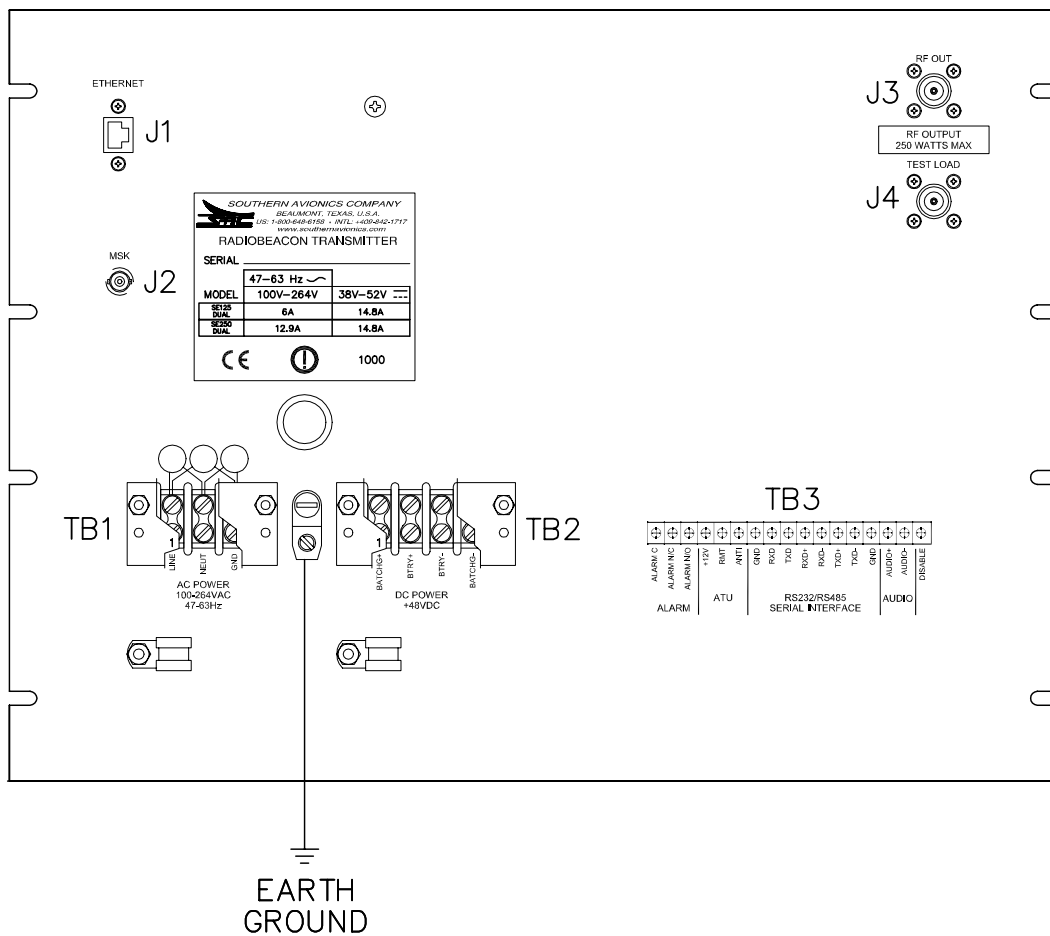
1- Front Panel support Bracket - S1340007

3.2 System Grounding

3.2.1 Enclosure Mounted System

Connect the bronze ground lug, located on the outside bottom of the enclosure, to a good Earth ground, as shown in [Figure 3-1. SE250 System Ground on Page 3-2.](#)


Recommended conductor: 12 AWG, multi-stranded copper wire, or better




SDF33030 Rev C

Figure 3-1. SE250 System Ground

3.3 Transmitter Input Power

	<p>Danger: Shock Hazard. Serious injury or death from electrical shock is possible when handling electrical power input wiring. Ensure AC and DC main breakers are open. Observe any applicable standards regarding Logout/Tagout (LOTO) procedures.</p>
---	---

3.3.1 Maximum Input Current Requirements

	<p>Warning The maximum continuous AC and DC current requirements are tabulated in Table 3-1. The main AC and DC power breakers selected should be rated accordingly and, in the case of the AC breaker, incorporate appropriate delay.</p>
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3.3.1.1 SE250 Transmitter


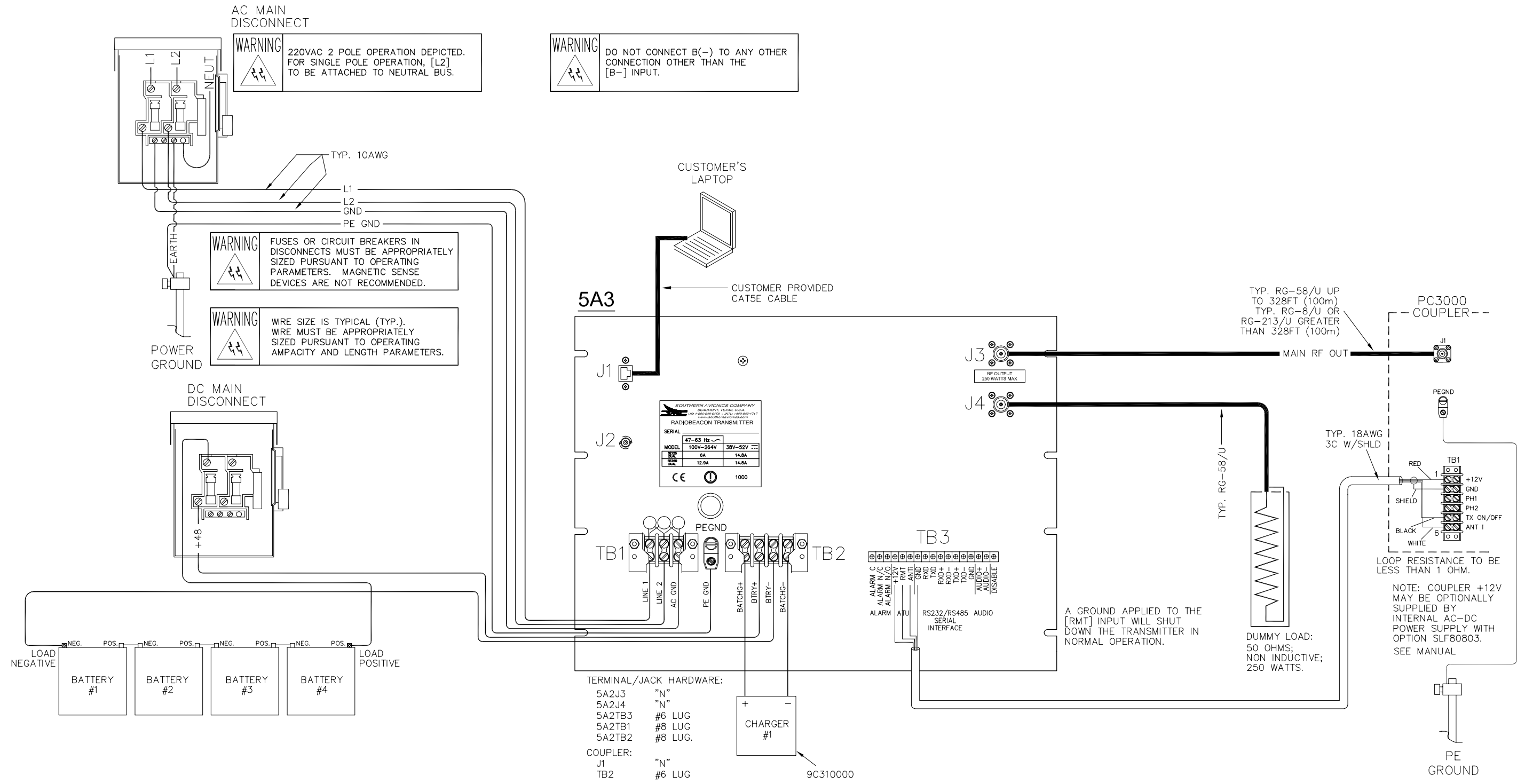
	<p>Warning The maximum current is based on a single transmitter running at 125% maximum power and 100% continuous modulation. Fault protection circuitry will shutdown the system if these are exceeded.</p>
---	---

Table 3-1 Transmitter MAX Input Current Requirements (Amps)

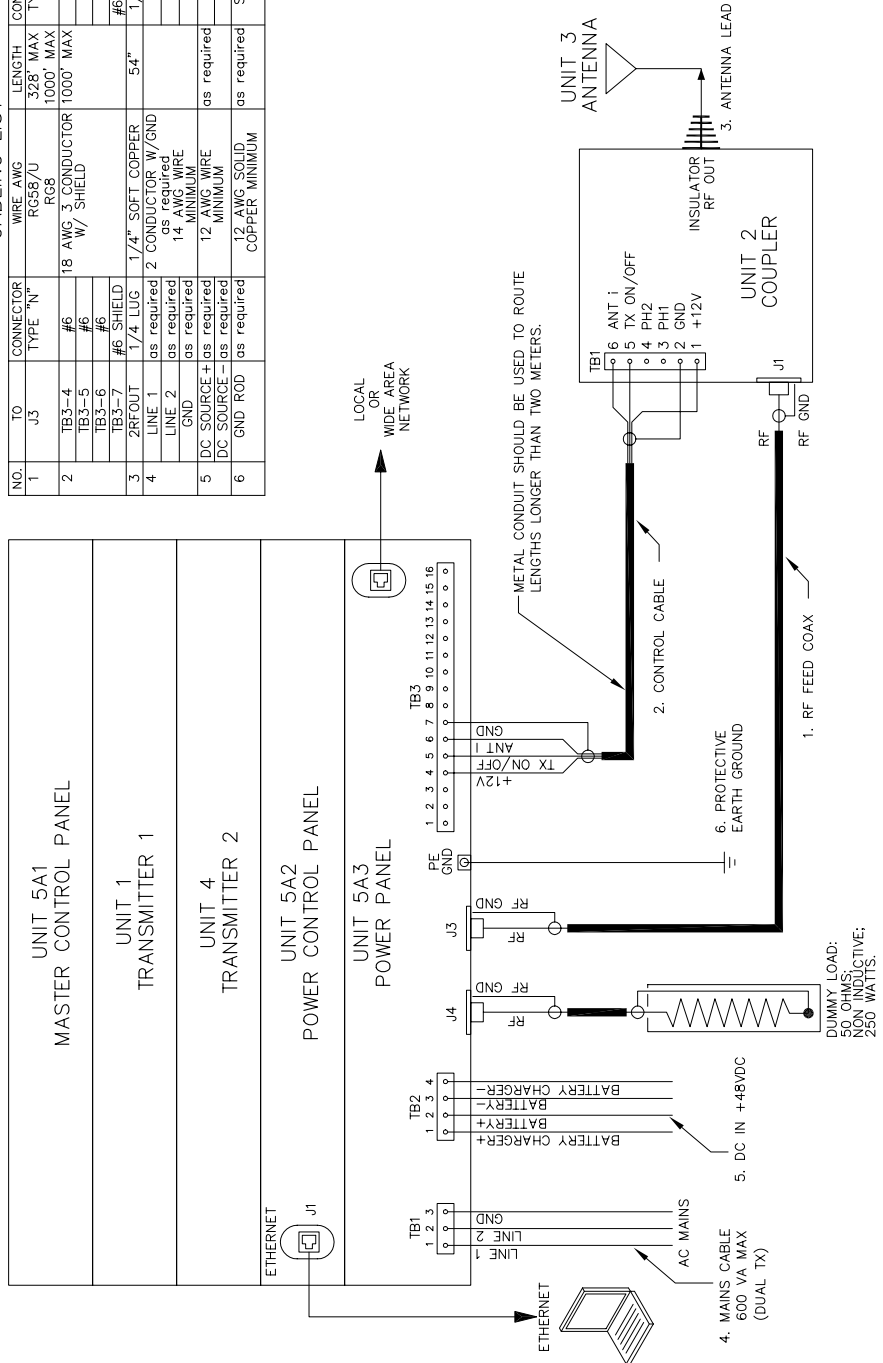
SYSTEM	100-264 VAC	230 VAC	BATTERY (38-52 VDC) DC BACKUP NOT INTENDED FOR TEST MODE OPERATION
SE250	12.9A	3.6A	14.8A



SDF20022 Rev A - SE250 Power I/O diagram

CABLING LIST

NO.	TO	CONNECTOR TYPE "N"	WIRE AWC	LENGTH	CONNECTOR TYPE "N"	FROM
1	J3	#6	RG58/U	328' MAX	#6	2J1
2	TB3-4	#6	RG8	1000' MAX	#6	2TB1-1
	TB3-5	#6	18 AWC 3 CONDUCTOR W/ SHIELD	1000' MAX	#6	2TB1-5
	TB3-6	#6			#6	2TB1-6
	TB3-7	#6 SHIELD			#6 SHIELD	2TB1-2
3	2RFOUT	1/4 LUG	1/4" SOFT COPPER	54"	1/4 LUG	3 ANT FEED
4	LINE 1	as required	2 CONDUCTOR W/GND		#8	TB1-1
	LINE 2	as required	as required		#8	TB1-2
	GND	as required	14 AWG WIRE		#8	TB1-3
5	DC SOURCE +	as required	12 AWC WIRE	as required	#8	TB2-2
	DC SOURCE -	as required	MINIMUM		#8	TB2-3
6	GND ROD	as required	12 AWC SOLID COPPER	as required	SCREW DOWN	PE GND



SDF2002 Rev A
Figure 3-3. SE250 System Interconnect



Warning The SE Series Transmitter is intended to operate from a secondary battery source and primary AC source. The secondary DC source must be batteries or a source not requiring suppression of conducted emissions

Recommended conductors:

- **AC Power** - insulated 14AWG, multi-stranded, copper wiring; observe local electrical code for insulator color
- **DC Power (optional)** - insulated 12AWG, multi-stranded, copper wiring; observe local electric code for insulator color

3.3.1.2

For Steps 3.3.2.2 - 3.3.2.4, and Steps 3.3.2.6 - 3.3.2.7, if using battery backup, trim all wires to the proper length for neat routing. Terminate the AC power wiring with insulated 14AWG, #8 crimp spade terminals (supplied in installation/ship kit). Terminate the optional DC power wiring with the insulated 12AWG, #8 crimp spade terminals.

3.3.1.3

Connect AC Power line 1 (“hot” wire Line1 in 230 V_{AC} systems) to position 1 of TB1.

3.3.1.4

Connect AC Power line 2 (“neutral” wire in 230V_{AC} single phase systems; “hot” wire Line 2 in 220V_{AC} two phase systems) to position 2 of TB1.

3.3.1.5

Connect AC Input ground to position 3 of TB1.

3.3.1.6

Connect DC Power BTRY+ (Battery “+”/positive wire of 48V_{DC} battery stack) lead to position 1 of TB2.

3.3.1.7

Connect DC Power BTRY- (Battery “-”/negative wire of 48V_{DC} battery stack) to position 2 of TB2.

3.4 Coupler Power/Signal

3.4.1

Remove/open, the Coupler enclosure's front panel.

3.4.2

Remove the Coupler's coil access panel located above the tuning controls panel, as shown in [Figure 9-1. Coupler Access Panel on Page 9-2](#)

3.4.3

Route the Coupler DC power cable, Antenna Current and Tx On/Off cable, supplied with the installation kit, from inside the coupler's enclosure up to the bottom of the transmitter's enclosure. Southern Avionics Company recommends a maximum distance of 300 feet for this cable.

3.4.4 Transmitter Connections

3.4.4.1 *Coupler Power, Current and Transmitter On/Off switch*

- connect the red wire (+12V_{DC}) to position 4 of TB3
- connect the black wire (TX On/Off) to position 5 of TB3
- connect the white wire (ANT I) to position 6 of TB3
- connect the cable's shield to position 7 of TB3

3.4.5 Coupler Connections

Refer to [Figure 9-2. PC3000 Coupler connection detail on Page 9-4.](#) in the Coupler setup section for wiring illustrations. If ATU is spaced further from the Transmitter than the distance necessary to utilize the provided 50' long interface cable, it will be necessary to provide the correct length with proper terminations as described in [Figure 3-3. SE250 System Interconnect on Page 3-5.](#)

3.4.5.1 *Coupler Power, Current and TX On/Off switch:*

- connect the red wire (+12V_{DC}) to position 1 of TB1
- connect the cable's shield to position 3 of TB1
- connect the black wire (TX On/Off) to position 4 of TB1
- connect the white wire (ANT I) to position 2 of TB1

3.5 Optional Signal I/O

3.5.1

Route all of the optional signal cables (Alarm Relay, Remote Control, Voice) to TB3 on the transmitter's back panel.

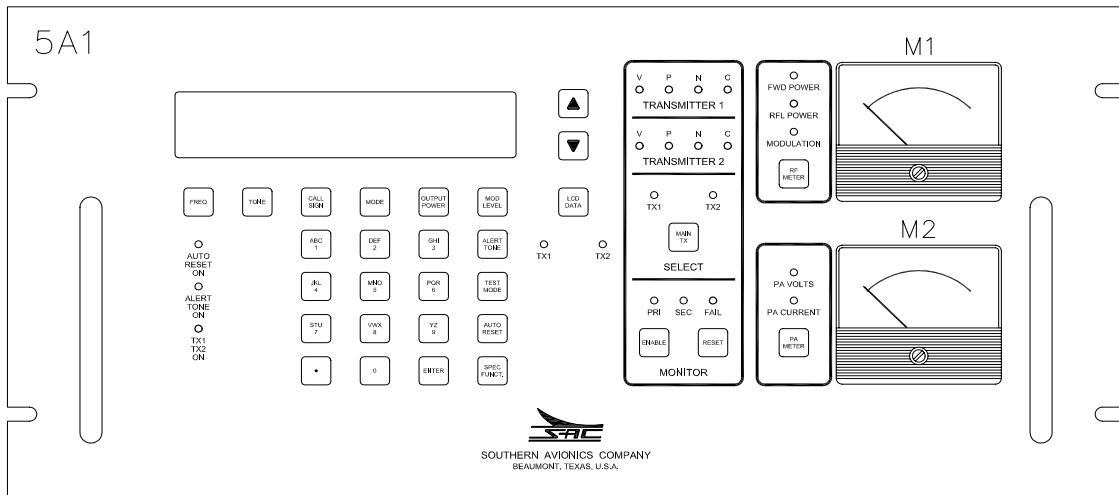
3.5.2 Ethernet Interface

Remove the Transmitter's upper back panel and install the D-Link Ethernet switch utilizing the preinstalled hardware. Connect the RJ-45 cable from the transmitter's power panel to position 1 of the D-Link Switch. Connect the RJ-45 connector, with origins at the transmitters, key pad panel, to position 3 of the D-Link switch. Finally connect the provided power cable to the D-Link Switch.

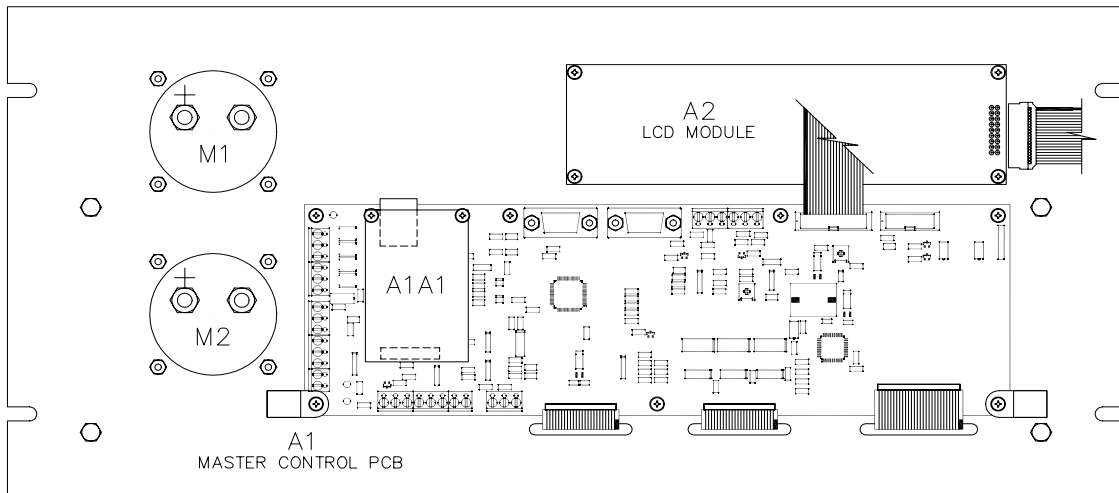
Route the user's Ethernet access cable (RJ-45) via the transmitter's rear access panel to the D-Link switch position 2.

4 Master Control Panel Description

The Master Controller Panel is the main control panel for the SE series transmitters. The following gives directions on how to operate the SE transmitter using the Master Controller Panel keypad. The Master Controller keypad consists of 30 keys, 23 LEDs, a 4 line by 40 character LCD display and dual analog meters.



EXTERIOR VIEW



INTERIOR VIEW

SDE33010 Rev B
Figure 4-1. SE Master Control Panel

4.1 Definitions:

4.1.1 Meters

The upper analog meter monitors the following three functions

- **Forward Transmit Power** - Indicates how much radio frequency transmit power the SE transmitter is sending to the ATU
- **Reflected Transmit Power** - Indicate how much, of the forward power, is being reflected back to the transmitter from the ATU because of mismatches in the antenna impedance
- **Modulation** - Indicates the modulation index
- The lower analog meter monitors the following two functions
- **Power Amplifier Voltage (PAV)** - This gives an indication of the voltage applied to the final FETS in the **Switching Power Amplifier**.
- **Power Amplifier Current (PAI)** - This gives an indication of the current flowing through the final FETS in the **Switching Power Amplifier**.

Taking these two values and multiplying them together will give an indication of the power input to the final FETS.

$$\text{SPA Power Input} = \text{PAV} * \text{PAI}$$

The efficiency of the Switching Power Amplifier is calculated by taking the forward transmit power from the upper meter and dividing this number by the calculated SPA power input to the final FETS.

$$\text{Efficiency (\%)} = (\text{Forward Transmit Power}) / (\text{SPA Power Input}) * 100\%$$

4.1.2 Keys/LEDs

Frequency Key (FREQ) - This key sets the transmitting frequency of the transmitter. The transmitter can be set to the desired frequency by pressing the FREQ key, then entering the desired frequency using the numeric keys and then pressing the ENTER key. Although the transmitter can cover any frequency from 190.0 KHz to 535.0 KHz, the Filter/Monitor module must be configured for the desired frequency.

Tone Key (TONE) - This key sets the tone frequency of the Identifier. The frequency can be toggled to either 400 Hz or 1020 Hz using the tone key.

Call Sign Key (Call Sign) - This key allows the user to enter the identifier of the station. An alphanumeric identifier up to 8 characters may be used. The default call sign is "SAC". Using the numeric part of the keypad, the user may enter the identifier. This type of entry is identical to text messaging on a cell phone. To begin this procedure, the operator presses the call sign key. The present call sign, if present, will clear to all blanks. The most significant character is entered first. For example, by pressing the "1" key the first time produces an "A" for the character. Pressing the key again, changes the character from an "A" to a "B". If the user continues to press

the "1" key, they would see the character "C" next, then the number "1", and then the character "A" again. To keep the desired character, wait for 2 seconds and the character place will shift over. This process continues until the entire identifier is in place. The user presses the enter key and the identifier is stored into memory. An example of this procedure is as follows for an Identifier "SAC". The user would perform the following:

- press "**CALL SIGN**" key
- press the "**7**" key once
- wait 2 seconds
- press the "**1**" key once
- wait 2 seconds
- press the "**1**" key 3 times
- wait 2 seconds
- press "**Enter**" key.

This completes the operation.

Mode Key (MODE) - This key toggles between 3 modes of operation the SE transmitter will operate in. They are as follows:

Ident - In this mode the transmitter will send out the identifier of the transmitter. This process repeats continuously.

CARR - In this mode, the transmitter simply sends out a dead carrier with no modulation.

CONT. - In this mode, the transmitter sends out a continuous tone.

Output Power -This key sets the RF output power of the transmitter. Press Output Power, enter a power level between 0 and 250 Watts and then press Enter.

Modulation Level (Mod Level) - This key sets the amplitude modulation level of the transmitter. Press Mod Level, enter a modulation level between 50% and 100%, and then press Enter.

Alert Tone - This key turns an audio alert tone ON or OFF. An LED (Alert Tone ON) on the left hand side of the keypad indicates the status of Alert Tone.



Warning DO NOT PRESS THIS KEY WITHOUT PUTTING A DUMMY LOAD ON THE OUTPUT OF THE TRANSMITTER NOT CURRENTLY OPERATING. DOING SO WILL DAMAGE THE COAXIAL RELAY AND POSSIBLY ONE OR BOTH TRANSMITTERS.

Test Mode - This key allows both transmitters to operate at the same time. This mode is for troubleshooting one transmitter while the other transmitter is still on the air. AN LED (TX1TX2 ON) on the left hand side of the keypad indicates whether both transmitters are activated.

Special Function (SPCL FCTN) - This switch is discussed under the special function section 4.2 on page 4-5.

LCD DATA - This switch allows the user to select the type of data that is seen on the **LCD Display** whether it is operating parameters or special parameters including observed frequency, modulation index, forward and reflected power. The LED's (TX1 TX2) below this switch indicate which transmitter the data relates to.

UP/DWN Switches above LCD Data - These switches allow the user to **scroll up and down** through the data observed or data selections.

Main TX Select (Main TX) - This switch allows the user to select which transmitter is selected as the main transmitter - **TX1 or TX2**. The **LED's (TX1 TX2)** above the switch indicate which TX is selected.

Monitor Enable (Enable) - This switch enables the transmitting monitoring circuitry. This function monitors for a number of faults. These are: VSWR, Power, Continuous and No Tone.

RF Meter Select - This switch toggles through forward power, reflected power and modulation index indicating which parameter is currently being viewed on the RF meter. An LED indicates the selected parameter.

PA Meter - This switch toggles between PA voltage and PA current indicating which parameter is displayed on the PA meter. An LED indicates the selected parameter.

4.1.3 Alarm Conditions

VSWR Overload - This alarm occurs when the VSWR exceeds a preset limit.

Power Output OVER/UNDER - This alarm occurs when the output power either goes below or above the preset limits set in the transmitter.

No Tone - This alarm occurs if the monitoring circuitry detects a **No Tone Condition** where the transmitter is producing a dead carrier.

Continuous Tone - This alarm occurs when the monitoring circuitry detects a continuous tone and not an identification sequence or low modulation (<70%).

These alarms are indicated by LED's for each transmitter in the upper middle of the keypad. These are indicated by

V = VSWR, P = Power, N = No Tone, and C = Continuous Tone

These alarms will cause a transmitter transfer in the case of a dual transmitter and a transmitter shutdown in the case of a single.

Two other alarms that are indicated on the LCD, but not by LED, are

Observed Frequency - This alarm occurs when the built in frequency counter detects the measured frequency is out of tolerance with the desired frequency.

Incorrect Identification - This alarm occurs when the monitoring circuitry detects a different Identifier from the desired Identifier. The LED's above the monitor enable switch indicate the present status of the transmitters. The PRI LED indicates the primary transmitter selected by the main TX select key is the operating transmitter. The SEC LED indicates failure in the Primary transmitter and the monitoring circuitry has commanded the transmitter to switch to the secondary transmitter. The fail LED indicates that both transmitters have failed and the system has shut down.

When testing the SE transmitter, Monitor Enable must be turned OFF.

4.2 Special Functions on the (SPCL FCTN) Key

All Functions are SPCL FCTN Key + Number

SPCL FCTN +1

This function stores all data into the onboard EEPROM. Once data is stored, the transmitter will come back to the original settings if AC and DC power are lost.

SPCL FCTN +6

This function is a special test mode. In this mode the Master Controller will test for improper identification. The Master Controller commands the Transmitter Control to add 32 to the ascii value of every ID character. After the transmitter changes identification, it is still sending back data on all of the parameters associated with that transmitter including identification. Once the identification changes, the Master Controller will institute a transmitter changeover and shutdown of the offending transmitter.

SPCL FCTN +7

This function is a special test mode. In this mode, the Master Controller will test for under power shutdown. The Master Controller commands the Transmitter Controller to decrease the output power by over 50%. As the transmitter changes power level, it is still sending back data on all of the parameters associated with that transmitter. Once the power level drops below an acceptable level, the Master Controller will institute a transmitter changeover and shutdown of the offending transmitter.

SPCL FCTN +8

This function calibrates the modulation power and frequency for each transmitter. This offset compensates for the error that exists between the Transmitter Control digital to analog converter and the measured output.

SPCL FCTN +9

This function configures the DCAD or network for SE systems.

SPCL FCTN +0 (Software not available at this time)

This function puts the Master Controller into a logging mode. It stores all pertinent data for a given interval.

SPCL FCTN + “Down Arrow Key” (Software not available at this time)

This test function tests the linearity of the forward/reflected power and modulation meter. First the Master Controller commands the Transmitter Control to increase the RF output power in increments of 5 Watts starting at 10 Watts and increasing to 125 Watts. It then reverses and decreases by 5 Watts until the transmitter returns to 10 Watts output. It then will start increasing the modulation level by 5% from 0 to 95%. The modulation then returns to 0% and the unit goes back to power increase and decrease.

5 Network Control Program Software (optional)

Network Requirements:

- Desktop or laptop personal computer (PC) running Vista, XP or Windows 7
- Operating System: Microsoft Windows
- Mouse or touchpad
- Windows Internet Explorer or FireFox
- Network IP capability
- Ethernet cable

5.1 Network IP Configuration

If the user does not have an IP address, set the IP address, network Mask, and gateway as described in Section [6.6 on page 6-14](#). In some instances you may need to contact your network administrator for assistance.

5.2 WEB Watch Program Software

The main **Web Watch** window is shown below, and the following four groups are used for transmitter system monitoring.

- Transmitter status (Power ON/OFF, Primary TX selected, ATU ON/OFF and voice present)
- System status (PRI, SEC, FAIL) and TX shutdowns / Faults
- Overall system parameters (i.e. Date/Time, Call Sign, Frequency, Fwd, Ref Power, etc.)
- Transmitter parameters include Built In Test Equipment readings for
 1. Power Control and Modulators Input/Output (PCM)
 2. Switching Power Amplifiers (SPA)

The Web Watch program includes ten operational controls buttons:

- Power (ON/OFF)
- Toggle (from TX1 or TX2 to allow LCD view / control)
- Monitor (Enable or Disable fault shutdown)
- Primary TX (TX1 or TX2)
- TX Setup (RF Frequency, Tone Frequency, Call Sign, TX Mode, RF Power Level, and Modulation Level)
- Calibration (Power Factor, Modulation Factor, Power Display Error, Frequency, and Antenna Factor)
- IP Configuration (IP Address, Network Mask, and Gateway)
- Time & Date
- Site Location
- Save



SE Series Dual Transmitter (Version 2.10)

TRANSMITTER 1 ●

PRIMARY	TEST	ATU	VOICE
TX1	●	●	●

System Status

Primary	Secondary	Fail	<input type="button" value="Reset"/>
●	●	●	

Shutdown / Fault

V	P	N	C	Fault: NONE
●	●	●	●	●

2012	April	11	Wednesday	14	40
Call Sign		Frequency Setting		Location	
SAC		320000Hz		SAC	
Forward Power	Reflected Power	Modulation	VSWR	Frequency Measured	Antenna(I)
113 W	0 W	97 %	1.00	320000 Hz	0.0 A
Battery Charge	Battery Discharge	Filter +5V	PWM Drive Level	MOD Drive Level	
-0.1 A	0.0 A	5.0 V	4.9 V	1.4 V	

[Primary TX](#)

[TX Setup](#)

[Calibration](#)

[IP Configuration](#)

[Time & Date](#)

[Location/Site](#)

[Save](#)

LOW VOLTAGE / HIGH VOLTAGE POWER SUPPLY STATUS

High Side (I)	Low Side (I)	HV Output	PWR Supply (V)	Battery Sample	Temperature
4.4 A	4.4 A	173 V	48 V	0 V	53.3 C
12VDC Supply	5VDC Supply				
12.0 V	4.9 V				

POWER CONTROL MODULATOR STATUS

PWR Control(I)	Modulator(I)	5VDC Supply	PWR Control V	VMOD (Out)	Temperature
●	●	5.1 V	94 V	41.0 V	51.9 C

SWITCHING POWER AMPLIFIER STATUS

RF Present	SPA(I) Fault	5VDC Supply	SPA Current	VMOD (In)	Temperature
●	●	5.1 V	2.1 A	42.9 V	46.2 C

Master Control Logging

```

000 2012-04-09 11:19:01 MC: LOG DATA CLR
001 2012-04-09 13:04:07 NB: RF FREQUENCY
002 2012-04-09 13:04:40 NB: TONE FREQ
003 2012-04-09 13:05:02 NB: CALL SIGN
                    
```

Figure 5-1. Web GUI Main Window

This page intentionally left blank.

6 System Site Configuration

6.1 Control Program Initialization

Once the SE250 has been installed, the system is ready for operation. The unit is powered on by the AC main breaker switch located on the Power Control Panel. Actuating this breaker begins the initialization process. The SE250 will proceed through two initialization screens on the LCD indicating which version of firmware is being used. When communicating with the factory, please have the version available. The system will default to transmitter 1 as the primary transmitter; LCD data on TX1, Monitor Enabled, FWD POWER meter, PA VOLTS meter, and System Status are also primary. All other functions are turned OFF. The initialization screens are as follows:

```

SE250
Southern Avionics Company
Beaumont Texas USA
Firmware Version X.XX © 2011

```

```

SE250
Initialization System
Please wait ...
MM-DD-YYYY

```

```

SE250
8-bit;1-stop;ODD-parity;19200
NO XON/XOFF
RCU ID: 0

```

```

SE SERIES [DUAL]           Fault: NONE
RF Frequency Setting ..... 320000 Hz
Tone Frequency Setting ..... 400 Hz
Call Sign: SAC             TX Mode: IDENT

```

NOTE: Normally the ATU switch should be in the ON position. If the ATU switch is OFF, the SE system will show the ATU message (shown below) automatically on the main menu.

***** ATU SWITCH IS OFF *****
Please check hardware.

The transmitter system will be defined in the upper left hand side of the screen following “SE SERIES” (see Main Menu above). If any faults exist, they will be shown in the upper right hand side of the screen. Additional display screens are chosen by using the UP and DOWN keys to more menus which show the overall / transmitter data.

The system utilizes the following four keys:

- LCD DATA - to choose TX1 or TX2 display and control.
- TEST MODE - to allow both transmitters to operate simutaniously for testing purposes.
- MAIN TX - to allow primary/secondary assignment monitor.
- MONITOR (system status: PRI, SEC, FAIL) - to enable or disable monitoring usually for testing purposes.

Use the **UP** key to cancel or go the previous menu anytime.

6.2 Primary Transmitter Selection

LCD DISPLAY

Use the **MAIN TX** key to change TX1 <->TX2 as primary transmitter.

Example: Press the **MAIN TX** key to change to TX2. The TX2 green indicator will illuminate and the TX1 indicator will extinguish.

WEB WATCH

In the SE SERIES TRANSMITTER Web Watch window, click on **Primary TX** from the right column box on the **Main** window to open the **Primary Transmitter** window, shown in [Figure 6-1. Primary Transmitter Window on Page 6-3.](#)



Figure 6-1. Primary Transmitter Window

6.3 Transmitter Display Selection

LCD DISPLAY

Use the **LCD DATA** key to select TX1 or TX2 for display / control of the transmitter.

WEB WATCH

Click on the **Toggle** button on the **Main** menu to toggle between TX1 and TX2 for display and control of the Transmitter.

6.4 Transmitter Setup

This section details how to set RF frequency, tone frequency, call sign, power and modulation as dictated by the site license.

6.4.1 RF Frequency Setup

LCD DISPLAY

Press the **FREQ** key to open the **RF FREQUENCY ENTRY** menu as shown below.

RF FREQUENCY ENTRY

FREQ should be between 190K and 535K Hz
 Enter RF Frequency: [320000] Hz

Repeat pressing the **FREQ** key to clear then enter the desired frequency in the field.

When the **ENTER** key is pressed, the RF power level will be set to 0 Watts immediately to protect the transmitter.

Press **SPCL FCTN** then **1** to store any changes.

WEB WATCH

In the SE SERIES TRANSMITTER Web Watch window, click on **Setup** in the right column box on the **Main** window to open the **Transmitter 1/2 : Setup** window shown in [Figure 6-2. Web GUI Transmitter Setup Window on Page 6-4.](#)

Transmitter 1 : Setup

<p style="text-align: center;">RF Frequency</p> <p style="text-align: center;">190K - 1800K (Hz)</p> <p style="text-align: center;">[320000] <input type="button" value="Set"/></p>	<p style="text-align: center;">Tone Frequency</p> <p style="text-align: center;">400 - 3000 (Hz)</p> <p style="text-align: center;">[1020] <input type="button" value="Set"/></p>	<p style="text-align: center;">Call Sign</p> <p style="text-align: center;">up to 8 characters</p> <p style="text-align: center;">[SAC] <input type="button" value="Set"/></p>
<p style="text-align: center;">Transmitter Mode</p> <p style="text-align: center;">Select CARR, IDENT, or CONT</p> <p style="text-align: center;">[IDENT] <input type="button" value="Set"/></p>	<p style="text-align: center;">RF Power Level</p> <p style="text-align: center;">0 - 125 (Watts)</p> <p style="text-align: center;">[100] <input type="button" value="Set"/></p>	<p style="text-align: center;">Modulation Level</p> <p style="text-align: center;">50 - 100 (%)</p> <p style="text-align: center;">[95] <input type="button" value="Set"/></p>

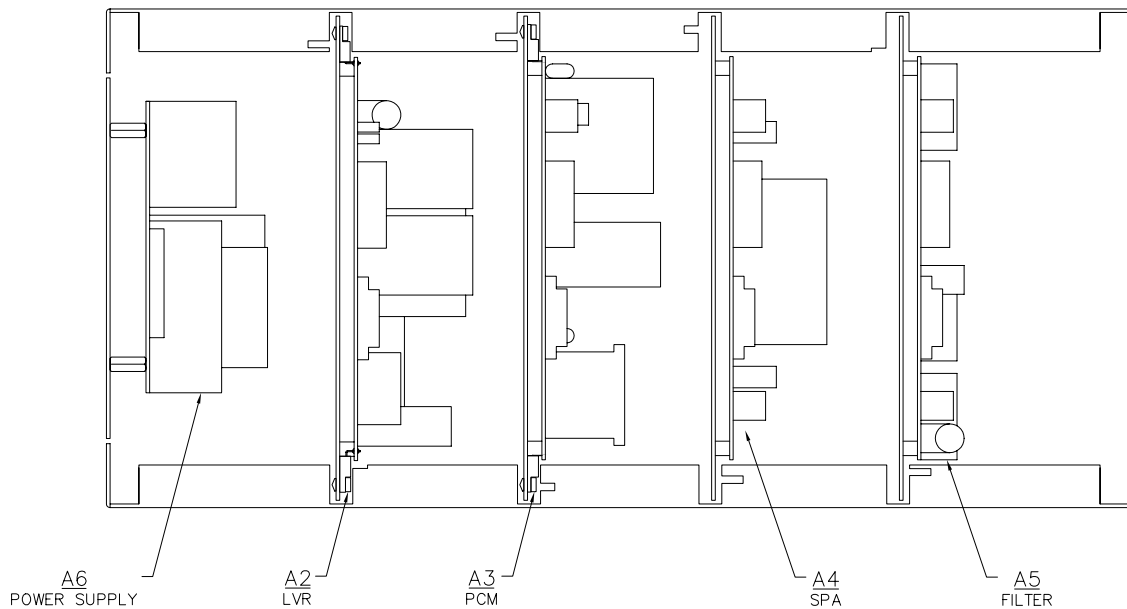
Figure 6-2. Web GUI Transmitter Setup Window

After making changes, click the **Set** button to send the value to **Transmitter Control** board memory.

Click the **Back** button to close the **Transmitter Setup** window and return to the **Main** window.



Warning Verify beforehand that any frequency selected is within the Filter/Bridge modules configuration limits as described below



SDF33030 Rev A

Figure 6-3. SE250 Transmitter Drawer Diagram

The Filter Assembly includes a modified 10 element Butterworth-Cauer low pass filter capable of more than 60dB harmonic attenuation. The assembly filters in the band (190-535kHz).

The Standard band filter is subdivided as follows:

Standard Band: 190-300kHz, 300-450kHz and 450-535kHz

These sub-bands are selected using on board jumpers, JP1 – JP10 as indicated in the table below.

Standard Band	190-300kHz	300-450kHz	450-535kHz
JP1	A,B,C,D,E	A,C,D	D
JP2	OPEN	B	A
JP3	A,B,C,D	A,B	B
JP4	A,B,C,D	A,B,D	D
JP5	OPEN	B	A
JP6	D	A,C	B
JP7	C,D	A,B,C	C
JP8	OPEN	B	A
JP9	A,B,C,D	B,D	C, D
JP10	C,D,E	B,D	A,E

Medium Band	500-750kHz	700-950kHz	900-1250kHz
JP1	E	A,D	B,C
JP2	OPEN	B	A
JP3	B,D	A,D	A,C
JP4	A,B,C,D,E	A,B,C,D	B,C
JP5	OPEN	B	A
JP6	C,D	A,D	B,C
JP7	A,B,D	D	A,C
JP8	OPEN	B	A
JP9	A,D	A,C	A,B,D
JP10	A,C,D	A,D	B,C

High Band 1500-1800kHz			
JP1	A,B	JP6	A
JP2	OPEN	JP7	A,B
JP3	A	JP8	OPEN
JP4	A,	JP9	A
JP5	OPEN	JP10	A,B

6.4.2 Tone Frequency Setup

LCD DISPLAY

Press the **TONE** key to toggle between 400 Hz or 1020 Hz.

WEB WATCH

In the **Transmitter 1 : Setup** window, for instance, Transmitter 1 is selected as shown in [Figure 6-2. Web GUI Transmitter Setup Window on Page 6-4](#). Enter the desired tone frequency and click the **Set** button to send the desired value to the **Transmitter Control** board.

When the transmitter setup is done completely, click the **Back** button to close the **Transmitter Setup** window and return to the **Main** window.

6.4.3 Call Sign Setup

LCD DISPLAY

Press the **CALL SIGN** key to open the **CALL SIGN ENTRY** menu, as shown below.

<p style="text-align: center;">CALL SIGN ENTRY Maximum 8 Characters</p> <p>Entry Call Sign: SAC</p>
--

Repeat pressing the **CALL SIGN** key to clear the entry in the field box.

Press the **ENTER** key when complete.

WEB WATCH

In the **Transmitter 1 : Setup** window shown in [Figure 6-2. Web GUI Transmitter Setup Window on Page 6-4](#). Set the Call Sign as desired, then click the **Set** button to send the value to **Transmitter Control** board memory.

When transmitter setup is complete, click the **Back** button to close the **Transmitter Setup** window and return to the **Main** window.

6.4.4 Transmitter Mode Setup

There are three options CARR, CONT, IDENT.

LCD DISPLAY

Press the **MODE** key to toggle the CARR, CONT, IDENT


Example: change from IDENT to CARR by pressing the **MODE** key on the LCD screen as shown below

```
SE SERIES [DUAL]                Fault: NONE
RF Frequency Setting ..... 320000 Hz
Tone Frequency Setting ..... 400 Hz
Call Sign: SAC                   TX Mode: CARR
```

WEB WATCH

Select the desired mode from the pulldown menu and click on **Set** to send the mode to the Transmitter Control board memory.

6.4.5 RF Power Level Setup

	<p>Caution Ensure that the RF Frequency setting corresponds to that of the Filter PCB.</p>
---	---

LCD DISPLAY

Press the **OUTPUT POWER** key to open the **RF POWER SETTING** menu, as shown below

```
----- RF POWER SETTING -----  
  
POWER should be between 0 and 250.  
Enter RF Power Level: [250] watts
```

Repeat pressing the **OUTPUT POWER** key to clear the RF power level in the field box. Enter the desired power using the keypad.

When the **ENTER** key is pressed, the Master Control will send the desired level to Transmitter Control board memory.

WEB WATCH

Operates similarly to the LCD DISPLAY above.

6.4.6 Modulation Level Setup

LCD DISPLAY

Press the **MOD LEVEL** key to open the **MODULATION SETTING** menu, as shown below

```
----- MODULATION SETTING -----  
  
MOD Level should be between 0% and 100%.  
Enter Modulation Level: [ 95]%
```

Repeat pressing the **MOD LEVEL** key to clear the modulation level in the field box.

Enter the mod level desired using the keypad.

WEB WATCH

Operates similar to the LCD DISPLAY above.

6.5 Transmitter Calibration

This section details how to calibrate the RF Frequency output, the RF output power, the Modulator output and the RF power displayed.

Using the **SPCL FCTN** key to open the special function menu as shown below

```
1=STORE          7=PWR TEST
2=LOGGING        8=CALIBRATE
5=RCU            9=SYSTEM
6=ID TEST
```

Select the **8** key to open the calibration menu as shown below

```
Select the following key -----
1.Power Factor Cal  4.Power Display Error
2.MOD Factor Cal
3.Frequency Calibration
```

6.5.1 (Power factor) Calibration (output adjustment)

Transmitters are factory calibrated at 250W for an operating range of 25-250 Watts. Power calibration should **only** be done locally with the system connected to a 50 Ohm dummy load, or incorrect readings could result.

LCD DISPLAY

Press the **1** key to open the **POWER FACTOR CALIBRATION** menu, as shown below.

```
----- POWER FACTOR CALIBRATION -----

Power Factor should be between 5 and 250.
Enter power factor: [100]
```

Enter the **Power Factor** value in the field box to make the value measured, by either a power meter or oscilloscope, agree with the output power selected. If the measurement is being made using an oscilloscope, the power factor value should be adjusted until the waveform's peak-to-peak voltage reaches the correct value.

$$P = \left(\frac{V_{PP}}{2\sqrt{2}} \right)^2 / R_{DUMMY\ LOAD}$$

Observe that the value displayed in the Forward Power comes into agreement with the true power measured by the power meter or the oscilloscope.

Press the **ENTER** key to store then exit.

WEB WATCH (Locally connected)

In the SE SERIES TRANSMITTER Web Watch window, click on **Calibration** in the right column box on the **Main** window to open the **Transmitter 1 : Calibration** window shown in [Figure 6-4. Web GUI Transmitter Calibration Window on Page 6-11.](#)

Operation is similar to the LCD DISPLAY above. Click **set** to save the change.

Transmitter 1 : Calibration

Power Factor 5 - 250 <input type="text" value="100"/> <input type="button" value="Set"/>	Power Display Error 5 - 250 <input type="text" value="110"/> <input type="button" value="Set"/>	Modulation Factor 5 - 250 <input type="text" value="100"/> <input type="button" value="Set"/>
Frequency <input type="button" value="Calibrate"/>	Tone Factor (1020HZ) 5 - 250 <input type="text" value="110"/> <input type="button" value="Set"/>	Antenna Current Factor 5 - 250 <input type="text" value="108"/> <input type="button" value="Set"/>

Figure 6-4. Web GUI Transmitter Calibration Window

6.5.2 Modulation Factor Calibration (display adjustment)

LCD DISPLAY

Press the **2** key to open the **MODULATION CALIBRATION** menu, as shown below.

```
---- MODULATION FACTOR CALIBRATION ----  
  
MOD Factor should be between 5 and 250.  
Enter modulation factor: [100]
```

Set the modulation level to 100%. Verify that this is actually 100% modulation by monitoring the RF waveform envelope on the dummy load. Vary the MOD Factor and press enter. Do this until the displayed modulation is 95%

WEB WATCH (Locally connected)

Operates similar to the LCD DISPLAY above. See [Figure 6-4. Web GUI Transmitter Calibration Window on Page 6-11.](#)

6.5.3 Frequency Calibration (display adjustment)

LCD DISPLAY

Press the **3** key to open the **FREQUENCY CALIBRATION** menu, as shown below.

```
----- FREQUENCY CALIBRATION -----  
Setting: 320000HZ           Measured: 320000HZ  
  
ENTER = Calibrate
```

Enter the measurement from the test frequency counter and press the **ENTER** key. After a few moments, the measured frequency displayed on the LCD screen should agree with the test equipment measurement. After a few seconds, the screen returns to the home menu automatically.

WEB WATCH (Locally connected)

Operates similar as LCD DISPLAY above. See [Figure 6-4. Web GUI Transmitter Calibration Window on Page 6-11](#)

6.5.4 Power Display Error Calibration (display adjustment)

Note: Scope connected to 50 Ohm dummy load to read true output power.

LCD DISPLAY

Press the 4 key to open the **POWER TARGET CALIBRATION** menu, as shown below.

```
--- POWER DISPLAY ERROR CALIBRATION ---  
  
P.D.E Factor should be between 5 and 250  
Enter power target factor: [100]
```

Change the factor number and press return to achieve the proper LCD RF power readout agreeing with the scope.

WEB WATCH

NONE

6.5.5 Antenna Calibration

LCD DISPLAY

NONE

WEB WATCH See [Figure 6-4. Web GUI Transmitter Calibration Window on Page 6-11](#)

- Under Calibration, verify the antenna factor is set to 10 (default).
- The displayed value of antenna current should be made to agree with the value on the ATU meter by adjusting the factor until identical readings are achieved.

When the transmitter calibration is complete, click the **Back** button to close the **Transmitter Calibration** window and return to the Main window.

6.6 DCAD (DC Automatic Disconnect)

LCD DISPLAY

Press the **SPCL FCTN** key, then the **9** key to open the **SE SYSTEM** menu, as shown below.

```
----- SE SYSTEM -----  
1. DCAD . . . . . [OFF]  
2. Network  
   Press ENTER key to confirm, then exit.
```

Press the **1** key repeat to toggle “ON” or “OFF” on the LCD screen, then the ENTER key to exit. ENTER must be pressed to store the selection.

WEB WATCH

Operates similar to the LCD DISPLAY above.

6.7 Network IP Configuration

LCD DISPLAY

Press the **SPCL FCTN** key, then the **9** key to open the **SE SYSTEM** menu, as shown below.

```
----- SE SYSTEM -----  
1. DCAD . . . . . [OFF]  
2. Network  
   Press ENTER key to confirm, then exit.
```


Press the **2** key to open the Network IP on the LCD screen, then select one of the following numbers:

- 1 DHCP
- 2 IP Address
- 3 Netmask
- 4 Gateway

1. DHCP: [ENABLED]
2. IP Address: 192.168.1.122
3. Netmask: 255.255.255.0 Press ENTER
4. Gateway: 192.168.1.1 to confirm

Press the **Enter** key to confirm the Network IP settings.

WEB WATCH (Read Only)

In the SE SERIES TRANSMITTER Web Watch window, click on the **IP Configuration** from the right column box on the **Main** menu to open the **Network : IP Configuration** window, shown in [Figure 6-5. Web GUI Network IP Configuration Window on Page 6-15.](#)

Network : IP Configuration

IP Address
192.168.1.124
Network Mask
255.255.255.0
Gateway
192.168.1.1
DHCP Select
DHCP: Enabled

Figure 6-5. Web GUI Network IP Configuration Window

6.8 Time & Date Setting

LCD DISPLAY

NONE

WEB WATCH

In the SE SERIES TRANSMITTER Web Watch window, click on the **Time & Date** from the right column box on the **Main** menu to open the **Time & Date Setting** window, shown in [Figure 6-6. Web GUI Time & Date Setting Window on Page 6-16.](#)

Year	Month	Day of Month
2000-2099 11	January - December June	1-31 21
Day of Week	Hours	Minutes
Sunday - Saturday Tuesday	0 - 23 09	0 - 59 38

Submit

Figure 6-6. Web GUI Time & Date Setting Window

After setting parameters desired, click the **Submit** button to store them in Netburner EEPROM memory.

6.9 Location Site Setting

LCD DISPLAY

NONE

WEB WATCH

In the SE SERIES TRANSMITTER Web Watch window, click on the **Location Site** in the right column box on the **Main** window to open the **Location Site** window, shown in [Figure 6-7. Web GUI Location Site Window on Page 6-17](#).



Figure 6-7. Web GUI Location Site Window

A maximum of 30 characters are allowed for the location site name. Click the **Submit** button to store in (EEPROM) memory on the NETBURN board.

6.10 Monitor Enable

LCD DISPLAY

Press the **ENABLE** key to open the **MONITOR** menu, as shown below (transmitter 1 is selected).

```

-----  TRANSMITTER 1  -----
MONITOR . . . . . [ENABLED]
  Press ENTER key to confirm, then exit.
  
```

Press **ENABLE** to toggle “ENABLED” or “DISABLED” on the LCD screen, then the **ENTER** key to exit. **ENTER** must be pressed to store the selection.

WEB WATCH

Operates similar to the LCD DISPLAY above.

6.11 Transmitter Data

Using the DOWN or UP arrow key to view the following previous or next menu as below:

```
----- TRANSMITTER 1 -----  
FORWARD PWR : 100W   VSWR      : 1.00  
REFLECTED PWR:  0W   ANTENNA(I): 2.4A  
MODULATION:   95%   FREQ      : 320000HZ
```

```
----- TRANSMITTER 1 -----  
PWM DRV LVL: 4.9V   MOD DRV LVL: 1.3V  
FILTER +5V : 5.0V  
BTRY CHARGE: 2.7A   BTRY DISCH : 2.1A
```

```
----- LV/HVPS STATUS (1 of 2) -----  
PWR SUPPLY(V): 48V   BTRY SAMPLE: 48V  
HIGH SIDE(I) : 4.5A  LOW SIDE(I) : 4.4A  
HV OUTPUT    : 173V  TEMPERATURE: 32.1C
```

```
----- LV/HVPS STATUS (2 of 2) -----  
12VDC SUPPLY: 12.0V   5VDC SUPPLY: 5.0V
```

```
----- POWER CONTROL MODULATOR STATUS -----  
PWR CTRL (I): PASS  MODULATOR(I): PASS  
POWER CTRL V:  96V  VMOD (OUT)  : 41.2V  
TEMPERATURE  : 34.1C  5VDC SUPPLY : 5.0V
```

```
--- SWITCHING POWER AMPLIFIER STATUS ---  
RF PRESENT : PASS   SPA(I) FAULT: PASS  
SPA CURRENT: 2.2A   VMOD (IN) : 42.1V  
TEMPERATURE: 31.2C 5VDC SUPPLY : 5.0V
```

6.12 Active Monitoring and Control

Transmitter shutdown (single) or transfer (dual) conditions:

- loss of modulation (carrier only, duration = 30 sec)
- low modulation (70%, duration = 30 sec)
- continuous modulation (no keying, duration = 30 sec)
- low power (50%, duration = 30 sec)
- high power (125%, duration = 30 sec)
- VSWR (> 2.62:1, duration = 2 sec)
- under-temperature (< - 40C, duration = 120 sec)
- over-temperature (> 70C, duration = 120 sec)
- under-frequency (> 100Hz, duration = 120 sec)
- over-frequency (> 100Hz, duration = 120 sec)
- ID sequence error (immediate action)

SE250 Series Transmitter

User Software Default Setup

Version 2.01

SITE CONFIGURATION	
Location	<Blank>
Call Sign	"SAC"
Tone Frequency	1020 Hz
RF Frequency	320K Hz
DOT	125m sec
DOT SPACE	125m sec
DASH	375m sec
DASH SPACE	375m sec
WAIT SPACE	2 sec
SHUTDOWN	
Monitor	Enable
VSWR	2.62
VSWR Timeout	5 sec
Power – Low	-3dB
Power – High	+2dB
Power – Timeout	30 sec
Modulation – Low	70%
Continuous Tone	30 sec
Modulation – Timeout	30 sec
OTHER SHUTDOWN	
Power Supply (230VAC)	< 195VAC
DCAD – Low Voltage	< 114V
DCAD Enable	YES
Temperature	-40°C to 70°C
Temperature Timeout	120 sec
Frequency PPM	100 Hz
Frequency Timeout	120 sec
CALIBRATION	
Power Factor	100
Dummy Load	50 OHM
Modulation Factor	100
Co-Efficient (0)	0.0300490
Co-Efficient (1)	0.0138441
Antenna Factor	10
TRANSMITTER	
Primary Transmitter	Transmitter 1
Transmitter Mode	IDENT
Auto RF Power Up at Startup	YES
LOCAL / REMOTE CONTROL PANEL	

RF Meter	FWD POWER
PA Meter	PA VOLTS
LCD Data	TX1
LED - AUTO RESET ON	OFF
LED – ALERT TONE ON	OFF
LED – TX1 TX2 ON (Test Mode)	OFF
LED - MONITOR	PRI
LED – MAIN TX	TX1

6.13 Logging Firmware

Logging Requirements:

- FRAM device, U27, on the Master Control board SLP43300
- Use of the Real Time Clock device on the Master Control board
- Latest firmware installed in both the Master Control and Embedded Ethernet Server.

In either a dual or a single SE Transmitter system, the SE Master Control panel firmware records Date & Time stamp, Transmitter fault/shutdown and any Operator changes using U27's 32K bytes of FRAM on the Master Control board. The standard format follows:

nnn YYYY-MM-DD hh:mm:ss dddddddddddddddd

nnn = logged line number (3 characters)

YYYY = year (4 chars)

MM = month (2 chars)

DD = day of month (2 chars)

hh = hour (2 chars)

mm = minutes (2 chars)

ss = seconds (2 chars)

d... = data type. Either TX fault/shutdown or User changes (16 chars)

6.13.1 Local Logging

The user has the option to view, on the Master Control panel, logged data containing Faults, Shutdowns and User Changes recorded for TX1 and TX2 for dual systems. When the LCD DATA key is set for TX1's data display, logged data represents only TX1's activity. Alternately, when the LCD DATA key is set for TX2's data display, logged data represents TX2's activity. A total of 300 lines of logged data for TX1 and another 300 lines logged for TX2 is available for the customer to scroll through at any given time. Once the 300 line limit is reached the oldest entry will fall out of the history. There are 40 bytes (characters) maximum on each line (row) on the LCD display as seen below. Two functions allow the user to manage the logged data at the LCD "View" and

“Clear”. Below are examples of the front panel LCD. The Master Control panel captures any user changes from the Web Watch screen or the Remote Control Unit.

The user presses the **SPCL FCTN** key to open the standard window below.

1=STORE	7=PWR TEST
2=LOGGING	8=CALIBRATE
5=RCU	9=SYSTEM
6=ID TEST	

By pressing the **2** key for Logging the logging menu below is seen.

-----	Logging	-----
1. Clear		2. View
Please ENTER to exit		

6.13.1.1 Logging – Clear

Press the **1** key to clear all TX logged data as shown below. The Please Wait processing message will appear on the LCD display.

You can verify the cleared logged data message is viewed correctly by pressing the **SPCL FCTN + 2 + 2** keys to view the logged data window shown below.

000 2012-03-21 08:12:57 MC: LOG DATA CLR
--

6.13.1.2 Logging – View

Press the SPCL FCTN + 2 + 2 keys to see the SE system’s newest logged data on the LCD display.

By using the ▲ or ▼ key the user can view all logged events.

	<u>Logging No</u>	<u>Date</u>	<u>Time</u>	<u>TX Fault or Operating Change</u>
	↓	↓	↓	↓
Oldest →	000	2012-03-05	14:12:03	MC: LOG DATA CLR
	001	2012-03-19	10:01:57	MC: SYSTEM RESET
	002	2012-03-20	06:12:44	AC FAILURE
	003	2012-03-20	06:15:21	PWR UP COMPLETE

By pressing the ▲ key, older data is viewed. By pressing the ▼ key, newer data is viewed.

Newest →	004	2012-03-20	06:16:57	MC: OUTPUT POWER
	005	2012-03-20	06:17:04	MC: MONITOR
	006	2012-03-20	06:22:05	FAULT: NO TONE
	007	2012-03-20	06:23:19	MC: SYSTEM RESET

If the user wishes to exit to the Home menu, press the **ENTER** key.

6.13.2 Remote Logging (Web Watch)

Web Watch continuously requests all logged information stored in FRAM on the Master Control Panel. The following five buttons on the Web Watch window are used to view and clear data. The remote Web Watch screen shows the same information as the Local LCD display described above.

5. **First** – selected to view the oldest logged data.
6. **Next** – selected to view the next group of four data lines.
7. **Previous** – selected to view the previous group of four data lines.
8. **End** – selected to view the newest logged data.
9. **Clear All** – clear all logging data on TX (TX1 or TX2)



SE Series Dual Transmitter (Version 2.10)

TRANSMITTER 1 ● Power Off Toggle Monitor Enable

PRIMARY	TEST	ATU	VOICE
TX1	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>

System Status

Primary	Secondary	Fail	
<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="button" value="Reset"/>

Shutdown / Fault

V	P	N	C	Fault: NONE
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2012	April	11	Wednesday	14	40
Call Sign		Frequency Setting		Location	
SAC		320000Hz		SAC	
Forward Power	Reflected Power	Modulation	VSWR	Frequency Measured	Antenna(I)
113 W	0 W	97 %	1.00	320000 Hz	0.0 A
Battery Charge	Battery Discharge	Filter +5V	PWM Drive Level	MOD Drive Level	
-0.1 A	0.0 A	5.0 V	4.9 V	1.4 V	
LOW VOLTAGE / HIGH VOLTAGE POWER SUPPLY STATUS					
High Side (I)	Low Side (I)	HV Output	PWR Supply (V)	Battery Sample	Temperature
4.4 A	4.4 A	173 V	48 V	0 V	53.3 C
12VDC Supply	5VDC Supply				
12.0 V	4.9 V				
POWER CONTROL MODULATOR STATUS					
PWR Control(I)	Modulator(I)	5VDC Supply	PWR Control V	VMOD (Out)	Temperature
<input checked="" type="radio"/>	<input checked="" type="radio"/>	5.1 V	94 V	41.0 V	51.9 C
SWITCHING POWER AMPLIFIER STATUS					
RF Present	SPA(I) Fault	5VDC Supply	SPA Current	VMOD (In)	Temperature
<input checked="" type="radio"/>	<input checked="" type="radio"/>	5.1 V	2.1 A	42.9 V	46.2 C

Primary TX
TX Setup
Calibration
IP Configuration
Time & Date
Location/Site
Save

Master Control Logging

```

000 2012-04-09 11:19:01 MC: LOG DATA CLR
001 2012-04-09 13:04:07 NB: RF FREQUENCY
002 2012-04-09 13:04:40 NB: TONE FREQ
003 2012-04-09 13:05:02 NB: CALL SIGN
                    
```

First

Next

Previous

End

Clear All

6.14 List of Logging Label Names

The maximum 16 display characters (see below) of TX fault, shutdown, and user changes are added to the end string of Date and Time stamp plus one space character per line.

For example:

000 2012-03-23 14:20:55 (16 characters of data)

The following TX faults can occur on either Transmitter 1 or Transmitter 2 and will be logged:

- VSWR
Display: "FAULT: VSWR"
- Low Power
Display: "FAULT: LOW POWER"
- High Power
Display: "FAULT: HIGH PWR"
- No Tone
Display: "FAULT: NO TONE"
- Low Modulation
Display: "FAULT: LOW MOD"
- Continuous Tone
Display: "FAULT: CONT TONE"
- ID Code
Display: "FAULT: ID CODE"
- Over/Under Frequency
Display: "FAULT: FREQUENCY"
- MOD Temperature
Display: "FAULT: MOD TEMP"

- SPA Temperature
Display: "FAULT: SPA TEMP"

- HVPS Temperature
Display: "FAULT: HVPS TEMP"

- Power Control(I) Overload 1
Display: "FAULT: PWR CTLi1"

- Power Control(I) Overload 2 (500 Watt TX)
Display: "FAULT: PWR CTLi2"

- Power Control(I) Overload 3 (1000 Watt TX only)
Display: "FAULT: PWR CTLi3"

- Power Control(I) Overload 4 (1000 Watt TX only)
Display: "FAULT: PWR CTLi4"

- Modulator(I) Overload 1
Display: "FAULT: MOD(I) 1"

- Modulator(I) Overload 2 (500 Watt TX)
Display: "FAULT: MOD(I) 2"

- Modulator(I) Overload 3 (1000 Watt TX only)
Display: "FAULT: MOD(I) 3"

- Modulator(I) Overload 4 (1000 Watt TX only)
Display: "FAULT: MOD(I) 4"

- SPA(I) Overload 1
Display: "FAULT: SPA(I) 1"

- SPA(I) Overload 2 (500 Watt TX)
Display: "FAULT: SPA(I) 2"

- SPA(I) Overload 3 (1000 Watt TX only)
Display: "FAULT: SPA(I) 3"

- SPA(I) Overload 4 (1000 Watt TX only)
Display: "FAULT: SPA(I) 4"

- RF Present

Display: "FAULT: RF DDS"

- I2C Timeout

Display: "I2C TIMEOUT" (not available)

- AC Failure

Display: "AC FAILURE"

- TX Mismatch (checksum)

Display: "TX MISMATCH" (not available)

- DCAD – Low Voltage

Display: "DCAD LOW VOLTAGE"

- Software Error

Display: "SOFTWARE ERROR" (not available)

The following are **User Induced Operating Changes** which will be logged when acted on.

LCD display:

Master Control (MC = Front Panel Changes)

- "MC: RF FREQUENCY"
- "MC: TONE FREQ"
- "MC: CALL SIGN"
- "MC: TX MODE"
- "MC: OUTPUT POWER"
- "MC: MOD LEVEL"
- "MC: AUTO RESET" (not available)
- "MC: TEST MODE ON"
- "MC: MAIN TX"
- "MC: SYSTEM RESET"
- "MC: MONITOR"
- "MC: POWER CAL"
- "MC: PWR DSP CAL"
- "MC: TONE CAL"
- "MC: FREQ CAL"
- "MC: MOD CAL"
- "MC: ANTENNA CAL"
- "MC: STORE EEPROM"

- “MC: DCAD SET”
- “MC: NETWORK SET”
- “MC: RCU SET”
- “MC: LOG DATA CLR”
- “MC: PASSWORD” (not available)

Netburner (NB = Web Interface Changes)

- “NB: RF FREQUENCY”
- “NB: TONE FREQ”
- “NB: CALL SIGN”
- “NB: TX MODE”
- “NB: OUTPUT POWER”
- “NB: MOD LEVEL”
- “NB: MAIN TX”
- “NB: SYSTEM RESET”
- “NB: MONITOR”
- “NB: POWER CAL ”
- “NB: PWR DSP CAL ”
- “NB: TONE CAL ”
- “NB: FREQ CAL ”
- “NB: MOD CAL ”
- “NB: ANTENNA CAL ”
- “NB: STORE EEPROM”
- “NB: RTC SET”
- “NB: LOG DATA CLR”
- “NB: PASSWORD” (not available)
- “NB: TX POWER OFF”
- “NB: TX POWER ON”

Remote Control Unit (RC = RCU Changes)

- “RC: TX POWER OFF”
- “RC: TX POWER ON”
- “RC: MAIN TX”
- “RC: SYSTEM RESET”

Default SE Transmitter System level sequences or changes

- “PWR UP COMPLETE”
- “DISABLE ALL” (not available)
- “ATU SWITCH OFF”

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7 Operational Checks

At the heart of the SE series system is a class D Power Amplifier that operates through a low pass filter, with RF sourced from a Direct Digital Synthesizer (DDS). The embedded microprocessor lends itself nicely to automatic adjustment of system operating parameters. However, to ensure proper operation, verification with calibrated test equipment is required.

7.1 Test Equipment Required

3 1/2 digit digital multi-meter (DMM), calibrated

dual trace oscilloscope, calibrated

frequency counter, calibrated (± 1 Hz accuracy)

1000 Watt, 50 Ohm non-reactive dummy load

7.2 Dummy Load Hookup

Connect a 250 Watt, 50 Ohm, non-reactive dummy load to the RF output jack (J3), an N Type RF connector, on the back of the transmitter.

7.3 Power Up

Switch the AC switch (S2) to the ON position

7.4 Power Up Verification

Observe the following sequence of Front Panel LCD displays:

<p style="text-align: center;">SE250 Southern Avionics Company Beaumont Texas USA Firmware Version X.XX © 2011</p>
--

```
SE250
Initialization System
Please wait ...
MM-DD-YYYY
```

```
SE SERIES [DUAL]           Fault: NONE
RF Frequency Setting ..... 320000 Hz
Tone Frequency Setting ..... 1020 Hz
Call Sign: SAC             TX Mode:IDENT
```

7.5 Transmitter #1 RF Power Level Checks

7.5.1

Connect an oscilloscope or a calibrated power meter to the system's RF output at the dummy load.

7.5.2

Use the **MAIN TX** key to select TX1 as primary transmitter. Green LED's will illuminate indicating which TX is Primary. Select TX1 as Primary.

7.5.3

Use the **LCD DATA** key to select TX1 as the display / control transmitter data.

7.5.4

In the Monitor section press the **ENABLE** key until "Disabled" is displayed on the LCD. Press **ENTER** to store this condition. This action will be necessary until shutdown testing is performed later in this section.

7.5.5

Press the **FREQ** key to open the **RF FREQUENCY ENTRY** menu, as shown below.

```
RF FREQUENCY ENTRY  
FREQ should be between 190K and 535K Hz  
Enter RF Frequency: [ 320000] Hz
```

7.5.6

Enter the desired frequency of operation using the numeric keypads then press **ENTER** to store the selection. (If necessary press the **FREQ** key repeatedly to clear the RF frequency field).

7.5.7

Press the **TONE** key to toggle between 400 Hz and 1020 Hz modulation frequency.

7.5.8

Enter the desired call-sign using the numeric keypads then press **ENTER** to store the selection. Press the **CALL SIGN** key to open the **CALL SIGN ENTRY** menu, as shown below. (If necessary press the **CALL SIGN** key repeatedly to clear the call sign field).

```
CAL SIGN ENTRY  
Enter 1 to 8 Characters  
  
Entry Call Sign: SAC
```

7.5.9

Press the **MODE** key to toggle the CARR, IDENT, CONT., to Carrier Mode (CARR).

7.5.10

Press the **OUTPUT POWER** key to open the **RF POWER SETTING** menu, as shown below.

```
----- RF POWER SETTING -----  
  
POWER should be between 0 and 250.  
Enter RF Power Level: [250] watts
```

7.5.11

Key in the desired power level for the site and press **ENTER** to store and activate that level. In a few seconds, the power output level selected should register on the meter and voltage on the PA meter should be indicated.

Record the readings for PA voltage and PA current for reference data to be used in Section 10 for proper Antenna tuning and matching.

7.5.12

Verify the output RF power level measured at the dummy load agrees (within 5%) with the value displayed on the LCD in the Transmitter 1 section.

7.6 Transmitter #1 Modulation Level Check

7.6.1

Press the **MOD LEVEL** key to open the **MODULATION SETTING** menu, as shown below.

```
----- MODULATION SETTING -----  
  
MOD Level should be between 0% and 100%.  
Enter Modulation Level: [ 95]%
```

Press the **MOD LEVEL** key repeatedly to clear the modulation level box.

Enter 95% modulation and press **ENTER** to store that level.

7.6.2

Scope the modulation waveform and record the max/min envelope values to calculate the modulation percentage. $(v_{max}-v_{min})/(v_{max}+v_{min})=mod\%$

7.6.3

Verify the set modulation percentage (displayed on the LCD) and the calculated modulation percentage agree to within 5%.

7.7 Transmitter #1 Frequency Checks

7.7.1

As an example, when calibrating RF output frequency, International Civil Aviation Organization (ICAO) regulations state a maximum variance of ± 100 parts per million (ppm) Hertz is allowed provided the output frequency is less than 1606.5 kHz.

The formula for calculating the variance at 100ppm is:

$$\text{variance} = (\text{operating frequency} * 100) / 1,000,000$$

For example, at 320,000 kHz the variance allowed would be 32 Hz.

7.7.2

Connect a calibrated frequency counter to the dummy load to measure the RF output frequency.

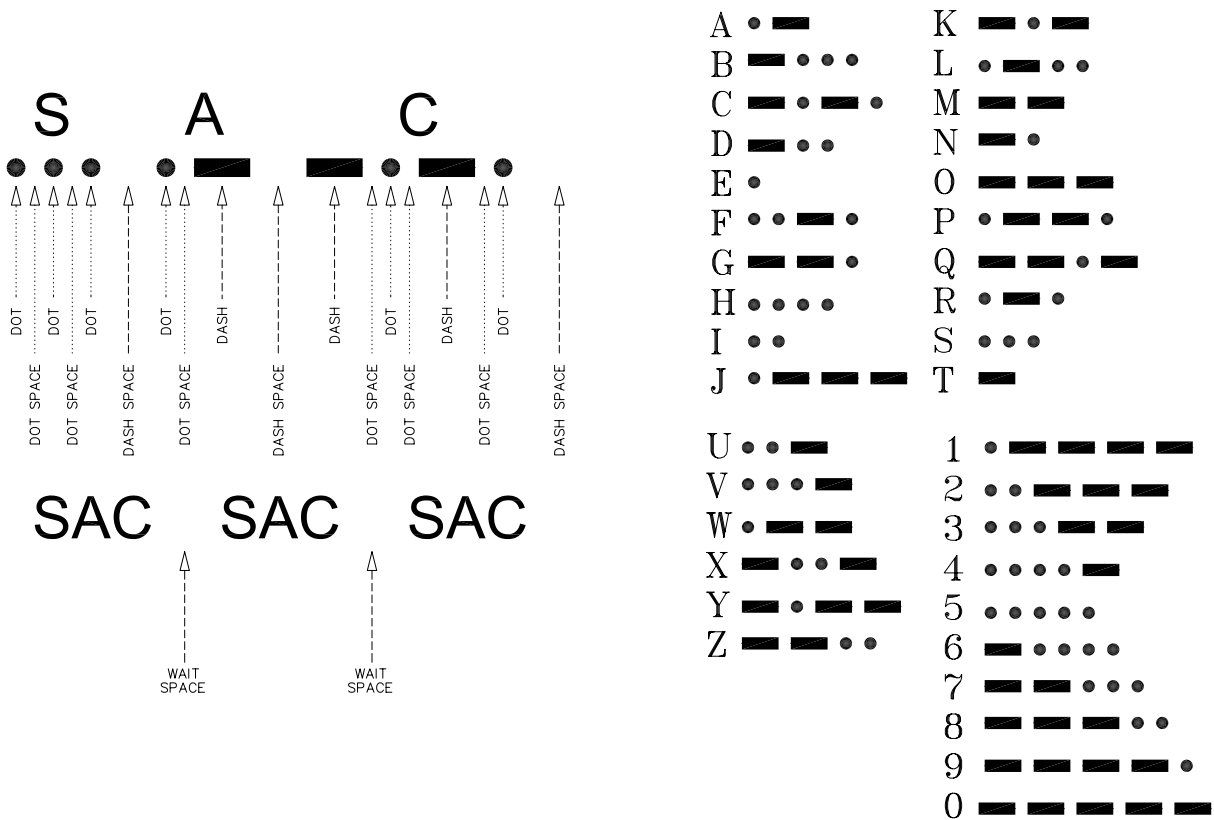
7.7.3

Verify the measured frequency equals the site frequency ± 100 ppm Hz. If the frequency is within this tolerance, disconnect the frequency counter. If it is out of tolerance, verify frequency counter's accuracy, and contact Southern Avionics' technical department for further assistance.

7.8 Transmitter #1 Morse Code Identifier Check

7.8.1

Attach the oscilloscope to the dummy load and verify the output RF modulation envelope is being keyed with the site's required Morse code identifier entered earlier in this section. Refer to [Figure 7-1. Morse code Identifier detail on Page 7-6](#) to assist in verification.



SDE10060 Rev A
Figure 7-1. Morse code Identifier detail

7.8.2

This completes general operational tests of transmitter #1.

7.9 Transmitter #2 RF Power Level Checks

7.9.1

Connect an oscilloscope or a calibrated power meter to the system's RF output at the dummy load.

7.9.2

Use the **MAIN TX** key to select TX2 as primary transmitter. Green LED's will illuminate indicating which TX is Primary. Select TX2 as Primary.

7.9.3

Use the **LCD DATA** key to select TX2 as the display / control transmitter data.

7.9.4

In the Monitor section press the **ENABLE** key until "Disabled" is displayed on the LCD. Press **ENTER** to store this condition. This will be necessary until shutdown testing is performed later in this section.

7.9.5

Press the **FREQ** key to open the **RF FREQUENCY ENTRY** menu, as shown below.

```
RF FREQUENCY ENTRY
FREQ should be between 190K and 535K Hz
Enter RF Frequency: [ 320000] Hz
```

7.9.6

Enter the desired frequency of operation using the numeric keypads then press **ENTER** to store the selection. (If necessary press the **FREQ** key repeatedly to clear the RF frequency field).

7.9.7

Press the **TONE** key to toggle between 400 HZ and 1020 HZ modulation frequency.

7.9.8

Enter the desired call-sign using the numeric keypads then press **ENTER** to store the selection. Press the **CALL SIGN** key to open the **CALL SIGN ENTRY** menu, as shown below.

```
          CAL SIGN ENTRY
        Enter 1 to 8 Characters

Entry Call Sign: SAC
```

7.9.9

Press the **MODE** key to toggle the CARR, IDENT, CONT. to Carrier Mode (CARR).

7.9.10

Press the **OUTPUT POWER** key to open the **RF POWER SETTING** menu, as shown below.

```
----- RF POWER SETTING -----

POWER should be between 0 and 250.
Enter RF Power Level: [250] watts
```

7.9.11

Key in the desired power level for the site and press **ENTER** to store and activate that level. In a few seconds, the power output level selected should register on the meter and voltage on the PA meter should be indicated.

7.9.12

Verify the output RF power level measured at the dummy load agrees (within 5%) with the value displayed on the LCD in the Transmitter 2 section.

7.10 Transmitter #2 Modulation Level Check

7.10.1

Press the **MOD LEVEL** key to open the **MODULATION SETTING** menu, as shown below.

```
----- MODULATION SETTING -----  
  
MOD Level should be between 0% and 100%.  
Enter Modulation Level: [ 95]%
```

Press the **MOD LEVEL** key repeatedly to clear the modulation level box.

Enter 95% modulation and press ENTER to store that level.

7.10.2

Scope the modulation waveform and record the max/min envelope values to calculate the modulation percentage. $(v_{max}-v_{min})/(v_{max}+v_{min})=mod\%$

7.10.3

Verify the set modulation percentage (displayed on the LCD) and the calculated modulation percentage agree to within 5%.

7.11 Transmitter #2 Frequency Checks

7.11.1

As an example, when calibrating RF output frequency, International Civil Aviation Organization (ICAO) regulations state a maximum variance of ± 100 parts per million (ppm) Hertz is allowed provided the output frequency is less than 1606.5 kHz.

The formula for calculating the variance at 100ppm is:

$$\text{variance} = (\text{operating frequency} * 100) / 1,000,000$$

For example, at 320,000 kHz the variance allowed would be 32 Hz.

7.11.2

Connect a calibrated frequency counter to the dummy load to measure the RF output frequency.

7.11.3

Verify the measured frequency equals the site frequency \pm 100 ppm Hz. If the frequency is within this tolerance, disconnect the frequency counter. If it is out of tolerance, verify frequency counter's accuracy, and contact Southern Avionics' technical department for further assistance.

7.12 Transmitter #2 Morse Code Identifier Check

7.12.1

Attach the oscilloscope to the dummy load and verify the output RF modulation envelope is being keyed with the site's required Morse code identifier entered earlier in this section. Refer to [Figure 7-1. Morse code Identifier detail on Page 7-6](#) to assist in verification.

This completes general operational tests of Transmitter #2.

7.13 Shutdown Tests Setup

7.13.1

Note: fault indications will appear on the **LCD** for the transmitter selected to display. After a shutdown transfer occurs, the **LCD DATA** key must be pressed to display fault information for the TX that caused the transfer.

7.13.2

Set up both TX1 and TX2 with the same parameters. Set both transmitters in the normal IDENT mode by pressing to **MODE** key.

7.13.3

Using the **LCD DATA** key to select either TX1 or TX2, turn **both** transmitter monitors on by pressing **ENABLE** in the monitor section until the LCD reads enable and press **ENTER** to store this condition.

7.14 No Tone Shutdown Test - Loss of Modulation

7.14.1

Set TX1 as the PRIMARY transmitter by pressing the **MAIN TX** key.

7.14.2

Set TX1 mode to CARR (carrier only) by pressing the **MODE** key. The transmitter should shutdown within 60 seconds and transfer to TX2 with the SECONDARY lamp illuminated.

7.14.3

Verify TX2 operation is stable for 2 or more minutes.

7.14.4

Set TX2 mode to CARR by pressing the **MODE** key. The transmitter should shut down within 60 seconds and the system should illuminate the red FAIL indicator.

7.14.5

Set both transmitters back to the IDENT mode by pressing the **MODE** key.

7.14.6

Press **RESET** and the system should return to normal stable operation.

7.14.7

Repeat the above test with TX2 as PRIMARY and verify the same results.

7.14.8

Return to TX1 as PRIMARY for the next test by pressing the **MAIN TX** key.

7.15 Low Modulation Shutdown Test

7.15.1

Press the **MOD LEVEL** key and set the modulation level to less than 70%.

7.15.2

Verify that TX1 shuts down within 60 seconds, thus indicating a low modulation fault condition and transfers to TX2 with the **SECONDARY** lamp illuminated.

7.15.3

Verify TX2 operation is stable for 2 or more minutes.

7.15.4

Press the **MOD LEVEL** key and set the modulation level to less than 70%.

7.15.5

Verify TX2 shutdown within 60 seconds, indicating a low modulation fault condition. The system enters the failed state with the **FAIL** lamp illuminated.

7.15.6

Repeat the above test with TX2 as **PRIMARY**, using the **MAIN TX** key, and verify the same results.

7.15.7

Reset both modulation levels to 95% and return to TX1 as **PRIMARY** for the next test by pressing the **MAIN TX** key.

7.16 Continuous Tone Shutdown Test

7.16.1

Press the **MODE** Button setting TX1 to **CONT** (Continuous Tone).

7.16.2

Verify TX1 shutdown within 60 seconds, thus indicating a continuous tone modulation fault condition, and transfers to TX2 with the SECONDARY lamp illuminated.

7.16.3

Press the **MODE** Button setting TX2 to CONT.

7.16.4

Verify TX2 shutdown within 60 seconds, indicating a continuous tone fault condition, and enters the failed state with the FAIL lamp illuminated.

7.16.5

Repeat the above test with TX2 as PRIMARY, using the **MAIN TX** key, and verify the same results.

7.16.6

Reset both Transmitters modes to IDENT and return to TX1 as PRIMARY for the next test by pressing the **MAIN TX** key.

7.17 Power Shutdown Test - Low Power

7.17.1

Press the special function key **SPCL FCTN**, then press menu number **7**. This is a special test mode. In this mode, the Master Controller will test for under power shutdown. The Master Controller commands the Transmitter Control to decrease the output power by 5 Watt intervals in 5 second intervals. As the transmitter changes power level, it is still sending back data on all of the parameters associated with that transmitter. Once the power level drops below an acceptable level, the Master Controller will institute a transmitter changeover and shutdown of the offending transmitter.

7.17.2

Verify TX1 shutdown within 60 seconds, indicating a Low Power shutdown condition, and transfers to TX2 with the SECONDARY lamp illuminated.

7.17.3

Again, assert the **SPCL FCTN + 1** keys.

7.17.4

Verify TX2 shutdown within 60 seconds, indicating a Low Power shutdown condition, and illuminates the FAIL indicator.

7.17.5

Repeat the above test with TX2 as PRIMARY, using the **MAIN TX** key, and verify the same results.

7.17.6

Press the RESET button setting TX1 as PRIMARY using the **MAIN TX** key.

7.18 VSWR Shutdown Test

7.18.1

Reduce the power output to less than 125 Watts on the PRIMARY transmitter.

7.18.2

Disconnect the RF connector from the dummy load.

7.18.3

TX1 “V” LED should illuminate and the system transfer to TX2.

7.18.4

If the open condition is rectified before TX2 comes up to power, it will stay on the air; otherwise, TX2 will also shutdown with a VSWR “V” fault, and the system will enter the FAIL state.

7.18.5

Repeat the above test with TX2 as PRIMARY, using the **MAIN TX** key, and verify the same results.

7.18.6

Press the RESET button setting TX1 as PRIMARY using the **MAIN TX** key.

7.19 ID CODE Test

7.19.1

Press **SPCL FCTN +6**. This is a special test mode. In this mode the Master Controller will test for improper identification. The Master Controller commands the Transmitter Controller to reverse the identification. After the transmitter changes identification, it still sends data to the Master Control of parameters associated with that transmitter including identification. Once the identification changes, the Master Controller will institute a transmitter changeover and shutdown of the offending transmitter.

7.19.2

Verify TX1 shutdown and transfer to TX2 within 60 seconds. Press **LCD DATA** to display TX1, revealing TX1 has shutdown due to an IDENT fault.

7.19.3

Press **LCD DATA** again to display TX2.

7.19.4

Press **SPCL FCTN +6** again to test the TX2 IDENT.

7.19.5

Verify TX 2 shutdown within 60 seconds and the FAIL LED illuminates. The LCD should indicate TX2 has shutdown due to an IDENT fault.

7.19.6

Press RESET to return to normal operation.

7.19.7

This concludes SE Series Dual Transmitter Operational Checks using Front Panel Controls.

8 Maintenance

8.1 Built In Test Equipment (BITE)

The SE250 has extensive BITE features that give the technician on site the ability to troubleshoot the transmitter. Every stage in the transmitter has built in monitors to allow the technician to troubleshoot down to an individual stage. As the signal is created and amplified, each step is carefully monitored for correct operation. Each monitored function for each module in the SE is described below.

Note: Certain parameters such as shutdown LED's and overload LED's are displayed as LED's on the hardware and on the web browser connected to the Ethernet interface. They will be displayed as a "Pass" or "Fail" on the LCD screen implementation of BITE.

8.1.1 BITE parameters

Transmitter (TX) status

- forward power level (FORWARD PWR)
- Voltage Standing Wave Ratio (VSWR)
- reflected power level (REFLECTED PWR)
- measured Antenna Current (Antenna (I))
- modulation level (MODULATION)
- measured frequency output (FREQ)
- PWM drive level (PWM DRV LVL)
- modulation control voltage level (MOD DRV LVL)
- RF Bridge voltage (FILTER + 5V)
- Battery Charger's Current (BTRY CHARGE)
- Battery discharge current (BTRY DISCH)

LV/HVPS status

- AC source 48VDC generated (PWR SUPPLY (V))
- input 48VDC from battery backup source (BTRY SAMPLE)
- high side FET current draw on high voltage oscillator output stage (HIGH SIDE (I))
- low side FET current draw on high voltage oscillator output stage (LOW SIDE (I))
- output high voltage supplied to the PC/MOD module (HV OUTPUT)
- internal temperature (TEMPERATURE)
- supply 12VDC provided by LVREG/HVPS module (12VDC SUPPLY)
- internal 5VDC generated within LVREG/HVPS module (5VDC SUPPLY)

Power Control Modulator (PC/MOD) status

- Power Control current overload (PWR CTRL (I))
- modulation current overload (MODULATOR (I))
- power controller voltage (PWR CTRL V)
- modulated high voltage output from PC/MOD module (VMOD (OUT))
- PC board temperature (TEMPERATURE)
- internal 5V generated supply in PC/MOD module (5VDC SUPPLY)

Switching Power Amplifier (SPA) status

- RF input present (RF PRESENT)
- Power Amplifier current overload (SPA (I) FAULT)
- Power Amplifier current (SPA CURRENT)
- Power Amplifier voltage (VMOD (IN))
- internal temperature (TEMPERATURE)
- internal 5V generated supply on SPA module (5VDC SUPPLY)

8.1.2 Built In Test Equipment Parameters

Table 8-1. BITE Parameters

BITE Display Group	Parameter Name	Normal Value (25-250 Watts CARR MODE unless stated)	Module Affected
TX	FORWARD PWR	25-250 Watts	Filter Bridge or Transmitter Control PCB
TX	VSWR	1:1-2.62:1	Antenna, ATU, Filter or Transmitter Control PCB
TX	REFLECTED PWR	0-5 Watts	Antenna, Filter Bridge or Transmitter Control PCB
TX	ANTENNA (I)		ATU or Master Control PCB
TX	MODULATION PWR	50-100% Cont Mode	Filter Bridge or Transmitter Control PCB
TX	FREQ	5% of desired Frequency	TX Control PCB
TX	PWM DRV LVL	4.5-5VDC	TX Control PCB
TX	MOD DRV LVL	0.7-1.5V @ 50-100% mod	TX Control PCB
TX	FILTER +5V	5 Volts +/- 10%	Filter Bridge or Transmitter Control PCB
TX	BTRY CHARGE	0-20 Amps	Battery Charger, Battery Sense PCB or Master Control PCB
TX	BTRY DISCH	0.5-4 Amps	Battery Sense PCB or Master Control PCB
LV/HVPS	PWR SUPPLY (V)	48VDC +/- 10%	Offline Power Supply or LVREG/HVPS
LV/HVPS	BTRY SAMPLE	38-52VDC	Batteries, Sample Resistors R1 or R2
LV/HVPS	HIGH SIDE (I)	3-5 Amps	LVREG/HVPS or Transmitter Control PCB
LV/HVPS	LOW SIDE (I)	3-5 Amps	LVREG/HVPS or Transmitter Control PCB
LV/HVPS	HV OUTPUT	190-150V	LVREG/HVPS or Transmitter Control PCB

BITE Display Group	Parameter Name	Normal Value (25-250 Watts CARR MODE unless stated)	Module Affected
LV/HVPS	12VDC SUPPLY	12VDC +/- 5%	LVREG/HVPS or Transmitter Control PCB
LVH/VPS	5VDC SUPPLY	5VDC +/- 5%	LVREG/HVPS or Transmitter Control PCB
PC/MOD	PWR CTRL (I)	PASS	PC/MOD
PC/MOD	MODULATOR (I)	PASS	PC/MOD
PC/MOD	PWR CTRL (V)	15-110 Volts	LVREG/HVPS or Transmitter Control PCB
PC/MOD	VMOD (OUT)	5-50 Volts	PC/MOD or Transmitter Control PCB
PC/MOD	5 VDC SUPPLY	5 Volts +/- 5%	PC/MOD
SPA	RF PRESENT	PASS	TX Control PCB or SPA
SPA	SPA (I) FAULT	PASS	SPA or Transmitter Control PCB
SPA	SPA CURRENT	0.1-3 Amps	SPA
SPA	VMOD (IN)	5-50 Volts	PC/MOD, SPA or Transmitter Control PCB
SPA	5VDC SUPPLY	5 Volts +/- 5%	SPA

8.2 Maintenance Schedule

Equipment Required

1. Digital Multimeter
2. Frequency Counter
3. Oscilloscope

Transmitter

Commissioning

Forward Power _____ Reflected Power _____

P.A. Amps _____

P.A. Volts _____

Every 6 Months

Forward Power _____

Reflected Power _____

P.A. Voltage. At 100% forward power in CARR. Mode

Record Value _____

P.A. Amps. At 100% power in CARR. Mode

Record Value _____

Modulation level should be 95% Record value _____

The carrier frequency should be checked to within 5 parts per million (ppm).

Tolerance is 50 ppm

Record Value _____

The Tone frequency should be checked for 400 Hz or 1020 Hz.

Tolerance is +/- 25 hz.

Record Value _____

The Monitor functions should be checked for Half Power, No Tone, and Continuous Tone.

Check for foreign object within the enclosure.

Coupler

Commissioning

Coarse Taps_____

Fine Taps_____

Impedance_____

Operating Amps_____

Every 6 Months

Operating Amps_____

Check for water ingress

Antenna

Every 6 Months

Tighten turnbuckles and down leads (where applicable)

H-Pad antenna- check insulator bushings and remove slack from long wire

Check for corrosion on all connections

Yearly

Polish all insulators and fiberglass with SAC silicon polish

Part # 9P610001

Note: This will be required more often in a high salinity environment

9 Coupler Setup



The antenna must be installed according to the Antenna Installation manual prior to setting up the coupler. The user may want to read the appended section on Antenna Theory (Section [9.4 Antenna Theory on page 9-8](#)).

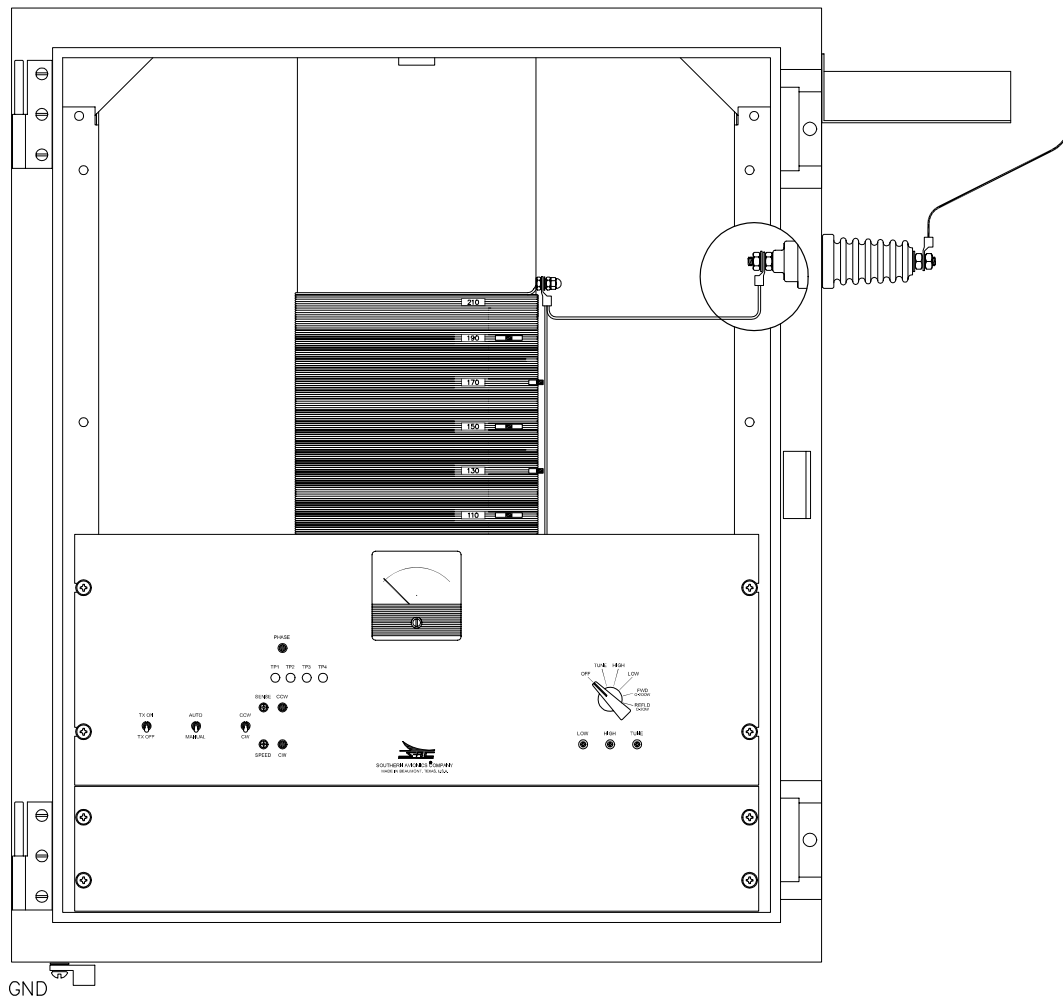


High reactive voltages are present at the couplers output and within the coupler. Use extreme caution when working on or near an energized NDB system's coupler and antenna.

9.1 Assembly

9.1.1

Remove the Coupler enclosure's front panel, if not already removed.



SDF20022 Rev A
Figure 9-1. PC3000 Coupler Access Panel

9.1.2

Remove the Coupler's coil access panel located above the tuning controls panel, as shown in [Figure 9-1. PC3000 Coupler Access Panel on page 9-2](#).



For the following steps in Section 9-1, refer to [9.2 Cable/Wire Connections on page 9-5](#)

9.1.3

Locate the two piece antenna feed through insulator and thread through the side panel. Do not over tighten or stress the insulator components.

9.1.4

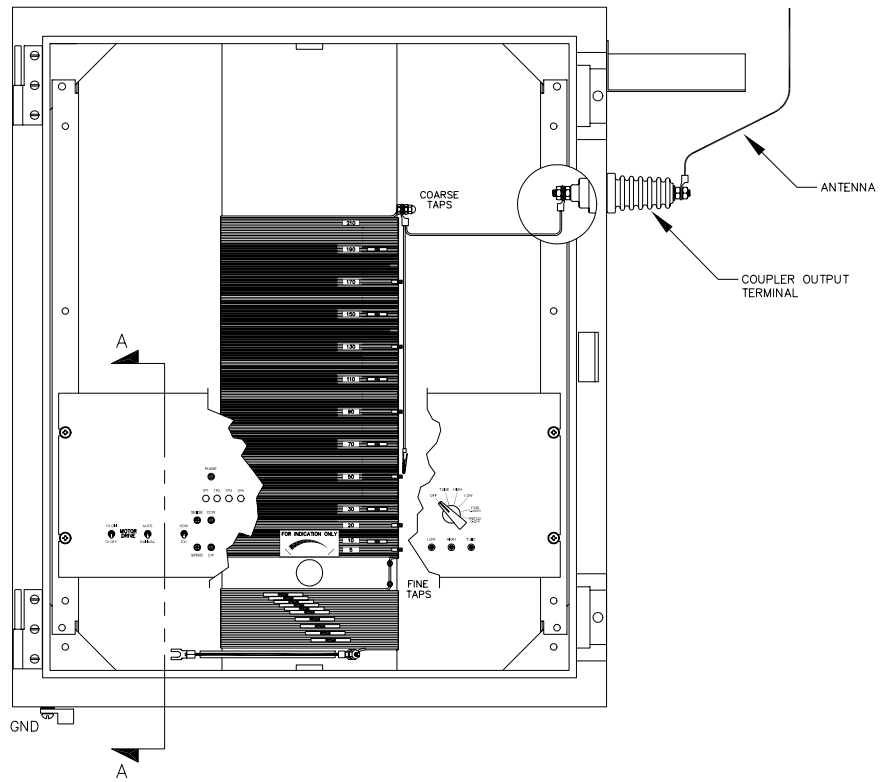
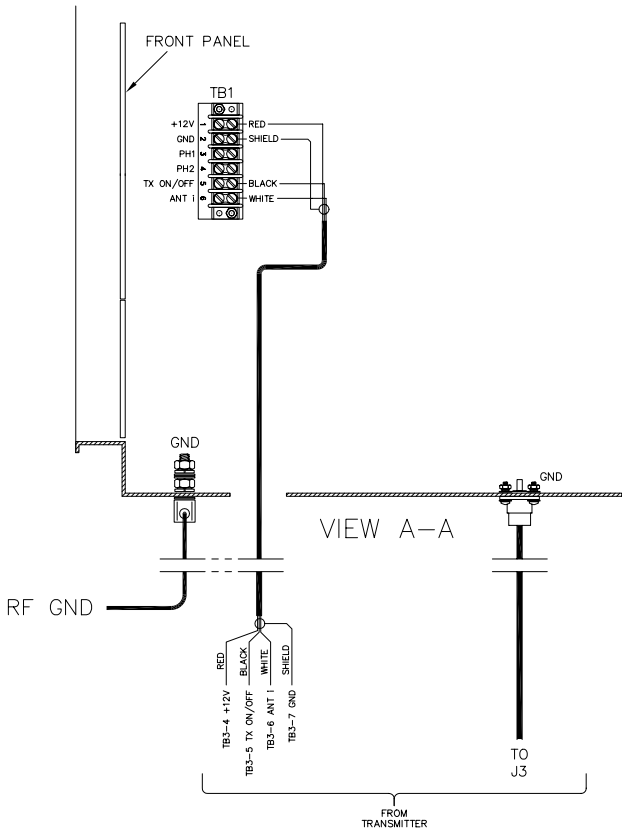
Locate the rain shield and install it according to the enclosed directions.

9.1.5

Connect the wire from the top of the coil assembly in the coupler to the interior lug of the insulator bushing. Ensure the wire is routed at least three inches from metal surfaces.

9.1.6

Locate and install the lightning arrester with the two screws located between the insulator bushing and the front access door. Adjust the spark gap if necessary to approximately one inch.



SDF20022 Rev A
 Figure 9-2. PC3000 Coupler connection detail

9.2 Cable/Wire Connections



Coupler power and signal connections to the transmitter were made in Step 3.4.6. Refer to [Figure 9-2. PC3000 Coupler connection detail on page 9-4.](#)

9.2.1 Coupler Grounding

Attach the ground wire from the counterpoise system the bronze ground lug on the bottom of the coupler.

Recommended conductor: 12AWG, multi-stranded copper wire, or better

9.2.2 RF Coaxial Cable

Connect one end of the N-terminated RF coaxial cable (supplied with installation kit) to the transmitter's RF output jack (J3), route the other end over to the coupler, and connect it to the Coupler's RF input jack.

9.2.3 Antenna Lead

Connect the antenna lead to the exterior lug of the insulator bushing on the coupler. Ensure the lead remains at least three inches away from metal surfaces to prevent arcing.

9.3 Initial Impedance Setting

9.3.1


Set the coupler's impedance by setting the **IMPEDANCE** selector switch on the Coupler's bottom left to the position specified in the following table

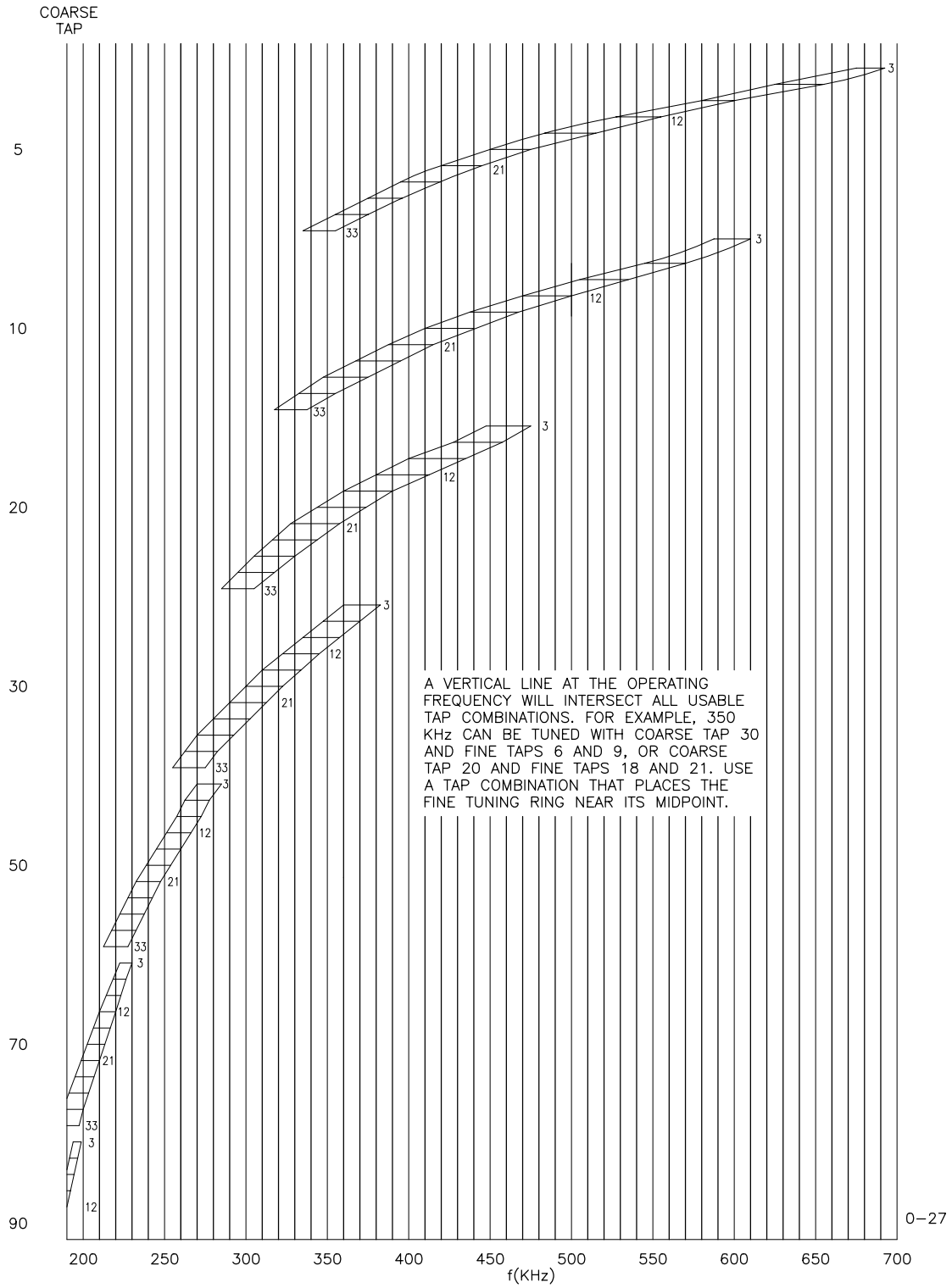
f(kHz)	SYMMETRICAL “T”
190-220	5
220-250	4
250-290	4
290-535	4

Table 9-1 Coupler Impedance Selector Settings

9.3.2

Set the coupler’s inductance by tapping its coarse tap coil windings according to the tuning charts shown in [Figure 9-3. Symmetrical T Antenna on page 9-7](#). Select the appropriate chart based upon antenna type and transmitter operating frequency.

	<p>Coarse tapping is performed by connecting a clip lead to the proper coil tap (this temporary connection will be made permanent later). Fine tapping is performed by setting the FINE TAP selector wire on the Coupler’s bottom right terminal block (TB3) in the position shown in Figure 9-3. Symmetrical T Antenna on page 9-7 .</p>
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SDF20020 Rev E
 Figure 9-3. Symmetrical T Antenna

9.4 Antenna Theory

The range of a beacon and antenna depends on many variables and cannot be guaranteed. The field strength can be calculated if the ground conductivity is known, but the field strength needed depends on the background environmental noise which depends on location. A field strength of 70uV/m is generally adequate in the United States and Europe but may not be sufficient in latitudes between 30° and 30°S.

9.4.1 Symmetrical “T” Antenna

A Symmetrical “T” Antenna is recommended for use with a 125 - 250 Watt transmitter if sufficient land is available. This antenna requires a plot of ground approximately 150 feet by 400 feet for a 60 foot high antenna to 150 feet by 500 feet for a 120 foot high antenna.

The standard Symmetrical “T” Antenna is supported by 60 foot above ground level towers or poles placed 300 feet apart and has a 55 foot vertical radiator and a 2 wire 280 foot horizontal top hat. Range depends on the field strength required, the ground condition, and the power radiated. The power radiated increases with frequency, however, the propagation loss due to ground condition decreases with frequency. For a 70 uV/m field strength, the range over “good” ground varies from approximately 60 miles at 190 KHz to 70 miles at 535 KHz with a 50 watt transmitter and approximately 80 miles at 190 KHz to 90 miles at 535 KHz with a 100 watt transmitter.

A Symmetrical “T” Antenna supported by 90 foot towers has a 85 foot vertical radiator and a 2 wire 280 foot horizontal top hat. Range with this antenna over “good” ground varies from approximately 90 miles at 190 KHz to 95 miles at 535 KHz with a 50 watt transmitter and from approximately 105 miles at 190 KHz to 115 miles at 535 KHz with a 100 watt transmitter.

9.4.2 Tower Antenna

A Tower Antenna can be used if sufficient land is not available for a Symmetrical “T” Antenna. A portion of the top set of guy wires is used to form the top hat for this antenna. A Tower Antenna is electrically inferior to a Symmetrical “T” Antenna of the same height due to the decreased top loading. Top loading serves two purposes; decreasing the input reactance and consequently the voltage on the antenna and increasing the effective height.

A 50 foot tower requires a plot of ground with a radius of 60 feet. Range over “good” ground varies from approximately 40 miles at 190 KHz to 50 miles at 535 KHz with a 50 watt transmitter and from approximately 60 miles at 190 KHz to 65 miles at 535 KHz with at 100 watt transmitter.

10 Antenna Tuning and Matching for PC3000C

The objective of this section is to setup the coupler to present a 50 Ohm, minimally reactive load to the SE Transmitter. To ensure this, the inductance of the coupler should be adjusted so that the measured PA current and voltage matches the values recorded in [Step 7.5.11](#) as closely as possible.

10.1

The SE Series transmitter is shipped with the default turn on power output set to Zero Watts. If the power output has been changed, then connect the SE Transmitter's RF output to a dummy load.

Turn the system ON and verify that:

TX1 is set as Primary transmitter

The MODE is set to CARR

The OUTPUT POWER is set to Zero (0) watts into a DUMMY LOAD.

MONITOR is disabled

10.2

After verification, connect the Transmitter RF output coax to the Coupler's input RF N connector. (It is assumed here that the coupler control cable has already been connected to the SE Transmitter according to installation instructions.)

10.3

On the coupler front panel, set R16 Tol. Adjust counter clockwise temporarily.

10.4

Set the **RF Power Level** to approximately 20 Watts, making sure the Coupler TX ON/OFF switch is ON.

10.5

Check the **Reflected Power** reading to determine the antenna's state of tune. A value of 0, or nearly 0, indicates the antenna is tuned. If it is tuned, go to [step 10.10 on page 10-2](#) to ensure that the best tap combination has been selected. If not, continue to [step 10.6 on page 10-2](#).

10.6

Rotate the coupler's **INDUCTANCE** from one limit to the other by using the vernier knob switch while in setup mode. Monitor the coupler meter tune reading during this process for a change in reflected power. If a change is seen, place the switch in run to allow the Autotune to make adjustments freely and go to [step 10.7 on page 10-2](#).

10.7

Turn the Coupler TX ON/OFF Switch OFF, change the **FINE TAPS** selector switch to the next lower setting and repeat [step 10.4 on page 10-1](#) through [step 10.6 on page 10-2](#). If the antenna does not tune, change the **FINE TAPS** selector switch to the next higher setting and repeat [step 10.4 on page 10-1](#) through [step 10.6 on page 10-2](#). Continue this bracketing procedure until the Autotune motor starts to tune the antenna.

If the **FINE TAPS** selector is at its lowest setting and it is necessary to decrease the inductance, change the Coarse Tap to the next lower tap and change the **FINE TAPS** selector to the highest setting. If the **FINE TAPS** selector is on the highest setting and it is necessary to increase the inductance, change the Coarse Tap to the next higher tap and change the **FINE TAPS** selector to the lowest setting. Due to overlap, it may be necessary to change the **FINE TAPS** selector a few positions before the inductance will be the same as it was before the Coarse Tap was changed.

10.8

Set the **RF Power Level** to the transmitter's maximum rated level. Verify the measured **Forward Power** level agrees with this setting. Adjust the Coupler's front panel Tol. Adjust control (R16) counterclockwise for autotune stability as necessary. It will be fine set later in this procedure.

10.9

Record the measured **Reflected Power** level and then turn the Coupler TX ON/OFF Switch OFF.

10.10

Increase the coupler's **IMPEDANCE** selector switch setting by one position then turn the Coupler TX ON/OFF Switch ON. Set the **RF Power Level** to the transmitter's maximum rated level and verify the measured **Forward Power** level agrees with this setting.

10.11

Record the measured **Reflected Power** level and compare it with the level recorded in [step 10.9 on page 10-2](#). If the current level is greater than the recorded level, turn the Coupler TX ON/OFF Switch OFF and decrease the **IMPEDANCE** selector switch setting by two positions then turn the Coupler TX ON/OFF Switch ON. If the current level is less than the recorded level, turn the Coupler TX ON/OFF Switch OFF and increase the **IMPEDANCE** selector switch setting by one position.

10.12

Repeat [step 10.9 on page 10-2](#) through [step 10.11 on page 10-2](#) until the **IMPEDANCE** selector setting is found that gives the lowest **Reflected Power** level and results in a PA current and voltage close to that recorded in [step 7.5.11 on page 7-4](#).

Normal voltage and current readings at 50 Ohms for each specific transmitter can be found in the transmitter's Factory Acceptance Test (FAT) procedure.

10.13

Set the transmitter to operate in Morse Code Identifier (IDENT) **Mode**.

10.14

Adjust the Tol. adjustment potentiometer on the coupler Autotune PCB counter clockwise (CCW) until the Autotune motor begins to chatter, then adjust it back clockwise until all chattering stops.

10.15

Reduce the **Output Power** to 0.

10.16

Turn the transmitter OFF (Switch the **AC and DC** switch to the OFF position.)

10.17

Remove the coupler's RF output lead where it is attached to the coil.

10.18

Remove the clip from the lead end and trim the wire to the proper length. Ensure at least 3 inches (7.6cm) separates the wire from both the coil and the coupler enclosure.

10.19

Dress the wire to avoid sharp bends that may lead to high voltage corona discharge, and solder the lead to the selected coarse tap on the coil.

10.20

Replace the Coupler's front cover panel. The system may now be turned ON and placed into service at the desired power.

11 Closing Up The System

11.1 Reinstalling/Closing Panels

11.1.1

Reinstall the Power Control Panel and all transmitter panels, while ensuring none of the wiring is pinched or kinked. Fasten the panels with any mounting screws removed.

11.1.2

Reinstall the Coupler's coil access panel that was removed in [step 9.1.2 on page 9-3](#).

11.1.3

Reinstall/close the Coupler enclosure's front panel that was removed/opened in [step 9.1.1 on page 9-1](#). Ensure that the screws are torqued sufficiently to seal the enclosure against water and dust ingress without crushing or deforming the sealing gasket. Begin by starting all screws and then tighten sequentially from the center outward in steps. The gasket should be uniformly compressed to approximately one half of its original thickness.

11.2 Conduit Sealing

For the coupler seal any open conduits at the bottom of the coupler's enclosure with a silicone sealant to preserve its ingress protection rating.

11.3 Optional RF Weatherproofing

11.3.1

Apply two wraps of electrical tape over the Type N RF connection on the Coupler.

11.3.2

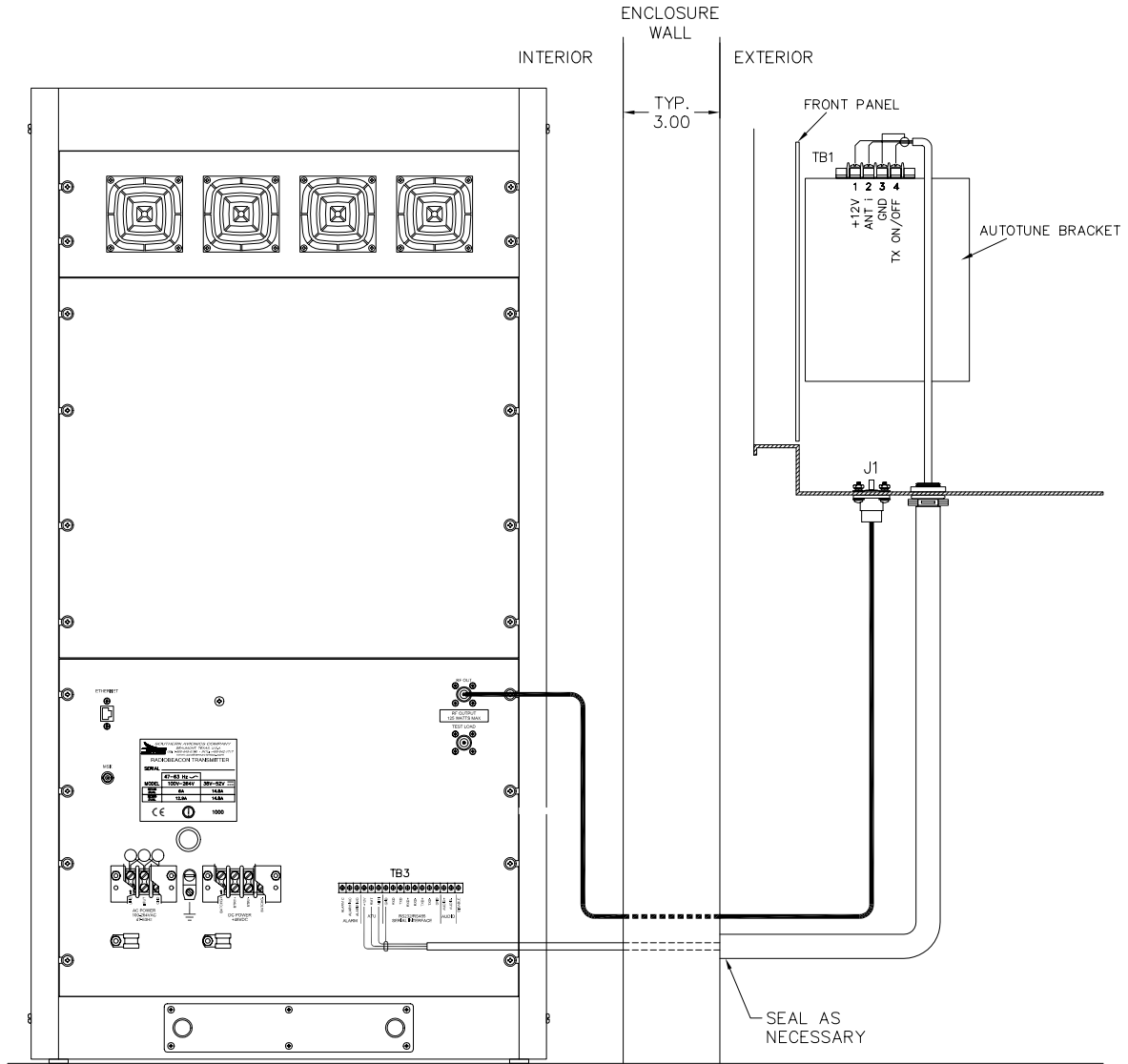
Secondly, apply a layer of Coax-Seal over the tape layers making sure that there are no air cavities or openings in the wrap.

11.3.3



Finally, apply 2 wraps of electrical tape over the Coax-Seal layer with the final wrap spiraling UP to minimize water migration. With no further adjustments required, the system is now ready to be connected to the Beacon Site antenna system. The user is strongly advised against attempting any system adjustments while it is connected to the Antenna system, except those allowed by software.

Repeat these steps to seal the cut end of conduit for AC, DC and Serial Interface connections.



SDF33030 Rev C
Figure 11-1. Shelter Conduit Interface Diagram

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12 Optional Equipment

12.1 Audio - SLP10020

12.1.1 General Description

The Audio PCB is an OPTIONAL addition to the standard system which allows the user to broadcast AWOS announcements. The option consists of four sections as follows:

- Audio Input Amplifier
- Automatic Gain Control (AGC)
- Chebyshev Passband Filter
- Voice Detector

The Voice amplifier takes the nominal -17 dBm signal level and amplifies it to a level usable by the AGC section. The amplifier is common mode balanced with adjustable gain.

The AGC circuit is responsible for modulation limiting. It is adjusted to "capture" the level at -17 dBm and output a constant modulation level to the PWM section up to levels exceeding +10 dBm. This section prevents inadvertent over modulation of the voice signal. It is necessary since the Controller has no control over user input.

The Chebyshev Passband filter is designed for 300 to 3000Hz. The output at 4000Hz is down more than 45 dB, ensuring any out of band audio signals from the operator will not cause adjacent channel interference.

The Voice Detector has two functions. It detects the presence of an announcement sequence and automatically attenuates the keying tone level down to 20% modulation. The announcement level is summed with the keying tone level and set to achieve 95% composite modulation. This action prevents over modulation and allows the announcement to be heard over the beacon Morse code IDENT tones. The Voice Detector signals the Controller to temporarily suspend modulation alarms, since the IDENT tone level is dropped below the alarm threshold.

12.1.2 Detailed Circuit Analysis

General Operation

The Audio PCB is an option that allows an externally applied signal, usually AWOS, to modulate the transmitter. The option provides amplification, automatic gain control, audio pass-band filtering, and input detection and control.

Input Amplifier

The input differential amplifier takes a 600 Ohm or high impedance input depending on the setting of JP1 and is made up of U2A, U2B, and U3A.

VOICE+ and VOICE- come in through R7, C5 and R21, C10 to develop a balanced voltage drop across R13 and R18. R8 and R22 couple this voltage to U2A and U3A. R15, R19, and potentiometer R24 provide common mode rejection to be fine tuned for minimal line noise. JP2 is used when making this adjustment, and R16 and R25 set the gain of this stage. U2B, along with the C7, R17 network, and R20, C10 network, provide a flat audio band response. The output of this stage continues on to the AGC circuitry.

AGC section

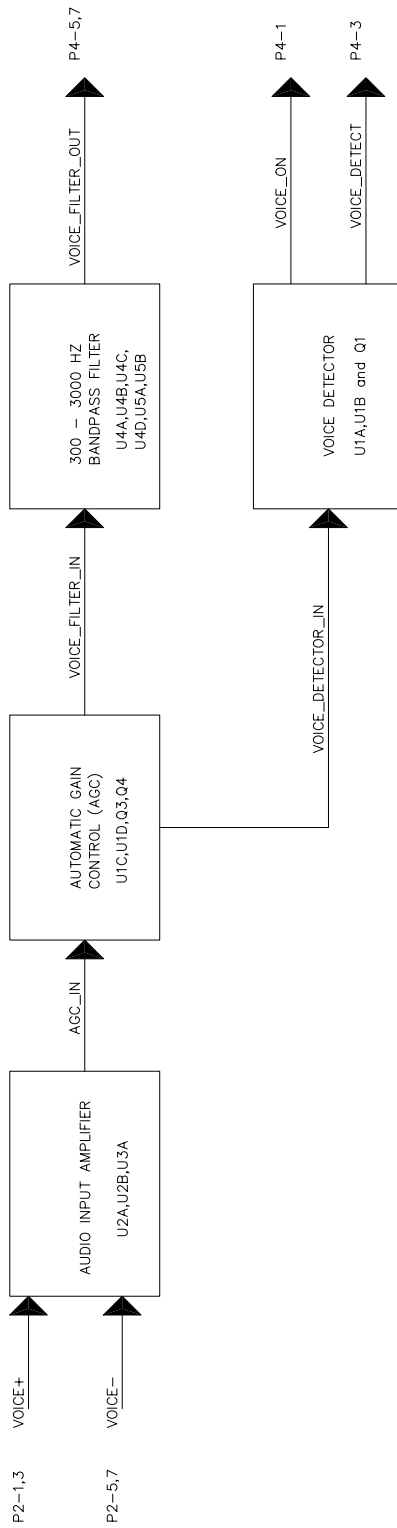
The signal AGC_IN is coupled via network C14, R27, and C15 to input calibration potentiometer R26 where it is coupled, via C16 and R30, to U1C. R28, R33, C18, and R29 provide midpoint bias for U1C whose gain is set by R36, C21 and R38, C25. A sample of this signal is fed via C22 to AGC circuit U1C, Q2, Q3, and Q4. Q12 acts as a variable resistor at the input of U2A, U1C. The resistance is controlled by the signal level fed back from U1C pin 1. As the signal level increases, the gate voltage on Q2 decreases and the resistance decreases, thus lowering the audio input level to U1C pin 10 and holding the average audio output level constant. U1D boosts the level of the audio signal, which is output through modulation level adjustment potentiometer R31 and C19 as VOICE_FLTR_IN. A constant level output is also sent to VOICE_DETECTOR_IN.

Pass-band Filter section

VOICE_FLTR_IN is coupled into a Chebyshev active pass band filter consisting of U4, U5, and associated components. Its low end 3dB roll off point is 300Hz, and its high end 3dB roll off point is 3000Hz, with sufficient attenuation to meet or exceed FCC requirements. The detailed theory of operation of multi-stage active filters is beyond the scope of this manual and best left to a textbook on the subject. The output of this stage is called VOICE_FLTR_OUT.

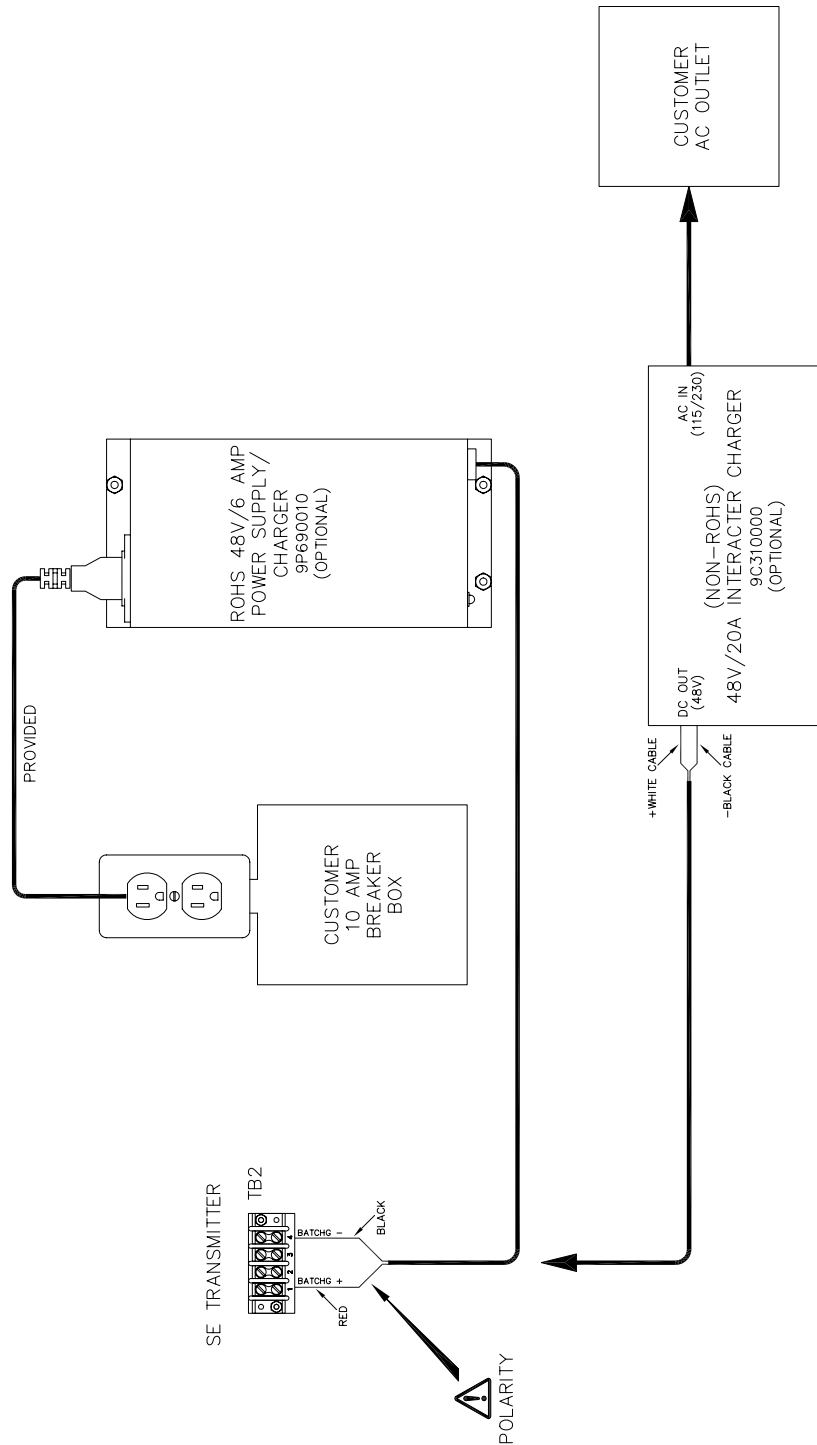
Voice Detector Section

The voice detector's purpose is to notify the Controller that a voice announcement sequence is beginning. This process automatically attenuates the normal IDENT output to allow clear reception of the message and prevents over modulation. A sample of the AGC output is routed as VOICE_DETECTOR_IN via C2 to buffer U1A. CR1 and C3, R4 convert the audio to a DC level. When this level is enough to overcome the bias on U1B pin 6, the output goes high causing Q1 to virtually short one end of potentiometer R2 to ground. The adjustable leg of the potentiometer leaves the board as VOICE_DETECT and connects to the TONE input line on the Digital I/O PCB. Therefore, R2 becomes a shunt to ground, which is adjusted to lower the tone level appropriately when an AWOS announcement is input. Buffer U3B provides an additional level shifted output called VOICE_ON, which notifies the Controller external modulation is being applied.



SDB10020 Rev B
Figure 12-1. Audio Block Diagram

12.2 Optional Battery Charger



SDE33072 Rev D

Figure 12-2. SE250 Optional Battery Charger

12.3 Ethernet to Land line Dial-up

Intended use – This configuration is only intended to allow the end user access to the SE Series Transmitter's embedded Web Server via a dial up telephone network modem.

This modem is a Remote Access Switch that combines a telephone modem with a 5 port Ethernet managed switch. This powerful combination allows you to easily and securely access your Ethernet network from any remote location over standard telephone lines. When dialed, the SE Transmitter will answer automatically. For other applications see www.sixnet.com/department/ethernet-switches-fags-158.cfm)

NOTE: The SE Transmitter will not automatically call out when a fault occurs.

Requirements

- Laptop with an internal modem, Ethernet capabilities, Microsoft Windows XP or later and Internet Web Browser installed
- An available Telephone Network
- Telephone cable between laptop and telephone network
- 1- SIXNET CD with Quick Guide and Manuals (provided)
- 1- Ethernet Cable (6-FT provided)
- 1-24VDC Power Supply (provided)
- 1- Din Rail (provided)

How to Configure a Switch as a Server

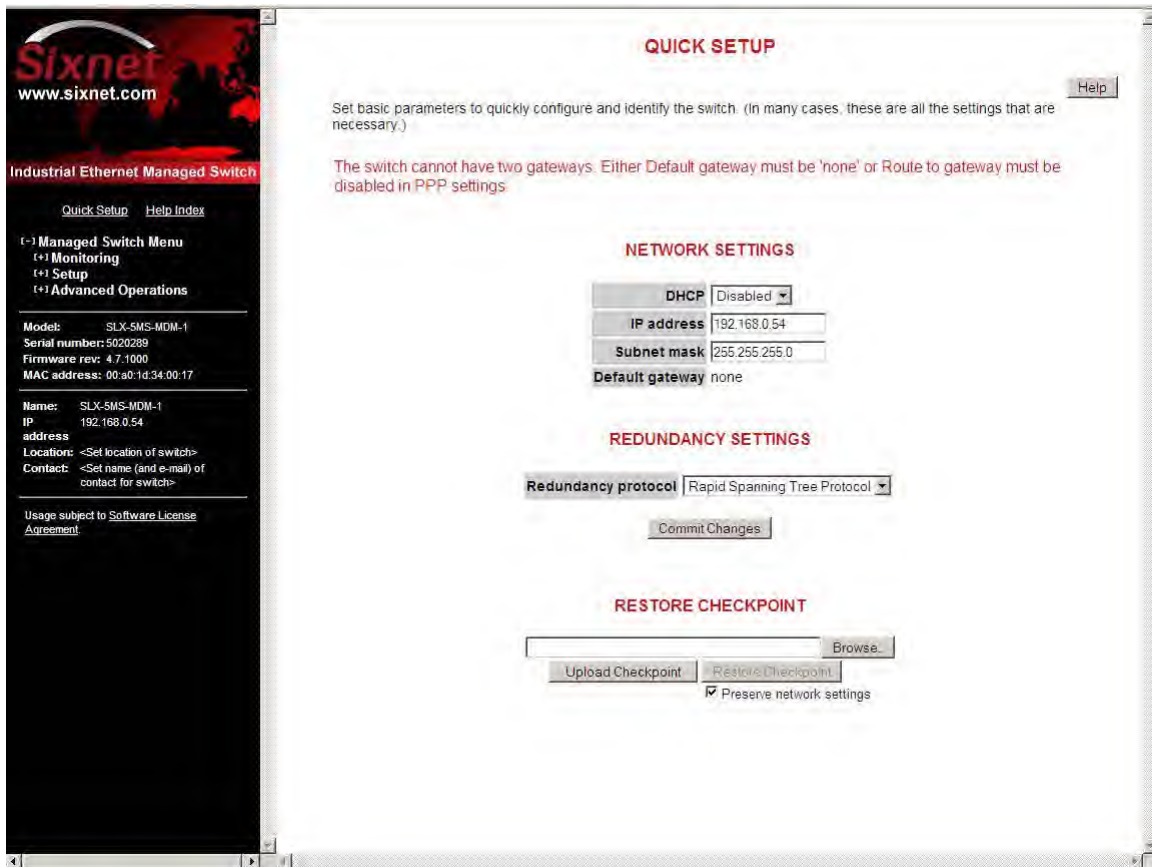
1. Connect the laptop to the Ethernet Dial-Up Modem using the Ethernet cable provided using either of ports 1 to 5. (Default Port 5)
2. Configure the Modem using the following steps from [SLX-5MS-MDM-Tutorial.pdf](#) available at www.sixnet.com/department/ethernet-switches-fags-158.cfm.

Configuring an SLX-5MS-MDM Switch as a Server

The SLX-5MS-MDM switch, as the server, must assign an IP address to the PC when it dials in. To configure the SLX-5MS-MDM switch, you must define an IP address that is not being used on the SLX-5MS-MDM switch's LAN. You must then create a list of authorized remote users so that only remote users from that list are able to connect to the remote network.

To configure an SLX-5MS-MDM switch as a server, do the following:

1. Click on **Quick Setup** from the SLX-5MS-MDM switch's Web user interface to display the **System Settings/Quick Setup** page.
2. Assign an IP address to the SLX-5MS-MDM switch (see the screen shot below).



3. From the Managed Switch menu, choose Setup>Modem Access Settings>PPP Settings to display the PPP Settings page. Set the PPP mode of the SLX-5MS-MDM switch to Server.
4. In the PPP Server Settings, set the Client IP to the IP address of the Windows PC dialing in.

Sixnet
www.sixnet.com

Industrial Ethernet Managed Switch

[Quick Setup](#) [Help Index](#)

Managed Switch Menu

- Monitoring
- Setup
 - Main Settings
 - Modem Access Settings
 - Modem Settings
 - PPP Settings
 - Remote Users
 - Routing
 - Dial-out Messaging
 - Redundancy Settings
 - Traffic Priority
 - Multicast Filtering (IGMP)
 - Virtual LANs (VLANs)
 - Security Settings
 - Advanced Operations

Model: SLX-SMS-MDM-1
Serial number: 5020289
Firmware rev: 4.7.1000
MAC address: 00:a0:1d:34:00:17

Name: SLX-SMS-MDM-1
IP address: 192.168.0.54
Location: <Set location of switch>
Contact: <Set name (and e-mail) of contact for switch>

Usage subject to [Software License Agreement](#)

PPP SETTINGS

Set PPP parameters [Help](#)

PPP mode: Server

PPP CLIENT SETTINGS

User name:

Server phone number:

Password:

Idle timeout: 60

Default route: Enabled

Server calls back: Disabled

Switch's phone number:

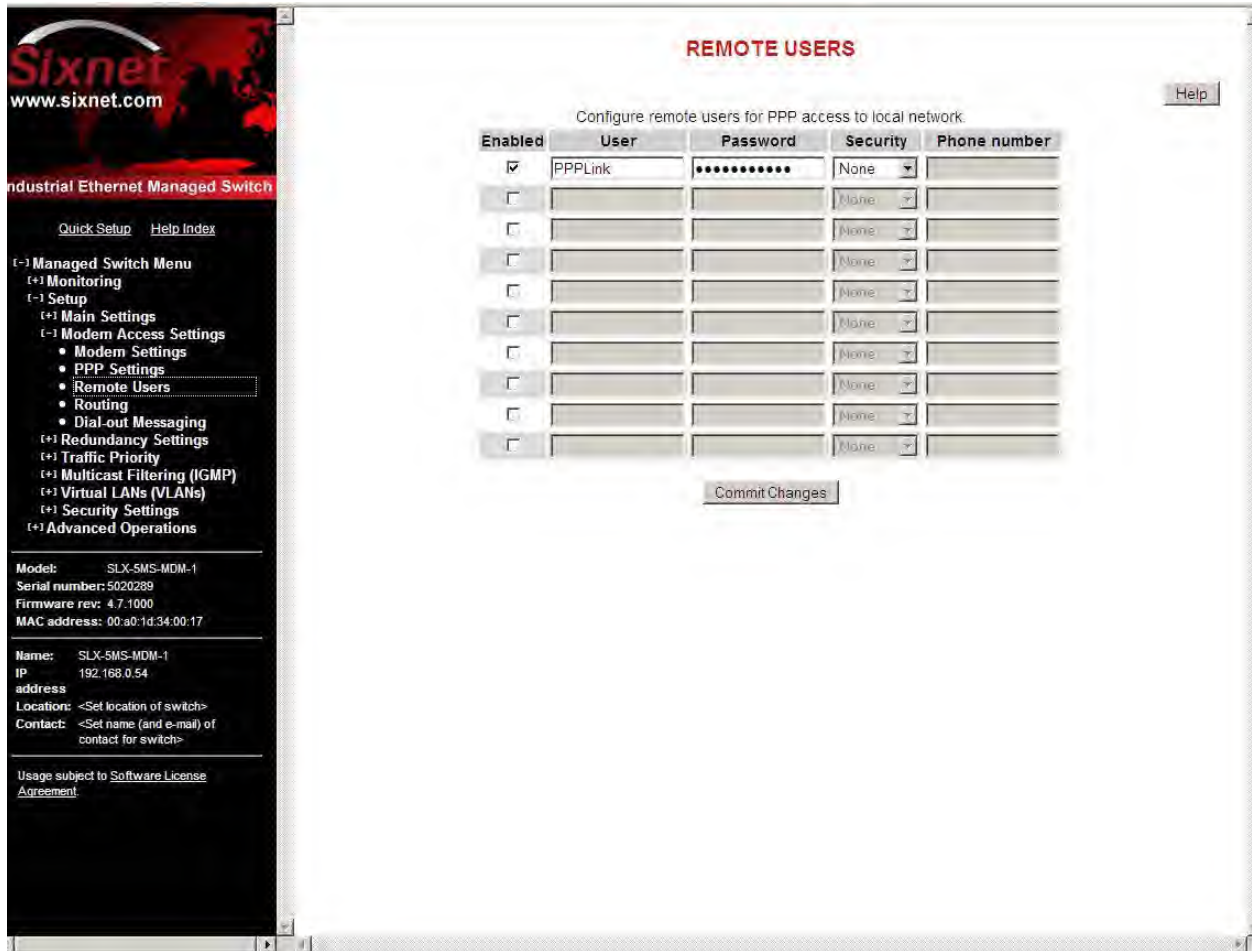
PPP SERVER SETTINGS

Client IP: 192.168.0.1

Route to gateway: Enabled

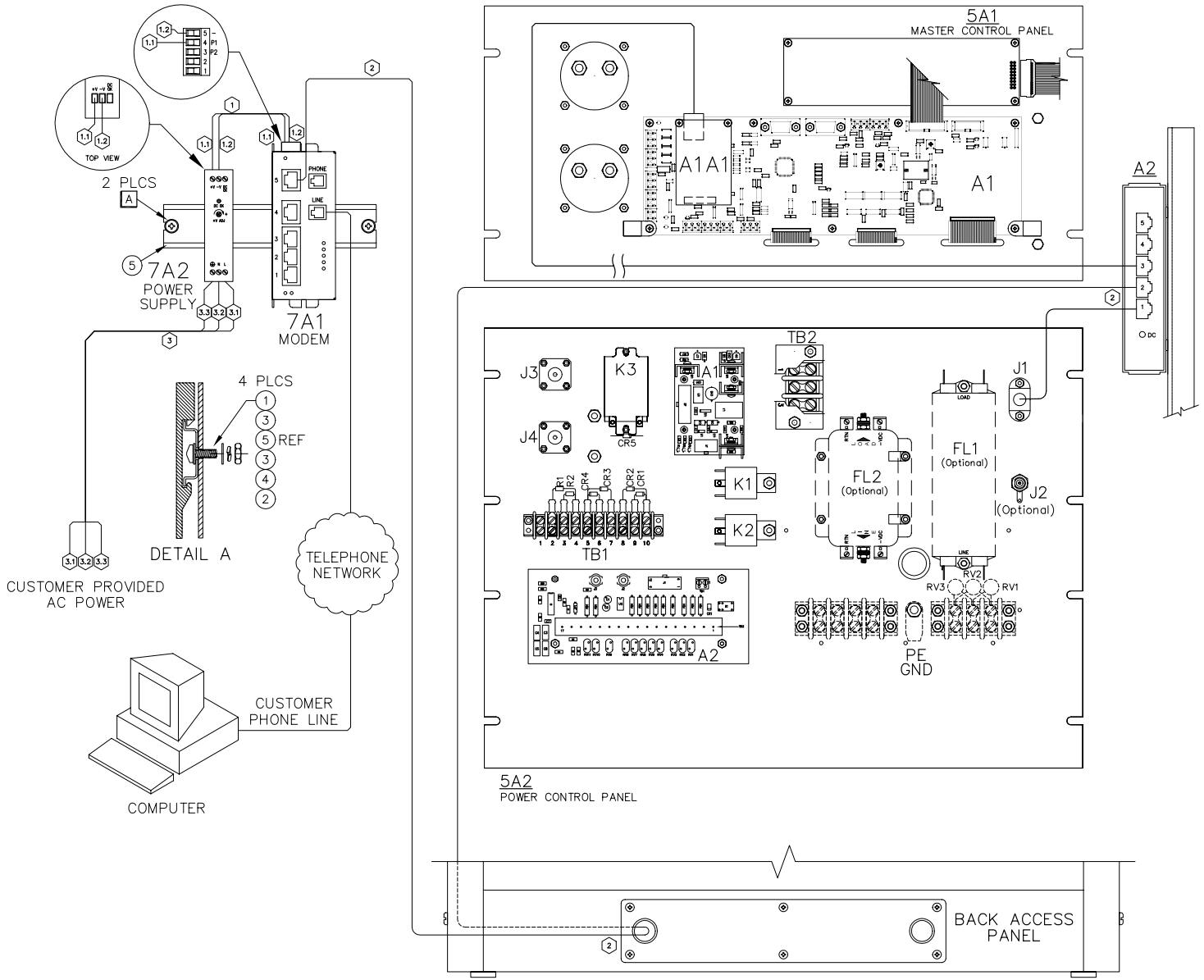
[Commit Changes](#)

5. Finally, click on Remote Users to add a list of remote users that are authorized to dial in and access the remote devices. In the screen shot shown below, the default User name of PPPLink and password Link2Sixnet is used.



Connection Detail

Configure the system as shown in the connection detail below. The modem must be connected to the SE Series Transmitter via the Ethernet cable provided and the modem connected to the dedicated phone line as shown in [Figure 12-3. SE250 Rack mount Ethernet to Land line Dial-Up.](#) on page 12-9



WIRE LIST

NO.	AWG	COLOR	LENGTH	PART NO.	F TERM.	F DEVICE	F PIN	VIA 1	VIA 2	VIA 3	VIA 4	VIA 5	TO DEVICE	TO PIN	TO TERM.
1	22	2/5	6"	38424500	-	-	-	-	-	-	-	-	-	-	-
1.1	-	2	-	-	STRIP	7A1	F	-	-	-	-	-	7A2	+V	STRIP
1.2	-	5	-	-	STRIP	7A1	C	-	-	-	-	-	7A2	-V	STRIP
2	CAT5E	6	60"	9C012046	-	7A1	5	-	-	-	-	-	A2	5	-
3	14	-	N/A	N/A	-	-	-	-	-	-	-	-	-	-	-
3.1	-	0	-	-	STRIP	7A2	L	-	-	-	-	-	CUSTOMER	AC	SUPPLY
3.2	-	9	-	-	STRIP	7A2	N	-	-	-	-	-	CUSTOMER	AC	SUPPLY
3.3	-	5	-	-	STRIP	7A2	GND	-	-	-	-	-	CUSTOMER	AC	GROUND

SAF83314 Rev E

Figure 12-3. SE250 Rack mount Ethernet to Land line Dial-Up

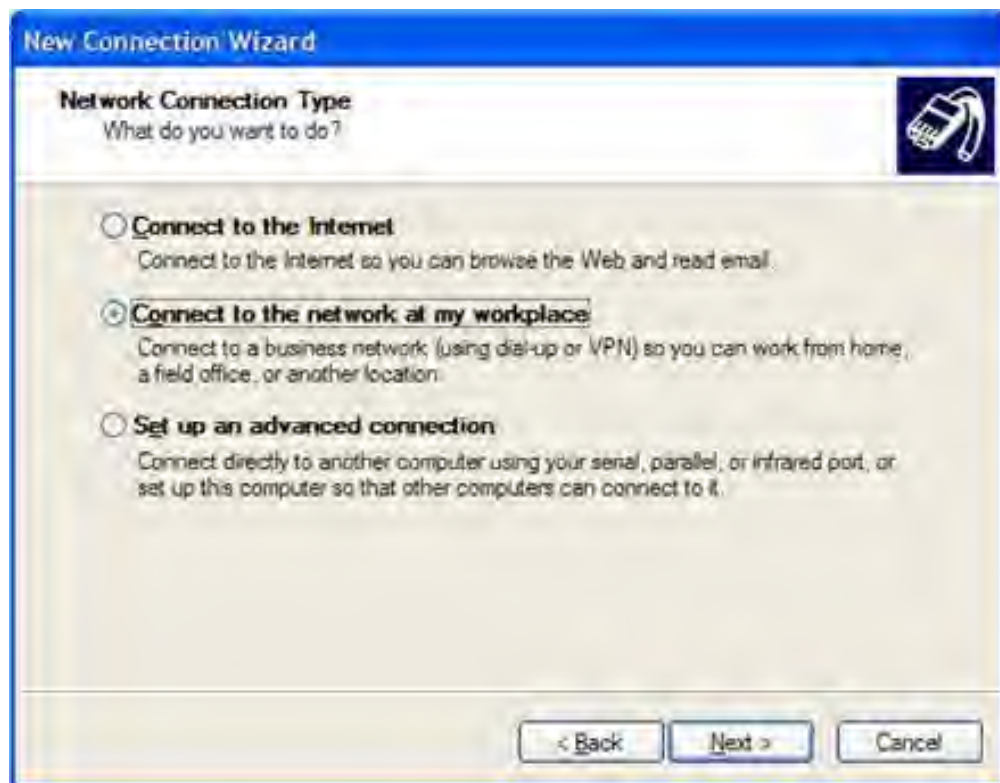
How to Configure a Microsoft Windows PC as a Client

Note: In this section you will configure a User Name and Password needed in a subsequent step.

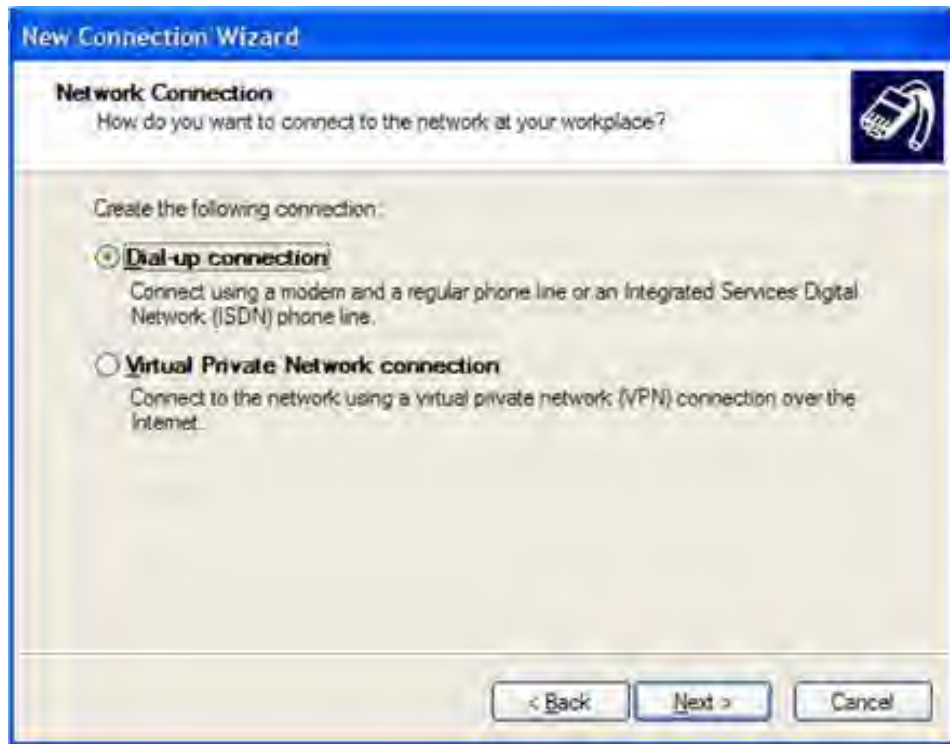
Configuring a Microsoft Windows PC as a Client

To configure Microsoft Windows as a client, you must have a modem installed. If you need to install a modem, see the user manual of your modem for installation instructions. Then do the following to create a dial-up connection:

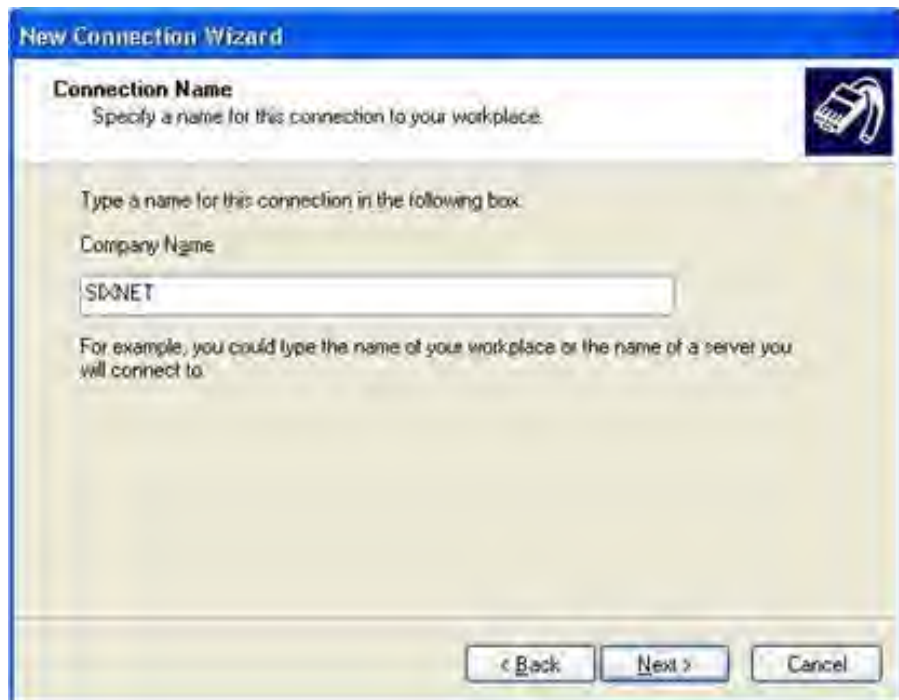
1. From the Windows Start menu, click on the Control Panel, and double-click on Network Connections. The Network Connections window displays on the screen.
2. Under Network Tasks, click **Create a new connection** to open the New Connection Wizard. Click **Next**.
3. Select **Connect to the network at my workplace**, and then click Next.



4. Select **Dial-up connection**, and then click **Next**.



5. Enter the name to use for the connection. In this case we will use Sixnet. Click **Next**.



6. Enter the phone number of the phone line that the ET/SLX-5MS-MDM switch is connected to (the phone number is 5554444 in this case). Click **Next**.

7. Select the availability of the connection. Click **Next**.
8. Click **Finish** to create the connection and exit the New Connection Wizard. A connect window displays on the screen.
9. Enter a user name and password from the Remote Users page of the ET/SLX-5MS-MDM switch that is being called. In this case the default user name PPPLink and password Link2Sixnet are used.
10. Click **Dial** to initiate the call.



11. When the above configurations are complete, record the SE Transmitter's IP Address found in the Network IP configuration section of the Master Control panel See SE Series Installation and Setup manual: Section [5 Network Control Program Software \(optional\) on page 5-1](#).

Steps to bridge SE Transmitter to Web Watch

- At your laptop, go to the **Network Connections** window (**Start\Connect To>Show all connections**)
- Select one of the dial-up names on the list, then appears the Connect 'name' window
- Enter User name and Password
- Type SE system's telephone number in the dial box
- Select the dial button
- The system should connect within 60 seconds
- When successfully connected, open your Internet Browser and enter the SE Transmitter's IP address in the address bar.

The Web Watch window should be displayed as seen in [Figure 5-1.Web GUI Main Window," on page 5-3.](#)

12.4 Parts list - SLF83314

SLF83314 Ethernet to Land line Dial-up

REF DES	QTY	PART NO.	DESCRIPTION
1	2	20005016	SCREW; PAN HEAD PHILLIPS 10-32X1/2 STAINLESS
2	2	21005000	NUT; HEX 10-32 STAINLESS STEEL
3	4	22005000	WASHER; FLAT #10 STAINLESS STEEL
4	2	22015000	WASHER; SPLIT LOCK NO. 10 STAINLESS STEEL
5	2	S1330006	RAIL; 6 3/4"W/ 1/2" X 1/4" MOUNTING SLOTS
W1	6in	38626500	WIRE, TWISTED PAIR 18 AWG RED-GREEN
W2	1	9C012046	CABLE, CAT5E RJ45 MALE/MALE BLUE
7A1	1	9M590004	MODEM, FIVE PH ETHERNET 10/100 LAND-LINE DIAL UP
7A2	1	9P690011	POWER SUPPLY, 20W SINGLE OUTPUT INDUSTRIAL DUAL

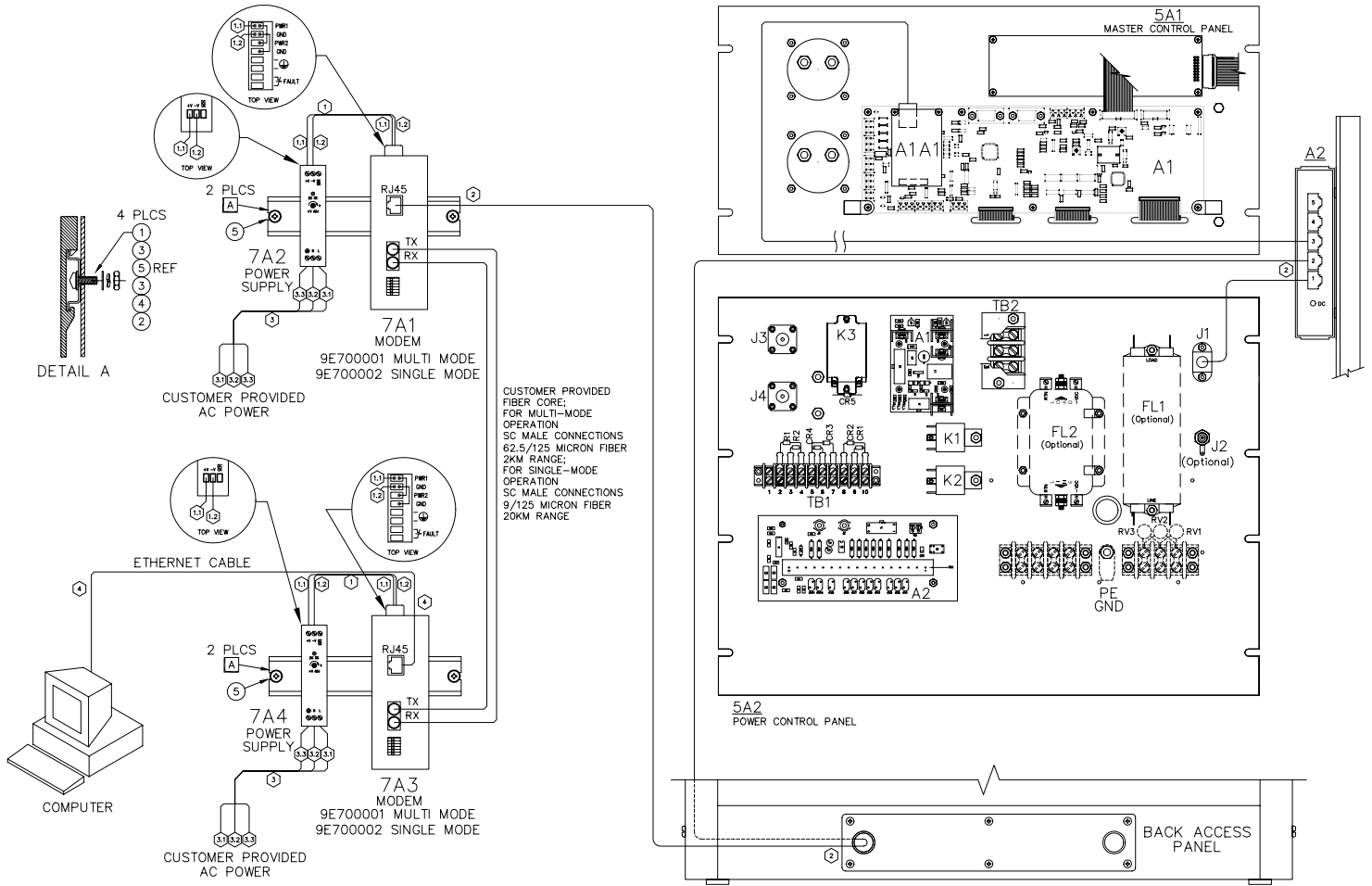
12.5 Multi-Mode Ethernet to Fiber Converter - SLF83303/SLF83308

A Fiber Optic Converter is combined with an internal Ethernet bridge to allow connection of the SE Series Transmitter's embedded serial server program with a remote computer utilizing a fiber medium at a distance of up to 1.24mi (2km) for Multi-mode operation and 12.4mi (20km) for Single-mode operation. Two identical converters are required in order to communicate data between the Transmitter and an Ethernet ready computer.

Requirements

- Laptop with Microsoft Windows XP or later, Ethernet capabilities and Internet Web Browser installed
- Fiber Optic Cable pair:
- Terminations: SC/UPC SM Male Connectors
- Size: 62.5/125 micron Multi-mode or 9/125 micron Single-mode
- Mode of operation: Multi-mode or Single-mode
- 14AWG AC Voltage hookup wire for power supply
- One Quick Installation Guide (provided)
- Two 5ft (1.5m) Ethernet Cables (provided)
- Two 24VDC Power Supplies (provided)
- Two mounting Din Rails (provided)
- Two Multi-mode or Single-mode Ethernet to Fiber Optic Converters (provided)
- Determine the IP address and network Subnet mask of your SE Series Transmitter. This is read from the Transmitter's Master Control LCD See the SE Installation Manual: Section [6.7 Network IP Configuration on page 6-14](#). You may input your own IP address or use the SAC default address.

Install the Ethernet to Fiber Optic Converters as depicted in the following drawing



NO.	AWG	COLOR	LENGTH	PART NO.	F TERM.	F DEVICE	F PIN	VIA 1	VIA 2	VIA 3	VIA 4	VIA 5	TO DEVICE	TO PIN	TO TERM.
1	22	2/5	6"	38424500	-	-	-	-	-	-	-	-	-	-	-
1.1	-	2	-	-	STRIP	7A1/3	PWR1	-	-	-	-	-	7A2/4	+V	STRIP
1.2	-	5	-	-	STRIP	7A1/3	GND	-	-	-	-	-	7A2/4	-V	STRIP
2	CAT5E	6	60"	9C012046	-	7A1	RJ45 TX	-	-	-	-	-	A2	5	-
3	14	CUSTOMER PROVIDED			-	-	-	-	-	-	-	-	-	-	-
3.1	-	0	-	-	STRIP	7A2/4	L	-	-	-	-	-	CUSTOMER	AC	SUPPLY
3.2	-	9	-	-	STRIP	7A2/4	N	-	-	-	-	-	CUSTOMER	AC	SUPPLY
3.3	-	5	-	-	STRIP	7A2/4	GND	-	-	-	-	-	CUSTOMER	AC	GROUND
4	CAT5E	6	60"	9C012046	-	7A3	RJ45 TX	-	-	-	-	-	COMPUTER	ETHERNET	-

SAF83303 Rev D

Figure 12-4. SE250 Multi-Mode Ethernet to Fiber Optics Converter

Fiber Optic Device Settings for EIR-M-SC or EIR-S-SC (see Quick Installation Guide)

1. Power Connections on the removable green terminal block

Connect +V from the Power Supply's output to PWR1, and jumper PWR1 and PWR2 together using a piece of the wire provided. If the jumper is not connected, the FAULT Led will remain on. Also jumper both GND (PWR1) and GND (PWR2) are tied using a piece of the wire provided.

2. 100BaseFX connections

Using two SC male terminated Fiber Optic cables, the Tx (transmit) port of device 1 is connected in the Rx (receive) port of device 2, and the Rx (receive) port of device 1 is connected to the Tx (transmit) port of device 2.

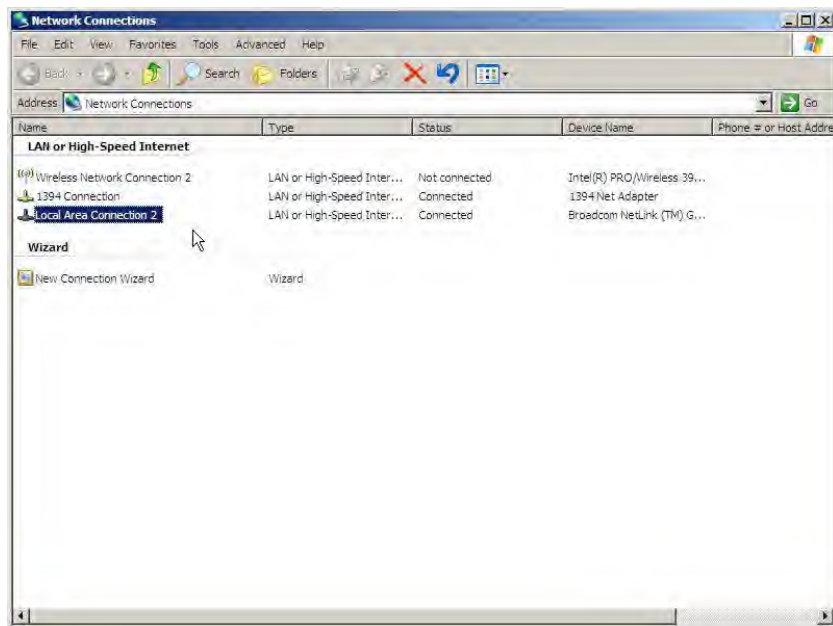
3. DIP Switch Settings for both devices

Position no. 1 and 6 are to one (1).

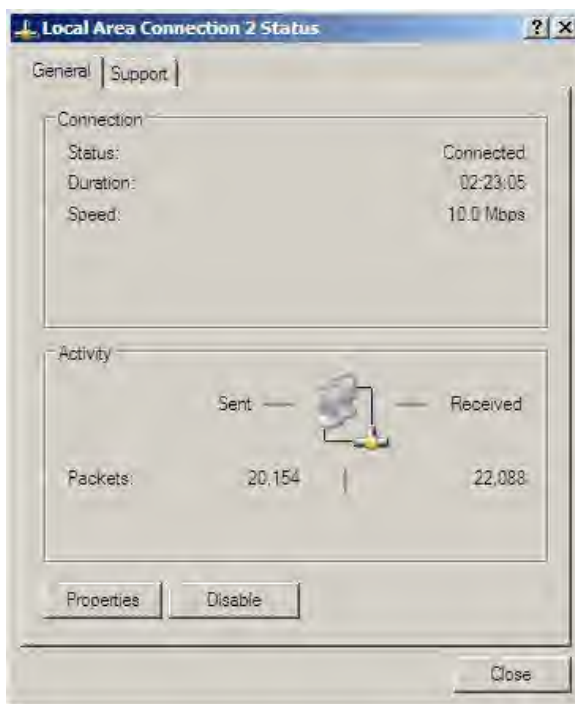
Position no. 2 thru 5 are to zero (0).

Configure Microsoft Windows Network as a Client

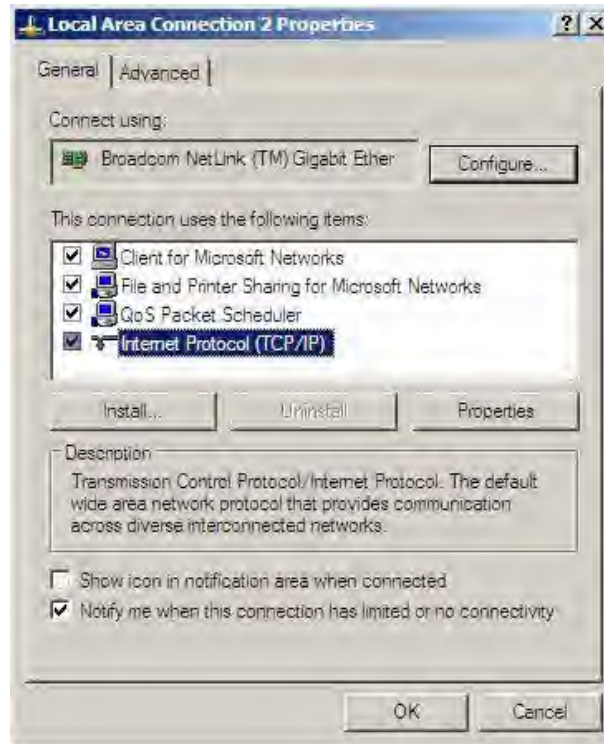
1. Energize the Fiber Optic Converter.
2. Connect your laptop to the Fiber Optic Converter using the Ethernet cable provided.
3. At the laptop, select **Start** → **Connect To** → **Show all connections**. The Network connections window below appears. Select **Local Area Connection 2** from the selection under LAN or High Speed Internet.



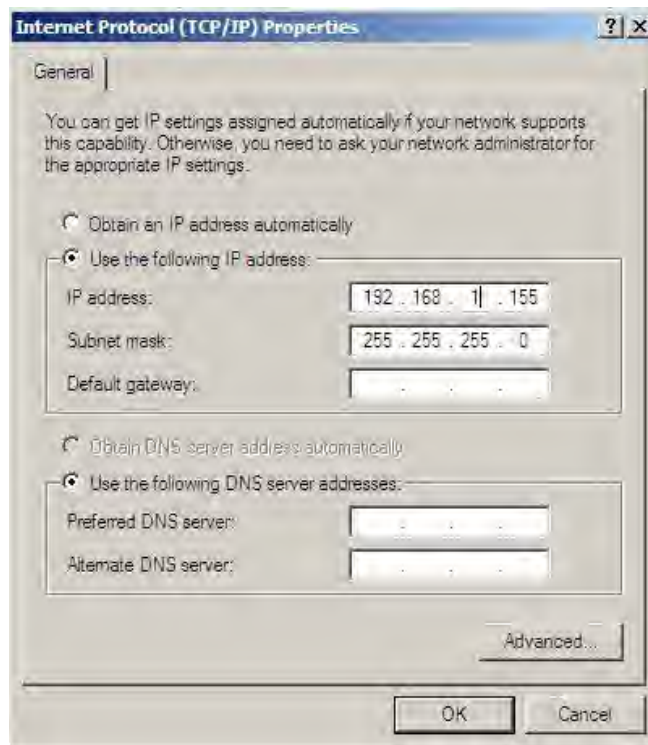
4. The screen displays the **Local Area Connection Status** window. Select **Properties**.



5. The **Local Area Connection Properties** window appears as below. Select **Internet Protocol (TCP/IP)**, and then select **Properties**.



Select Use the following IP address, and then enter the IP address and Subnet mask from the SE Series Transmitter. Click OK.



6. Then click **OK** on the **Local Area Connection Properties** window.
7. Click **Close** under the **Local Area Connection Status** window to exit.

Steps to bridge SE Transmitter to Web Watch

- Energize the SE Transmitter.
- Turn on both Ethernet Fiber Optics converters, and wait approximately 30 seconds for them to connect. If they do not connect, verify all connections and try again.
- Verify both devices' LNK/ACT LEDs are flashing while communicating with each other.
- Connect your laptop computer to the remote Fiber Optic converter using the Ethernet cable provided.
- When successfully connected, open your computer's Internet Web Browser and enter the SE Transmitter's IP address in the address bar.
- You should see the main WEB Watch Program screen described in Section 5.2 of the SE Transmitter's Installation Manual.
- This concludes the installation and initial operation of the Multi-mode and Single-mode Ethernet to Fiber Optic converters for the SE Series Transmitter System.

12.6 Parts list - SLF83303

SLF83303 Multi-Mode Ethernet to Fiber Converter 2KM

REF DES	QTY	PART NO.	DESCRIPTION
1	4	20005016	SCREW; PAN HEAD PHILLIPS 10-32X1/2 STAINLESS
2	4	21005000	NUT; HEX 10-32 STAINLESS STEEL
3	8	22005000	WASHER; FLAT #10 STAINLESS STEEL
4	4	22015000	WASHER; SPLIT LOCK NO. 10 STAINLESS STEEL
5	2	S1330019	RAIL; 8 1/2"W/ 1/2" X 1/4" MOUNTING SLOTS
W1	1.170 ft	38626500	WIRE, TWISTED PAIR 18 AWG RED-GREEN
W2	1	9C012046	CABLE, CAT5E RJ45 MALE/MALE BLUE
W4	1	9C012046	CABLE, CAT5E RJ45 MALE/MALE BLUE
7A1	1	9E700001	CONVERTER, ETHERNET 10/100 TO SINGLE MODE 2KM
7A3	1	9E700001	CONVERTER, ETHERNET 10/100 TO SINGLE MODE 2KM
7A2	1	9P690011	POWER SUPPLY, 20W SINGLE OUTPUT INDUSTRIAL DUAL
7A4	1	9P690011	POWER SUPPLY, 20W SINGLE OUTPUT INDUSTRIAL DUAL

12.7 Parts list - SLF83308

SLF83308 Multi-Mode Ethernet to Fiber Converter 20KM

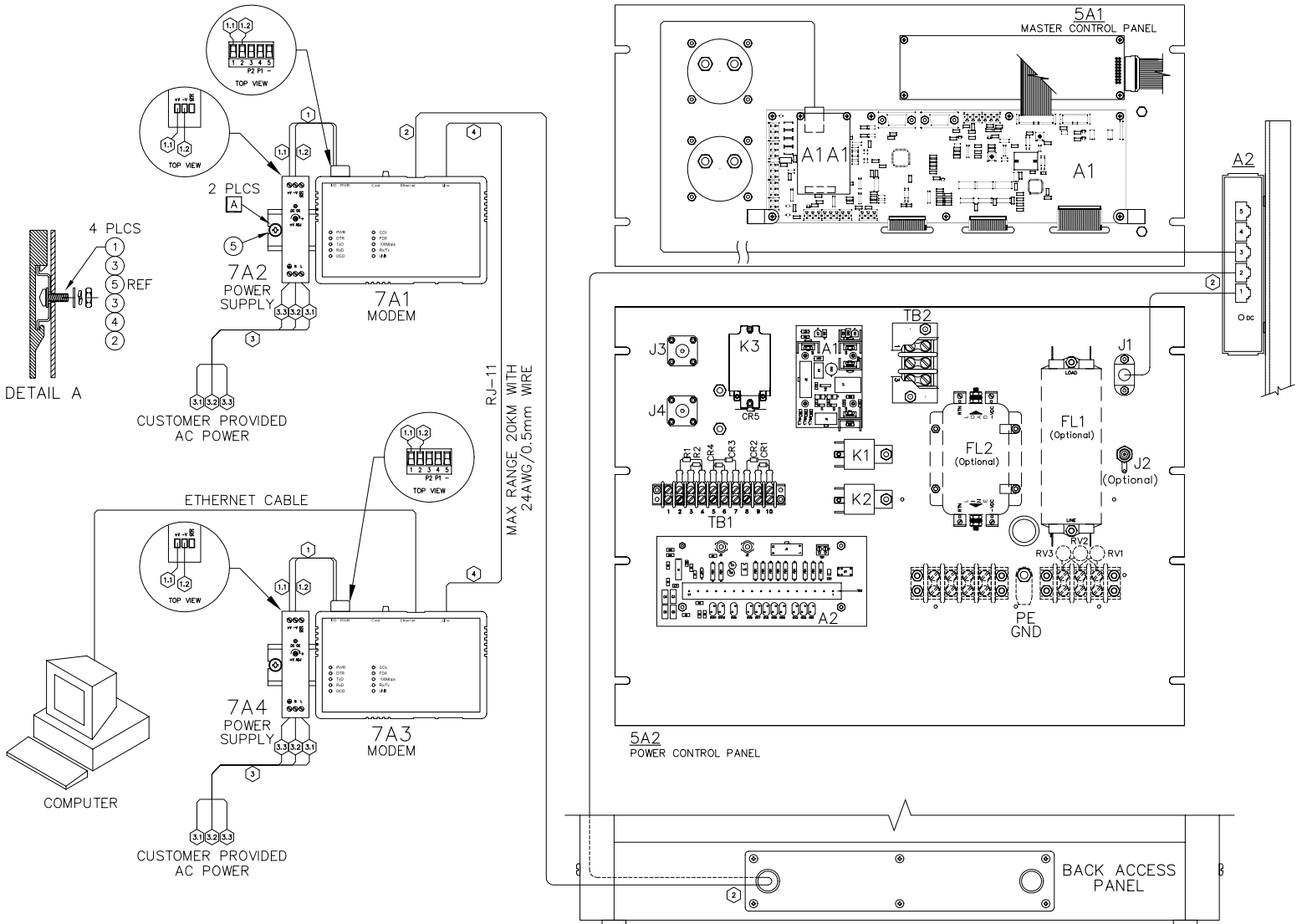
REF DES	QTY	PART NO.	DESCRIPTION
1	4	20005016	SCREW; PAN HEAD PHILLIPS 10-32X1/2 STAINLESS
2	4	21005000	NUT; HEX 10-32 STAINLESS STEEL
3	8	22005000	WASHER; FLAT #10 STAINLESS STEEL
4	4	22015000	WASHER; SPLIT LOCK NO. 10 STAINLESS STEEL
5	2	S1330019	RAIL; 8 1/2"W/ 1/2" X 1/4" MOUNTING SLOTS
W1	1.170 ft	38626500	WIRE, TWISTED PAIR 18 AWG RED-GREEN
W2	1	9C012046	CABLE, CAT5E RJ45 MALE/MALE BLUE
W4	1	9C012046	CABLE, CAT5E RJ45 MALE/MALE BLUE
7A1	1	9E700002	CONVERTER, ETHERNET 10/100 TO SINGLE MODE 20KM
7A3	1	9E700002	CONVERTER, ETHERNET 10/100 TO SINGLE MODE 20KM
7A2	1	9P690011	POWER SUPPLY, 20W SINGLE OUTPUT INDUSTRIAL DUAL
7A4	1	9P690011	POWER SUPPLY, 20W SINGLE OUTPUT INDUSTRIAL DUAL

12.8 Ethernet Leased Line Modem - SLF83301

A Leased Line Modem, combined with an internal Ethernet bridge, allows connection of the SE Transmitter to a remote located computer via a TELCO Network. Two identical modems are required for proper communication of data over telephone line or copper wires extended between the user's computer and the SE Transmitter.

Requirements

- Laptop with Microsoft Windows XP or later, Ethernet capabilities and Internet Web Browser installed
- Telephone Line or Copper wires
- One User Guide (provided or <http://www.mulogic.com/llm-336-eth.html>)
- Two 5ft (1.5m) Ethernet Cables (provided)
- Two Ethernet to Leased Line modems (provided)
- Two 24VDC Power Supplies (provided)
- Two Din Rails (provided).



WIRE LIST

NO.	AWG	COLOR	LENGTH	PART NO.	F TERM.	F DEVICE	F PIN	VIA 1	VIA 2	VIA 3	VIA 4	VIA 5	TO DEVICE	TO PIN	TO TERM.
1	22	2/5	6"	38424500	-	-	-	-	-	-	-	-	-	-	-
1.1	-	2	-	-	STRIP	7A1/3	F	-	-	-	-	-	7A2/4	+V	STRIP
1.2	-	5	-	-	STRIP	7A1/3	C	-	-	-	-	-	7A2/4	-V	STRIP
2	CAT5E	6	60"	9C012046	-	7A1/3	5	-	-	-	-	-	A2	5	-
3	14	CUSTOMER PROVIDED			-	-	-	-	-	-	-	-	-	-	-
3.1	-	0	-	-	STRIP	7A2/4	L	-	-	-	-	-	CUSTOMER	AC	SUPPLY
3.2	-	9	-	-	STRIP	7A2/4	N	-	-	-	-	-	CUSTOMER	AC	SUPPLY
3.3	-	5	-	-	STRIP	7A2/4	GND	-	-	-	-	-	CUSTOMER	AC	GROUND
4	-	CUSTOMER PROVIDED			-	7A1	LINE	-	-	-	-	-	7A3	LINE	-

SAF83301 Rev E
Figure 12-5. SE250 Leased Line Modem

Steps to Configure the Local Modem at the SE Transmitter

Connect the modems to the transmitter, remote computer and TELCO phone line as shown in the connection diagram

Dip-switch 1 (DS1) settings (shipped with default baud: 33.6 kbit/s):

1. Off (UP)
2. Off (UP)
3. Off (UP)
4. Off (UP)
5. On (DOWN)
6. Off (UP)
7. Off (UP)
8. Off (UP).

Dip-switch 2 (DS2) settings:

1. Off (UP)
2. On (DOWN) for 2-wire operation
3. Off (UP)
4. Off (UP)
5. Off (UP)
6. Off (UP)
7. On (DOWN) for Originate mode
8. Off (UP).

How to Configure the Remote Modem at the user's location (Client)

Dip-switch 1 (DS1) settings (shipped with default baud: 33.6 kbit/s)

1. Off (UP)
2. Off (UP)
3. Off (UP)
4. Off (UP)
5. On (DOWN)
6. Off (UP)
7. Off (UP)
8. Off (UP)

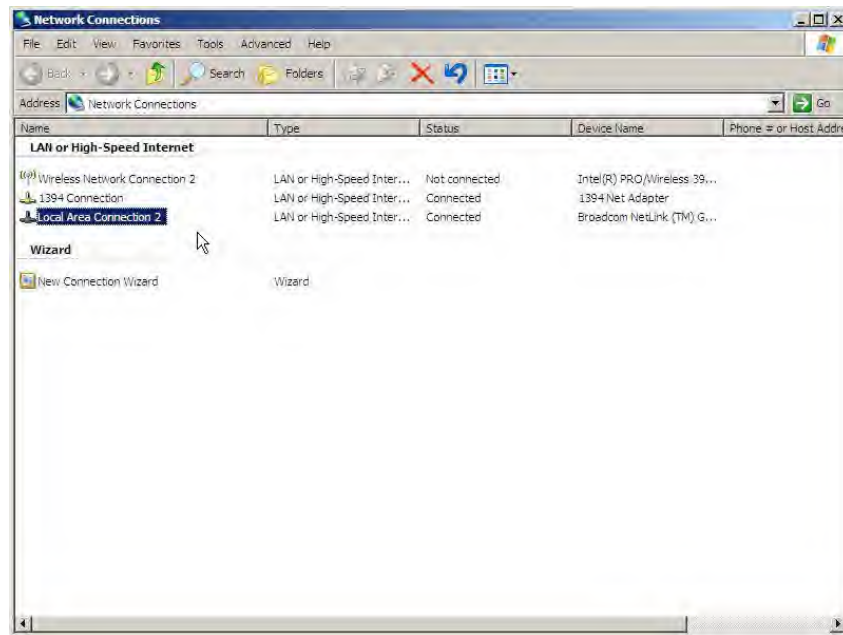
Dip-switch 2 (DS2) settings

1. Off (UP)
2. On (DOWN) for 2-wire operation
3. Off (UP)
4. Off (UP)
5. Off (UP)
6. Off (UP)
7. Off (UP) for Answer mode
8. Off (UP)

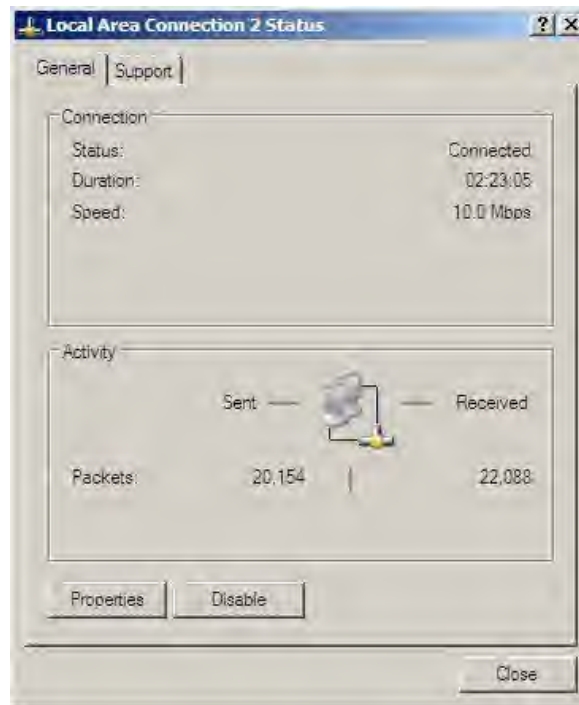
When the above settings are complete, record the SE Transmitter's IP address and Netmask contained in the network IP configuration under the Transmitter's Master Control panel See SE manual: section [6.7 Network IP Configuration on page 6-14](#).

How to configure Microsoft Windows Network as a Client

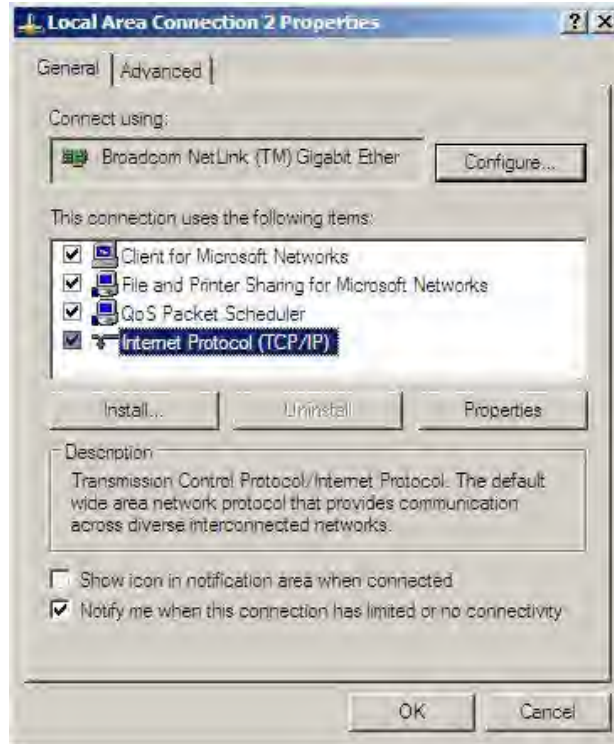
1. Energize the remote Leased Line Modem.
2. Connect your laptop to the Leased Line modem using the Ethernet cable provided.
3. At the laptop, select **Start** → **Connect To** → **Show all connections**. The Network connections window below appears. Select **Local Area Connection 2** from the selection under LAN or High Speed Internet.



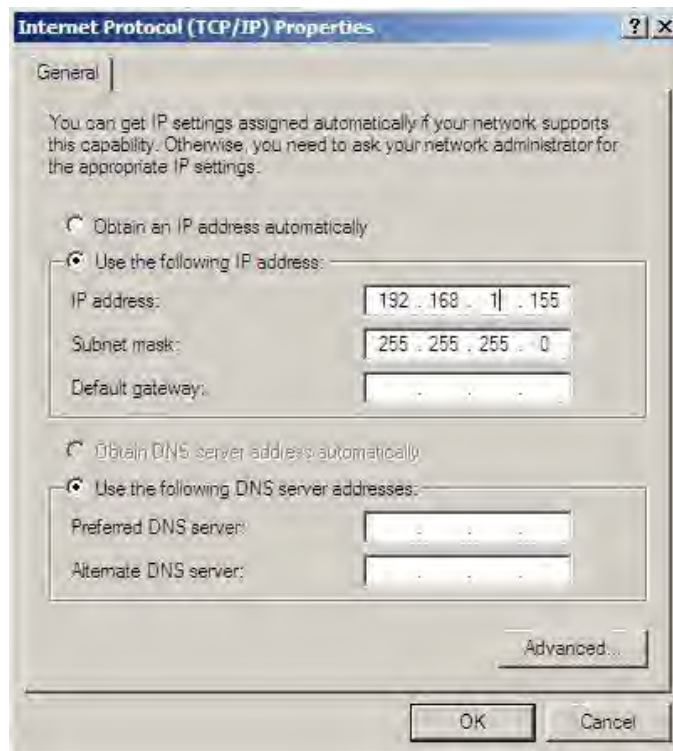
4. The screen displays the **Local Area Connection Status** window. Select **Properties**.



5. The **Local Area Connection Properties** window appears as below. Select **Internet Protocol (TCP/IP)**, and then select **Properties**.



Select Use the following IP address, and then enter the IP address and Subnet mask from the SE Series Transmitter. Click OK.



6. Then click **OK** on the **Local Area Connection Properties** window.
7. Click **Close** under the **Local Area Connection Status** window to exit.

Steps to bridge SE Transmitter to Web Watch

- Energize the SE Transmitter.
- Turn on both Ethernet Leased Line modems, and wait approximately 30 seconds for them to connect. If they do not connect, verify all connections and try again.
- Verify both devices' LNK LEDs are flashing while communicating with each other.
- Connect your laptop computer to the remote Leased Line modem (above) using the Ethernet cable provided.
- When successfully connected, open your computer's Internet Web Browser and enter the SE Transmitter's IP address in the address bar.
- See the main WEB Watch Program screen described in [5.2 WEB Watch Program Software on page 5-1](#).

12.9 Parts list - SLF83301

SLF83301 Leased line modem

REF DES	QTY	PART NO.	DESCRIPTION
1	4	20005016	SCREW; PAN HEAD PHILLIPS 10-32X1/2 STAINLESS
2	4	21005000	NUT; HEX 10-32 STAINLESS STEEL
3	8	22005000	WASHER; FLAT #10 STAINLESS STEEL
4	4	22015000	WASHER; SPLIT LOCK NO. 10 STAINLESS STEEL
5	2	S1330019	RAIL; 8 1/2"W/ 1/2" X 1/4" MOUNTING SLOTS
W1	12in	38626500	WIRE, TWISTED PAIR 18 AWG RED-GREEN
W2	1	9C012046	CABLE, CAT5E RJ45 MALE/MALE BLUE
W4	1	9C012046	CABLE, CAT5E RJ45 MALE/MALE BLUE
7A1	1	9E700003	ETHERNET 10/100 SINGLE OUTPUT INDUSTRIAL
7A2	1	9E700003	ETHERNET 10/100 SINGLE OUTPUT INDUSTRIAL
7A3	1	9P690011	POWER SUPPLY, 20W SINGLE OUTPUT INDUSTRIAL DUAL
7A4	1	9P690011	POWER SUPPLY, 20W SINGLE OUTPUT INDUSTRIAL DUAL

12.10 Ethernet Extender - SLF83315

Two Ethernet Extenders are combined with an internal Ethernet bridge to allow series extension of the SE Series Transmitter's Ethernet communication network via a RJ-11 terminated TELCO Network cable (see Quick Start Guide provided for detailed description).

Requirements:

- Laptop with Microsoft Windows XP or later, Ethernet capabilities and Internet Web Browser installed
- One Pair of TELCO Network cable with RJ-11 termination
- Two AC to DC Power Adaptors (provided)
- One Quick Start Guide (provided)
- Two 5ft (1.5m) Ethernet Cables (provided)
- Determine the IP address and network Subnet mask of your SE Series Transmitter. This is read from the Transmitter's Master Control LCD (See the SE Installation Manual: Section 6.6 **Network IP Configuration**). You may input your own IP address or use the SAC default address.

Install the Ethernet Extenders as depicted in the following drawing:

Power Connections:

The power adaptor (provided) plugs into the power port of each Ethernet Extender.

DIP Switch Settings:

Extender 1 at the SE Transmitter location must be set to local (Loc).

Extender 2 at the laptop location is set to remote (Rmt).

Communication Connections:

For the local Extender, the Ethernet cable connects between one of the ports of the SE Transmitter's LAN switch and the Ethernet port of the Ethernet Extender.

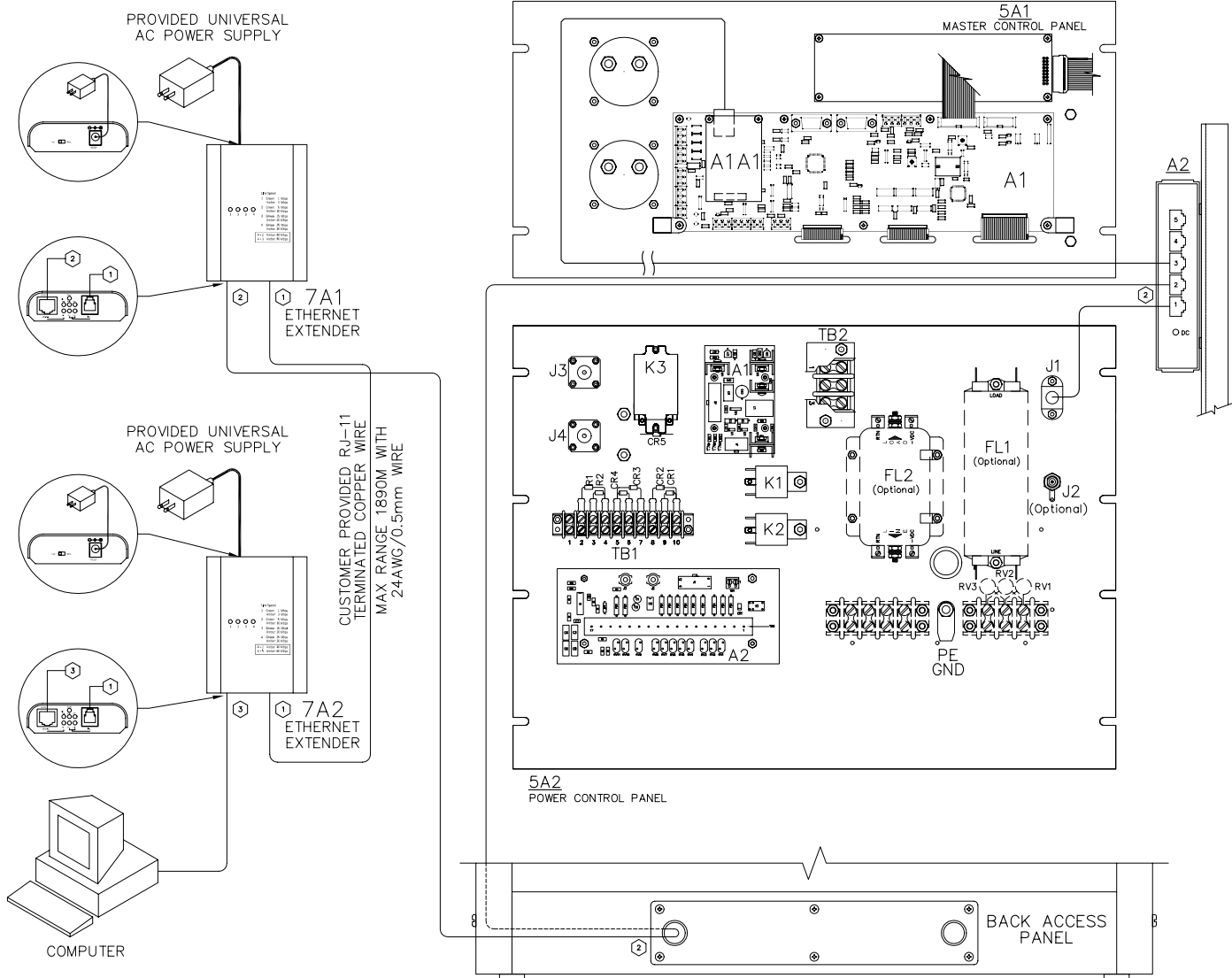
For the remote Extender, the Ethernet cable connects between the Ethernet port of your laptop and the Ethernet port of the Ethernet Extender.

One RJ-11 TELCO Network cable connects between the Line port of the Local Extender and the Line port of the Remote Extender.

Configure of Microsoft Windows Network as a Client (insert the same write up as the Fiber Optics section)

Steps to bridge the SE Transmitter to the SE Transmitter's WEB Watch:

- Energize the SE Transmitter.
- Turn on both Ethernet extenders, and wait approximately 10 seconds for them to connect. If they do not connect, verify all connections and try again.
- Verify both devices' LNK/ACT LEDs are flashing while communicating with each other.
- Verify both devices' Line Speed LEDs are the same number(s).
- Verify the local extender's LOC LED is on and the remote extender's RMT LED is on.
- When successfully connected, open your computer's Internet Web Browser and enter the SE Transmitter's IP address in the address bar.
- See the main WEB Watch Program screen described in Section 5.2 of the SE Transmitter's Installation Manual.



WIRE LIST

NO.	AWG	COLOR	LENGTH	PART NO.	F TERM.	F DEVICE	F PIN	VIA 1	VIA 2	VIA 3	VIA 4	VIA 5	TO DEVICE	TO PIN	TO TERM.
1	—	—	—	CUSTOMER PROVIDED	—	7A1	LINE	—	—	—	—	—	7A2	LINE	—
2	CAT5E	6	60"	9C012046	—	7A1	ETHERNET	—	—	—	—	—	A2	5	—
3	CAT5E	6	60"	9C012046	—	7A2	ETHERNET	—	—	—	—	—	COMPUTER	ETHERNET	—

SAF83315 Rev E
Figure 12-6. SE250 Ethernet Extender

12.11 Parts list - SLF83315

SLF83315 Ethernet extender modem

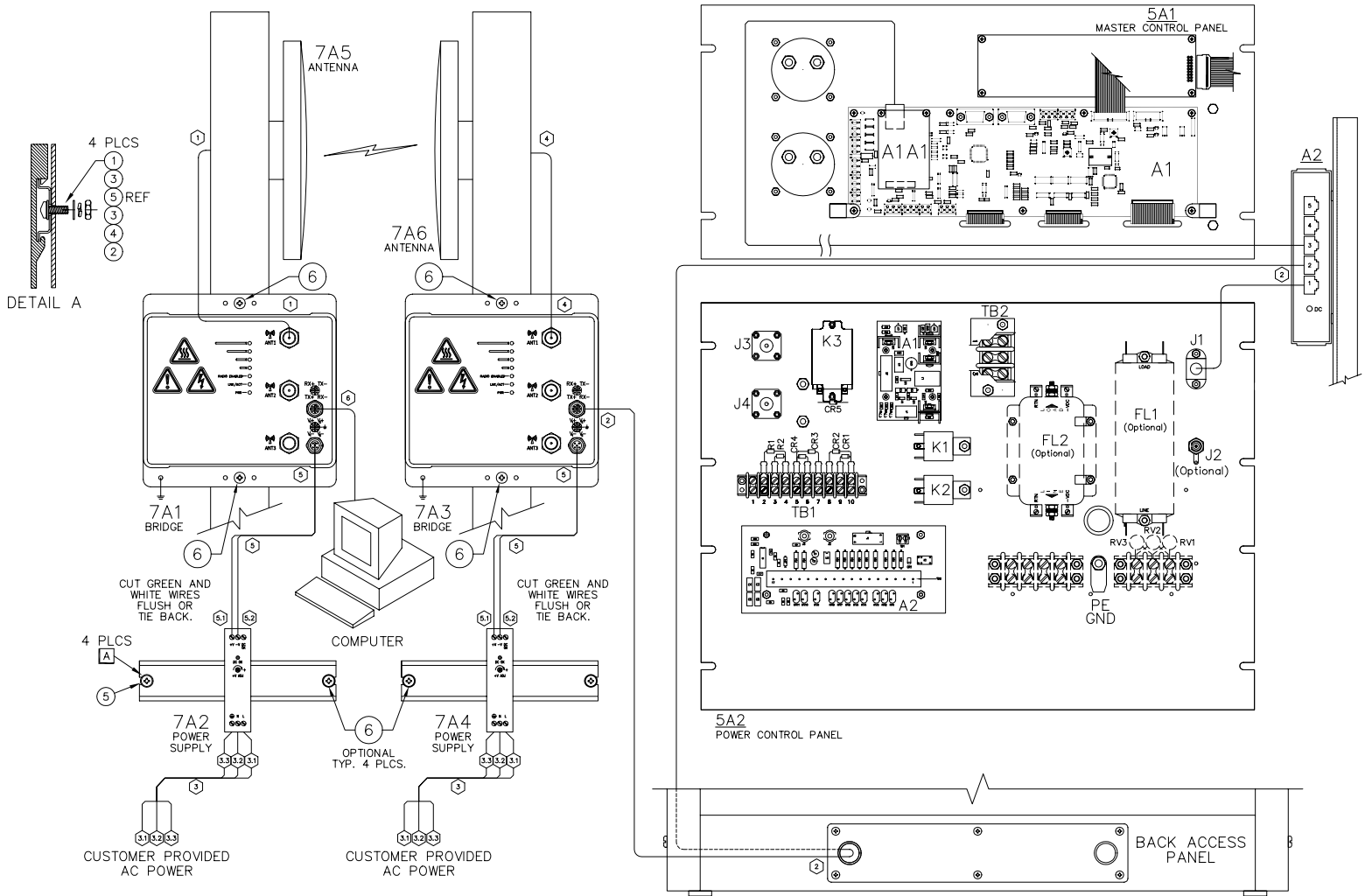
REF DES	QTY	PART NO.	DESCRIPTION
W2	1	9C012046	CABLE, CAT5E RJ45 MALE/MALE BLUE
W4	1	9C012046	CABLE, CAT5E RJ45 MALE/MALE BLUE
7A1	1	9E700000	ETHERNET COPPER EXTENDER 10/100 Mbps, 6200 FEET RANGE
7A2	1	9E700000	ETHERNET COPPER EXTENDER 10/100 Mbps, 6200 FEET RANGE

12.12 Ethernet Radio Link - SLF83304

Introduction: This option is an IP67 rated Industrial Wireless Radio equipped with an Ethernet bridge allowing the connection of the SE Series Transmitter's Ethernet port over a wireless radio medium to a distant Ethernet ready computer or LAN. The wireless transceivers must be the same model at both NDB and remote sites to allow communication of data over this wireless link.

Requirements:

- Laptop with Microsoft Windows XP or later, Ethernet capabilities and Internet Web Browser installed.
- Two Industrial Ethernet Wireless Radio.
- Two 5.8GHz, 19dBi Panel Directional Antenna N-Female Connector and Pole Mount Brackets (provided).
- One N-TRON 702M12-W Software CD with User's Manual & Installation Guide (provided).
- Two 24VDC Power Supplies (provided).
- Two Din Rails (provided).
- #2 Phillip's head (star) screwdriver
- Narrow #1 flat head screwdriver
- 10mm nut driver
- 13mm nut driver



WIRE LIST

NO.	AWG	COLOR	LENGTH	PART NO.	F TERM.	F DEVICE	F PIN	VIA 1	VIA 2	VIA 3	VIA 4	VIA 5	TO DEVICE	TO PIN	TO TERM.
1	-	0	50'	9C012053	TYPE N	7A5	-	-	-	-	-	-	BRIDGE	ANT 1	TNC
2	-	0	10'	9C040001	M12	7A3	RX/TX	-	-	-	-	-	A2	5	RJ45
3	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3.1	-	0	-	-	STRIP	7A2/4	L	-	-	-	-	-	CUSTOMER	AC	SUPPLY
3.2	-	9	-	-	STRIP	7A2/4	N	-	-	-	-	-	CUSTOMER	AC	SUPPLY
3.3	-	5	-	-	STRIP	7A2/4	GND	-	-	-	-	-	CUSTOMER	AC	GROUND
4	-	0	50'	9C012053	TYPE N	7A6	-	-	-	-	-	-	BRIDGE	ANT 1	TNC
5	-	-	10'	9C040000	-	-	-	-	-	-	-	-	-	-	-
5.1	-	0	-	-	STRIP	7A2/4	-V	-	-	-	-	-	7A1/7A3	V+ /V-	-
5.2	-	2	-	-	STRIP	7A2/4	+V	-	-	-	-	-	7A1/7A3	V+ /V-	-

SAF83304 Rev D
Figure 12-7. SE250 Ethernet Radio link detail

Note:

Read the User's Manual & Installation Guide special emphasis is placed on review all safety warnings prior to beginning this installation.

The 702M12-W Installation:

To install the Wireless Radio mounted to a DIN-Rail, bulkhead or an outdoor pole (see Pages 9 to 11 of the User's Manual & Installation Guide on the CD provided).

Two options for DIN-Rail installation exist to mount the provided power supplies. Mount the rail using either reference designator combination (1), (3), (5), (3), (4) and (2); or use the provided sheet metal/wood screws reference designator (6), as seen in the Radio Link option drawing. Mount the provided Power Supplies (7A2) and (7A4) to the Din-Rails. Ethernet Bridges (7A1) and (7A3) should be mounted using sheet metal/wood screws (6). See Antenna mounting instructions and use hardware provided with the antenna to mount. You will need a 10mm and 13mm socket to tighten antenna hardware.

Applying Power:

The M12A coded power connector is keyed, so a mating connection from the power supply can only be made when the male and female ends are properly aligned. Connect one cable, reference designator (5), between power supply (7A2) and Ethernet Bridge (7A1), and connect one cable, reference designator (5), between power supply (7A4) and Ethernet Bridge (7A3). In each case cut or tie back the green and white wires. These wires are available for redundant supply use, see note below.

Notes: (Recommended 24V DC Power Supply provided)

- Only one power supply must be connected for full operation. For redundant power operation V1 and V2 inputs must be connected to separate DC Voltage sources. The transmitter will draw current from both sources simultaneously. Use 16-18 gauge wires when connecting to the power supply.

Ethernet Connections:

Connect wire (6) between Ethernet Bridge (7A1) and the remote computer. Connect wire (2) between Ethernet Bridge (7A3) and the SE Transmitter's Ethernet Switch.

Earth Grounding:

See page 16 of the User's Manual and Installation Guide for proper transmitter grounding.

Troubleshooting:

- Make sure the PWR (Power LED) is ON.
- Make sure you are supplying sufficient current the version chosen.
- Note: The Inrush current will exceed the steady state current by ~2X
- Verify that the LNK/ACT (Link/Activity LED) is ON for the connected port.
- Verify cabling used between SE Transmitter unit and station.
- Verify that cabling is Category 5E or greater for 100Mbit operating.

Wireless Radio Software Configurations:

To Configure the Settings of the Wireless Radio (see Pages 19 thru 55 in the User's Manual and Installation Guide). The following topology has been chosen at Southern Avionics Company as the default: Scenario 1 - Basic Bridge.

Remember: record IP Address and Network Subnet Mask found in the network IP configuration settings of SE Transmitter's Master Control panel (See the SE Installation and Setup Manual: section 5 **Network Control program Software and** section 6.6 **Network IP Configuration**).

Device #1 Setting: (N-TRON 702M12-W) at transmitter.

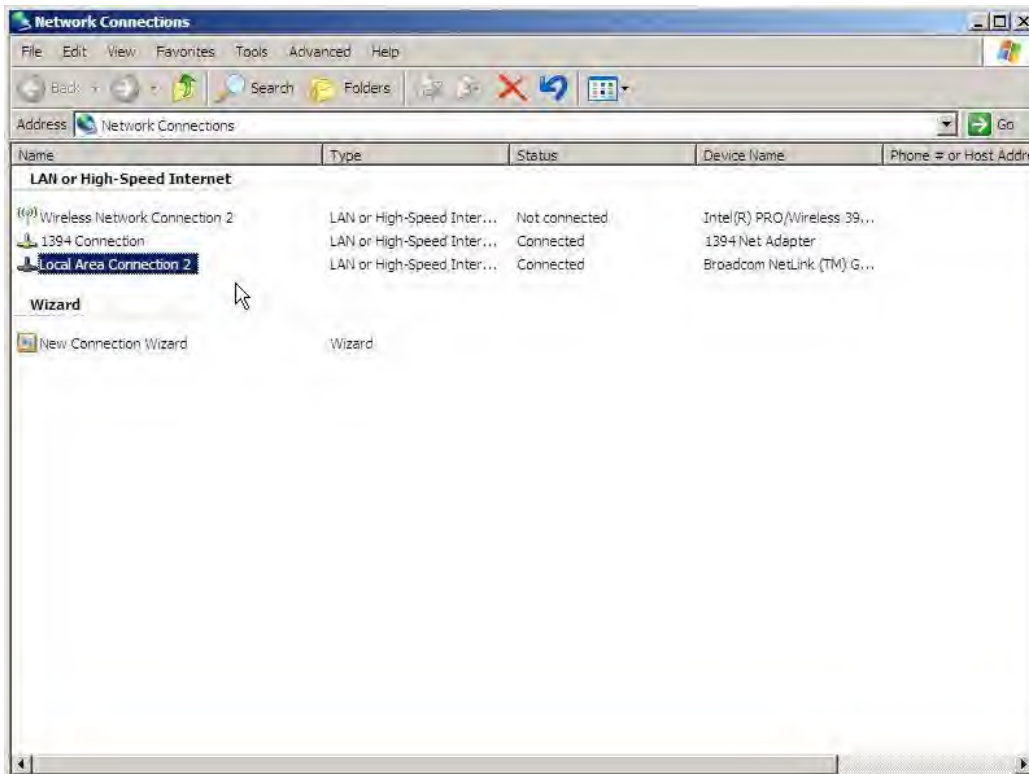
Link Setup	Label Name	Enter
	Wireless Mode:	AP
	SSID:	N-TRON
	Country Code:	United States
	802.11 Mode:	11Ng-20MHz
	Channel:	10 – 2457MHz
	Extension Channel:	N/A
	Output Power:	12dBm
Network		
	Mode:	Bridge
	IP Address:	192.168.1.7
	Netmask:	255.255.255.0
	Gateway:	192.168.1.1

Device #2 Setting: (N-TRON 702M12-W) at remote computer.

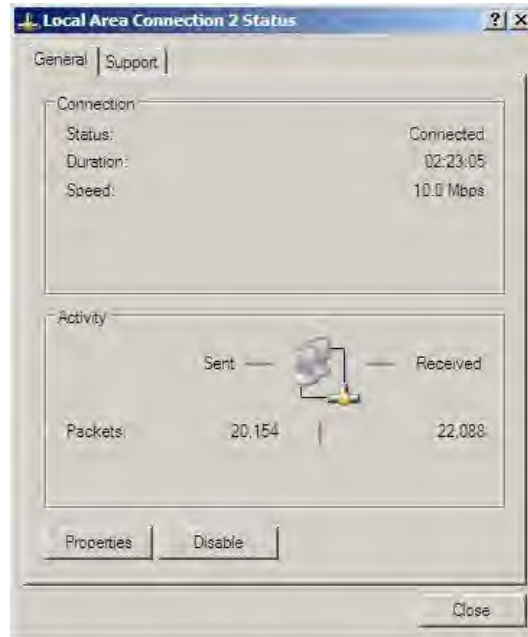
Link Setup	Label name	Enter
	Wireless Mode:	Station
	ESID:	N-TRON
	Country Code:	United States
	802.11 Mode:	11Ng-20MHz
	Extension Channel:	N/A
	Output Power:	12dBm
Network		
	Mode:	Bridge
	IP Address:	192.168.1.8
	Netmask:	255.255.255.0
	Gateway:	192.168.1.1

Configure Microsoft Windows XP Network as a Client

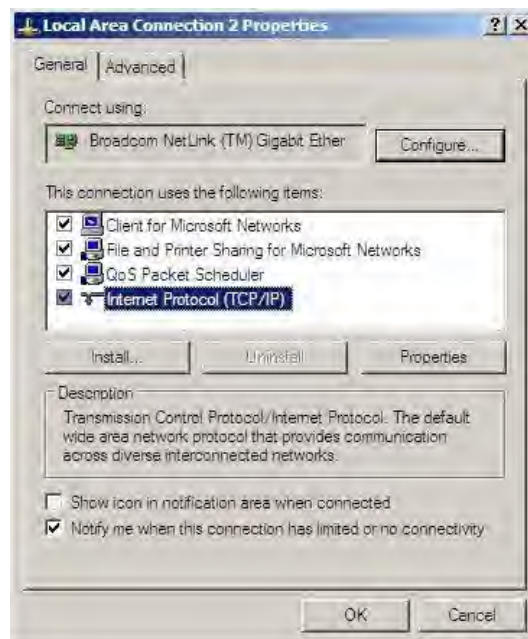
1. Energize the Ethernet Wireless Radio.
2. Connect your laptop to the Wireless Radio using the Ethernet cable provided.
3. At the laptop, select **Start** → **Connect To** → **Show all connections**. The Network connections window below appears. Select **Local Area Connection 2** (not wireless) from the selection under LAN or High Speed Internet.



4. The screen displays the **Local Area Connection Status** window. Select **Properties**



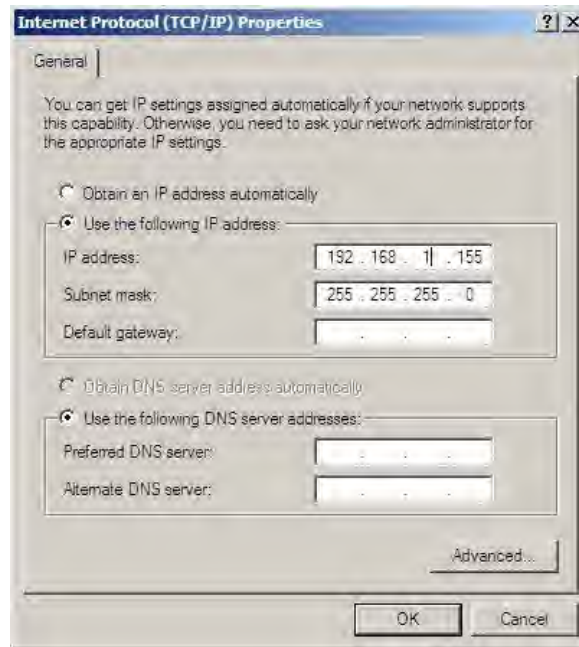
5. The **Local Area Connection Properties** window appears as below. Select **Internet Protocol (TCP/IP)** or **Internet Protocol Version 4 (TCP/IPv4)**, and then select **Properties**.



Select **Use the following IP address**, and then enter an IP address one number above the SE Series Transmitter's address. Select **OK**.

Example:

Transmitter's IP address is 192.168.1.135 then you would enter 192.168.1.136



6. Then click **OK** on the **Local Area Connection Properties** window.
7. Click **Close** under the **Local Area Connection Status** window to exit.

Steps to bridge SE Transmitter to Web Watch

- Energize the SE Transmitter.
- Turn on both Ethernet Wireless Radio devices, and wait approximately 30 seconds for them to connect. If they do not connect, verify all connections and try again.
- Verify both devices' RADIO ENABLED, and PWR LEDs are ON and the LNK/ACT LED is flashing while communicating with each other.

Connect your laptop computer to the remote device (above) using the Ethernet cable provided.

- When successfully connected, open your computer's Internet Web Browser and enter the SE Transmitter's IP address in the address bar.
- You should see the main WEB Watch Program screen described in Section 5.2 of the SE Transmitter's Installation Manual.

12.13 Parts list - SLF83304

SL83304 Ethernet Radio link option

REF DES	QTY	PART NO.	DESCRIPTION
1	2	20005016	SCREW; PAN HEAD PHILLIPS 10-32X1/2 STAINLESS
2	2	21005000	NUT; HEX 10-32 STAINLESS STEEL
3	4	22005000	WASHER; FLAT #10 STAINLESS STEEL
4	2	22015000	WASHER; SPLIT LOCK NO. 10 STAINLESS STEEL
5	2	S1330006	RAIL; 6 3/4"W/ 1/2" X 1/4" MOUNTING SLOTS
6	8	20095032	SCREW; PAN HEAD SHEET METAL 10X1 STAINLESS
W1	1	9C012053	CABLE; COAXIAL, TNC REVERSE POLARITY TO TYPE-N MALE
W2	1	9C040001	CABLE; CAT5E, 90 deg, M12 TO RJ45, SHIELDED, 10FT
W4	1	9C012053	CABLE; COAXIAL, TNC REVERSE POLARITY TO TYPE-N MALE
W5	2	9C040000	CABLE; POWER, 90 deg M12 A-CODED FMLE BARE
W6	1	9C040001	CABLE; CAT5E, 90 deg, M12 TO RJ45, SHIELDED, 10FT
7A1	1	9E700004	ETHERNET BRIDGE, WIRELESS OUTDOOR, 5.8 GHz mi RANGE
7A3	1	9E700004	ETHERNET BRIDGE, WIRELESS OUTDOOR, 5.8 GHz mi RANGE
7A5	1	9A540005	ANTENNA; N-FEMALE 5.8GHz, 19dBi FLATPANEL
7A6	1	9A540005	ANTENNA; N-FEMALE 5.8GHz, 19dBi FLATPANEL

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