



FEDERAL SIGNAL CORPORATION'S

MODEL ACFCTB

**SIREN CONTROL SYSTEM
WITH
FEDERAL CONTROLLER, TWO-WAY SERIES B (FCT)**

**INSTALLATION, OPERATION & SERVICE
MANUAL**

IMPORTANT NOTICE

Federal Signal reserves the right to make changes to devices and specifications detailed in the manual at any time in order to improve reliability, function or design. The information in this book has been carefully checked and is believed to be accurate; however, no responsibility is assumed for any inaccuracies.

SAFETY NOTICES

People's lives depend on your selection of suitable equipment and installation sites and your safe installation, service, and operation of our products. Federal Signal recommends the following publications from the Federal Emergency Management Agency for assistance with planning an outdoor warning system: 1. The "Outdoor Warning Guide (CPG 1-17), 2. "Civil Preparedness, Principles of Warning" (CPG 1-14), 3. FEMA-REP-1, Appendix 3 (Nuclear Plant Guideline), and 4. FEMA-REP-10 (Nuclear Plant Guideline). Contact Public Safety Systems Customer Care Center at: <http://www.federalsignalpublicsafety.com> or 1-800-524-3021 for further information about these publications.

It is important to read, understand and follow all instructions shipped with this product. In addition, listed below are some other important safety instructions and precautions you should follow.

PLANNING

- If suitable warning equipment is not selected, the installation site for the siren is not selected properly or the siren is not installed properly, it may not produce the intended optimum audible warning. Follow Federal Emergency Management Agency (FEMA) recommendations.
- If sirens are not activated in a timely manner when an emergency condition exists, they cannot provide the intended audible warning. It is imperative that knowledgeable people, who are provided with the necessary information, are available at all times to authorize the activation of the sirens.
- When sirens are used out of doors, people indoors may not be able to hear the warning signals. Separate warning devices or procedures may be needed to effectively warn people indoors.
- The sound output of sirens is capable of causing permanent hearing damage. To prevent excessive exposure, carefully plan siren placement, post warnings, and restrict access to areas near sirens.
- Activating the sirens may not result in people taking the desired actions if those to be warned are not properly trained about the meaning of siren sounds. Siren users should follow FEMA recommendations and instruct those to be warned of correct actions to be taken.
- A siren that doesn't work won't provide any warning. After installation, service, or maintenance, test the siren system to confirm that it is operating properly. Test the system regularly to confirm that it will be operational in an emergency.
- If future service and operating personnel do not have these instructions to refer to, the siren system may not provide the intended audible warning and service personnel may be exposed to death, permanent hearing loss, or other bodily injury. File these instructions in a safe place and refer to them periodically. Give a copy of these instructions to new recruits and trainees. Also give a copy to anyone who is going to service or repair the siren.

SAFETY NOTICES

People's lives depend on your safe installation, service and operation of our products. It is important to read, understand and follow all instructions shipped with this product. In addition, listed below are some other important safety instructions and precautions you should follow:

INSTALLATION & SERVICE

- Electrocutation or severe personal injury can occur when performing various installation and service functions such as making electrical connections, drilling holes, or lifting equipment. Therefore experienced electricians in accordance with national, state and any other electrical codes having jurisdiction should perform installation. All work should be performed under the direction of the installation or service crew safety foreman.
- The sound output of sirens is capable of causing permanent hearing damage. To prevent excessive exposure, carefully plan siren placement, post warnings and restrict access to areas near the sirens. Sirens may be operated from remote control points. Whenever possible, disconnect all siren power including batteries before working near the siren.
- After installation or service, test the siren system to confirm that it is operating properly. Test the system regularly to confirm that it will be operational in an emergency.
- If future service personnel do not have these warnings and all other instructions shipped with the equipment to refer to, the siren system may not provide the intended audible warning and service personnel may be exposed to death, permanent hearing loss, or other bodily injury. File these instructions in a safe place and refer to them periodically. Give a copy of these instructions to new recruits and trainees. Also, give a copy to anyone who is going to service or repair the sirens. For additional copies, call the Public Safety Systems Customer Care Center at 800-524-3021 or write to them at 2645 Federal Signal Drive, University Park, IL 60484.

OPERATION

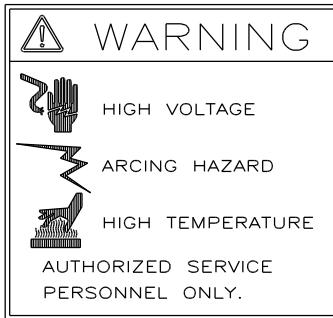
- Failure to understand the capabilities and limitations of your siren system could result in permanent hearing loss, other serious injuries or death to persons too close to the sirens when you activate them or to those you need to warn. Carefully read and thoroughly understand all safety notices in this manual and all operations-related-items in all instruction manuals shipped with equipment. Thoroughly discuss all contingency plans with those responsible for warning people in your community, company, or jurisdiction.

WARNING

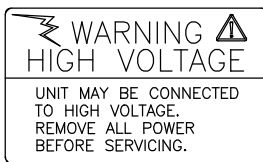
Read and understand the information contained in this manual, before attempting to install or service this siren.

Pay careful attention to the following notices located on the equipment.

A. NOTICES - EXTERNALLY PLACED



B. NOTICES-INTERNALLY PLACED



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Warning Labels

Limited Warranty

*The Signal Division, **Federal Signal Corporation**, warrants each new product to be free from defects in material and workmanship, under normal use and service, for a period of two years on parts replacement and bench labor (one year for Informer, EAS, and Federal software products) from the date of delivery to the first user-purchaser. Public Safety Systems warrants every 2001 Siren (Top of pole only) to be free from defects in material, per our standard warranty, under normal use and service for a period of five years on parts replacement.*

During this warranty period, the obligation of Federal is limited to repairing or replacing, as Federal may elect, any part or parts of such product which after examination by Federal discloses to be defective in material and/or workmanship.

Federal will provide warranty for any unit which is delivered, transported prepaid, to the Federal factory or designated authorized warranty service center for examination and such examination reveals a defect in material and/or workmanship.

This warranty does not cover travel expenses, the cost of specialized equipment for gaining access to the product, or labor charges for removal and re-installation of the product. The Federal Signal Corporation warranty shall not apply to components or accessories that have a separate warranty by the original manufacturer, such as, but not limited to, batteries.

This warranty does not extend to any unit which has been subjected to abuse, misuse, improper installation or which has been inadequately maintained, nor to units which have problems related to service or modification at any facility other than Federal factory or authorized warranty service centers. Moreover, Federal shall have no liability with respect to defects arising in Products through any cause other than ordinary use (such as, for example, accident, fire, lightning, water damage, or other remaining acts of god).

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Glossary of Terms

AC	Electric Alternating Current occurs when charge carriers in a conductor or semi-conductor periodically reverse their direction of movement. For sirens, this is provided by landline power.
AR Timer	Activating Control for Model 2 and STH10
AWG	American Wire Gauge is a United States standard set of non-ferrous wire conductor sizes
BCD	Binary Coded Decimal, a format for representing decimal numbers in which each digit is signified by four bits
CCU	Central Control Unit
CD	Carrier Detect – An indication that an RF carrier is present
CPU	Central Processing Unit
dB	dB = Decibel, a standard for measuring sound pressure level. C = C weighted filtering
DC	Directional Current is the unidirectional flow or movement of electric charge carriers. For sirens, this is provided by battery power.
DMM	Digital Multi-Meter
DSA	Directional Speaker Array type of electronic siren
DTMF	Dual-Tone Multi-Frequency, an analog communications technology
EAS	Emergency Alert System
FC	Federal Controller
FCDS	Federal Commander Digital System
FCT	Federal Controller Two-way
FEMA	Federal Emergency Management Association
FSK	Frequency Shift Keying, a digital communications technology
FSPWARE	Federal Signal Windows Based Programming Software
IAEM	International Association of Emergency Managers
IC	Integrated Circuit
LED	A semiconductor device that emits visible light when an electric current passes through it.
Low Band	Low frequency end of the VHF band, 30-50 MHz
MOD	Modulator Electronic Siren
Model 2	Omni-directional Mechanical Siren
MOSCAD	Motorola SCADA System
MSK	Minimal Shift Keying – a form of FSK
NEMA	National Emergency Managers Association
Ohm	Standard International (SI) measurement of Electrical Resistance
Omni Antenna	An antenna with a non-directional pattern on the given plane of the antenna, and a directional pattern in any orthogonal plane
PCB	Printed Circuit Board
PTT	Push to Talk
RF	Radio Frequency
RTU	Remote Terminal Unit
SCADA	Supervisory Control and Data Acquisition
SFCDWARE	Federal Commander Digital System software package
SINAD	Signal to noise and distortion ratio
SS2000/SS2000D	One-way/Two-way Digital Encoder
STH10	Mechanical Omni-Directional Siren
UHF	Ultra High Frequency ranging from 450 MHz to 470 MHz for most applications
UL	Underwriters Laboratories Inc.
UltraVoice	Electronic Siren Controller
VAC	Standard Measurement of Horsepower, volts AC current
VDC	Standard Measurement of Horsepower, volts for DC current
VHF	Very High Frequency ranging from 150 MHz to 174 MHz for most applications
VSWR	Voltage Standing Wave Ratio
Yagi Antenna	Unidirectional antenna with gain (amplification)
2001SRNB	2001 Electro-mechanical Siren

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1. ACFCTB SERIES CHARACTERISTICS

1.1 Scope of this Manual

This manual describes the characteristics, specifications, installation, theory of operation, and setup instructions for the controller and its sensors as well as the additional information required to operate, service and maintain the control unit.

1.2 Overview

The ACFCTB series Siren Control Systems contain the following components: motor contactors, backup 12 VDC battery and charging system, 2-way radio communications controller with diagnostic sensors and an optional radio transceiver and a 2001TRB transformer/rectifier that converts the 208, 220 or 240 VAC mains to power the 48 VDC siren. Additional 120 VAC tap to power the siren controller and backup charging system is provided.

The antenna system is not included with the radio controller models. The appropriate directional or omni-directional antenna system must be ordered separately.

1.3 Control Unit Description

The Control Unit consists of one NEMA 4 cabinet, which is channel mounted for ease of installation (see figure 1-1). The control cabinet houses the necessary electronics and controls for producing the siren signals, and the charging system for the backup 12-Volt battery.

The charging system has two outputs. One output is a three state battery charger. The other output provides an 8 Amp DC supply that will supply 2-way radio power even if battery power is lost.

The controller is configured to work primarily off the AC input voltage. In the event of an AC power failure, the controller automatically obtains power from the backup 12 VDC battery to enable AC power failure alarms to be logged.

1.4 Description of ACFCTB Communications Controller

The ACFCTBs are two-way control and status monitoring siren controllers. The units interface to an off-the-shelf two-way radio transceiver and communicate to a base control unit via either DTMF or FSK signaling depending on the model purchased.

The controllers will decode any combination of Single-Tone, Two-Tone Sequential, DTMF, EAS, POCSAG or FSK formats for activation. This makes the 2-way controller compatible with virtually any existing siren control system.

The digital ACFCTBs provide the capability of digital encoding and decoding with added security. Throughout this manual, all references to digital encoding, digital decoding, and FSK features and functions pertain only to the ACFCTBD series models. The DTMF version of the ACFCTB can be upgraded to the digital version ACFCTBD with a software update. All ACFCTB models come equipped with 4 useable relay outputs, which can be programmed independently to activate with various codes. Relays 1, 2, and 4 have normally open contacts.

Relays #3 is wired as a normally closed contact. Relay #4 is reserved for a low voltage disconnect for the 12 VDC battery.

There are also 4 landline inputs and 4 local push buttons, which can be used to activate and cancel the unit.

The decode codes, relay timing and optional warning sounds are programmed into the unit through a standard RS232 serial port.

The ACFCTBs contain 6 user programmable functions in addition to the 5 preset functions: ARM, DISARM, REPORT, GROWL TEST, MASTER RESET.

The ACFCTBs come equipped with the necessary sensors and wiring to provide information on the following areas of operation:

- AC Power Status
- Communications Status
- Low Battery Voltage Indication
- Siren Activation Chopper Current
- Intrusion into Control Cabinet
- Siren Rotation
- Local Activation/False Alarm

The above information is returned in a Pass / Fail format. For example, if battery voltage is at proper operating level, then it is returned as "Battery Voltage Pass". This status information is made available for viewing at the Central Control Unit. This reporting feature greatly improves warning system reliability by quickly alerting operating personnel to problems that are encountered.

The Integral LCD displays Function Counters, Decoded 2-Tone, DTMF, POCSAG, MSK Digital functions decoded and the current Software Revision. The display constantly scrolls through the display items.

1.5 Radio Control

The Federal Signal ACFCTBs are available in high band and UHF models using 2-way radio transceivers to provide two-way signaling capabilities. Refer to the radio instruction manual for details concerning operation, specifications and maintenance. Consult the PSS Customer Care Center at 1-800-524-3021 for specialized radio equipment needs.

1.6 2001TRB Transformer/Rectifier

The ACFCTB uses a transformer/rectifier for primary system power with battery back up and allows the siren to operate from a 208, 220 or 240 VAC power source.

The 2001TRB also has a 115 VAC secondary tap that can be used to provide power to the siren control cabinet.

During a power failure, the siren head will not have power, but communications and controller operations are maintained due to the internal backup battery in the ACFCTB.

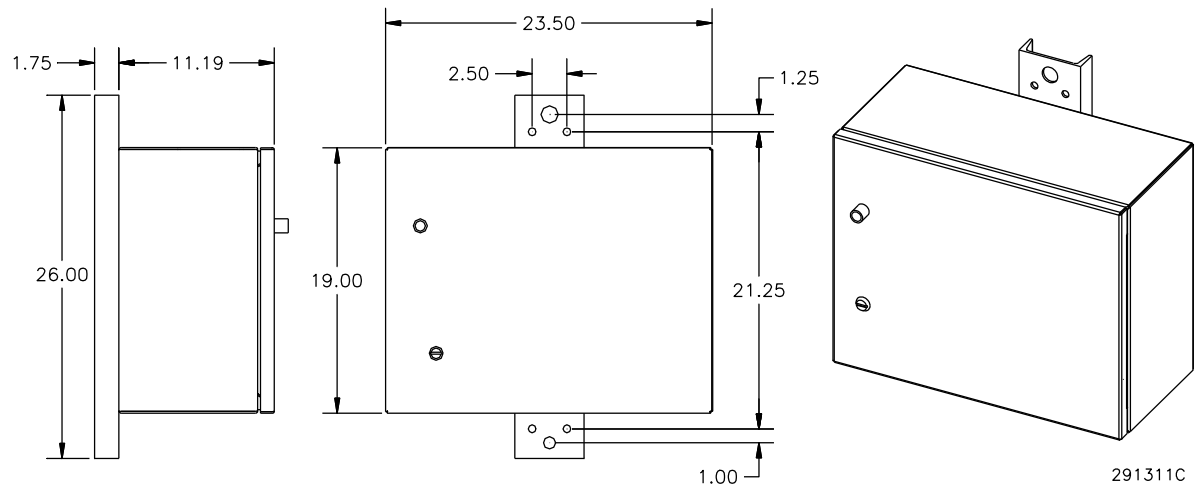


Figure 1-1. ACFCTB Control Cabinet

2. SPECIFICATIONS

2.1 Specifications for the ACFCTBs

2.1.1 Input Power Requirements

AC Voltage	115 VAC +/- 10%, 50-60 Hz
Current draw	4.0 Amps (maximum)

2.1.2 2001TRB: AC Primary Operation

Operating Voltage	208/220/240 VAC single phase
Current Requirements	25-30 Amps (nominal) (50 Amp service recommended, to be fused with 35 Amp Slo-Blow)
Output Voltage	47 VDC +/- 1.0 under load

2.1.3 System Operating Power from the 12 VDC Battery

Output Voltage	13.6 VDC (nominal)
Battery Capacity	12 Amp/hours (nominal)
Battery Backup Capability	12 hours (minimum)
Battery Type	Sealed Lead Acid
Terminals:	Quick Disconnect Spade Type POSITIVE =.250 in. x .032 in. NEGATIVE =.187 in. x .032 in.

2.1.4 Charging System and Power Supply

AC Input	115 VAC (50-60 Hz), 4 A max.
Charger Output	0-13.8 VDC, 2.5 A max.
Power Supply Output	13.8 VDC, 10 A max.
Current Limiting	Protected with automatic recovery Power

2.1.5 Transceiver Specifications

Refer to the radio owner's manual for product specifications

2.1.6 Environmental

Operating Temperature	-30 °C to +65 °C
Humidity	0-98% non-condensing

2.1.7 Weights and Dimensions

Control Cabinet	19.00" x 23.50" x 11.19"
(NEMA 4)	483 mm x 597 mm x 284 mm
Total Weight	95 lbs. (43.2 kg.)
Shipping Weight	155 lbs. (70.5 kg.)
Finish	Aluminum (Stainless steel also available, Increases weight additional 6 lb.)
Transformer/Rectifier	
Dimensions (HxWxD)	20" x 10.25" x 8.75" 508 mm x 261 mm x 223 mm
Weight	150 lb. (68.1 kg.)
Shipping Weight	190 lb. (86.2 kg.)
Shipping Dimension	28" x 32" x 18"

2.2 ACFCTB Control Board Specifications

2.2.1 Input Power Requirements

AC Power

AC supply voltage (switchable)	120 VAC +/- 10%, 50-60 Hz or 220 VAC +/- 10%, 50-60 Hz
Current draw	0.2 A maximum

Back-up Battery

DC Voltage	13.6 VDC
Current Draw	
with AC present	none
without AC (back up mode)	150 mA. Standby
with 2-way radio	add 8 A max., 0.5 A Standby
Recommended battery: maintenance free, lead acid, 12 V, 12AH	

2.2.2 Serial Communications

Serial Port Configuration	RS232C 1200,N,8,1
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2.3 Signaling Format Specifications

6 user programmable functions in addition to the 5 preset functions: ARM, DISARM, REPORT, GROWL TEST, and MASTER RESET.

2.3.1 Two-Tone Sequential

Frequency range	282 Hz - 3000 Hz
Tone timing	1 st Tone – 0.5 sec. minimum 2 nd Tone – 0.25 sec. minimum 8 sec. maximum for both tones
Intertone Gap	400 ms (maximum)
Tone Accuracy	+/- 1.5%
Tone Spacing	5.0% preferred, 3% minimum

2.3.2 Single tone

Frequency range	282 Hz - 3000 Hz
Tone timing	0.5 sec. - 8 sec maximum
Tone Accuracy	+/- 1.5%
Tone Spacing	5.0% preferred, 3% minimum

2.3.3 DTMF

String length	(All timings in milliseconds) 3 - 12 standard DTMF characters Wildcard options for each DTMF string
Mark/Space timing:	
Decoder Minimum	50 ms/50 ms (below 50/50 consult factory)
Decoder Maximum	800 ms total mark/space timing per function
Encoder	50 ms/50 ms mark/space timing
Space between Stacked codes, minimum	1.25 seconds

2.3.4 FSK

Baud rate	1200 bps
Modem type	MSK (minimal shift key)
Mark frequency	1200 Hz
Space frequency	1800 Hz
Error checking	16 bit CRC

2.3.5 EAS

Supports standard EAS codes and wildcards.

2.3.6 POCSAG

Supports Binary frequency shift keying 512 Baud numeric messages.

2.4 Inputs and Outputs

2.4.1 Relay Outputs

4 relay outputs	SPST (3 relays standard, 1 relay reserved for low voltage cutout)
Contact Rating	5 A @ 28 VDC and 240 VAC

2.4.2 Audio Output

Output Voltage	2 V _{peak to peak}
Maximum Load	8 ohms
Total Harmonic Distortion	< 10% @ 1 kHz Sine wave

2.4.3 Remote Activation Inputs

Quantity	4
Input Type	Dry contact closure <1 k ohm (Requires >1 second closure)

2.5 Transceiver Specifications

Programmable Frequency, Power Out, and Private Line options are available. For further details, consult the radio owner's manual.

3. FUNCTIONAL DESCRIPTION

3.1 ACFCTB System Operating Description

3.1.1 Siren Activation

NOTE: The DTMF versions of ACFCTBs enable the user to program an ARM string into the controller for extra security. If an arm string is not programmed, then an ARM command is not required to activate a function. Digital versions of ACFCTBs do not use the ARM function.

Activation Using the ARM function:

To start a siren activation via the radio, it is necessary to ARM the siren before initiating a siren function such as a Wail or Steady. Once the siren is ARMED, it will remain ARMED for 255 seconds or 4.25 minutes. Upon activation of the siren, it will run until the function times out, is canceled, or is reset. The ARM command is not required prior to sending a CANCEL, RESET or REPORT command.

To start a function by either land line or push-button it is necessary to provide a one second closure on the landline or a one second depression of the push buttons.

3.1.2 Site Status Monitoring

To monitor or poll a site, the user must first request a report. The site does not need to be armed before requesting a report. Once a request has been made for a report, the ACFCTB reports its status back immediately if the ACFCTB automatically initiates a report. If the channel is busy, the ACFCTB is equipped with a carrier detect transmit hold off that will cause the unit to wait until the channel is clear before the report is transmitted.

DTMF ONLY

The siren controller will report when polled from the SS2000T or when one of its sensors changes state. The status of the site is encoded in a 9-digit DTMF string that is designed to work with a Federal Signal SS2000T to decode, format, and time and date stamp the received string. For detailed information about the DTMF coding format, see the “Software Description of ACFCTB Encoding Format” in section 4.

3.1.3 Automatic Reports

The ACFCTB automatically sends back a report if one of the following sensors has a change of state: AC, Low Battery, Intrusion, or the siren is activated locally. The control station can also be set to automatically poll the system at a predefined interval. Automatic reporting may be optionally disabled on ACFCTBD systems. The ACFCTB is equipped with a carrier detect transmit hold off that will cause the unit to wait until the channel is clear before an Automatic report is transmitted.

3.1.4 Growl Test

The Standard Growl Test will run the rotator for 12 seconds and the chopper motor until the sensors latch or a maximum of 2 seconds. This function is commonly used when doing periodic testing to verify proper operation while generating minimal sound.

3.2 ACFCTB Control Cabinet Functional Descriptions

The ACFCTB Control cabinet has 6 main parts:

- Motor Contactors
- Battery Charger/Power Supply
- Power Distribution and fusing at the din rail
- Radio Transceiver
- ACFCTB Communications / Controller Board

Motor Contactors

Two 200 amp rated motor contactors are used for switching the 48 VDC power to the siren chopper motor via K2, and the rotator motor via K1. The contactors are controlled by the relay outputs on the ACFCTB controller board.

The wiring to the siren and rotator motor is protected by a 200 Amp fuse.

Battery Charger and Power Supply

The battery charger maintains a float charge on the battery. A separate 12 VDC circuit in the charger/power supply provides 12 VDC power to the controller. Diagnostic indicators on the charger/power supply indicate battery state of charge and power supply output condition.

Power Distribution and fusing at the Din rail

The Din rail is used to distribute and fuse various voltages. The following is a description of the terminals at the din rails:

<u>Terminal</u>	<u>Description</u>
<u>TB1</u>	
1	Ground Terminal
2	Ground Terminal
3	Ground Terminal
<u>TB2</u>	
1	12 VDC to rotation sensor board and to JP18-8 for switched radio power
2	Bridge diode supplies 12 VDC to Chopper sensor board, to controller board JP5-2 for 12 VDC sensing.
<u>TB3</u>	
1	12 VDC from Charger to Bridge Diode and Battery Terminal.
<u>TB4</u>	
1	K2-2 supplies 48 VDC to K2-C3, to JP5-4 controller for the 48 VDC sensing
<u>TB5</u>	
F1	10 Amp Fuse for 120 VAC Neutral
F2	10 Amp Fuse for 120 VAC Line
1	Fused AC Neutral
2	Fused AC Neutral
3	Ground
4	Fused AC Line

Transceiver

When a radio option is purchased, the transceiver is factory installed, programmed and aligned to work with Federal Signal's ACFCTB. Consult the radio's operating manual for further operating details.

ACFCTB Communications / Controller Board

The Communications / Controller board is located on the backplate of the control cabinet. This board controls all functions of the ACFCTB. The board consists of seven main sections:

- Transceiver Interface
- Digital Inputs
- Relay Outputs
- Speaker Output
- Land line and Local Push-Buttons
- Power Inputs and Power Supply
- Encoder and Decoder Sections

3.2.1 ACFCTB Communications / Controller Board Layout (See figure 3-1)

Reference	Description	Indication
D48	CPU LED	Microprocessor Heartbeat
D12	RECEIVE LED	RF Carrier Indicator on w/ carrier
D7	TRANSMIT LED	Transmit
D25	RELAYS ARMED	Power to relays on
D29	RELAY #1 LED	Relay #1 closed
D38	RELAY #2 LED	Relay #2 closed
D39	RELAY #3 LED	Relay #3 closed
D43	RELAY #4 LED	Relay #4 closed, or PA mode
D15	PRESSURE LED	Pressure Sensor input
D13	INTRUSION LED	Intrusion Sensor input
D18	CURRENT LED	Current Sensor input
D14	ROTATION LED	Rotation Sensor input
D16	LOW BATTERY LED	Low Battery Sensor (internal)
D17	AC POWER FAIL LED	AC Power Fail Sensor (internal)
D34	POWER LED	12 V Operating Power
D36	ISO 12V	Isolated 12V power
D34	ISO 5V	Isolated 5V power
U16	LCD Display	Displays Function Counters, Decodes and Software Revision

JP1 SINAD

- 1 – Receiver module carrier detect, short to pin 2 when using SINAD board along with both side of JP4.
- 2 – External transceiver carrier detect.

JP2 Test Speaker

- 1 – 0 to 2 V_{p-p}, Audio Source: Receiver Audio during P.A. functions, Siren Audio during Electronic Siren functions.
- 2 – Ground.

- JP3 Short For VOX Carrier Detect**
 1 – Short to (JP3, pin 2), for VOX carrier detect.
 2 –
- JP4 Receiver Priority**
 1 – VCC, +5V
 2 – VCC, +5V
 3 – Short pins 1 & 3 to give priority to the external transceiver.
 4 – Short pins 2 & 4 to give priority to the internal receiver.
 With no shorting jumper, first carrier detect has priority.
 Short both sides when using SINAD board along with JP1.
- JP5 Sensor Inputs (#1 @ left edge)**
 1 – Pressure sensor input, dry Contact closure < 1 K.
 2 – ISO Ground.
 3 – Intrusion sensor input, dry Contact closure < 1 K.
 4 – ISO Ground.
 5 – Current sensor input, dry Contact closure < 1 K.
 6 – ISO Ground.
 7 – Rotation sensor input, dry Contact closure < 1 K.
 8 – ISO Ground.
 9 – 48 Volt Battery input to 48 Volt sensor and to power supply,
 15 – 75 VDC.
 10 – Ground.
 11 – 12 Volt Battery input to 12 Volt sensor and to power supply,
 11–15 VDC.
 12 – Ground.
- JP6 Speaker Mute gate bypass**
 Short pins 1&2 to bypass speaker mute gate, allow monitoring of radio channel with local speaker.
- JP7 Receiver Module**
 1 – Ground.
 2 – +8Volts DC, < 100 mA current.
 3 – Synthesizer programming Clock line, 0 to 5 Volt levels.
 4 – Synthesizer programming Data line, 0 to 5 Volt levels.
 5 – Synthesizer programming Latch line, 0 to 5 Volt levels.
 6 – Carrier Detect not line, goes low with carrier, 0 to 5 Volt levels.
 7 – Receive Audio, De-emphasized, 700 to 900 m V_{p-p} w/ 1kHz tone
 @ 3 kHz dev.
 8 – Receive Audio, Flat.
- JP8 Serial and FLASH programming Port**
 1 –
 2 – TXD, standard RS232 levels.
 3 – RXD, standard RS232 levels.
 4 – Ground.
 5 – Processor Serial Clock, used during FLASH programming.
 6 – Processor Reset not, pulsed low (to Ground) during FLASH programming.

JP9 LEDs on w/ Intrusion

1 – Short to pin 2, to disable LEDs when Intrusion switch is closed.

JP10 Remote Activation and Sensor Inputs (#1 @ left edge of connector)

1 – Spare Sensor Input #2, dry Contact closure < 1 K.

2 – ISO Ground.

3 – Spare Sensor Input #1, dry Contact closure < 1 K.

4 – ISO Ground.

5 – Remote Activation Input #4, Activates Functions under code 4,
dry Contact closure < 1 K.

6 – ISO Ground.

7 – Remote Activation Input #3, Activates Functions under code 3,
dry Contact closure < 1 K.

8 – ISO Ground.

9 – Remote Activation Input #2, Activates Functions under code 2,
dry Contact closure < 1 K.

10 – ISO Ground.

11 – Remote Activation Input #1, Activates Functions under code 1,
dry Contact closure < 1 K.

12 – ISO Ground.

JP12 SINAD

1 – Directly to processor pin #58 (ADC7).

2 – Ground.

JP13 CTCSS Encoder / Decoder

1 – Receive audio, not DC isolated, set to 1 V_{p-p} w/ 1kHz tone @3kHz dev.

2 – Ground.

3 – +8Volts DC, < 100mA current.

4 – Decode not & PTT line, low with decode, set low by processor
during transmit.

5 – Transmit audio, 0 to 2 V_{p-p} of Digital data or Tone.

JP14 Force Carrier Detect

1 – Short to (JP14, pin 2), to force carrier detect on.

2 – Ground.

JP15 Short To Set Deviation

1 – Short to ISO Ground (JP15, pin 2), causes unit to transmit for
setting deviation.

2 – ISO Ground.

JP16 I2C Port

1 –

2 – I2C Data line, buffered.

3 – I2C Clock line, buffered.

4 – +12 Volts DC, 1 Amp max. current.

5 – Ground

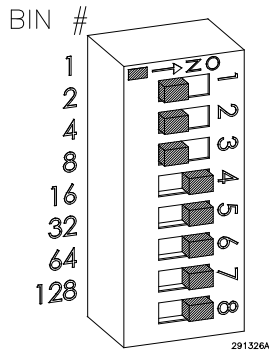
6 –

- JP17 Short to Test Relay Output #1**
1 – Short to pin 2, to engage Relay output #1.
- JP18 Short to Test Relay Output #2**
1 – Short to pin 2, to engage Relay output #2.
- JP19 Short to Test Relay Output #3**
1 – Short to pin 2, to engage Relay output #3.
- JP20 Short to Test Relay Output #4**
1 – Short to pin 2, to engage Relay output #4.
- JP21 Relay Outputs, 3 Amps, up to 240VAC, (#1 @ left edge of connector)**
1 – Relay 1, Common
2 – Relay 1, N.O.
3 – Relay 2, Common
4 – Relay 2, N.O.
5 – Relay 3, Common
6 – Relay 3, N.O. or N.C., depending on jumper JU1
7 – Relay 4, Common
8 – Relay 4, N.O. or N.C., depending on jumper JU2
- JP22 AC Power Input**
1 & 2 - 120 or 240 VAC +/- 10%, 60 Hz
- P1 Transceiver Interface**
1 – Transmit audio, DC isolated, 0 to 1 V_{p-p}
2 – Receive audio, DC isolated, 350 mV_{p-p} to 3 V_{p-p}
3 – PTT not, goes low (<0.65 V) during transmit
4 – Ground
5 – +12 Volts DC, 100 mA max., 2 A w/ battery.
6 – Carrier Detect not, set low (<0.65 V) during receive
7 – No connection
8 – Ground
9 – Ground
- TJ1 Test Jack**
1 – Ground
2 – Reference (+4 V)
3 – Receive Audio
4 – VCC (+5 V)
5 – +8 V
6 – +12 V
7 – +17 V
8 –
- TJ2 Test Jack**
1 – Isolated +12 V
2 – Isolated +5 V
3 – Isolated Ground

- TP1 Two-Tone Decoder, HighPass Filter Enable**
Goes high when processor is decoding a tone > 2100Hz
- TP2 Receive audio to Two-Tone Decoder**
Audio at last stage before two-tone comparator, 1 to 3 V_{p-p}
- TP3 Transmit audio**
0.1 to 3 V_{p-p}
- TP4 Receive audio from Two-Tone Decoder to processor**
Audio after two-tone comparator, square waves to processor, 0 to 5 V_{p-p}
- TP5 Voltage at 48 Volt Battery Input**
0 – 70 Volts = 0 – 5 Volts
- TP6 Voltage at 12 Volt Battery Input**
0 – 20 Volts = 0 – 5 Volts
- TP7 Two-Tone Decoder, LowPass Filter Enable**
Goes high when processor is decoding a tone < 400 Hz
- TP8 Receive audio level set**
External transceiver receive audio set to 1Vpp using R48
- TP9 RX Data**
Receive data from digital modem IC, 0 to 5 Volts
- TP10 DTMF Decoder STD**
Goes low whenever a DTMF digit is being decoded.
- TP11 8 Volt Regulated power supply**
- TP12 5 Volt Regulated power supply**
- TP13 Incoming unregulated 17 Volt power supply**
- TP14 Ground**
- TP15 12 Volt Regulated power supply**
- TP16 Isolated +12 Volt Regulated power supply**
- TP17 Isolated +5 Volt Regulated power supply**
- TP18 Isolated Ground**
- S1 Local Activation #4**
Press and hold for ½ second, Activates Functions under code 4.
- S2 Local Activation #1**
Press and hold for ½ second, Activates Functions under code 1.
- S3 Local Activation #2**
Press and hold for ½ second, Activates Functions under code 2.

- S4 Local Activation #3**
Press and hold for ½ second, Activates Functions under code 3.
- S5 Processor Reset**
- S7 110 / 220 VAC Selector switch**
- R48 External transceiver receive audio set to 1Vpp at TP8**
- R61 Test Speaker output level set**
- R70 MSK modem transmit deviation level set**
- R71 DTMF transmit deviation level set**
- S6 Site Address Switch**
Sets units site number

Unit Address



The unit address sets the siren site number and is used to identify the site in two-way report back systems. The unit address is a three-digit number with a range of 001-255. The unit address is set via dipswitch S1. S1 Off position indicates active position. Add binary active switch positions to get ID address.

Switch number	1	2	3	4	5	6	7	8
Binary number	1	2	4	8	16	32	64	128

Example: Switch number 1, 2 & 3 are binary numbers 1, 2 & 4, which when added would equal unit address 7.

Note: Must be set to address one to program controller board or to program a non-digital unit. When programming is completed, change dipswitch setting to actual site address. Programming details are in the software manual. The ID address is stored at power up of the controller. If the ID address is changed, the power (Battery and AC) must be turned off and then on.

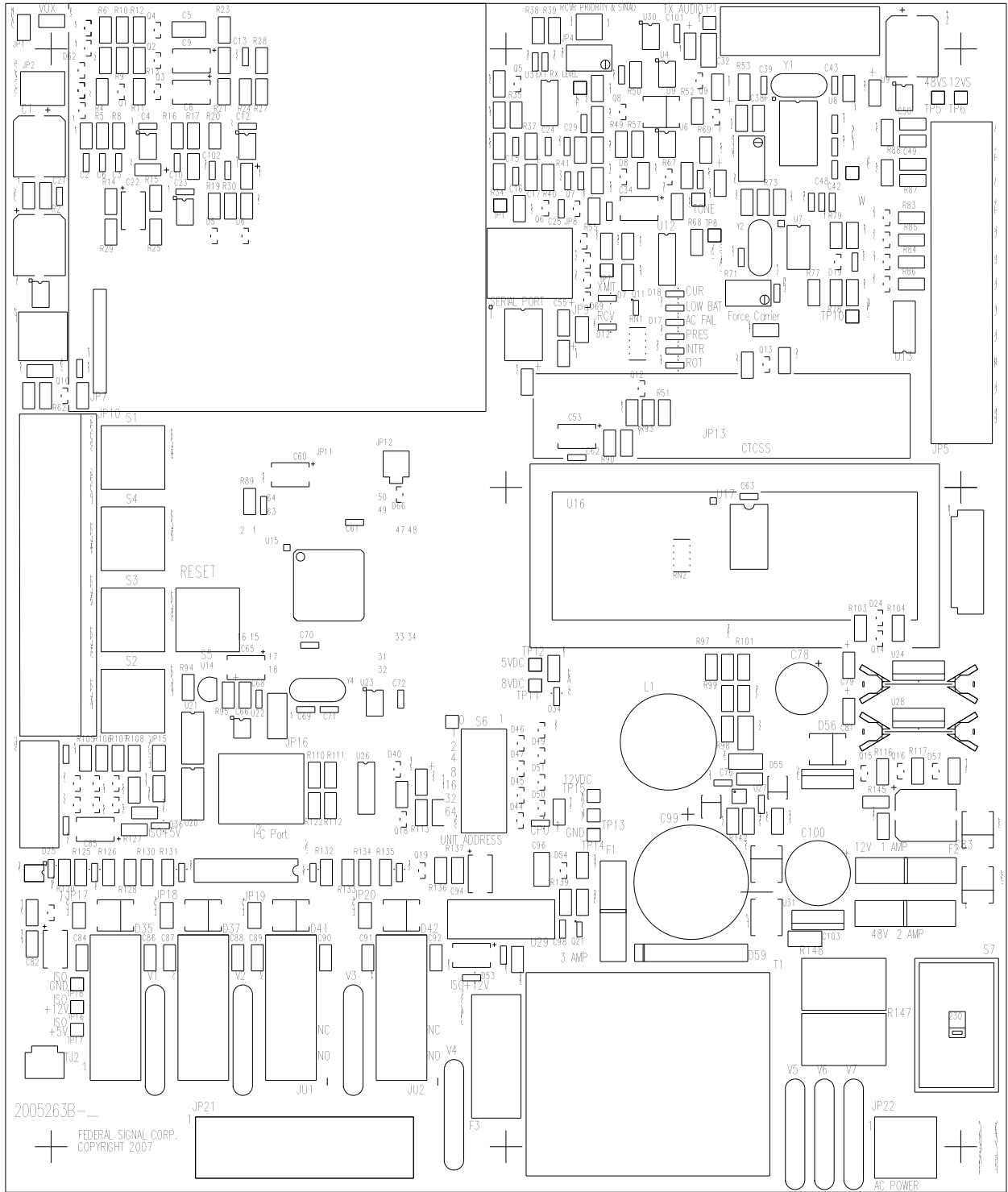


Figure 3-1. ACFCTB Communications / Controller Board Layout

3.3 Transceiver Interface

A transceiver may be interfaced through the male DB9 connector, P1.

<u>Position</u>	<u>Description</u>
1	Transmit Audio (DC isolated)
2	Receive Audio (DC isolated)
3	PTT (active low)
4	Ground
5	12 VDC (unregulated)
6	Carrier Detect (active low)
7	Not used
8,9	Ground

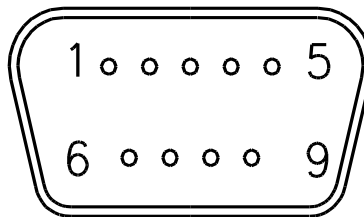


Figure 3-2. Transceiver Interface Connector P1

3.3.1 Transmit Audio

The encoded audio can be adjusted from 0 to 1.2 V_{p-p} (O.C.) using the DTMF Deviation Potentiometer, R71 and Digital Deviation Potentiometer, R70. This is used to set the audio output level to the transceiver. The transmit audio should be connected to the radio's mic (emphasized) audio input and adjusted as follows:

- DTMF - Adjust for 3 kHz Deviation (Add .75 kHz deviation if CTCSS is used.)
- Digital - Adjust for 3 kHz Deviation (Add .75 kHz deviation if CTCSS is used.)
- *Note: Deviation levels are cut in half when using 12.5 kHz channel spaced radios.

3.3.2 Receive Audio

The receive audio should be connected to the radio's de-emphasized audio out. The audio level of an external transceiver can be adjusted by R48 and should be adjusted to 1 V_{p-p} at TP8 when receiving a properly modulated signal as described above.

3.3.3 PTT

Push-to-talk pulls to ground to place the transceiver into transmit mode.

3.3.4 +12 VDC

The +12 VDC is an unregulated, 1.0 Amp supply that can vary from 11.5 - 15.5 VDC if a 12 V backup battery is connected.

3.3.5 Carrier Detect

Carrier Detect input requires a pull to ground to indicate when carrier is present.

3.4 Sensors and Sensor Inputs

The ACFCTB comes with the following inputs to work with external sensors and 2 built-in sensors to report the following conditions:

- AC JP22
- AC (External Sensor Input) JP10-1
- Low Battery, 12 VDC JP5-11
- Low Battery, 48 VDC JP5-9 (only used with 48 V type sirens.)
- Rotation (Proximity Switch) JP5-7
- Rotation (Current Sensor) JP10-3
- Main Siren Motor Current JP5-5
- Intrusion JP5-3

3.4.1 AC Sensor (built-in)

During normal operation (when AC is present) the built-in AC sensor will not light. If AC is lost, the AC LED will light. The AC sensing logic is dependent on both the built-in AC sense AND the external AC sense points. If an AC loss is detected at either point, a report will be sent. A loss of AC will not report immediately. The controller will make sure the loss lasts at least 20 seconds then it will add (1 second per Site #) before reporting. Each siren with an AC failure will report by site number in sequential order with a two second delay between sites. Once AC is restored another automatic report will be sent in the same order to show change of state. If AC is restored before the automatic report is sent, the report is cancelled.

3.4.2 Low Battery Sensor (built-in)

The low battery sensor input measures the voltage across the 12 V battery. If the battery voltage goes below ~12.5 V for 20 seconds, the controller reports a low battery condition. The controller will not automatically report when the battery voltage returns to normal to eliminate possibility of multiple reports when a battery is very weak. The low battery condition will remain latched in memory until the controller is reset or a function is run and the battery voltage is restored.

3.4.3 Digital Inputs for Rotation Sensor

NOTE: Two rotation sensor inputs exist. Depending on the sensor option purchased, either the current sensor or proximity switch input is used.

- Standard Rotation Sensor Input: JP10-3 is used for the rotation motor current sensor. This input latches when current is detected. During a siren rotation this input is pulled low. The latch is reset by the RESET command or by another activation command.
- Proximity Switch Rotation Sensor Input: JP5-7 is used to connect a proximity switch to detect siren rotation. This input may be left unconnected if a non-rotating siren is used or if JP10-3 is used to detect rotation. During a normal siren activation (when the siren is rotating), the external rotation sensor, which is usually an open collector proximity device

mounted in the siren to detect gear movement, will provide active low pulses. Once this input receives more than 11 low pulses during siren activation, this input will latch active until a reset command is received.

3.4.4 Digital Input for Current Sensor

JP5-5 is used to detect the main siren motor operating current during siren activation. This input is pulled low when the external current sensor detects proper running current during siren activation. If this input is pulled low for ¼ second, the input is latched active until another activation command is received or a Reset command is sent.

3.4.5 Digital Input for Intrusion Sensor

JP5-3 is used to detect an intrusion into the control cabinet. With the control cabinet closed, the intrusion switch will be in a normally closed position. If the intrusion condition changes state for more than one second, an auto-report will be sent.

3.4.6 Digital Input for Pressure Sensor (Optional)

JP5-1 is used to detect blower pressure on Thunderbolt sirens during siren activation. This sensor input latches when operating current is detected (input is pulled low) and resets when a RESET command is received.

3.5 Relay Outputs

JP21 Pin-Out

- 1 – Relay 1, Common
- 2 – Relay 1, N.O.
- 3 – Relay 2, Common
- 4 – Relay 2, N.O.
- 5 – Relay 3, Common
- 6 – Relay 3, N.O. or N.C., depending on jumper JU1, (N.C is standard)
- 7 – Relay 4, Common
- 8 – Relay 4, N.O. or N.C., depending on jumper JU2, (N.O. is standard)

There are 4 relay outputs, which are controlled by the microprocessor. The relays provide isolation and are spike protected to prevent voltage spikes from affecting the unit. As the relay coil is energized, the outputs close and the associated LED will light. The ACFCTB comes standard with two usable relays. Relay #3 is wired as a normally closed contact. Relay #4 is reserved for the radio low voltage cutoff feature. A jumper placed on JP20 keeps relay #4 closed until the ACFCTB reaches a low voltage cutoff limit. Upon cutoff, relay #4 opens preventing the radio from completely discharging the battery.

3.6 Speaker Output

The speaker output at JP2 can be used to monitor received audio, route remote P.A. or provide signal out when the tone generator option is used. Speaker output can be adjusted up to 2.0 V_{p-p} into an 8-Ohm load using R61.

JP2 Pin-out

Pin #1 Audio

Pin #2 Ground

3.6.1 Monitor Received Audio

When carrier is present, the received audio is routed to the test speaker output at JP2.

3.6.2 Remote Public Address

P.A. needs to be programmed as a function via the software if it is to be used. When the P.A. function is activated, the ACFCTB will route the received audio to the speaker output as long as carrier is detected. If the carrier drops out for more than 15 seconds, the unit will go back to standby mode.

3.6.3 Audio Function Generator Option

To use this feature, one of the standard signals or a custom signal needs to be programmed via the software. When the Audio function is activated, the audio from the function generator is routed to the speaker output until the function finishes or a cancel code is sent.

3.7 Land Line and Local Push-Button Activation

The first 4 pre-programmed functions can be activated locally via the push buttons on the ACFCTB PCB, or remotely by grounding one of the landline activation inputs at JP10 for at least one second. The remote inputs are protected by limiting diodes and cannot exceed 5.1 V. Each push button is labeled with its associated function. The Remote inputs on JP10 are identified as follows:

JP10 Pin-out

Pin #1 EXTERNAL AC SENSOR INPUT

Pin #2 common

Pin #3 ROTATOR CURRENT SENSOR INPUT

Pin #4 common

Pin #5 FUNCTION #4

Pin #6 common

Pin #7 FUNCTION #3

Pin #8 common

Pin #9 FUNCTION #2

Pin #10 common

Pin #11 FUNCTION #1

Pin #12 common

3.8 ACFCTB AC Power Input

The standard ACFCTB has a 115 VAC power input. The 2001TRB transformer provides a 115 VAC tap if needed for AC power. The AC selection switch (S7) on the control board must **always** be set to the 110 VAC position. When the proper voltage is applied, the “POWER” LED will be lit. See Section 7 for installation details.

3.9 ACFCTB DTMF Decoding and Encoding Formats

3.9.1 ACFCTB Decoding Format

DTMF

The ACFCTB will decode any valid 3 to 12 digit DTMF string with timing of 50/50 to a total mark/space time of 800 milliseconds. Faster DTMF decode timing, down to 35/5 ms, is available but needs to be specified when ordered. When stacking multiple DTMF strings together, a 1.25 second spacing is needed before and after a valid DTMF string for the ACFCTB. Otherwise, the ACFCTB will disregard the string.

Two-Tone

The ACFCTB will decode two-tone codes between 282 and 3000 Hz with tone accuracy within 1.5%. Timing must be at least 80% of what has been programmed. The two-tone timing parameters set up the time duration of the activation tone codes. The three parameters, A-Time, B-Time and S-Time; sets the time duration for the A-tone, B-tone and Single-tone respectively.

Note: the two-tone timing parameters are minimum values only. The actual tone times may be longer than the specified times.

The inter tone gap must be less than 400 milliseconds. The recommended minimum tone spacing is 5%. Tone timings can be used between 0.5 sec. to 8 sec. for the A tone and 0.25 sec. to 8 sec. for the B tone.

3.9.2 ACFCTB DTMF Encoding Format

The ACFCTB encodes a 9 digit DTMF string that includes the RTU’s unit type, ID number, function status and sensors status. See section 4, “ Software Description of ACFCTB Encoding Format”.

4. THEORY OF OPERATION

4.1 ACFCTB Control Board Theory of Operation

4.1.1 Description of ACFCTB Block Diagram

Power Supply Section

The unit can be power by either 110VAC or 220VAC (on JP22). The unit is protected by MOVs V5, V6 and V7, resistors R147 and R148 and by fuse F2. These will absorb spikes and limit over-voltages. The power is stepped down by the transformer, rectified by D59 and filtered by C99. The voltage at this point is about 24 volts DC. Tranzorb D61 blows fuse F1 if the voltage exceeds 30 VDC. This voltage is regulated to 12 VDC by switching regulator U27. This voltage turns on Q14 thru R104. The collector of Q14 sends a low to U22 pin 2 indicating the presence of AC Power.

U27 can also be powered by up to 75 Volts DC thru JP5 pin 9 from an external DC source. The 12VDC from U27 turns on Q15 thru R116. This pulls the gate of switch Q20 low allowing it to pass voltage from the 12 Volt battery thru Q20 to the rest of the board if needed due to a power failure. The passed battery voltage turns on Q16 thru R118 and Zener diode D57. Q16 also pulls the gate of Q20 low turning it on. If AC power fails, Q15 releases it's low to Q20. Then if the battery voltage drops below about 9.6 VDC, Q16 releases it's low to Q20. This turns off the power to the board, which stays off until AC power is restored.

U28 regulates the voltage further to 8 VDC and U24 regulates the voltage further to 5VDC. An LED (D34) is also tied to this point and indicates power. U18 is an isolated DC to DC converter which converts the 12 Volt supply to an isolated 5 Volt supply. This is used for sensor and remote activation inputs. LED (D36) is also tied to this point and indicates isolated 5 Volt power. U29 is an isolated DC to DC converter which converts the 12 Volt supply to an isolated 12 Volt supply. This is used for relay outputs. LED (D53) is also tied to this point and indicates isolated 12 Volt power.

U14 monitors the voltage of the 5 Volt power. If the power supply voltage falls below 3.3 Volts, U14 resets the microprocessor.

CPU Section

The microprocessor section is comprised of the microprocessor (U15). This processor contains a watchdog timer, a day/date clock, non-volatile EEPROM and FLASH memory, I/O pins and A to D convertors. The EEPROM is the non-volatile memory where all customer specific information held while the FLASH is the non-volatile memory where the main program is held. 1 allows the microprocessor to communicate over serial port JP8 for programming.

The unit contains an eight-position dipswitch for setting the unit's site address.

Remote Activation, Sensor & Battery Back-up Voltage Input Section

The remote activation inputs are available on connector JP10. Grounding any one of these pins will activate the function associated with it. The inputs are protected by limiting diodes and optical-isolator IC U21. There is also a push-button on the board for each of these functions that activates the associated input.

The Sensor inputs are available on connectors JP10 and JP5.

Rotation, Intrusion, Pressure, Current, and Spare sensor inputs #1 and #2 are all active low (shorting to isolated ground). When one of these inputs is shorted to isolated ground the output of the associated optical-isolator pulls low. This is read by the processor. The 12 Volt, and 48 Volt sensor inputs are analog voltages that are buffered by U9 and then passed on the A to D convertors in the processor to be read. These are not optically isolated and are referenced to ground.

For an External Transceiver

The receive audio, from P1 pin 2 (the two-way connector) is routed to U3A the output of which is set to 1 V_{p-p} at TP8 using R48. The CTCSS decoder option, if installed, gates Q5 on and allows audio to pass. U3B forms a highpass filter. This strips out any audio frequencies below 300 hertz. This filtered audio is then fed to the various decoders.

For an Onboard One-Way Receiver

The receive audio enters through R23 and C9 to Carrier Detect Gate Q2. The CTCSS decoder option, if installed, gates Q5 on and allows audio to pass. U3B forms a highpass filter. This strips out any audio frequencies below 300 hertz. This filtered audio is then fed to the various decoders.

Receiver Priority

Jumper JP4 sets the priority if an external transceiver and an on-board receiver are both used. The receiver with priority can interrupt the other receiver and its audio will pass through to the rest of the circuits in the controller. The receiver with priority cannot be interrupted. If neither receiver is given priority then whichever receiver asserts carrier detect first will pass through and the other receiver will not be able to interrupt it.

If the "EXT" side is jumpered then the external transceiver has priority. When it asserts carrier detect the low passes through D3 and R10 turning on Q4. This allows the received audio to pass through Q4, C8 and R39 to the decoder circuits. The low also passes through R4 to Q1 which forces Q2 off preventing audio from the on-board receiver from coming through.

If the "INT" side is jumpered then the on-board receiver has priority. When it asserts carrier detect the low passes through D2 and R9 turning on Q2. This allows the received audio to pass through Q2, C8 and R39 to the decoder circuits. The low also passes through R11 to Q3 which forces Q4 off preventing audio from the external transceiver from coming through.

If both sides of JP4 are jumpered then the two receive audio signals are mixed together. This is done if the SINAD option is used as it allows receive audio from the external transceiver jack to pass through Q4 and Q2 back to the on-board receiver connector to feed the SINAD option board. JP1 must also be jumpered when the SINAD option is installed.

VOX

Receive audio is routed from the external transceiver connector to buffer amplifier U2A, which drives RMS to DC converter U5B. The DC voltage at the cathode of D6 represents the Level of the incoming receive audio. U5A acts as a comparator whose output pulls low when the receive audio exceeds about 45 mV_{p-p} or about 750Hz of deviation (350Hz for narrowband systems). This passes

to JP3 which can be jumpered to provide VOX carrier detect for radios that don't provide carrier detect.

DTMF

Receive audio enters the DTMF decoder IC (U7) from the high pass filter thru C40 and R74. When a proper DTMF digit is being decoded, TP10 will go low and a binary output will appear on pins 18, 19, 20, & 20 of U7.

Tone Decode

Receive audio from the high pass filter U3B, is passed on to low pass filter U3C. These form a band pass filter from 300 to 3000 Hz. When the processor is decoding a tone greater than 2100 Hz, it turns Q6 on. This makes the band pass filter from 1900 to 3000 Hz, which aids in the decoding of high frequency tones. When the processor is decoding a tone less than 500 Hz, it turns Q7 on. This makes the band pass filter from 300 to 500 Hz, which aids in the decoding of low frequency tones. After the band pass filter the tone is amplified by U3D then passed to U6B, a comparator that converts the tone to a square wave, and feeds it to the microprocessor to be measured. The square waves can be seen on TP4.

EAS Decode

Receive audio from the high pass filter U3B, is passed on to low pass filter U3C. When EAS functions are programmed, the processor turns Q2 on. These form a band pass filter from 300 to 3000 Hz. After the band pass filter the tones is amplified by U3D then passed to U6B, a comparator that converts the tone to a square wave, and feeds it to the microprocessor to be decoded. The square waves can be seen on TP4.

POCSAG Decode

All POCSAG messages contain an Receiver Identity Code (RIC) or CAP code. This indicates which unit or group of units a message is intended for. The unit must have its RIC configured before it will respond to a message.

The Standard Format for Federal Signal POSAG codes consists of a 5 character numeric message preceded by a bracket “[“ and followed by a bracket “]”. For a total of seven characters. The first 3 numbers are the unit number. Any unit number less than 300 will activate only that unit number. A unit number of 300 will activate all units. Unit number of 301 to 316 will activate all units in zones 1 to zone 16 respectively. The unit must be configured for the zone in which it is to function.

The last two numbers in the message are the function number (01 through 06), which will activate functions 1 through 6. Function numbers 96, 97, 98 and 99 activate Poll All, Reset, Quiet Test or Cancel respectively.

Receive audio from the receiver module enters on JP7, pin 8. This audio is direct coupled and passes through lowpass filter U1A. R18 and C7 average the DC voltage present on U1A pin 1 and pass it to U1B pin 6. U1B acts a comparator converting the audio present on pin 5 into squarewaves. This is fed to the processor for decoding.

Digital

The receive audio is fed to the digital decoder IC (U8). U8 converts the alternating tones in the digital code to a string of highs and lows forming serial data. The data is sent to the processor's RXD port to be decoded.

Encoder Section

The transmit audio is generated by U7 (the DTMF encoder), U8 (the digital encoder) and the CTCSS board (if present). PTT is generated by the processor taking pin 26 low. This gates Q9 on allowing the transmit audio to pass out to the transmitter.

The PTT also sets the output of U12F high, which allows R65 to turn on Q8 thru R49. Q8 pulls the PTT line low and activates TRANSMIT LED D7. U12F, being high, also allows R57 to begin charging C34. When this exceeds 5 volts, U6A forces it's output to ground and shuts off Q8. This provides a time-out timer to prevent the transmitter from getting stuck in transmit.

The PTT signal also sets the output of U12F high turning on Q13. The sends a ground to the CTCSS board, telling to encode rather than decode.

Relay Output Section

There are 4 relay outputs that are controlled by the processor. They are driven through opto-isolator U25 and spike protected to prevent voltage spikes from affecting the unit. The outputs appear on a connector at the bottom of the board and are all normally open with contact ratings up to 5 Amps and 240 volts AC RMS. K3 and K4 outputs have selectable No or NC contacts.

Speaker Output Section

The microprocessor (U13) generates warning sounds on pin 17, which are routed out thru amplifier U10 to the speaker output JP2.

Serial and I²C Ports

Transmit serial data from pin 3 of the micro (U15) goes to U11 - pin 7 which converts the TTL level to +/- 12 Volts RS232 levels and passes the transmit data to serial port JP8. Receive data from JP8 is likewise converted from RS232 levels to TTL levels and sent to the micro on pin 2.

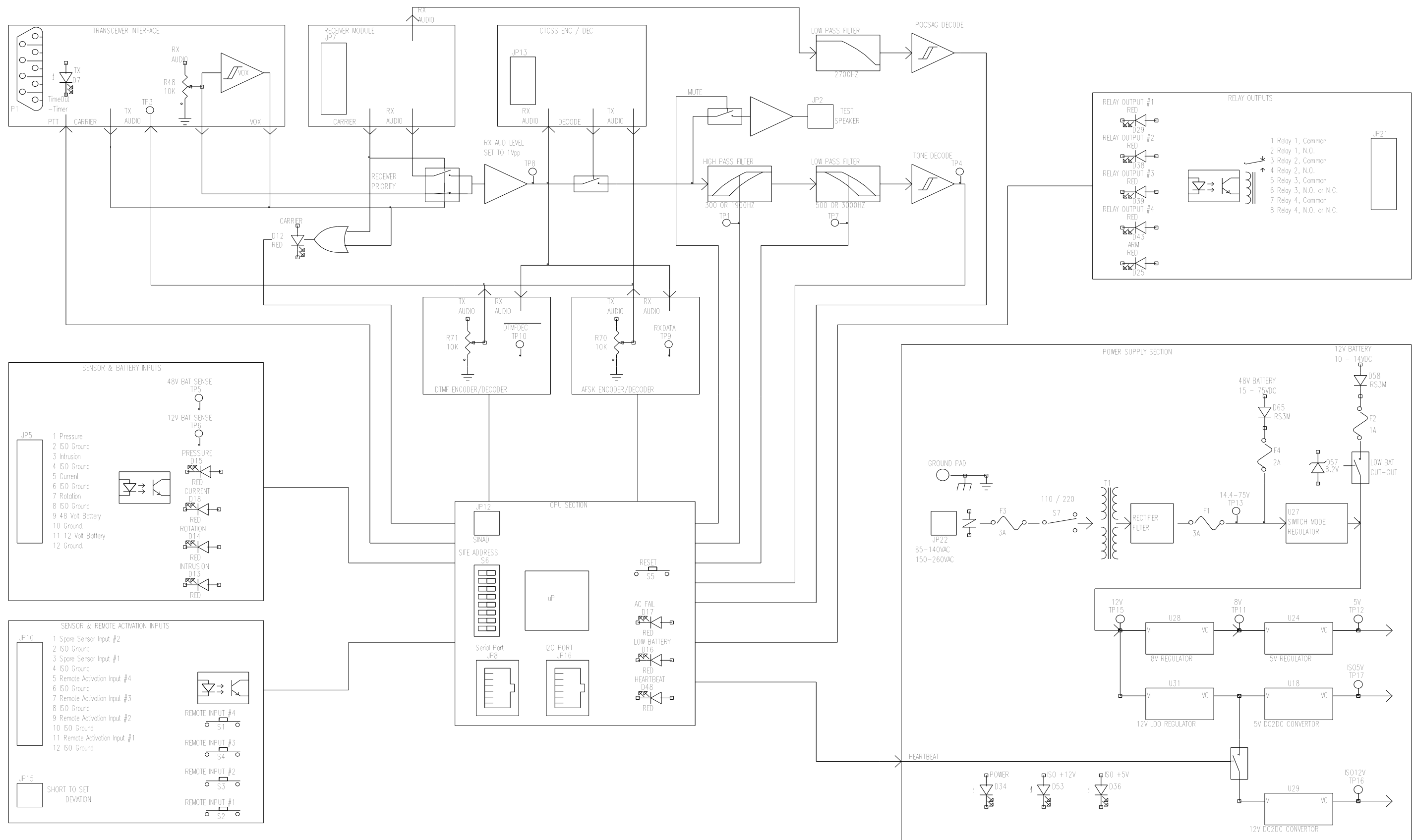


Figure 4-1. ACFCTB Block Diagram

4.1.2 Software Description of ACFCTB Encoding Format

The ACFCTB encodes a 9 digit DTMF string that includes the RTU's unit type, id number, function status and sensors status.

<u>Digit #</u>	<u>Description</u>
1	Start Character, always a DTMF "*"
2	Unit type programmed into unit (see unit types)
3	Function status (see function currently running)
4	unit number BCD most significant digit
5	unit number BCD middle digit
6	unit number BCD least significant digit
7	BCD of sensor status (see decoding of sensor status)
8	BCD of sensor status (see decoding of sensor status)
9	Terminating Character "*"

Conversion of DTMF Digit to BCD

<u>DTMF Character</u>	<u>BCD equivalent</u>
1	0 0 0 1
2	0 0 1 0
3	0 0 1 1
4	0 1 0 0
5	0 1 0 1
6	0 1 1 0
7	0 1 1 1
8	1 0 0 0
9	1 0 0 1
0	1 0 1 0
*	1 0 1 1
#	1 1 0 0
A	1 1 0 1
B	1 1 1 0
C	1 1 1 1
D	0 0 0 0

Unit Types

DTMF Character	ACFCTB types
A	single motor mechanical
B	three motor mechanical
C	2001AC or 2001DCB

Function currently running

DTMF Character	Function
0	Standby
1	Function 1
2	Function 2
3	Function 3
4	Function 4
5	Function 5
6	Function 6

Decoding sensor status

Sensor status decoding using the DTMF digit to BCD will report current sensor status. Depending on the type of unit selected the sensors required will vary.

<u>Digit 7</u>	<u>2001DCB or 2001AC</u>	<u>Single Motor Siren</u>	<u>Three Motor Siren</u>
Bit 1	Rotation	N/A	Rotation
Bit 2	Intrusion	Intrusion	Intrusion
Bit 4	AC power	AC power	AC power

Digit 8

Bit 1	Battery Voltage*	Battery Voltage*	Battery Voltage*
Bit 2	AUX 1	AUX 1	Blower Motor
Bit 3	Activation Current	Activation Current	Activation Current

* Battery voltage refers to the 12 V backup battery

Bit Status	0	1
	Rotation did occur	Rotation did not occur
	Cabinet Door is closed	Cabinet Door is open
	AC power is ON	AC power is OFF
	AUX 1 closed	AUX 1 open
	Blower did operate	Blower did not operate
	Activation Current detected	Activation Current not detected
	Battery Voltage Okay	Battery Voltage Low

EXAMPLE: Received DTMF report string * C 1 D D 2 4 A *

* Starting character
C Unit type ACFCTB with 2001 siren
1 Currently running function 1
DD2 Siren site number (0000) (0000) (0010), which equals site number 002

4 Sensor status is (0100), Bit 1 is 0, rotation occurred
Bit 2 is 0, cabinet door is open
Bit 3 is 1, not used, always 1
Bit 4 is 0, AC power is on

A Sensor status is (1101), Bit 1 is 1, Battery Voltage is low
Bit 2 is 0, AUX 1 is closed
Bit 3 is 1, Activation current not detected
Bit 4 is 1, not used, always 1

4.2 Chopper Motor Current Sensor Theory of Operation

4.2.1 Overview

The adjustable current sensor 2581200B is a window comparator device that utilizes a Hall Effect current sensor and an LM358 based window comparator. The active high output is opto-coupled and the entire circuit is powered by an MC78L08AC voltage regulator IC. The ground for the circuit is selected by way of jumper J2 between isolated or earth ground. The operation of the circuit is such that if the current passing through the probe of the current sensor is larger than the lower preset level and is less than the upper preset level, an active high output will result turning on the opto-coupled output, indicating that the sensed current is within the acceptable range.

4.2.2 Circuit Description

The circuit is energized when 12 VDC (Nominal) is applied to J1-3, and ground is applied to J1-1. The 12 VDC at J1-3 is applied directly to the MC78L08AC voltage regulator, IC1. The regulated 8 VDC output of IC1 is applied to the LM358 dual op amp (IC2) at pin 8, to MC14001B quad NOR gate (IC3) at pin 14, and also to the Hall-Effect current sensor (CS1) at its (+) input.

Current probe CS1 is designed to generate a reference voltage of 1/2 the supply voltage on its (0) output pin. With 8.0 VDC at the (+) input of CS1 and ground applied at the (-) input of CS1, CS1 will output 4.0 VDC on the (0) output when the current passing through the probe of CS1 is zero. This voltage is applied to R2, through which C4 is charged to 4.0 Volts, and this voltage is applied to the non-inverting input of IC2B and the inverting input of IC2A. The output of the current sensor is linearly scaled such that a change of 100 Amps in sensed current results in a change of 1.0 Volt at the output, and a change of 1.0 Amp results in a change of 0.01 Volts at the output. Using this calibration, POT1 and POT2 can be adjusted to set upper and lower current thresholds, respectively.

A typical application of the current sensor could be to set the device for an upper current threshold of 300 Amps, and a lower current threshold of 50 Amps. Using these values, the voltage at TP1 corresponding to 300 Amps would be:

$$4.0 \text{ V} + (300 \text{ A} * 0.01 \text{ V/A}) = 7 \text{ V.}$$

The voltage at TP1 corresponding to 50 Amps would be:

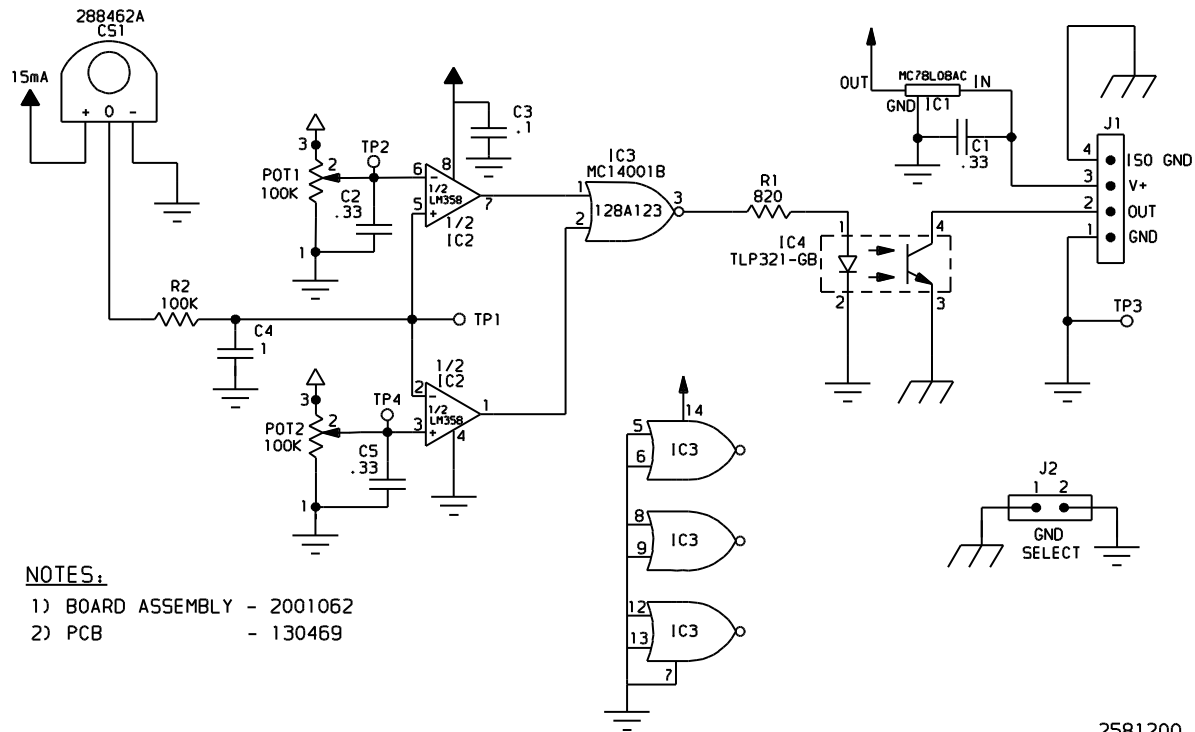
$$4.0 \text{ V} + (50 \text{ A} * 0.01 \text{ V/A}) = 4.5 \text{ V}.$$

Adjusting POT1 would set the upper current threshold voltage of 7 V at TP2, and adjusting POT2 would set the lower current threshold voltage of 4.5 V at TP4. With a sensed current value between 50 and 300 Amps, the voltage at TP1 will be between 4.5 and 7 Volts. Since the voltage at the inverting input of IC2B (pin 6, also TP2) is set to 7 Volts, and the voltage at the non-inverting input (pin 5) is less than 7 Volts, the output of IC2B (pin 7) will be logic low. Similarly, since the voltage at the non-inverting input of IC2A (pin3, also TP4) is set to 4.5 Volts, and the voltage at the inverting input (pin 2) is greater than 4.5 Volts, the output of IC2A (pin 1) will also be logic low. The outputs of IC2A and IC2B are applied directly to the inputs of NOR gate IC3. With a logic low at both inputs of IC3 (pins 1 and 2), the output of IC3 at pin 3 will be a logic high, around 8 Volts. 8 Volts applied through R1 to the input (pin 1) of opto-coupler IC4 will cause the output transistor of IC4 to be saturated and a logic low will be applied to J1-2, indicating that the sensed current is within the preset acceptable range.

In the case that the sensed current exceeds the upper current limit, the voltage at TP1 will be larger than 7 Volts, putting the non-inverting input of IC2B at a higher potential than the inverting input, resulting in a logic high at the output of IC2B, which is applied to pin 1 of IC3. A logic high at either or both inputs of IC3 will yield a logic low at the output of IC3, which will cause the output transistor of IC4 to be cut off and a logic high will be applied to J1-2, indicating that the sensed current is outside the acceptable range. J2-1 must be pulled high by whatever circuit it is connected to. In similar fashion, if the sensed current falls below the lower current limit, the voltage at TP1 will be less than 4.5 Volts, putting the inverting input at a lower potential than the non-inverting input, resulting in a logic high at the output of IC2A, which is applied to pin 2 of NOR gate IC3. As described above, this results in an active high applied to J1-2, indicating that the sensed current is outside the acceptable range.

Miscellaneous:

Capacitors C1 and C3 are power supply bypass capacitors that act to absorb power supply line transients. Capacitors C2 and C5 dampen any transient voltages on the inputs of the op-amps.



2581200

Figure 4-2. Schematic Chopper Current Sensor Board

PARTS LIST

<u>FEDERAL PART NO.</u>	<u>LOCATION</u>	<u>DESCRIPTION</u>
107A634	C6	CAPACITOR, TANT, 10 UFD
107A907A	C1,C2,C5	CAPACITOR, MONO, 33 UFD
107A905A	C3,C4	CAPACITOR, MONO, .01 UFD
128A217A	IC1	I.C., 8 VOLT, MC78L08ACP
128A045A	IC2	I.C., LM358, DUAL OP-AMP
128A123A	IC3	I.C., MC14001B
128254-01	IC4	I.C., TLP321GB OPTO
288462A	CS1	CURRENT SENSOR
105A276A	POT 1, POT 2	POTENTIOMETER, 100 K OHM
233A120A	PIN 1, PIN 2, PIN 3, PIN 4	TERMINAL, MALE, R93-31
140A235A-01	J1	CONNECTOR, 4 POSITION
140A235A	J2	CONNECTOR, 2 POSITION
100A247	R1	RESISTOR, CF, 820 OHM, 5 %
100A257	R2	RESISTOR, CF, 10 K OHM 5 %
103469B		PCB, ADJ. CURRENT SENSOR

4.3 Rotator Motor Current Sensor Theory of Operation

4.3.1 Overview

The Current Sensor board, 2005221 Rev B, is mounted on the backplate under the DC contactors. It monitors the DC current of the rotator motor. It scales the voltage reading to allow direct reading of the current passing through the sensor and employs a window comparator which signals that the current is between a lower and an upper limit.

Features

- Easy direct reading of current passing through the sensor
- Fixed window comparator, no adjustment needed
- Accurate to +/- 5%

4.3.2 Electrical Specifications

Input Voltage	7 VDC – 30 VDC
Input Current	<30 mA max.
Measurement Current Ranges	0 to 5 Amps, 0 to 5 VDC @ TP3 0 to 15 Amps, 0 to 5 VDC @ TP3
Window Comparator Thresholds	JP3 & JP4 not jumpered 0.34 VDC min, 1.50VDC max (0.34 & 1.5 Amps) JP3 & JP4 jumpered 1.00 VDC min., 2.67 VDC max. (3.0 & 8 Amps)
Window Comparator Output	Open collector, sink \leq 500 mA

4.3.3 Connectors

JP1 - Current Measurement Pass-Through

- 1 - (+) voltage source
- 2 - 0-5 Amp (for gear driven rotators) output to motor (-)
- 3 - 0-15 Amp (for belt driven rotators) output to motor (-)

JP2 - Interface, Power In & Signal Output

- 1 - Ground
- 2 - Window comparator output, open collector, pulls low when current is above min. and below max. current
- 3 - DC supply voltage input (7 VDC to 30 VDC)
- 4 - Analog sensor output. 0 – 5 VDC for 0 - 5 Amp input,
0 – 5 VDC for 0 - 15 Amp input

JP3 & JP4 - Jumper headers

Shorted to set window comparator thresholds for Belt driven rotators

4.3.4 Circuit Description

Power Supply

Power enters through D1, is regulated down to 5 VDC +/- 2%, by U4 and is filtered by C2 and C3.

The Current Measurement Path

The current sensor, U1, outputs a fixed DC voltage (2.5 V) plus a variable voltage representing the current being measured. For the 0 - 5 Amp input a 2 Amp current draw would = 2.5 VDC + 0.625 VDC or 3.125 VDC.

U3B generates an offset voltage. This voltage is summed through U3A with the voltage from the current sensor. This subtracts off the 2.5 VDC from the current sensor leaving only the voltage representing the current being measured. U3A multiplies this voltage and scales it so that 1 Amp of current being measured = 1 VDC at TP3 (3 Amps = 1 VDC for the 0 - 15 Amp input).

The output of window comparator U2A & U2B goes high if the voltage is greater than the voltage at U2 pin 6 and less than the voltage at U2 pin 3. This turns on Q1 which pulls the output at JP2 pin 2 low.

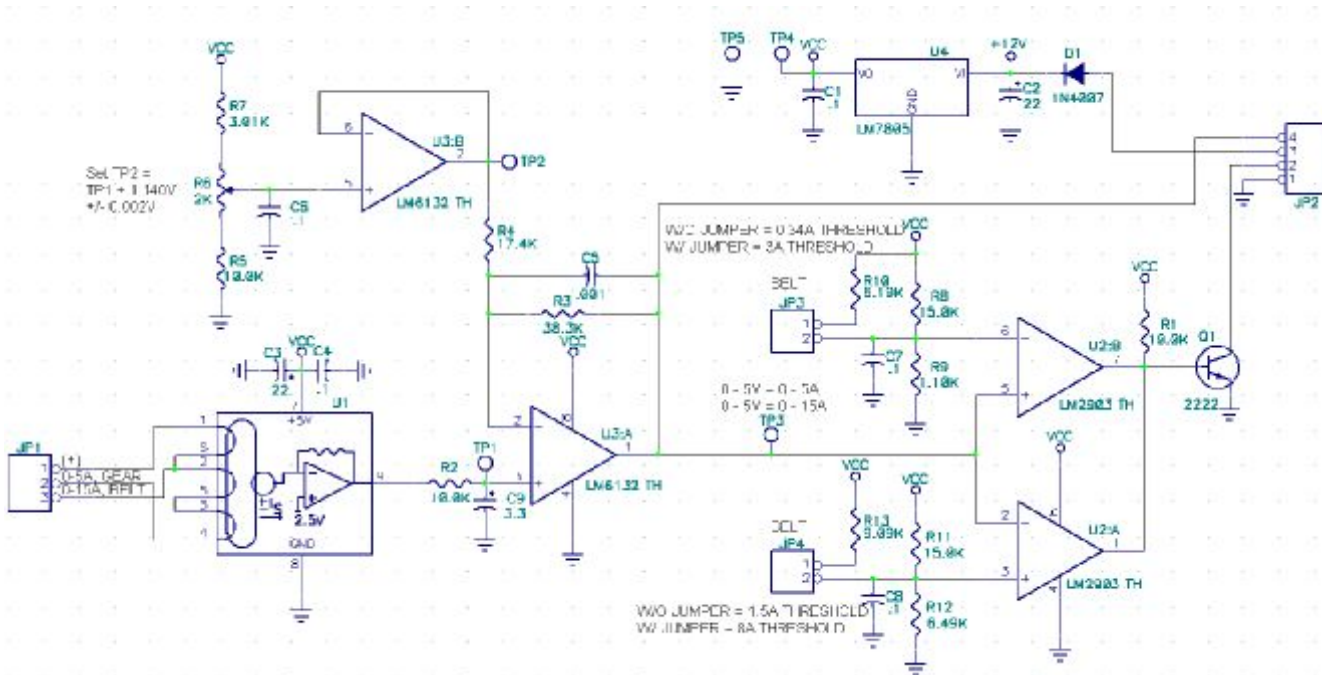


Figure 4-3. Schematic Rotation Current Sensor Board 2005221B

4.4 Battery Charger Theory of Operation

4.4.1 Overview

In the cabinet is a combination smart charger and power supply. The charger section monitors battery conditions, temperature and varies charge rate. The power supply section provides a power supply voltage separately.

Charger/Power Supply	Description	Connection
Black Wire	Ground	To TB1 (-)
Red wire 12VDC Charger	12 VDC battery charger stage, F5 = 5 A fused, fast blow	To TB3 (+)
Red wire 12VDC Power Supply	12 VDC power supply stage, F4 = 10 A fused, fast blow Nominal output voltage = 13.3 VDC	To Rectifier stage (+)

Battery Charger Status – The first green LED on the front left of the charger indicates charger status.

Battery charger status is as follows:

Green OFF= Charger OFF

Green Solid ON= Float Stage: (13.00-13.60 VDC @ 0.0-0.5 Amps)

Green Flashing= Bulk and Absorption Stage: (10.50-14.80 VDC @ 0.5-2.5 Amps)

Power Supply Status – The second pair of LED's on the front right of the charger indicates power supply status. Power Supply Status is as follows:

Red OFF, Green OFF= Power Supply is OFF

Red ON, Green OFF= Bulk Stage: (10.50 VDC - 13.00 VDC @ 7-11 Amps)

Red ON, Green ON= Absorption Stage: (13.00 - 13.60 VDC @ 3-7 Amps)

Red OFF, Green ON= Float Stage: (13.00 - 13.60 VDC @ 0-3 Amps)

Note: LED indication on the power supply section is controlled based on output current levels. Even though this is a power supply, the LED indicators are functioning as if it were a three-stage battery charger.

5. PROGRAMMING SOFTWARE

5.1 FSPWARE

FSPWARE software is a Microsoft Windows^R based program used to configure the DTMF version of the siren controller. The software communicates with the siren controller over an RS232 port. Refer to the Help menu provided with the software for operational details.

5.2 The Commandertm Digital System Software (SFCDWARE)

SFCDWAREtm software is a Microsoft Windows^R based program used to control, monitor and configure the digital version of the siren controller. The software communicates with the siren controller over an RS232 port. Refer to the Help menu provided with the software for operational details.

6. INSTALLATION

DANGER

Electrocution or severe personal injury can occur when making electrical connections, drilling holes, or lifting equipment. Therefore, experienced electricians in accordance with national and local electrical codes, acting under the direction of the installation crew safety foreman, should perform installation.

Explosive gases and corrosive materials may be present. To prevent explosion or severe personal injury, installation technicians must be experienced with the safe installation of lead-acid type batteries.

6.1 Recommendations on Control Box Location

The siren location and method of activation should be the first consideration before determining control box location. The ACFCTB unit can be activated remotely via radio or land line controls and locally using push buttons provided in the control unit. For additional information on remote activation using landline controls, refer to Section 6.3.4.

Since the controls are in a NEMA 4 rated enclosure it may be installed indoors or outdoors.

To ensure proper siren power is maintained, it is recommended that the control box location be within a 50 feet wire run to the siren. If it is necessary to make a longer run, it is recommended that a 1 AWG or larger wire be used for the siren motor.

When mounting the control box, it is recommended that the unit be out of reach to avoid vandalism but accessible to service personnel. The box is equipped with padlock hasps and it is recommended that it be used for added security.

The control box is shipped mounted on an aluminum channel with four mounting holes for 1/2-inch bolts. The total weight of the control box is approximately 90 pounds (41kg.). Therefore, insure that the mounting surface and fasteners can safely sustain the weight of the assembly and any additional environmental stresses placed upon it.

Refer to Figure 6-1(ACFCTB typical installation) for reference.

NOTE: When installing this product, insure that Local and NEC guidelines are followed.

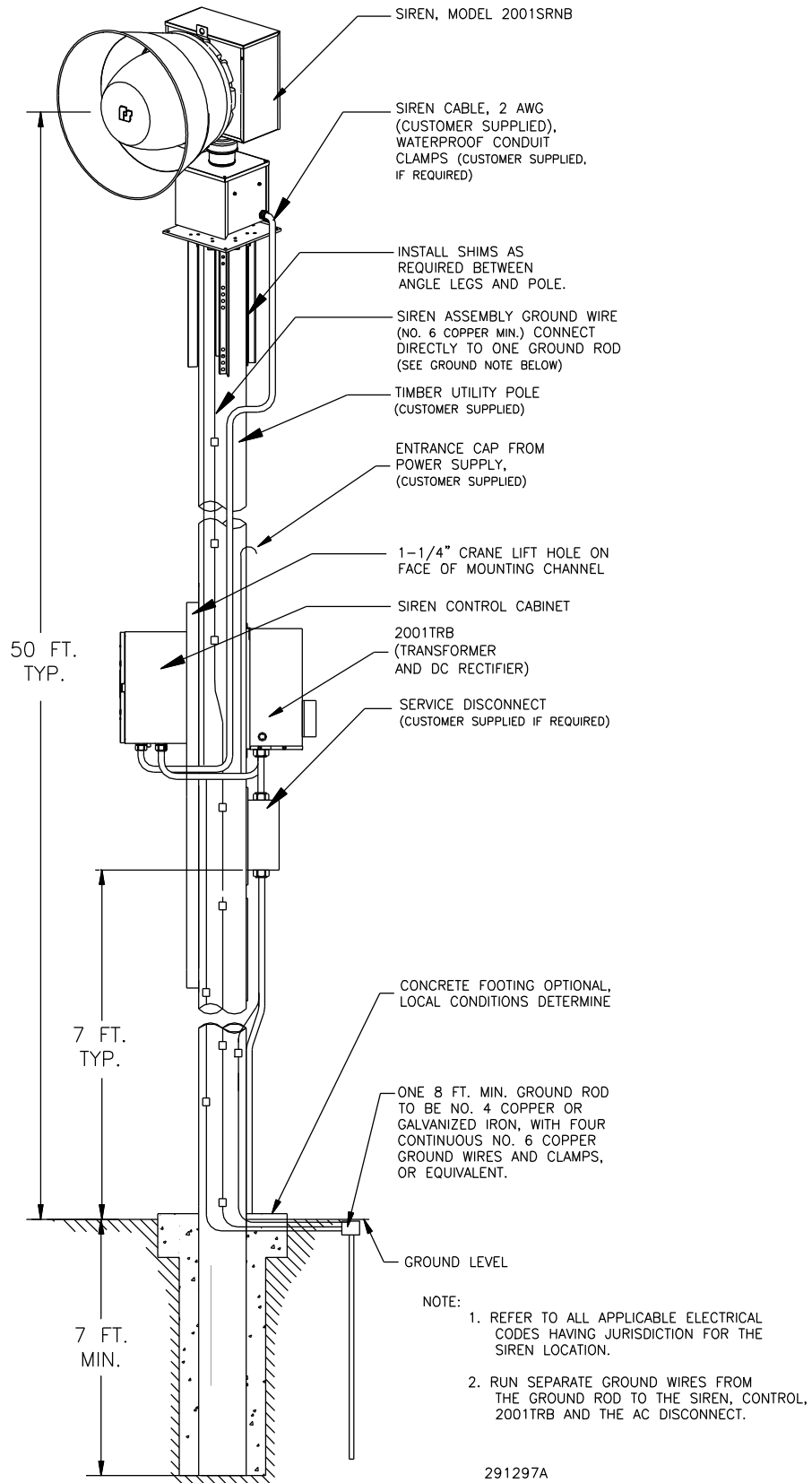


Figure 6-1. Typical ACFCTB Installation

6.2 Control Box Installation

The control box is attached to a length of 5” channel. There are six pre-drilled holes in the channel:

- (1) 1-1/4” convenient lifting point
- (1) 7/8”
- (4) 9/16” mounting holes

It is imperative that the mounting surface and mounting method selected can safely sustain the weight of the assembly. In addition, the mounting method and surface used must be able to withstand external mechanical stresses that may be applied to the assembly.

6.2.1 Installer Supplied Material List

The following is a general list of material required to install the model ACFCTB, 2001SRNB siren, and the 2001TRB. This list will vary depending on mounting methods, length of pole, other options, local electrical codes, etc. Therefore, this list should be used as a reference guideline only. Stainless steel hardware is recommended.

Material Description	QTY
1) 240 VAC, 1 phase/ 3 wire, fused disconnect	1 ea.
2) FRN 30, 30 Amp time delay fuse	2 ea.
3) 100 Amp meter socket (if required)	1 ea.
4) 1” Meter hub (overhead service only)	1 ea.
5) 1” service entrance (overhead service only)	1 ea.
6) Fork bolt (overhead service only)	1 ea.
7) 1/2” Liquid-Tight, 90 degree connectors (2001TRB Primary feed)	2 ea.
8) 1” Liquid-Tight 90 degree connector (2001TRB secondary feed)	1 ea.
9) 1” Liquid-Tight 45 degree connector (2001TR B secondary feed)	1 ea.
10) 1/2” EMT compression box connector (Disconnect/ meter ground)	1 ea.
11) 1” Heavy wall compression fittings (Rotator cabinet/ OH meter)	1 ea.
12) 1/2” Liquid-Tight flexible conduit (2001TRB primary feed)	18”
13) 1” Liquid-Tight flexible conduit (2001TRB secondary feed)	7 1/2”
14) 1/2” EMT thin wall conduit (Disconnect/ meter ground)	10’
15) 1” Aluminum Rigid (if applicable in your area/ cabinetry-siren raceway)	50’
16) 1/2” Nail drive straps (Securing 1/2” ground pipe)	4 ea.
17) 1/2” jiffy straps (Substitute for nail straps)	4 ea.
18) 1” Heavy wall 2-hole straps (1” raceway clamping)	15 ea.
19) 1” Lock rings (1” raceway tightening)	5 ea.
20) 1” plastic bushings	2 ea.
21) 1/2” plastic bushings	2 ea.
22) 1” close nipple (1” raceway/ cabinet-siren)	1 ea.
23) 1” chase nipple (1” LB-cabinet connection)	1 ea.
24) 1” LB’s w/ gaskets & covers (1” raceway/ cabinet-siren)	2 ea.
25) Split bolts, 10 AWG wire (2001TRB primary connection)	2 ea.
26) Mechanical lugs, 2 AWG wire (2001TRB siren motor feed)	6 ea.
27) Mechanical lugs, 6 AWG wire (System ground)	4 ea.
28) #6 Copper ground wire (System ground)	75’

Material Description	QTY
29) 5/8" x 8' Copper Ground rod (System ground)	1 ea.
30) Ground rod connector cold water type/ acorn style (System ground)	1 ea.
31) 1 1/4" to 1" Reducing washer (Meter socket/ O.H. service)	2 ea.
32) 1 1/4" Galvanized staples (Securing ground wire to pole)	30 ea.
33) 3/4" Galvanized staples (Securing antenna cable)	30 ea.
34) 12 AWG THHN stranded CU wire (Orange / rotator motor feed)	40'
35) 14 AWG THHN stranded CU wire (Black / AC line)	40"
36) 14 AWG THHN stranded CU wire (white / AC Neutral circuit)	40"
37) 10 AWG THHN stranded CU wire (black / TR option primary)	30"
38) 16 AWG THHN stranded CU wire (Optional, black / proximity sensor)	45'
39) 16 AWG THHN stranded CU wire (Optional, brown / proximity sensor)	45'
40) 16 AWG THHN stranded CU wire (Optional, blue / proximity sensor)	45'
41) 2 AWG, 600 V, stranded CU wire (Optional 2001TRB 48 V and ground)	12'
42) Green electrical tape (33+) (ground wire identification)	1 roll
43) Red electrical tape (33+) (48+ wire identification)	1 roll
44) White electrical tape (33+) (neutral wire identification)	1 roll
45) Black electrical tape (33+) (connector insulating wrap)	1 roll
46) Blue electrical tape (33+) (identification marking)	1 roll
47) Rubber tape (insulating connections)	1 roll
48) Spade crimp connector (red-14 ga. wire/ charger circuit)	2 ea.
49) Ring crimp connector (1/4" stud size 12 ga. wire/ rotator feed)	1 ea.
50) 1/4 x 20 3/4" hex head bolt (ground connection on siren leg)	1 ea.
51) 1/4 x 20 standard flat washer (ground connection on siren leg)	1 ea.
52) 1/4 x 20" intern/ extern star washer (ground connection on siren leg)	1 ea.
53) 1/4 x 20 split washer (ground connection on siren leg)	1 ea.
54) 1/4 x 20 hex head nut (ground connection on siren leg)	1 ea.
55) 5/16 hex head nut (ground connection on control cabinet)	1 ea.
56) 1/2"x 4" hex head lag bolt (securing TR option to utility pole)	3 ea.
57) 1/2"x 6" hex head SS lag bolt (securing siren/ control cabinet to utility pole)	16 ea.
58) 1/2" SS (Stainless Steel) flat washers (backing 1/2" lag bolts)	19 ea.
59) 10 x 1" hex head, slotted, sheet metal screws (securing straps/ equip to pole)	1 box
60) 10 x 2" hex head, slotted, sheet metal screws (securing straps/ equip to pole)	1 box
61) 10 x 3" hex head, slotted, sheet metal screws (securing straps/ equip to pole)	1 box

6.2.2 Pole Mounting

1. Use a crane to lift the control unit to the desired mounting height along the pole.
2. Use the crane to hold the control unit against the pole so that the four mounting holes on the mounting channel can be used as a template to drill four 3/8" pilot holes at least 3-1/2" deep.
3. Attach the control box to the pole using four user supplied 1/2" x 5" lag bolts. Slide a user supplied 1/2" flat washer onto each bolt before threading the bolt into the pole. Ensure the channel is plumb and straight. Do not bend the mounting channel by over tightening the lag bolts. Notch the pole or use shims if necessary to provide a flat stable mounting surface.
4. Mount a user supplied fused disconnect switch on the pole beneath or opposite the control/battery box assembly in accordance with Local and National Electrical Codes.

5. Drill three 3/8” holes at least 3-1/2” deep using the Transformer / Rectifier as a template. Attach the cabinet to the pole using three user-supplied 1/2” x 5” lag bolts. Slide a user-supplied 1/2” flat washer onto each bolt before threading into pole.

6.2.3 Flat Surface Mounting

1. Prepare the mounting surface for hanging the assembly using the steel channel as a template.
2. Attach the control box to a wall or other substantial vertical surface using the four 9/16” mounting holes.
3. Mount a user supplied fused disconnect switch in accordance with Local and National Electrical Codes.
4. Attach the 2001TRB cabinet to a wall or other substantial vertical surface using the three mounting holes. Make sure that the mounting surface and mounting method selected can safely sustain the weight of the Transformer. The weight of the Transformer / Rectifier is approximately 150 lb.

6.2 Electrical Connections

WARNING

Install the siren electrical system in compliance with local electrical codes and NEC recommendations. Federal Signal also recommends that all user-installed conduit connections enter from the bottom of the cabinet. Disconnect all power and read all warnings at the beginning of this manual and on the batteries before making connections.

CAUTION

THE SIREN AND CONTROL UNITS MUST BE SOLIDLY CONNECTED TO AN EARTH GROUND. If the siren is installed in a building, ground the system to a metallic object known to be grounded. For pole mount installations, drive a metal rod or bar at least 8 feet into the ground, as close as practical to the base of the pole. USE A SEPARATE, CONTINUOUS 6 AWG OR LARGER WIRE FROM THE SIREN FRAME TO GROUND AND FROM THE CABINET OF EACH SIREN CONTROL UNIT TO GROUND.

6.3.1 Siren Connections

The complete system wiring diagram is shown in Figure 6-2. All interconnections between the siren and Control Unit are accomplished using three wires. Two 2 AWG wires provide operating power to the siren motor. A single 12 AWG wire provides operating power to the rotator motor. Optionally, upon special order of a model 2001SRNT, three 18 AWG wires are used to connect a proximity switch rotation sensor in the siren head to the control cabinet. It is recommended that the interconnecting cable be routed through conduit between the siren and Control Unit. There are two terminal blocks (shown in figure 6-2) located in the rotator housing of the siren that accept stripped wire, and a terminal block and relays in the control box that accept 1/4 inch and 5/16 inch ring terminals. If the proximity switch option is ordered for rotation sensing, a DIN rail terminal block is used for making connections to the rotation sensor wiring. These points provide convenient locations for making connections.

6.3.1.1 Siren and Control Unit Interconnecting Wiring

1. Install a 1" user-supplied electrical conduit fitting in the bottom of the Control Unit cabinet and in the bottom of the siren rotator housing.
2. Install 1" user-supplied electrical conduit between the conduit fitting in the bottom of the siren rotator housing and the conduit fitting at the bottom of the Control Unit cabinet.
3. Route the interconnecting wiring (user-supplied) from the siren rotator housing to the Control Unit cabinet through the conduit.
4. Connect a red 12 AWG wire from terminal 1 of the three position terminal block (TB1) in the rotator housing to the bottom open terminal of the rotator control relay, K1, using a 1/4" ring terminal (user-supplied) at K1.
5. Connect a red 2 AWG wire from terminal 2 of the three position terminal block (TB1) in the rotator housing to the open left side of the 200 Amp fuse (F6) using a 1/4" ring terminal (user-supplied). See figure 6-2 System Wiring Diagram.
6. Connect a black 2 AWG wire to terminal 3 of the three position terminal block (TB1) in the rotator housing. Run the black 2 AWG wire to a 5/16" backplane ground stud in the control cabinet (labeled GRND) using a 5/16" ring terminal (user-supplied).
7. Ground the Siren and Control Unit to earth ground using separate continuous runs of wire (do not "T" from another ground wire).
8. Tighten all connections securely to provide good electrical connections.

6.3.2 AC Power Connections

WARNING

TO PREVENT DAMAGE TO THE CONTROL UNIT, DO NOT CONNECT 240 VAC POWER WITHOUT A MODEL 2001TRB TRANSFORMER/RECTIFIER.

1. As shipped from the factory, the Control Unit is configured for 120 VAC operation. The AC selector switch, S7 on the siren control board, must be set to the 110 VAC position.
2. Locate hole in the bottom of the Control Unit cabinet, install a user supplied 1/2" electrical conduit fitting. Route 1/2" conduit (steel preferred) between a user-supplied fused disconnect switch and user-supplied conduit fitting in the bottom of the Control Unit cabinet.
3. Route three user-supplied wires through the conduit that was just installed between the Control Unit and the fused disconnect switch. Use 14 AWG wire or larger.
4. Connect Neutral (white wire) from service disconnect to F1 on the DIN rail in Control Unit cabinet (see figure 6-2).
5. Connect Line (black wire) from service disconnect to F2 on the DIN rail in Control Unit cabinet (see figure 6-2).
6. Connect Ground (green wire) from service disconnect to the green ground block on the DIN rail in Control Unit cabinet (see figure 6-2). A small screwdriver must be pushed into the square opening in the terminal block to open the contacts of this block.
7. Follow the instructions included with the lightning protector (supplied) and install it in the service disconnect.
8. Size fuse or circuit breaker in service disconnect to 15 Amps max.

6.3.2.1 2001TRB Transformer/Rectifier Installation and Wiring

NOTE: 50 Amp 208, 220, or 240 VAC electrical service is required.

Preparation:

1. Refer to figures 6-1, 6-2 and 6-3. Remove the 2001TRB Transformer / Rectifier from its shipping crate and stand the transformer on its top to expose the inspection covers located on the bottom side.
2. Remove the four (4) 3/8" hex head bolts that secure the inspection covers and remove the inspection covers from the transformer.
3. Pull the four (4) primary lines marked H1, H2, H3, & H4 from the inside of the transformer.

4. Punch out two knockouts in the transformer; Use one ½” for AC in and one 1” for 120V and 48V out to the controller.
5. Install a 1” 45 degree Liquid-Tight connector into the 1” opening on the transformer. Face the connector to the rear of the transformer and tighten the 1” lock ring. Put a 1” plastic bushing over the exposed thread end on the 1” connector.
6. Cut a section of 1” Seal-Tight, 7” in length. This will provide raceway for the 48 VDC secondary and for control cabinet 120 VAC input.
7. Cut a section of 1/2” Seal-Tight 18” in length. This will provide A/C input voltage from the AC disconnect to the transformer.

Transformer Wiring:

Transformer Primary: (2 ea.) 10 AWG, CU, stranded, black 40” in length.

Rectifier Output: (1 ea.) 2 AWG, CU, Black, 30” in length – 48 VDC Negative.
 (1 ea.) 2 AWG, CU, Red, 40” in length – 48 VDC Positive.

Control Cabinet: (1 ea.) 14 AWG, CU, stranded, black 60” in length – 120 VAC Line
 (1 ea.) 14 AWG, CU, stranded, white 60” in length – Neutral

1. The (2 ea.) 40” black 10 AWG lines provide 208/220/240 VAC for transformer primary input.
2. The 60” black, and the 60” white provide the AC input to the control cabinet. These wires will pass through the transformer as a raceway then be routed into the control cabinet.
3. The 30” black 2-AWG line provides the 48 VDC negative to the ACFCTB control cabinet. It connects the terminal block in the 2001TRB labeled “-“ and the 5/16” ground stud on the backplane of the siren controller.
4. The 40” red 2 AWG line provides 48 VDC positive voltage to the control cabinet. It connects to the terminal block in the 2001TRB labeled “+” and to the labeled terminal of K2-2.

AC Line Wire Terminations:

<i>240 VAC operation</i>	<i>Service disconnect</i>	<i>Transformer</i>
Transformer Primary: 2 ea. #10 black wires	L1	H1
	L2	H4
<i>220 VAC operation</i>	<i>Service disconnect</i>	<i>Transformer</i>
Transformer Primary: 2 ea. #10 black wires	L1	H1
	L2	H3

208 VAC operation

Transformer Primary: 2 ea. #10 black wires

Service disconnect

L1
L2

Transformer

H1
H2

Note: Cap all unused taps with wire nuts

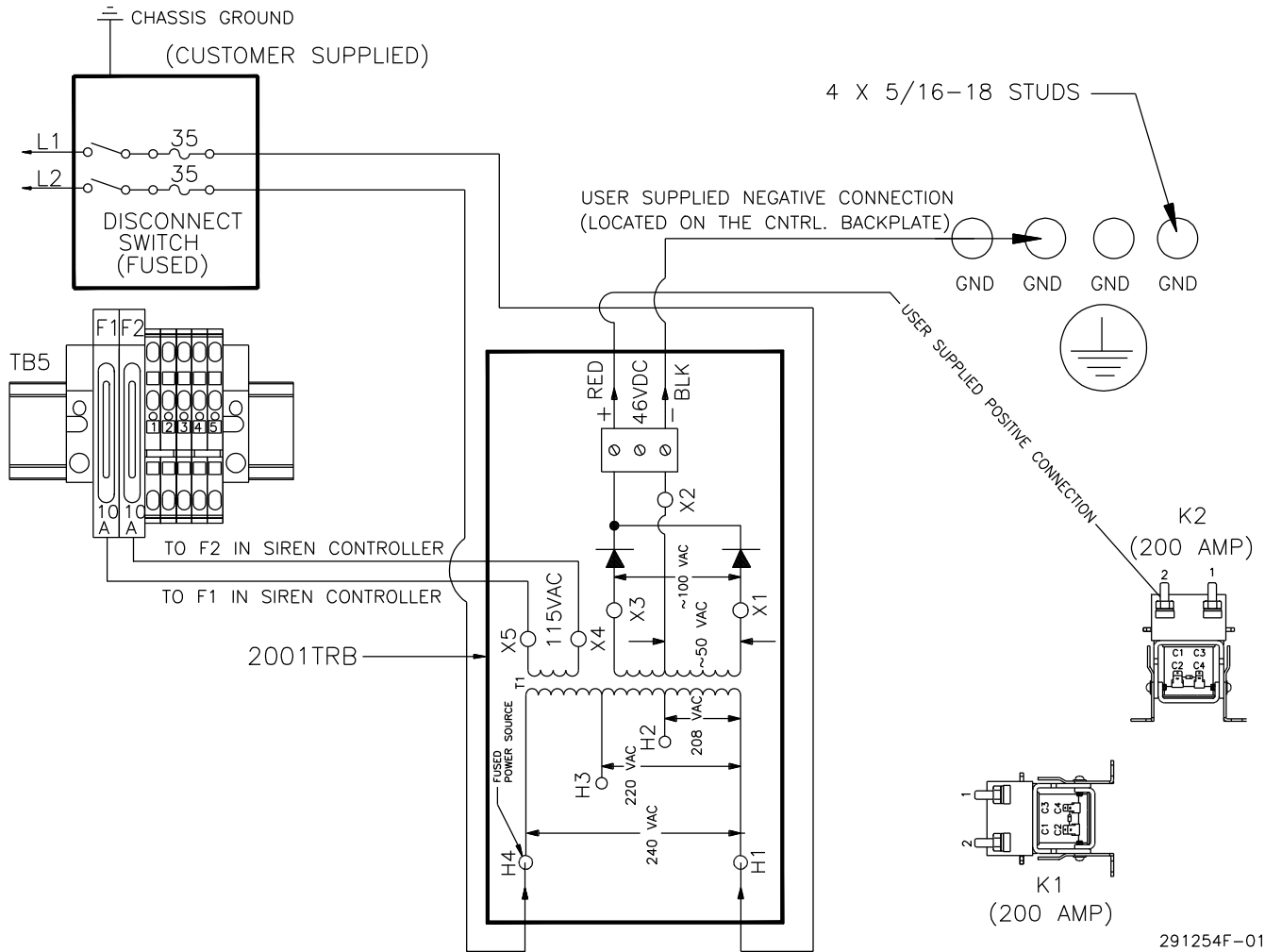


Figure 6-3. 2001TRB Schematic Diagram

6.3.3 Battery Installation and Wiring

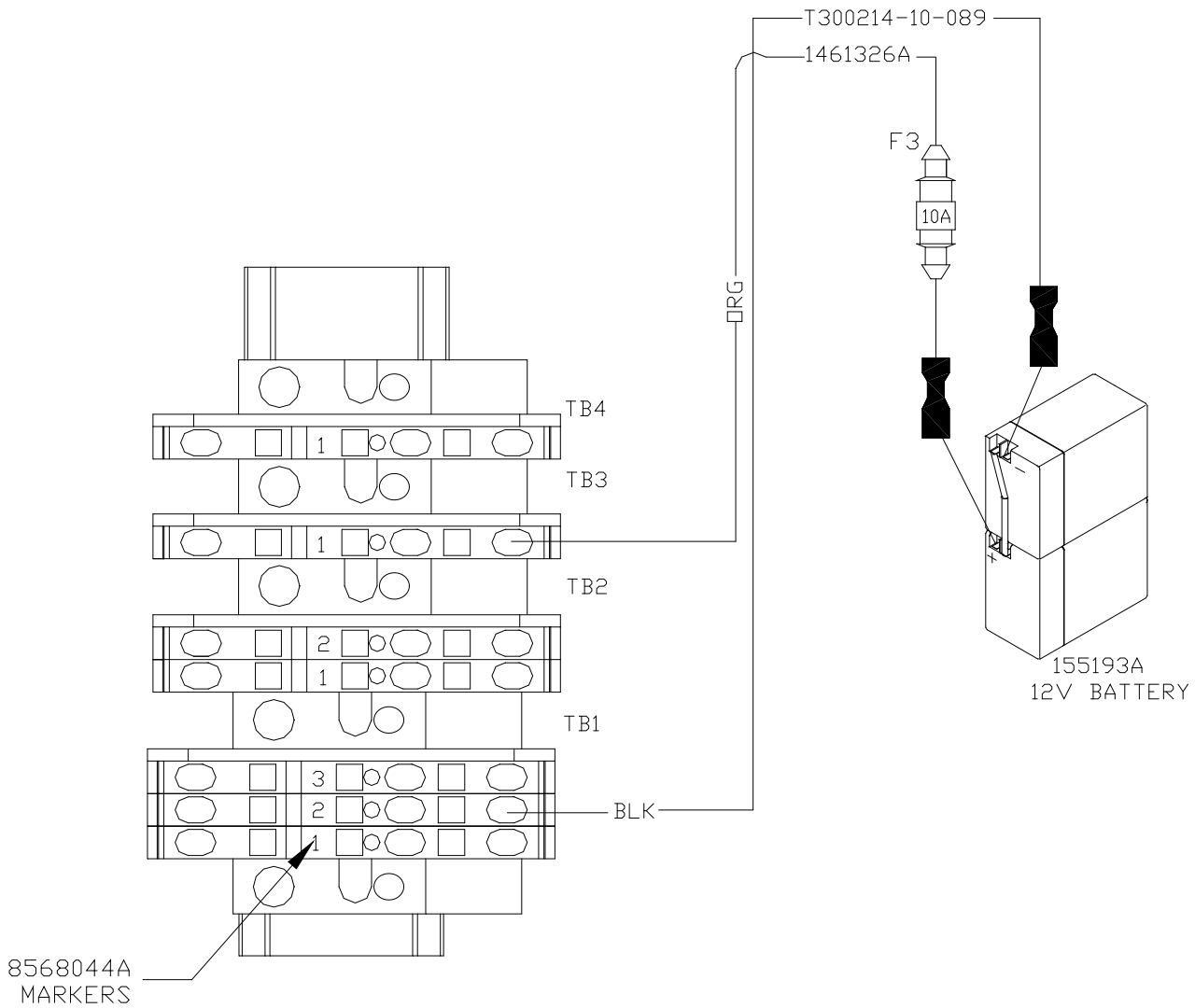


Figure 6-4. ACFCTB Battery Wiring Diagram

6.3.4 Land Line Control

The controller may be activated by applying contact closures to the remote activation inputs. Refer to Section 3-7 for a functional description and details on interfacing and wiring connections.

6.4 Antenna Installation

WARNING

TO PREVENT ELECTROCUTION OR SEVERE PERSONAL INJURY, INSTALL ANTENNA AWAY FROM POWER LINES AND INSTALL WITH PROPER GROUNDING. Refer to section 810 of the National Electrical Code, ANSI/NAPA No. 70. Refer to Figure 6-7 for details.

A factory installed internally wired Type N bulkhead is provided on the bottom side of the Control Unit for ease of antenna cable interface. The bulkhead requires the installation of a male Type N connector on the antenna cable for correct interface. **It is essential that the installer follow all tuning (if applicable), installation and safety instructions provided by the antenna manufacturer.**

6.4.1 Yagi Antenna Installation

6.4.1.1 Yagi Antenna Pre-Assembly Instruction:

1. Unpack the antenna and locate the following parts:
 - Boom (1-14" for 5 element model, 7/8" dia. for 3 element model)
 - 3/8 diameter elements (y---3 = 3 elements, y----5 = 5 elements)
 - Gamma match parts bag
 - Mounting bracket parts bag
2. Find the proper element dimension chart for your antenna, within the antenna instructions, and trim each element according to your operating frequency. Use care to trim equal lengths from each end of each element ensuring that the mounting hole is at the center.

Note A: Proper trimming and adjustment is critical to the Voltage Standing Wave Ratio, known as VSWR. (High reflected power levels decrease forward power. The life of the radio and transmit capabilities are dependent upon the VSWR being low as possible).

Note B: If two frequencies are being used, then trim the antenna to the transmit frequency of the unit where the antenna will be mounted.

3. Insert the elements into their respective locations through the boom, starting with R1 (the reflective element) in the hole closest to the mounting holes. Then insert Dr, D1 etc. in that order.

Note A: Shortest element is furthest away from the mount and increases in size as it gets closer to the mount.

Note B: Be very careful to line up the holes and not cross thread when securing the elements in the next step. The bolts must tighten all the way down upon the lock washers.

4. Secure the elements with the stainless steel 10-32 hex bolts and #10 lockwashers provided.
5. Locate the connector/brass tube assembly in the gamma match parts bag and insert the assembly first through the connector bracket, then thread the connector into the bracket. Be sure to tighten the connector fully. A drop of Loctite or other thread lock may be used in the threads to eliminate the possibility of the connector loosening.

6. Slide the gamma link onto the driven element and assemble the gamma match as shown in figure 1 or 2. Set dimensions “A” and “B” to those shown in table 1. Setting the match to the dimensions shown for your antenna is a good starting point, which will allow you to quickly line tune later. Complete the assembly by attaching the end cap onto the end of the gamma tube. The antenna is now ready for final tuning.

6.4.1.2 Final VSWR Tuning

1. Before final installation of the antenna, temporarily set it up in a clear area at least six feet above the ground.

Note A: Do not touch the antenna while the radio is transmitting.

Note B: Ensure antenna is not touching any conductive material and is pointed away from all objects and people. Pointing antenna at objects in close proximity may act as a reflector and create inaccurate readings.

2. Apply RF power to the antenna at the transmit frequency to be used at that antenna, and check for the low VSWR while performing each of the following steps.
 - A. First, loosen the setscrew with the Allen key provided and make a slight adjustment to the aluminum gamma tube for the lowest VSWR (Reflected power).
 - B. Next adjust the gamma link along the driven element for the lowest VSWR.
 - C. Repeat the above steps until the lowest VSWR is achieved. Reflected power must be less than 10% of the forward power.
 - D. Return to the dimensions shown in table 1 if there is any trouble achieving a good match. If the element dimensions are incorrect for the frequency being used, low VSWR may be unattainable. If the VSWR specification is still unattainable, replace the cable (A simple ohm meter check of the cable does not guarantee that the antenna cable is good, due to the DMM not having the ability to check the cable at high frequencies. If that does not take care of the problem, replace the antenna.

6.4.1.3 Mount Yagi Antenna

****NOTE****

SEE FIGURE 6-5

1. Install antenna, (using installation bracket or equivalent) as high as possible, such that the antenna cable and obstacles will allow, and install on side of pole closest to the receiving station. Aim antenna at receiving station.

Note A: Objects around the antenna will affect the antenna, keep antenna pointed away from objects.

2. Ensure antenna cable connections are tight. Seal all connection points with heat shrink or tape and seal with Scotch Coat, or equivalent.
3. Apply RF power to the antenna at the transmit frequency to be used at that antenna, and check the VSWR (Reflected power). Reflected power must be less than 10% of the forward power.

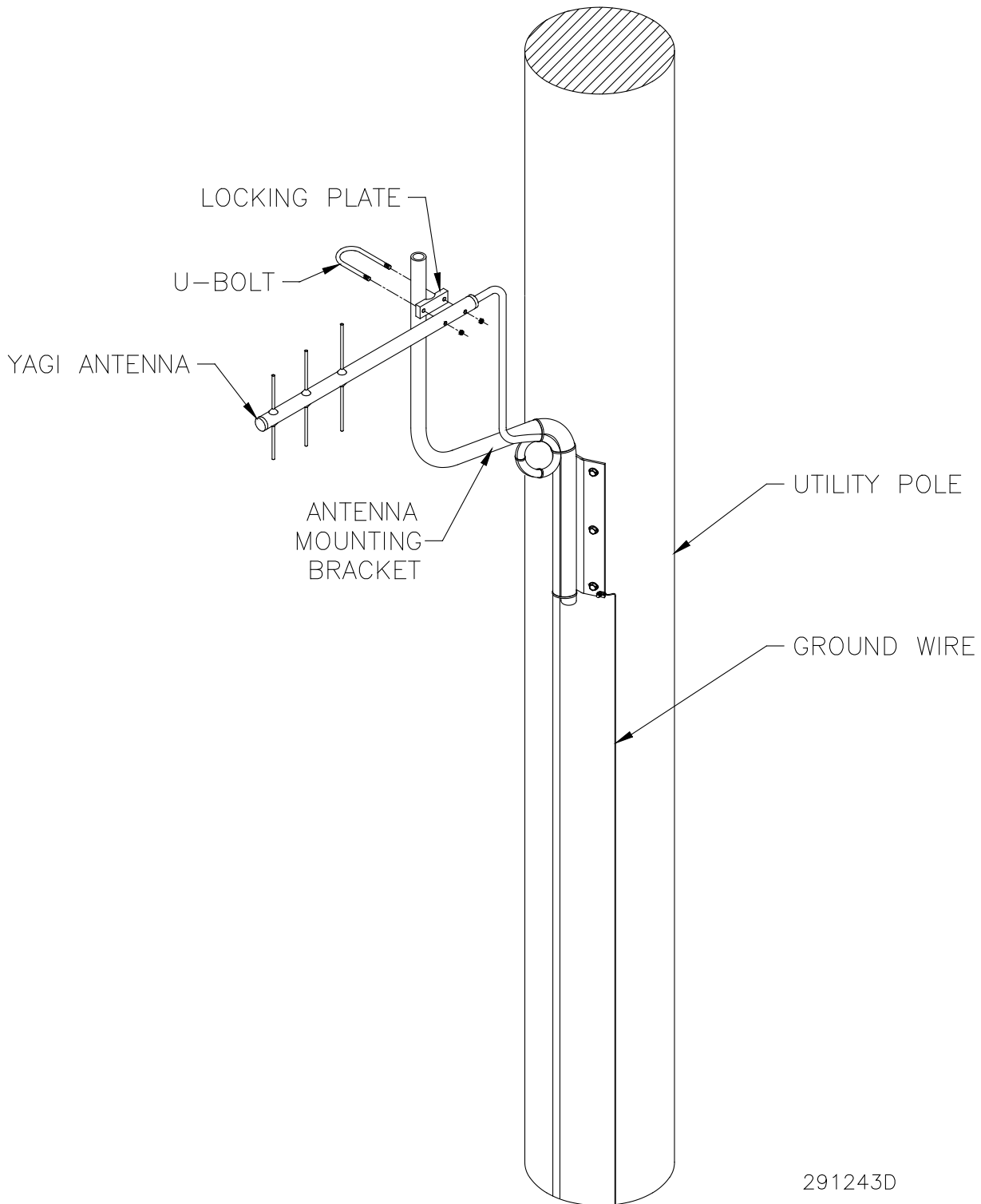
If the VSWR specification is unattainable, replace the cable (A simple ohm meter check of the cable does not guarantee that the antenna cable is good, due to the DMM not having the ability to check the cable at high frequencies). If that does not take care of the problem, replace the antenna.

6.4.2 Omni Fiberglass Antenna Models: (no tuning required)

****NOTE****

SEE FIGURE 6-6

1. Install antenna (using installation bracket or equivalent) as high as possible, such that the antenna cable and obstacles will allow, and install on side of pole closest to the receiving station.
Note A: Objects around the antenna will affect the antenna, keep antenna away from objects, and at least 1/4 wavelength from siren pole.
2. Ensure antenna cable connections are tight. Seal all connection points with heat shrink or tape and seal with Scotch Coat, or equivalent.
3. Apply RF power to the antenna at the transmit frequency to be used at that antenna, and check the VSWR (Reflected power). Reflected power must be less than 10% of the forward power.
If the VSWR specification is unattainable, replace the cable (A simple ohm meter check of the cable does not guarantee that the antenna cable is good, due to the DMM not having the ability to check the cable at high frequencies). If that does not take care of the problem, replace the antenna.



291243D

Figure 6-5. Yagi Antenna Installation Example

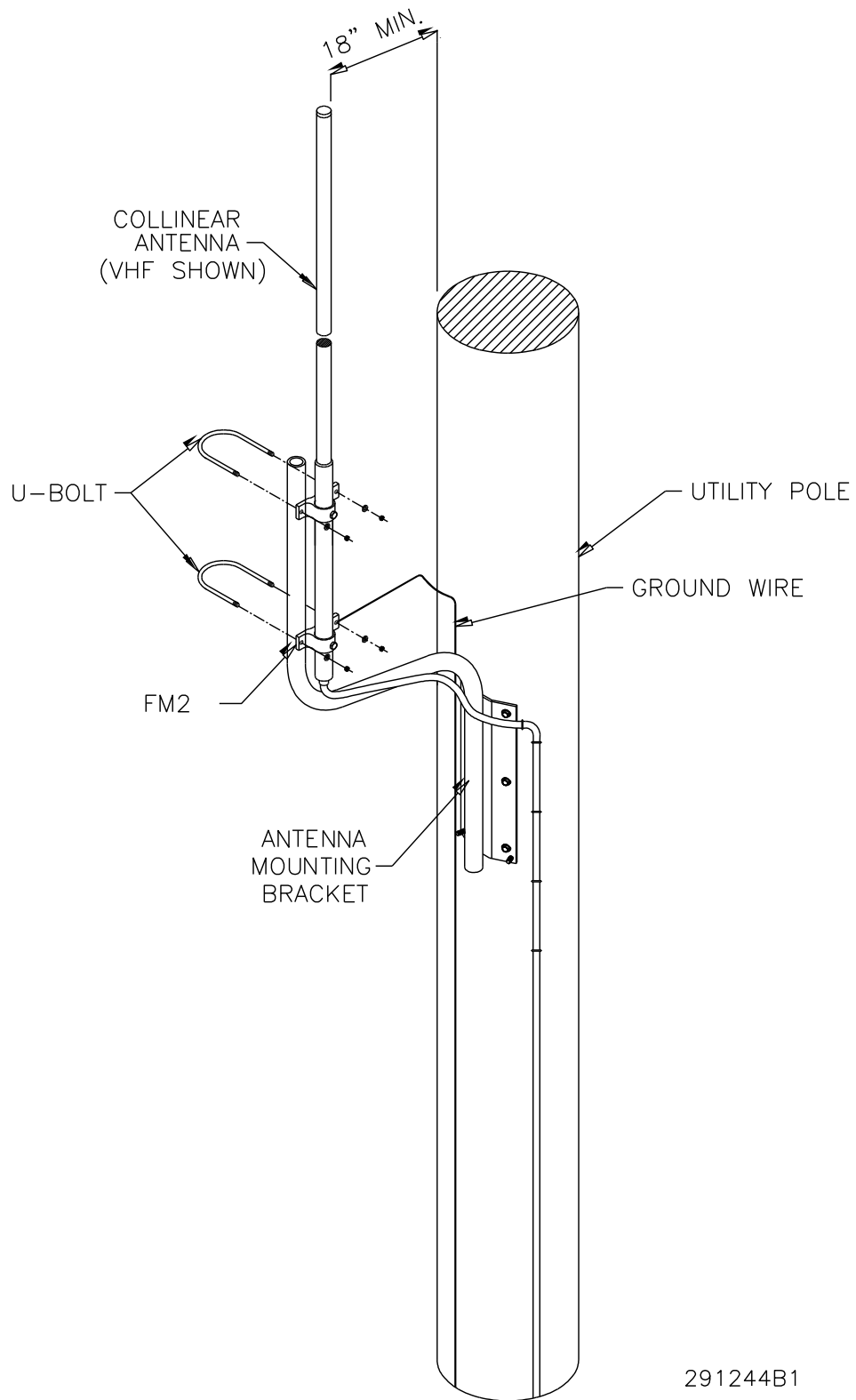
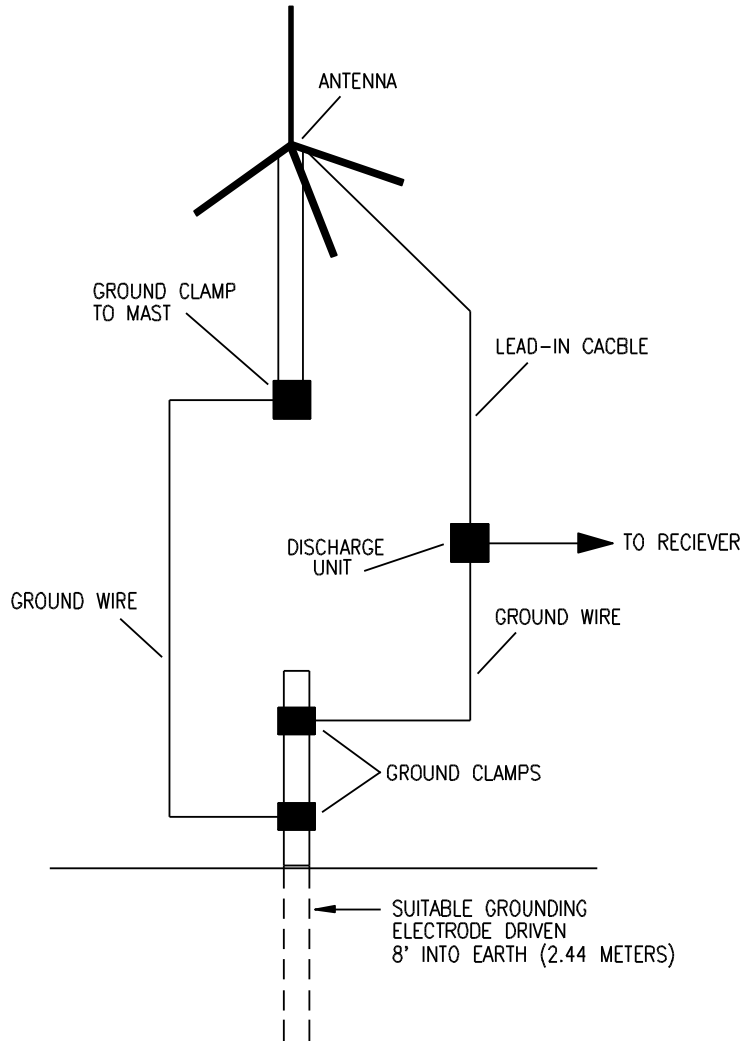


Figure 6-6. Omni Antenna Installation Example

EXAMPLE OF ANTENNA GROUNDING AS PER
 NATIONAL ELECTRICAL CODE INSTRUCTIONS
 (REFER TO N.E.C. FOR COMPLETE INSTRUCTIONS.)



- A. USE NO. 10 AWG COPPER, NO. 8 AWG ALUMINUM, NO. 17 AWG COPPER CLAD STEEL OR BRONZE WIRE, OR LARGER AS GROUND WIRE FOR BOTH MAST AND LEAD-IN.
- B. SECURE LEAD-IN CABLE FROM ANTENNA TO ANTENNA DISCHARGE UNIT AND MAST GROUND WIRES TO HOUSE WITH STAND-OFF INSULATORS, SPACED FROM 4 FEET (1.22 METERS) TO 6 FEET (1.83 METERS) APART.
- C. MOUNT ANTENNA DISCHARGE UNITS AS CLOSE TO WHERE LEAD-IN CABLE ENTERS HOUSE AS POSSIBLE.

291160

Figure 6-7. Antenna Grounding

7. PRE-OPERATIONAL SYSTEM TESTING

WARNING

The output sound level of a siren is capable of causing severe hearing discomfort or permanent hearing damage. Therefore, ALWAYS wear adequate hearing protection and minimize exposure time when performing any testing or maintenance on the siren.

WARNING

Failure to properly test the siren system before placing into service may prevent the siren from operating in an emergency. The following tests and calibrations must be performed by an experienced technician prior to using the siren system.

Notes:

1. See 'RTU Field Report' located at the end of this section. This is the suggested data sheet that can be used to test the siren.
2. Ensure RTU address is properly set. (See Section 3)

7.1 Initial Sensor Adjustments and Testing

To ensure proper and reliable two-way status operation, the operation and alignment of the sensors must be confirmed when the siren and control are installed. All of the sensors are factory adjusted and the following alignment instructions may only pertain to tuning replacement sensors.

7.1.2 Rotation Current Sensor

Locate the rotation current board (2005221) on the backplane of the control cabinet with the blue current sensor (see figure 6-2) This board is preset at the factory and should not be adjusted.

To check the board for proper operation:

1. Verify that the output at JP2-2 is high (4-5 VDC).
2. Activate a siren function by momentarily depressing one of the function push buttons on the controller board.
3. Measure the DC voltage on TP3. The voltage should correspond to the DC current draw of the siren motor (0.8ADC, +/- 0.3A).
4. Verify the output JP2-2 is low (0-1 VDC) for the duration of the siren function.
5. Verify that the ROT indicator (D14) on the controller board turns on for the duration of the siren function.

7.1.3 Master Chopper Current Sensor

Locate the master chopper current board (2001062) on the backplane of the control cabinet (See figure 6-2)

Note: This board is preset at the factory and may not require adjustment.

Adjustment Procedure

1. Using Pot 1, adjust the voltage at TP2 to 7 VDC.
2. Using Pot 2, adjust the voltage at TP4 to 4.5 VDC.

Activate a siren function by momentarily depressing one of the function push buttons on the controller board. Verify that input #4 CUR indicator (D14) on the controller board turns on for the duration of the siren function.

7.1.4 AC Power Sensor

Verify that the AC power indicator (D17) on the controller board is on while AC power is active. Measure across F1 TB5-1 and TB5-5 for 120 VAC. Confirm that with the AC power source turned off (via service disconnect) the AC power indicator is off.

7.1.5 Intrusion Sensor

With the cabinet door open, verify that intrusion indicator (D13) is ON. Depress the intrusion switch located at the lower left-hand side of the controller. With the switch depressed, confirm that the intrusion indicator is OFF. If failure, ensure contact closure of the intrusion switch.

Note: A jumper preset at JP9 will also cause all of the LED's to go dim when intrusion switch is pressed.

7.2 Battery Voltage Measurement

1. Allow the battery to charge for 24 hours to ensure it is fully charged.
2. Using a digital multi-meter (Fluke model 75 or equivalent), measure the battery voltage at the battery terminals. The voltage should be approximately 13.6 VDC.
3. Turn off AC power to the battery charger by disconnecting power at the service disconnect or opening F1 and F2 in the control cabinet.
4. Measure the battery voltage at the battery terminals again. If the voltage falls below 12.5 VDC, the battery must be replaced.
5. Turn AC power on by connecting F1 & F2 and turning on the service disconnect switch.

7.3 2001TRB Transformer / Rectifier Testing

1. With the AC service turned on, measure for 47.0 VDC, +/- 1.0 VDC between K2-2 and chassis ground (see figure 6-2).
2. This test must be run under load with K2 energized and siren making noise.
3. Shut off the service disconnect and confirm that K2 de-energizes.

7.4 Manual Siren Activation

Manually depress each function button and confirm correct siren operation. Refer to the controller programming and test data sheet (shipped with controller) for siren function details.

7.5 Land Line Siren Activation (optional)

Confirm that the user-supplied telephone control relay provides each appropriate remote function input with a momentary contact closure (1 second nominal) and observe proper siren activation. Refer to Section 3-8 for details on interfacing and wiring.

7.6 Transceiver Audio Level Adjustments & VSWR Testing

Due to the test equipment requirements and RF control systems knowledge required to perform the following controller testing, only a qualified two-way Radio Service Technician should conduct the following test steps.

To ensure reliable radio controlled siren operation, the following testing must be conducted upon initial controller installation. For the following steps, connect the Communications Service Monitor to the RF bulkhead mounted on the bottom side of the control cabinet.

7.6.1 DTMF Transmit Level Adjustments (DTMF versions of ACFCTB only)

1. To Transmit and generate a DTMF test tone, apply a jumper across the JP15 on the FCT controller board (see Figure 3-1 for details).
2. Confirm the deviation level is at 3.0 kHz (or 1.5 kHz for a 12.5 kHz spaced channel). This level has been pre-set at the factory, however if adjustment is required, set R71 on the controller board for a deviation level of 3.0 kHz.
3. Utilizing an in-line Watt meter confirm that the forward radiated power output matches the specified power output listed on the final test data sheet supplied with unit within 20%. Also verify that the VSWR is less than 5%. Refer to the Installation section if the VSWR is excessive.

7.6.2 FSK Transmit Level Adjustments (Digital FSK versions of ACFCTBD only)

1. To Transmit and generate an FSK modem tone, apply a jumper across the JP15 on the FCT controller board, (see Figure 3-1 for details).
2. Confirm the deviation level is at *3.0 kHz. This level has been pre-set at the factory, however if adjustment is required, set R70 on the controller board for a deviation level of *3.0 kHz. If CTCSS is used, the CTCSS level should be set to 0.75 kHz.
3. Utilizing an in-line Watt meter confirm that the forward radiated power output matches the specified power output listed on the final test data sheet supplied with unit within 20%. Also verify that the VSWR is less than 5%. Refer to the Installation section if the VSWR is excessive.

* Note: Deviation levels are cut in half on 12.5 kHz spaced channels.

7.6.3 Receive Level Adjustments

1. Inject a 100 uV carrier signal modulated with a 1 kHz tone at *3.0 kHz deviation for DTMF systems. Use *3.0 kHz deviation for digital systems.
2. Connect an oscilloscope to TP8 on the controller board and confirm a clean, undistorted sinewave of 1 V_{p-p}. The level has been pre-set at the factory, however if adjustment is required, set R48 on the controller board to 1 V_{p-p} for the external transceiver. The level of the on-board receiver module is fixed and does not need to be adjusted.

* Note: Deviation levels are cut in half on 12.5 kHz spaced channels.

7.6.4 Two-tone and DTMF Controller Decode-ability Testing

1. Unplug JP21 to disable the siren.
2. With the transmit modulation level set to 3 kHz from the communication monitor inject a 0.5 uV carrier signal.
3. Encode the appropriate DTMF strings and or 2-tone tones required to activate the desired siren function. Confirm reliable decoding of at least 10 of 10 tries.
4. Plug JP21 back in.

7.6.5 Confirming Controller Auto-Reporting

By toggling one of the following sensor inputs, confirm that the controller sends a correct report to the SS2000 base controller. Note that with digital systems the ACFCTBD must be programmed to auto-report the following sense points to perform this test.

Intrusion: Depress intrusion switch for at least 5 seconds. Release the switch.
Verify the door closed and door open reports we received at the SS2000.

AC Line Voltage: By removing AC power at the service disconnect confirm that a report is generated within 5 minutes. Confirm that another report is generated when power is restored.

WARNING

The output sound level of a siren is capable of causing severe hearing discomfort or permanent hearing damage. Therefore, ALWAYS wear adequate hearing protection and minimize exposure time when performing any testing or maintenance on the siren.

7.6.6 Test Activation Codes

Note: Refer to the factory data sheet and unit programming data sheet, which should have been shipped with the controller.

Test all siren functions from the siren control point. This test must be performed to ensure all desired siren functions have been properly entered at the control station and at the siren site. Request a report from the control station during the siren function. Verify the report indicates the

proper status conditions for the site being tested. After the installation is complete and it has been established that the siren is operating properly, Federal recommends that the Control Unit be padlocked to discourage vandalism.

Note:

1. A factory test data sheet and unit programming data sheet should have been shipped with the controller. Suggest that these data sheets be kept on record by the customer for future reference.
2. The following form should be filled out to document the installation.

ACFCTB RTU Field Report			
Customer:	Project Number:	Date:	
Contact Person:	Phone:	Second Phone:	
Radio Shop:	Contact:	Phone:	
Siren Type:	S/N	Voltage:	
Controller Type:	Antenna: Omni <input type="checkbox"/> Yagi <input type="checkbox"/>	A/C Service: O.H. <input type="checkbox"/> U.G. <input type="checkbox"/>	
CPU software:	Program file:	SMV:	
Radio Information: Low Band <input type="checkbox"/> VHF <input type="checkbox"/> UHF <input type="checkbox"/> 800 <input type="checkbox"/> Trunk <input type="checkbox"/> 25kHz <input type="checkbox"/> 12.5 kHz <input type="checkbox"/>			
Radio Frequency: TX PL RX PL			
TX Deviation = kHz		RX level = mVp-p	
Site Number:	Address:	Zone:	
A/C voltage: Vac	T/R voltage: VDC (under load)	Battery voltage: VDC	
Pwr Sply: VDC	Charger Volt: VDC		
Master Chopper Sensor			
TP1: VDC (4.00)	TP2: VDC (7.00)	TP4: VDC (4.50)	Pass <input type="checkbox"/> Fail <input type="checkbox"/>
Rotation Sensor			
TP2: VDC (1.140)	JP3: Amp low WO/Jumper: =0.5A W/Jumper =4A	JP4: Amp high WO/Jumper: =4A W/Jumper =10A	Pass <input type="checkbox"/> Fail <input type="checkbox"/>
Intrusion Sensor	Low Battery	A/C Power On	Local Activation
Pass <input type="checkbox"/> Fail <input type="checkbox"/>	Pass <input type="checkbox"/> Fail <input type="checkbox"/>	Pass <input type="checkbox"/> Fail <input type="checkbox"/>	Pass <input type="checkbox"/> Fail <input type="checkbox"/>
Desiccant in Control Cabinet: Yes <input type="checkbox"/> No <input type="checkbox"/>		Debris in Control Cabinet: Yes <input type="checkbox"/> No <input type="checkbox"/>	
Antenna connectors sealed: Yes <input type="checkbox"/> No <input type="checkbox"/>		Cable entry sealed? Yes <input type="checkbox"/> No <input type="checkbox"/>	
Tested by:		Date:	

Notes:

8. SERVICE AND MAINTENANCE

WARNING

The siren has moving parts, high operating current, explosive gases, corrosive materials, and high output sound levels which could cause severe personal injury, electrocution, or death.

Service or maintenance should be performed by qualified personnel familiar with the siren, associated controls, and power sources being used.

Before servicing or maintaining, ensure that remote activation cannot occur and disconnect power to the siren and the associated control equipment.

WARNING

Battery gasses are explosive. Replace battery with the same make and model as the original for proper operation.

8.1 General

The Model 2001SRNB Siren and Controllers are designed to require a minimum of maintenance. In addition, historical experience has shown that all Federal sirens are highly reliable devices. However, if a siren or controller failure does occur, Federal Signal will provide technical assistance with problems that cannot be handled satisfactorily and promptly locally. If replacement parts are needed, refer to the parts list in figure 8.1. If technical assistance is desired, contact:

Public Safety Systems Customer Care Center
2645 Federal Signal Drive
University Park, Illinois 60484
(800) 524-3021

8.2 Preventative Maintenance

To insure that the warning system is fully operational and to maintain the highest possible level of reliability it is recommended that the following monthly testing and annual inspection be performed. In order to maintain the integrity of the warning system, prompt investigation of any reported failures must be researched and corrected promptly.

8.2.1 Monthly Testing

The following is a typical monthly test outline:

1. Reset all sirens to clear latched sensor status inputs (DTMF systems only).
2. Activate one of the siren functions (3 minute activation recommended). Poll the system for siren status reports.
3. Examine each site report for any failed condition. If a failure condition is detected, notify designated service personnel.

8.2.2 Annual Inspection

It is highly recommended that the pre-operational system test procedure be performed on an annual basis. Refer to section 7 for details.

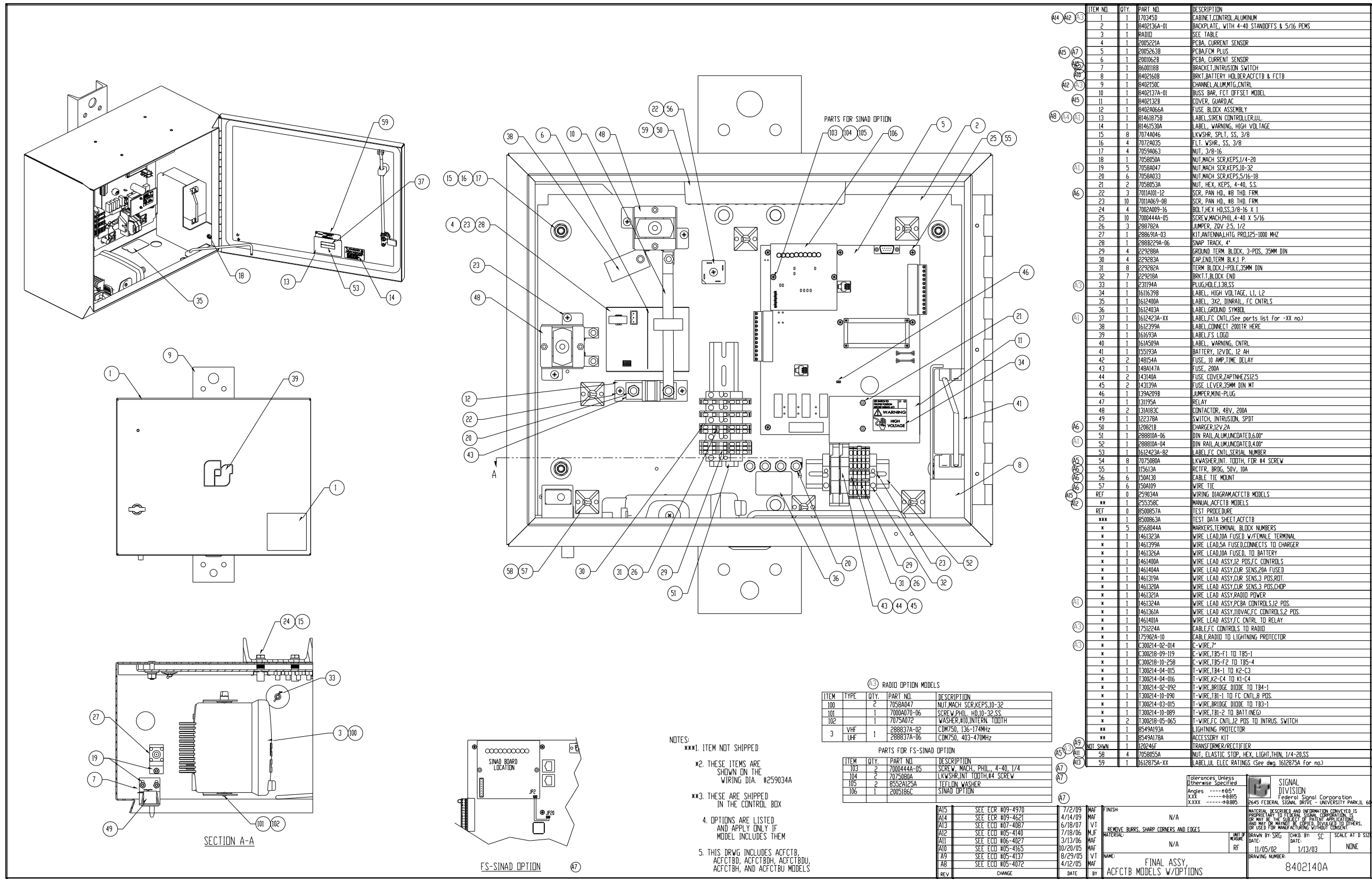


Figure 8-1. ACFTB FINAL ASSEMBLY

8.3 Troubleshooting

Refer to Safety Notices at beginning of this manual before attempting to troubleshoot the ACFCTB.

	PROBLEM	ACTION
1.	NO CPU LIGHT FLASHING	CPU light must flash or siren will not activate. Check power to board and fuses.
2.	NO RADIO POWER	Check that radio power switch on radio is on. Check that controller board relay 4 is energized (indicated by LED D43). Check for 12 VDC at the radio plug. Check that charger fuse F9 is intact. Check wiring and contact closure for controller board relay K4.
3.	NO RADIO DECODE	Unit was not armed before sending a DTMF function code (or) Unit is not programmed to recognize that particular code sequence (or) Signal is not being received properly (or) security code or 128 bit encryption key is incorrect. Verify programming is correct. Check the received audio signal quality at the RX test pin TP8 on the control board. Ensure that radio is working properly by using a service monitor to inject a strong, clean signal. Check transmitter deviation. Check radio connections (see wiring diagram).
4.	NO TWO TONE DECODE	Verify programming is correct. Ensure that radio is working properly by using a service monitor to inject a strong, clean signal. Check transmitter deviation and timing.
5.	FUNCTION STOPS BEFORE NORMAL TIME-OUT	Possible noise issue. Check grounding as per installation section. Use noise suppression devices. Check programming.
6.	BATTERY NOT HOLDING CHARGE	Check that charger fuse F5 is intact and check charger output at the battery. Load test battery.
7.	AC FAILURE	Check for AC led (indicated by LED D17). Check for the jumper at JP10-1&2. Check for AC at JP22.
8.	LOW OR IRREGULAR OUTPUT FROM SIREN	Check 2001TRB voltage, while operating siren.
9.	SIREN DOES NOT SOUND	Place jumper on JP17 on the control board, and ensure LED D29 is lit and that the chopper contactor K1 is activating. Check that chopper fuse F8 is intact. Check 2001TRB voltage while operating siren. Activate from base station and visually ensure LED D29 is lit.
10.	NO CHOPPER CURRENT SENSE	Check that the CUR LED D18 is lit during activation. Check for low at JP5-5 during activation.
11.	SIREN DOES NOT ROTATE	Check that the rotation relay on the control board is operating (indicated by LED D38). Check that the contactor K1 is activating. Also check fuse F6.
12.	NO ROTATION SENSE	Check that the ROT LED D14 is lit during rotation. Check for low at JP10-3 during rotation.
13.	LANDLINE ACTIVATION INPUTS DO NOT FUNCTION	Verify minimum 0.5 second contact closure is applied to JP10 on the motherboard.
14.	UNIT NOT RESPONDING TO POLLS	Open cabinet door and verify base station received report. See 'No radio decode above'

NOTE: For additional help contact the Public Safety Systems Customer Care Center at (800) 524-3021.

9.0 OPTIONS

9.1 SINAD Option

The SINAD Meter board is a small add-on board option that plugs into the siren controller. This gives the user the ability to measure the quality of the received RF signal reaching a Remote Terminal Unit (RTU). This option is only available on the SFCDWARE two-way communication system (SFCDWARE version 7_22 and later). The SFCDWARE system indicates the SINAD of the RTU through the selection of the SINAD test. See SFCDWARE help file for details. This enables the ability to track changes, which may indicate a degradation or failure in the receiving system. The on-board display also provides personnel in the field a way to visually confirm the quality of the received signal.

The truest measure of a decoders ability to perform its function is the ratio of signal to noise and distortion arriving at the decoder. The received audio which the decoder must decode contains the intended signal plus any noise and distortion. Many things can cause noise and distortion such as low transmitter power, terrain or weather conditions, a malfunctioning receiver or its antenna, or even other nearby transmitters. The fact that this measure of signal to noise and distortion ratio encompasses any and all things which have effected the received audio makes it a valuable measure for predicting the decoders ability to do its job.

This board measures the SINAD of a received 1200 Hz signal. The measured SINAD is passed to the processor of the FCM and also displayed on 10 LEDs on the SINAD Meter board. When the lowest LED lights, the SINAD is 3 dB and each successive LED is another 3 dB, up to 30 dB SINAD. Acceptable SINAD is 18 dB.

Features:

- SFCDWARE software indication of RTU SINAD
- Accuracy to +/- 1 dB
- Visual Display in 3 dB steps from 3 dB SINAD to 30 dB SINAD
- Easy installation on existing controllers

10.0 Model DCFCTBD-IP

10.1 General

The DCFCTBD-IP combines the characteristics of a DCFCTBD with Serial to Ethernet conversion capabilities. This allows serial devices to communicate over an Ethernet network and provides audio decoding of digitized audio sent over the network.

The converter is configured with its own fixed IP address and port number. When packets of data are received over the Ethernet port that are addressed to the board's IP and port number, they are converted to serial data and sent out over the serial port. Likewise, any data coming into the serial port is converted to TCP/IP data packets and sent out over the Ethernet port to the server's IP address. The unit also contains a digital to analog converter. This allows specially configured incoming data packets to be converted to audio, which is then filtered and sent out over a 600 ohm audio port.

10.2 Ethernet Board Specifications

Electrical

Input Voltage	10.5- 95VDC
Current Draw	<150 mA

Serial Port

Serial Port Protocol	RS232C, N, 8, 1 baud rate configurable
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Ethernet Port

Protocol	IEEE 802.3, 10 Base-T connection
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600 Ohm Audio Output Port

Protection	MOV and Transorb surge protection
Impedance	600 ohms
Audio Output Level (-17 dB to +2.7 dB) into 600 ohms	Adjustable from 0.30 to 3.00 V _{p-p}

Connectors

JP1 600 ohm Audio Output Port
Balanced line output

JP2 JTAG Emulation port

JP3 Audio Output Expanded or Flat Selection Jumper
Jumpers pins 1 & 2 for flat audio output
Jumpers pins 2 & 3 for expanded dynamic range audio output

JP4 RS232 Serial Port

- 1 -
- 2 -
- 3 - Ground, 0.5 Amps maximum current capacity
- 4 - Radio transmit data from PC, standard RS232 levels
- 5 - Radio receive data to PC, standard RS232 levels
- 6 - Ground, 0.5 Amps maximum current capacity

JP5 FLASH Programming and Converter Configuration Port

- 1 -
- 2 - TX Data, standard RS232 levels
- 3 - RX Data, standard RS232 levels
- 4 - Ground
- 5 - Serial Clock input for FLASH programming, standard RS232 levels
- 6 - Processor Reset Not line, used in programming FLASH, 10K pull-up

JP6 10.5-95 VDC Power Input

- 1 - (-)
- 2 - (+)

JP7 Resets board back to factory default settings.

J1 Ethernet Network Port

- 1 & 2 - Transmit data pair, balanced line
- 3 & 6 - Receive data pair, balanced line
- 4, 5, 7, 8 - AC coupled ground

Indicators

- D1 - CPU Heartbeat indicator, green
- D2 - Transmit data indicator, red
- D3 - Receive data indicator, yellow
- D4 - Power indicator, green

Controls

R1 – 600 ohm audio output level set

Environmental

Operating Temperature -30 °C - +65 °C
Humidity 0- 95% non-condensing

Physical

Dimensions ~ 2” height, 4” width, 6.5" length.
Weight < 2 lbs

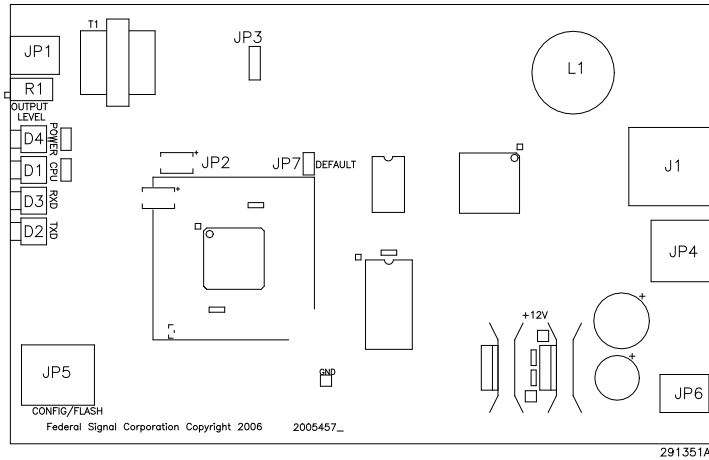


Figure 10-1. Serial to Ethernet Board

10.3 Network Information

Protocols Supported

- TCP/IP
- UDP (optional)
- XML (optional)
- XMPP (optional)

IP Ports Used

16,887 (Codespear TCP/IP)
 80 (HTTP)
 3100 (optional UDP Serial Over IP)
 3101 (optional UDP Voice Over IP)

IP Address

User selectable

TOS/DSCP (Type of Service)

User selectable

Bandwidth Requirements

Voice Over IP:	150K baud per connection
Siren Activation:	50 bytes per connection
Siren Poll Response:	74 bytes per connection