Village of Orland Park, Illinois

All Hazards Public Alerting Outdoor Warning Siren System

RFP # 22-008

March 11, 2022
11:00 a.m.

COPY

FEDERAL SIGNAL

2645 Federal Signal Drive
University Park, IL 60484

708-534-3400 • www.fedsig.com

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Table of Contents

Section 1: Technical Proposal

1.1 System Overview

Federal Signal is pleased to propose an outdoor warning siren system for the Village. Enclosed with our proposal, we have included a bill of materials and quotation that provides fifteen (15) 2001-130 AC/DC operated, rotating uni-directional, electromechanical outdoor warning sirens mounted on new 50' class 2 wood poles based on the criteria outlined in the Request for Proposal (RFP). Optional composite, steel, and concrete pole options are provided on Quote SYSQ8384-01.

A compliance statement is located in ***Appendix B – Compliance***.

1.2 Sound Propagation Model

Federal Signal Corporation utilized 'SoundPLAN', an internationally recognized noise modeling software, to estimate the Siren sound level. The SoundPLAN model is based on the International Standardization ISO 9613 and takes into account physical effects including geometrical divergence, atmospheric absorption, ground effect, reflection from surfaces, and screening by obstacles.

The environmental conditions applied in this noise model are based on the summertime daily averages for the area in interest include:

- Humidity 70.00%
- Air Pressure 1015.70 mbar
- Temperature 73.33°F

Siren data for this noise model includes:

Site #	Address / Description	Latitude	Longitude	Height
1	140th Street & Concord Drive	41.635475	-87.844015	50'
2	141st Street & Christina	41.634166	-87.823697	50'
3	147th Street & West Avenue	41.621224	-87.861648	50'
4	151st Street & 88th Avenue	41.616168	-87.833913	50'
5	Wheeler Drive & Hemlock Drive	41.610086	-87.807798	50'
6	Move to 167th street/88th Ave. Fernway School	41.587886	-87.829737	50'
7	Move to area of 17100 Wolf Rd	41.578768	-87.890425	50'
8	151st Street & Wolf Road	41.614528	-87.892107	50'
9	15750 S. Ravinia Avenue	41.606261	-87.856093	50'
10	Move to area 10900 159th Street/Near Century Junior High	41.597963	-87.884446	50'

Site #	Address / Description	Latitude	Longitude	Height
11	Eagle Ridge Drive & Voss Drive	41.560304	-87.878326	50'
12	Move to 139th Street/Wolf Rd.	41.635281	-87.892401	50'
13	179th Street & Southwest Highway	41.564909	-87.903315	50'
14	131st Street & Mill Road	41.651751	-87.858897	50'
15	NEW Location- Area of 10400 167th Street	41.586863	-87.860812	50'

A SoundPLAN map is located in ***Appendix A – SoundPLAN Map***.

1.3 Attachments

Federal Signal has included the following documents a part of the Appendix.

- Appendix A – SoundPLAN Map
- Appendix B – Compliance
- Appendix C – ISO Certificate
- Appendix D – UL Certificate
- Appendix E – Terms and Conditions
- Appendix F – Warranty
- Appendix G – Test Report
- Appendix H – Data Sheets
- Appendix I - Manuals

Section 2: Qualifications

2.1 Experience

Federal Signal is one of the top leaders in designing and engineering mass notification solutions for communities and facilities around the world, offering the widest range of Electronic and Electro-Mechanical Sirens available today. Since manufacturing our first outdoor siren in 1917, we have proven the ability to deliver systems and solutions through the utilization of advanced motor design and cutting-edge amplifier and acoustic driver technology. Our systems provide the highest level of reliability and quality available today to increase safety, security, and provide early warning to workers, first responders, and communities around the world of natural disasters, biological hazards, industrial hazards, and national emergencies, to name a few.

We have included factory-trained personnel that will perform installation, testing, training, support, and maintenance for this project. Our team is experienced in providing turnkey services that meet or exceed the needs of the County in the most expedient and economical manner possible. Below we provide a summary of the Federal Signal team and proposed roles.

Vendor	Role
Federal Signal Corporation	Prime vendor, manufacturer, system design, support, remote training, and project management
Braniff Communications	Installation and removal of the existing system, maintenance, and onsite training

References

References are included in ***Section 3: Required Forms***.

Illinois Client List

The following page provides a list of Illinois clients.

FEDERAL SIGNAL
Safety and Security Systems
Protecting people and our planet

Federal Signal Chicagoland Experience

Village of Algonquin
Village of Alsip
City of Annawan
Village of Antioch
Argonne National Lab
Aroma Park Fire Protection Dist.
Village of Barrington
City of Batavia
Village of Bedford Park
Village of Beecher
Village of Bellwood
City of Belvidere
Township of Belvidere
Village of Berkeley
City of Berwyn
City of Blue Island
Village of Bolingbrook
Town of Bonfield
Bonus Township (Boone County)
County of Boone
Village of Bourbonnais
Village of Bradley
Village of Bridgeview
Village of Broadview
Village of Buckingham
Village of Buffalo Grove
Village of Burbank
Village of Burr Ridge
Calumet City ESDA
Village of Calumet Park
Candlewick Lake (Poplar Grove, IL)
Village of Capron
Village of Carol Stream
Village of Carpentersville
Village of Cary
Central Stickney Fire Protection Dist.
Town of Chatsworth
Chebanse (Otto Township)
City of Chicago Heights
Village of Chicago Ridge
City of Chicago
Town of Cicero
Village of Cissna Park ESDA
Town of Cortland
City of Country Club Hills
City of Countryside
Village of Crest Hill
Village of Crestwood
Crete Township
Village of Crete
City of Crystal Lake
Town of Cullom
Village of Danforth
City of Darien
City of De Kalb
Village of Dolton
Village of Deer Park
Village of Deerfield
City of Des Plaines
Village of East Dundee
Village of East Hazel Crest
Village of Elburn
City of Elgin
City of Evanston
Village of Evergreen Park
ExxonMobil (Joliet, IL)
Fermi National Lab (Batavia, IL)
Village of Forestview
Village of Fox River Grove
Township of Frankfort
Village of Frankfort
Village of Garden Prairie
City of Geneva
Village of Gilberts
Village of Glendale Heights
Village of Glenview
Village of Glenwood
Village of Grant Park
Village of Grayslake
City of Harvey
Village of Hazel Crest
Village of Hickory Hills
City of Highland Park
City of Highwood
Village of Hinckley
Hines V.A. Hospital (Hines, IL)
Village of Hinsdale
Village of Hodgkins
Village of Homer Glen
City of Hometown
Village of Hopkins Park
Village of Inverness
Village of Itasca
City of Joliet
Village of Justice
City of Kankakee
Village of Kenilworth
Kirkland Community F.P.D.
Village of LaGrange
LaGrange Country Club
Village of Lake Bluff
Village of Lake in the Hills
Village of Lake Zurich
Village of Lakewood
Village of Lansing
City of LaSalle
Limestone Township
Village of Lincolnshire
Lockport Township
City of Lockport
Village of Lombard
Village of Lynwood
Village of Manhattan
Village of Manteno
Maple Park F.P.D. (Maple Park, IL)
City of Marengo
City of Markham
Village of Matteson
Village of Maywood
City of McHenry
Village of Melrose Park
City of Mendota
City of Merrionette Park
Village of Midlothian
Village of Mokena
Village of Momence
Village of Monee
Moraine Valley Community College
City of Naperville
New Lenox Township
Village of New Lenox
Village of Niles
Village of North Utica
Village of Northbrook
Village of Northfield
Village of Oak Brook
City of Oak Forest
Village of Oak Park
Village of Odell
Village of Olympia Fields
City of Ottawa
Village of Palatine
City of Palos Heights
City of Palos Hills
Village of Palos Park
Village of Park Forest
City of Park Ridge
Village of Peotone
City of Peru
Township of Poplar Grove
Village of Poplar Grove
Village of Prospect Heights
Township of Richmond
Village of Richton Park
Village of Riverdale
Village of Riverside
Village of Riverwoods
Village of Rockdale
Village of Romeoville
Rosalind Franklin University
Village of Round Lake Beach
City of Sandwich ESDA
Village of Sauk Village
Village of Schiller Park
Village of Shabbona
Village of Sheridan
Village of Somonauk
Village of South Chicago Heights
Village of South Elgin
Village of Spring Grove
City of St. Charles
Village of Stickney
City of Streator
Village of Summit
Village of Sun River Terrace
City of Sycamore
Village of Thornton
Village of Tinley Park
Village of Villa Park
City of Warrenville
City of Waukegan
Village of West Dundee
Village of Western Springs
Village of Westchester
Village of Westmont
Wheatland Township
City of Wheaton
Village of Wheeling
Village of Willow Springs
Village of Willowbrook
Village of Wilmette
Village of Winfield
Village of Woodridge
Village of Worth

Federal Signal Corporation I 2645 Federal Signal Drive I University Park, IL
60484 708-534-3400 (p) I www.fedsig.com I www.federalsignal.com

2.2 Operating History

Federal Signal Overview

For over 120 years, Federal Signal Corporation has delivered systems and solutions designed to enhance the safety, security, and well-being of communities and workplaces around the world. We have deployed thousands of warning solutions, mass communication, and surveillance systems for various City, County, State/Provincial agencies throughout North America all containing unique features to ensure the success of every project.

Since the founding of Federal Signal Corporation in 1901, the firm has consistently ranked within the top North American firms that specialize in public safety and security. With a mission to serve, listen, create, and deliver advanced security and well-being solutions that save lives.

Federal Signal Corporation's corporate headquarters is located, in Oak Brook, IL, and is publicly held and traded on the New York Stock Exchange: FSS. The Safety and Security Systems Group is headquartered in University Park, IL and it's the world's largest facility dedicated to the design and manufacture of public warning and safety, signaling, and communication products.

Federal Signal Corporation's Safety and Security Systems Group (SSG) operates under a rigorous certified quality management system designed to meet the requirements of ISO 9001:2015. This system demonstrates our ability to consistently provide products that meet customer and applicable regulatory agency requirements aimed toward enhancing customer satisfaction through effective applications. Our customers appreciate the extra steps we take toward reliability and satisfaction through our various forms of continuous process improvements, assurance of conformity, and certifications.

Federal Signal Corporation

- In Business for 120 years, since 1901
- In 1915 F.S. designed the first electronic siren
- F.S. has deployed 70% of the Community Outdoor Warning Systems in North America
- Publicly Traded Company NYSS: FSS (Since 1969)
- 2020 Annual Sales $1.2B (SSG: $231M)
- 3,100 employees globally
- University Park, IL is the world's largest facility dedicated to manufacturing Public Warning Systems
- Houses the largest Anechoic Sound Chambers on the East Coast

Our Products and Service Overview

Advancing security and well-being Federal Signal Corporation is the leader in alerting & notification solutions for communities and facilities around the world. Our solutions include systems for Command & Control, Interoperable Communication, Notification Messaging, Indoor & Outdoor Warning Systems, and Intercom & Public Address/General Alarm products. Our total solutions approach utilizes a variety of technologies enabling municipalities, campuses, healthcare, and industrial facilities, military installations, and utilities to maintain the safety, security, and well-being of their constituents and personnel. Our market-leading software, equipment, and services deliver "holistic" alerting and notification systems that integrate outdoor, indoor, and personal notification systems over a redundant networked platform.

- Electric-Mechanical Sirens
- Electronic Giant Voice Sirens
- Commander Monitoring and Activation Software
  - Manage Hundreds of Siren Locations
  - Premise or Cloud Base
  - Multiple Communication Platforms (RF, P25, IP, SAT, CELL)
- Project Managed and Engineerd Turn-Key Solutions
- ISO 9001:2015 Certified
- Products are cULus Listed for North America

As a certified ISO 9001 Quality System manufacturer, we contribute to the world we live in with pride by way of disseminating industry-standard knowledge, innovative advances in technology, and sharing superb management and conformity assessment practices. We continuously enhance our solutions for public safety and security and interoperable communications solutions to be used in multiple facets by commercial organizations, federal, and state/provincial municipalities, public transportation, and education entities around the world. Our experience highlights our ability to manage projects of this complexity.

ISO 9001:2015 - CERTIFIED BY DET NORSKE VERITAS

Total Quality Control System Includes:

1. Vendor Performance Rating System
2. Material Review Board
3. Statistical Process Control (SPC)
4. Computerized Numerical Controlled Process (CNC)
5. 100% Testing of All Finished Product

A hallmark of our planning process is the ability to thoroughly, yet quickly, define and refine our customer's needs. Our project managers and application engineers employ methods and disciplines appropriate to a customer's specific needs. As a project progresses, our project managers, production team, and engineers work collaboratively to ensure we deliver solutions that meet customer requirements. With a team of over 3,100 employees worldwide, we guarantee that our systems provide the complete functionality necessary, as well as a unique scalability and integration capability that satisfies our customer's needs.

Professional Services:

We offer a team of experts so you can focus on the mission. We focus on the technologies to make your mission a success.

Consulting

- Assessment
- Recommended Best Practices
- Business Continuity Planning

Design

- Solution Development
- Disparate System Integration
- Certified Engineers on Staff

Deployment

- Physical Installation
- Project Management
- Service Partner Network
- Commissioning
- End-user Training

Managed Services

- 24/7 Support
- Network Monitoring
- Preventive Maintenance and Inspection
- Tailored Support Agreement
- Software as a Service
- Infrastructure as a Service

Regulatory Specifications:

All materials and components shall be new and of the manufacturer's latest design in current production. The equipment shall comply with the specifications set forth herein and shall comply with all performance specifications as advertised or otherwise represented by Federal Signal. The equipment shall be manufactured, assembled, installed, and tested in accordance with the current industry standards, which shall be considered minimum requirements:

- The American National Standards Institute (ANSI).
- The Institute of Electrical and Electronic Engineers (IEEE).
- Federal Communications Commission (FCC).
- The National Electrical Code (NEC).
- Where test standards exist, all materials and equipment furnished shall bear the label of the Underwriters Laboratory (UL).
- Outdoor Warning Systems, Technical Bulletin (Version 2.0), January 12, 2006, Federal Emergency Management Agency (FEMA).

Braniff Communications (Subcontractor) Overview

Braniff Communications, Inc. (located in Crestwood, IL) has over 35 years of experience in equipment installations, service and long-term maintenance. Braniff Communications is a Certified Federal Signal Regional Installer with factory trained service technicians. Braniff Communications will be responsible for installing the proposed equipment listed in this proposal as well as removal, haul-away and disposal of the old existing siren equipment. Federal Signal and Braniff Communications have maintained an ongoing working relationship for over 35 years. Braniff Communications has a permanent place of business at 4741 136th St, Crestwood, IL 60445.

2.3 Qualifications

Our team is comprised of five major areas which are Design Engineering, Application Engineering, Project Management, Installation / Field Service, and Administration/Sales. Fundamental to Federal Signal Corporation is a belief in teamwork between owners, administration staff, the community, and project team. Collaboration between dedicated professionals is the best guarantee of achieving a process and project of the highest quality and functionality capabilities.

Our commitment to communicating effectively and adapt to change embodies our technical support team to develop innovative solutions that improve efficiency, enhance quality, increase economic responses, and ensures that both short-term and long-term goals are met successfully. Below is a list of our proposed key personnel that will be assigned to this project.

Prime/Subcontractor	Personnel	Role	Experience
Federal Signal	Nick Desautels	Project Manager	20 years
Federal Signal	Walter Strine	Systems Engineer	20 years
Braniff Communications	Jeff Ryba	President - Installation	35 Years
Braniff Communications	Joe Faifer	Installation and Field Services	20 Years
Braniff Communications	Gene Szymanski	Installation and Field Services	7 Years

2.4 Proposed Fee

Quote SYSQ8384-01 is included after this page.

FEDERAL SIGNAL
Safety and Security Systems

Protecting people and our planet

USA : Federal Signal Drive, University Park, Illinois, 60484 | Tel +1 708 534 4756

Quotation

Quote Number: **SYSQ8384-01**
Quote Date: **3/7/2022**
Expiration Date: **6/5/2022**
QUOTED

Company:
Village of Orland Park
15100 S. Ravinia Ave.
Orland Park, IL 60462

To:
Rich Miller
708-364-4997
rmiller@orlandpark.org

Sales Rep
Teague Cliff
Central Region Sales Manager
Phone +630-247-3835
Email tcliff@fedsig.com

Prepared By
Teague Cliff
Central Region Sales Manager
Phone +630-247-3835
Email tcliff@fedsig.com

Notes:
-All prices are in Us Dollars
-Braniff will pick up equipment when ready
-Computers supplied by client and will be configured by Braniff
-Batteries are included with system installation
-Installation adder Fees for Composite Poles and/or Concrete Poles have been listed in Optional Items section.

Project Ref:
Village of Orland Park

Term	Ship Via	FOB
NET 30 With Account Approval	Ex-Works, University Park, IL	Origin

LN	Qty	Part Number	Description	Unit Price	Extended Price
			Primary Central Control Unit (PD)		
1	1	SFCD25	Commander Programming/Monitoring Software for 25 Sites. License is for up to 5 computers (Required Server / Workstation Computer is not included and shall be provided by the Village of Orland Park)	$3,912.32	$3,912.32
2	1	SS2000+R	Rack Mount Encoder	$2,472.32	$2,472.32
3	1	COMMANDER1-S	CommanderOne Standard, Annual Subscription	$3,500.00	$3,500.00
4	1	Commander1-SM	CommanderOne Standard with Messaging, Annual Subscription	$450.00	$450.00
5	1	BSH	VHF Base Station Radio	$2,373.12	$2,373.12
6	1	AMB-W	Wall Mount Antenna Bracket	$164.90	$164.90
7	1	OMNI-ENGREQ	Omni RF Antenna, RF to be determined	$348.50	$348.50

LN	Qty	Part Number	Description	Unit Price	Extended Price
			Secondary Central Control Unit (EOC)		
8	1	SS2000+R	Rack Mount Encoder	$2,472.32	$2,472.32
9	1	BSH	VHF Base Station Radio	$2,373.12	$2,373.12
10	1	AMB-W	Wall Mount Antenna Bracket	$164.90	$164.90
11	1	OMNI-ENGREQ	Omni RF Antenna, RF to be determined	$348.50	$348.50
			Outdoor Warning Sirens & Controls		
12	15	2001-130	Electro-mechanical rotating siren, 130 db(C) 800Hz	$5,888.00	$88,320.00
13	15	DCFCTBDH	Two-Way DC Siren Controller with VHF Radio	$5,339.52	$80,092.80
14	15	2001TRBP	208/220/240 Transformer Rectifier	$1,770.24	$26,553.60
15	15	YAGI2	Antenna, 150-174 MHz, VHF	$351.90	$5,278.50
16	15	AMB-P	Pole Mount Antenna Backet	$124.10	$1,861.50
			SubTotal		$220,686.40
			Installation Services		
17	1	ES-PERFBOND	Performance Bond	$3,192.36	$3,192.36
18	15	TK-IO-CUSTINS	Installation Services, Custom, Installation of new 2001 series siren equipment on a new 50' Class 2 treated timber pole including related installer-provided material/hardware. Includes standard duty batteries as well as siren commissioning services.	$8,210.53	$123,157.95
19	14	TK-IO-CUSREMOV	Removal, haul-away and disposal of existing warning siren equipment & related timber pole.	$1,684.21	$23,578.94
20	2	TK-IO-CUSTINS	Installation of Central Control Point Components (SS2000+, BSH,and OMNI Antenna hardware) at PD facility in Orland Park. Includes related installer-provided hardware, equipment programming, alignment and commissioning services. Also includes Commander (SFCD25) Software installation, setup & configuration on customer-supplied computer.	$4,000.00	$8,000.00
21	1	TK-IO-CRTPAY-CU	ADMIN FEE-Prevailing Wage/Certified Payroll/Davis-Bacon Act.	$1,259.00	$1,259.00
22	1	FREIGHTANS	Shipping to be delivered by Braniff Communications	$0.00	$0.00
			SubTotal		$159,188.25
			Running SubTotal		$379,874.65

Quote Number: **SYSQ8384-01**

LN	Qty	Part Number	Description	Unit Price	Extended Price
				Subtotal	$379,874.65
				Tax	$0.00
				Total	$379,874.65
				Recurring	$3,950.00

Optional Items

LN	Qty	Part Number	Description	Unit Price	Extended Price
			Optional Steel Pole-Direct Burial		
23	15	TK-PO-GALDBPOL1	Pole Steel Galv Dir Bur Std 50' Length (Optional)	$5,150.00	$77,250.00
			Freight to site included in pricing		
			Optional Composite Pole-Direct Burial		
24	15	TK-PO-CUSPOLE	50 Brown Class 2 Composite Pole with Accy Kit (Optional)	$7,000.00	$105,000.00
			Includes Jacking Bar Assembly Kit		
25	15	TK-IO-CUSTINS	Installation Adder for Composite Pole (Optional)	$2,225.00	$33,375.00
26	1	FREIGHTANS	Freight Adder- GROUND Only (Optional)	$3,750.00	$3,750.00
			Optional Concrete Pole-Direct Burial		
27	15	TK-PO-CUSPOLE	50' Concrete Pole Direct Burial (Optional)	$4,749.38	$71,240.70
			Includes Freight to site		
28	15	TK-IO-CUSTINS	Installation Adder for Concrete Pole (Optional)	$3,125.00	$46,875.00

Lead Time:

Approximate equipment lead time is 12 weeks
Lead time on steel pole approximately 14-16 weeks
Lead time on composite poles approximately 10-12 weeks
Lead time on concrete poles 10-12 weeks from pole approvals

Quote Number: **SYSQ8384-01**

Quote Approved By: Tayne Cliff _____

Closing Notes:

Taxes

Prices do not include taxes. Buyer shall pay Seller, in addition to the price of the goods, any applicable excise, sales, use or other tax (however designated) imposed upon the sale, production, delivery or use of the Goods or Services ordered to the extent required or not forbidden by law to be collected by Seller from Buyer, whether or not so collected at the time of the sale, unless valid exemption certificates acceptable to the taxing authorities are furnished to Seller before the date of invoice.

Cancellation Schedule - Material:

-Percentages shown are of total order value with weeks representing number of weeks from receipt of official order:

10% after 2 weeks.
20% after 4 weeks.
40% after 6 weeks.
80% after 8 weeks.

Cancellation Schedule - Services:

-If any cancellation of scheduled service visit occurs, Federal Signal reserves the right to impose cancellation charges as follows:

-Cancellation of visit within 7 days of mobilization - 50% of agreed upon labor and incurred expenses plus handling fee.

-Cancellation of visit within 2 days of mobilization - 100% of agreed upon labor and incurred expenses plus handling fee.

Delivery Schedule:

-From receipt of official purchase order, delivery is based upon the agreed upon schedule. Production does not commence until receipt of approved drawings to Code B(approved with comments)

Warranty/Guarantee:

Please see Federal Signal Limited Warranty Terms and Conditions document (attached)

Storage Charges:

-0.5% storage charge per month on total amount of invoice applies if product is not pickup/shipped within two weeks after signed FAT.

Quote Approved By: _____ **Date:** _____

Quote Number: **SYSQ8384-01**

Section 3: Required Forms

The following forms are located after this page.

- Proposal Summary Sheet
- Certificate of Compliance
- References
- Insurance Requirements

PROPOSER SUMMARY SHEET
RFP #22-008
All Hazards Public Alerting Outdoor Warning Siren System

Business Name: Federal Signal Corporation

Street Address: 2645 Federal Signal Drive

City, State, Zip: University Park, IL 60484

Contact Name: Teague Cliff

Title: Regional Sales Manager

Phone: 630-247-3835 Fax: N/A

E-Mail address: tcliff@fedsig.com

Price Proposal

Equipment Price	$ 220,686.40
Installation Price	$ 159,188.25
GRAND TOTAL PROPOSAL PRICE	$ 379,874.65

Optional Items are included on quote SYSQ8384-01

AUTHORIZATION & SIGNATURE

Name of Authorized Signee: Brent Gambrel

Signature of Authorized Signee: Brent Gambrel

Title: VP/GM Systems Date: 3-8-2022

ORLAND PARK

CERTIFICATE OF COMPLIANCE

Proposals shall complete this Certificate of Compliance. Failure to comply with all submission requirements may result in a determination that the Proposals is not responsible.

The undersigned Brent Gambrel,
(Enter Name of Person Making Certification)

as VP/GM Systems
(Enter Title of Person Making Certification)

and on behalf of Federal Signal Corporation,
(Enter Name of Business Organization)

certifies that Proposers is:

1) A BUSINESS ORGANIZATION: Yes [X] No [ ]

Federal Employer I.D. #: 36-1063330
(or Social Security # if a sole proprietor or individual)

The form of business organization of the Proposer is (*check one*):

___ Sole Proprietor
___ Independent Contractor *(Individual)*
___ Partnership
___ LLC
X Corporation Delaware *(State of Incorporation)* 1/31/1969 *(Date of Incorporation)*

2) AUTHORIZED TO DO BUSINESS IN ILLINOIS: Yes [X] No [ ]

The Proposer is authorized to do business in the State of Illinois.

3) ELIGIBILE TO ENTER INTO PUBLIC CONTRACTS: Yes [X] No [ ]

The Proposer is eligible to enter into public contracts, and is not barred from contracting with any unit of state or local government as a result of a violation of either Section 33E-3, or 33E-4 of the Illinois Criminal Code, or of any similar offense of "bid-rigging" or "bid-rotating" of any state or of the United States.

4) SEXUAL HARASSMENT POLICY COMPLIANT: Yes [X] No [ ]

Please be advised that Public Act 87-1257, effective July 1, 1993, 775 ILCS 5/2-105 (A) has been amended to provide that every party to a public contract must have a written sexual harassment policy in place in full compliance with 775 ILCS 5/2-105 (A) (4) and includes, at a

minimum, the following information:

(I) the illegality of sexual harassment; (II) the definition of sexual harassment under State law; (III) a description of sexual harassment, utilizing examples; (IV) the vendor's internal complaint process including penalties; (V) the legal recourse, investigative and complaint process available through the Department of Human Rights (the "Department") and the Human Rights Commission (the "Commission"); (VI) directions on how to contact the Department and Commission; and (VII) protection against retaliation as provided by Section 6-101 of the Act. (Illinois Human Rights Act). (emphasis added). Pursuant to 775 ILCS 5/1-103 (M) (2002), a "public contract" includes "...every contract to which the State, any of its political subdivisions or any municipal corporation is a party."

5) EQUAL EMPLOYMENT OPPORTUNITY COMPLIANT: Yes [X] No [ ]

During the performance of this Project, Proposer agrees to comply with the "Illinois Human Rights Act", 775 ILCS Title 5 and the Rules and Regulations of the Illinois Department of Human Rights published at 44 Illinois Administrative Code Section 750, et seq.

The Proposer shall:

(I) not discriminate against any employee or applicant for employment because of race, color, religion, sex, marital status, national origin or ancestry, age, or physical or mental handicap unrelated to ability, or an unfavorable discharge from military service; (II) examine all job classifications to determine if minority persons or women are underutilized and will take appropriate affirmative action to rectify any such underutilization; (III) ensure all solicitations or advertisements for employees placed by it or on its behalf, it will state that all applicants will be afforded equal opportunity without discrimination because of race, color, religion, sex, marital status, national origin or ancestry, age, or physical or mental handicap unrelated to ability, or an unfavorable discharge from military service; (IV) send to each labor organization or representative of workers with which it has or is bound by a collective bargaining or other agreement or understanding, a notice advising such labor organization or representative of the Vendor's obligations under the Illinois Human Rights Act and Department's Rules and Regulations for Public Contract; (V) submit reports as required by the Department's Rules and Regulations for Public Contracts, furnish all relevant information as may from time to time be requested by the Department or the contracting agency, and in all respects comply with the Illinois Human Rights Act and Department's Rules and Regulations for Public Contracts; (VI) permit access to all relevant books, records, accounts and work sites by personnel of the contracting agency and Department for purposes of investigation to ascertain compliance with the Illinois Human Rights Act and Department's Rules and Regulations for Public Contracts; and (VII) include verbatim or by reference the provisions of this Equal Employment Opportunity Clause in every subcontract it awards under which any portion of this Agreement obligations are undertaken or assumed, so that such provisions will be binding upon such subcontractor.

In the same manner as the other provisions of this Agreement, the Proposer will be liable for compliance with applicable provisions of this clause by such subcontractors; and further it will promptly notify the contracting agency and the Department in the event any subcontractor fails or refuses to comply therewith. In addition, the Proposer will not utilize any subcontractor declared by the Illinois Human Rights Department to be ineligible for contracts or subcontracts with the State of Illinois or any of its political subdivisions or municipal corporations.

"Subcontract" means any agreement, arrangement or understanding, written or otherwise,

between the Proposer and any person under which any portion of the Proposer's obligations under one or more public contracts is performed, undertaken or assumed; the term "subcontract", however, shall not include any agreement, arrangement or understanding in which the parties stand in the relationship of an employer and an employee, or between a Proposer or other organization and its customers.

In the event of the Proposer's noncompliance with any provision of this Equal Employment Opportunity Clause, the Illinois Human Right Act, or the Rules and Regulations for Public Contracts of the Department of Human Rights the Proposer may be declared non-responsible and therefore ineligible for future contracts or subcontracts with the State of Illinois or any of its political subdivisions or municipal corporations, and this agreement may be canceled or avoided in whole or in part, and such other sanctions or penalties may be imposed or remedies involved as provided by statute or regulation.

6) PREVAILING WAGE COMPLIANCE: Yes [X] No [ ]

In the manner and to the extent required by law, this RFP is subject to the Illinois Prevailing Wage Act and to all laws governing the payment of wages to laborers, workers and mechanics of a Proposer or any subcontractor of a Proposer bound to this agreement who is performing services covered by this contract. If awarded the Contract, per 820 ILCS 130 et seq. as amended, Proposer shall pay not less than the prevailing hourly rate of wages, the generally prevailing rate of hourly wages for legal holiday and overtime work, and the prevailing hourly rate for welfare and other benefits as determined by the Illinois Department of Labor or the Village and as set forth in the schedule of prevailing wages for this contract to all laborers, workers and mechanics performing work under this contract (available at https://www2.illinois.gov/idol/Laws-Rules/CONMED/Pages/Rates.aspx).

The undersigned Proposer further stipulates and certifies that it has maintained a satisfactory record of Prevailing Wage Act compliance with no significant Prevailing Wage Act violations for the past three (3) years.

Certified Payroll. The Illinois Prevailing Wage Act requires any contractor and each subcontractor who participates in public works to file with the Illinois Department of Labor (IDOL) certified payroll for those calendar months during which work on a public works project has occurred. The Act requires certified payroll to be filed with IDOL no later than the 15th day of each calendar month for the immediately preceding month through the Illinois Prevailing Wage Portal—an electronic database IDOL has established for collecting and retaining certified payroll. The Portal may be accessed using this link: https://www2.illinois.gov/idol/Laws-Rules/CONMED/Pages/certifiedtranscriptofpayroll.aspx. The Village reserves the right to withhold payment due to Contractor until Contractor and its subcontractors display compliance with this provision of the Act.

7) PARTICIPATION IN APPRENTICESHIP AND TRAINING PROGRAM: Yes [ ] No [X]

Proposer participates in apprenticeship and training programs applicable to the work to be performed on the project, which are approved by and registered with the United States Department of Labor's Office of Apprenticeship.

Name of A&T Program: _____

Brief Description of Program: _____

8) TAX COMPLIANT: Yes [X] No [ ]

Proposer is current in the payment of any tax administered by the Illinois Department of Revenue, or if it is not: (a) it is contesting its liability for the tax or the amount of tax in accordance with procedures established by the appropriate Revenue Act; or (b) it has entered into an agreement with the Department of Revenue for payment of all taxes due and is currently in compliance with that agreement.

AUTHORIZATION & SIGNATURE:

I certify that I am authorized to execute this Certificate of Compliance on behalf of the Proposer set forth on the Proposer Summary Sheet, that I have personal knowledge of all the information set forth herein and that all statements, representations, that the proposal is genuine and not collusive, and information provided in or with this Certificate are true and accurate.

The undersigned, having become familiar with the Project specified in this RFP, proposes to provide and furnish all of the labor, materials, necessary tools, expendable equipment and all utility and transportation services necessary to perform and complete in a workmanlike manner all of the work required for the Project.

ACKNOWLEDGED AND AGREED TO:

Signature of Authorized Officer

Brent Gambrel

Name of Authorized Officer

VP/GM Systems

Title

3-8-2022

Date

REFERENCES

Provide three (3) references for which your organization has performed similar work.

Proposer's Name: Federal Signal Corporation
(Enter Name of Business Organization)

1. ORGANIZATION: City of Joliet
   ADDRESS: 101 E. Clinton Street, Joliet, IL 60432
   PHONE NUMBER: 815-724-3500, x221
   CONTACT PERSON: Greg Blaskey, Fire Chief
   YEAR OF PROJECT: 2008 - current

2. ORGANIZATION: Village of Romeoville
   ADDRESS: 1050 W. Romeo Road, Romeoville, IL 60446
   PHONE NUMBER: 815-886-6108
   CONTACT PERSON: Mike Littrell, Emergency Management Director
   YEAR OF PROJECT: 1992 - current

3. ORGANIZATION: City of Naperville
   ADDRESS: 1380 Aurora Ave, Naperville, IL
   PHONE NUMBER: 630-420-6009
   CONTACT PERSON: Dan Nelson, Emergency Management Director
   YEAR OF PROJECT: 1990 - current

ORLAND PARK

INSURANCE REQUIREMENTS

Please submit a policy Specimen Certificate of Insurance showing current coverage's along with this form.

WORKERS' COMPENSATION & EMPLOYER LIABILITY
Full Statutory Limits - Employers Liability
$500,000 – Each Accident $500,000 – Each Employee
$500,000 – Policy Limit
Waiver of Subrogation in favor of the Village of Orland Park

AUTOMOBILE LIABILITY (ISO Form CA 0001)
$1,000,000 – Combined Single Limit Per Occurrence
Bodily Injury & Property Damage

GENERAL LIABILITY (Occurrence basis) (ISO Form CG 0001)
$1,000,000 – Combined Single Limit Per Occurrence
Bodily Injury & Property Damage
$2,000,000 – General Aggregate Limit
$1,000,000 – Personal & Advertising Injury
$2,000,000 – Products/Completed Operations Aggregate
Additional Insured Endorsements: ISO CG 20 10 or CG 20 26 and CG 20 01 Primary & Non-Contributory
Waiver of Subrogation in favor of the Village of Orland Park

Please provide the following coverage, if box is checked:

☐ **PROFESSIONAL LIABILITY**
$1,000,000 Limit - Claims Made Form, Indicate Retroactive Date
Deductible not-to-exceed $50,000 without prior written approval

☑ **UMBRELLA LIABILITY (Follow Form Policy)**
$2,000,000 – Each Occurrence $2,000,000 – Aggregate
EXCESS MUST COVER: General Liability, Automobile Liability, Employers' Liability

☐ **UMBRELLA/EXCESS PROFESSIONAL LIABILITY**
$1,000,000 Limit – Claims Made Form, Indicate Retroactive Date
Deductible not-to-exceed $50,000 without prior written approval

☐ **BUILDERS RISK**
Completed Property Full Replacement Cost Limits -
Structures under construction

☐ **ENVIRONMENTAL IMPAIRMENT/POLLUTION LIABILITY**
$1,000,000 Limit for bodily injury, property damage and remediation costs
resulting from a pollution incident at, on or mitigating beyond the job site

☐ **CYBER LIABILITY**
$1,000,000 Limit per Data Breach for liability, notification, response,
credit monitoring service costs, and software/property damage

Any insurance policies providing the coverages required of the Consultant, excluding Professional Liability, shall be specifically endorsed to identify "The Village of Orland Park, and their respective officers, trustees, directors, officials, employees, volunteers and agents as Additional Insureds on a primary/non-contributory basis with respect to all claims arising out of operations by or on behalf of the named insured." The required Additional Insured coverage shall be provided on the Insurance Service Office (ISO) CG 20 10 or CG 20 26 endorsements or an endorsement at least as broad as the above noted endorsements as determined by the

Village of Orland Park. Any Village of Orland Park insurance coverage shall be deemed to be on an excess or contingent basis as confirmed by the required (ISO) CG 20 01 Additional Insured Primary & Non-Contributory Endorsement. The policies shall also contain a Waiver of Subrogation in favor of the Additional Insureds in regard to General Liability and Workers' Compensation coverage. The certificate of insurance shall also state this information on its face. Any insurance company providing coverage must hold an A-, VII rating according to Best's Key Rating Guide. Each insurance policy required shall have the Village of Orland Park expressly endorsed onto the policy as a Cancellation Notice Recipient. Should any of the policies be cancelled before the expiration date thereof, notice will be delivered in accordance with the policy provisions. Permitting the contractor, or any subcontractor, to proceed with any work prior to our receipt of the foregoing certificate and endorsements shall not be a waiver of the contractor's obligation to provide all the above insurance.

Consultant agrees that prior to any commencement of work to furnish evidence of Insurance coverage providing for at minimum the coverages, endorsements and limits described above directly to the Village of Orland Park, Nicole Merced, Management Analyst, 14700 S. Ravinia Avenue, Orland Park, IL 60462. Failure to provide this evidence in the time frame specified and prior to beginning of work may result in the termination of the Village's relationship with the contractor.

ACCEPTED & AGREED ON 3/8/2022

Brent Gambrel

Signature

Brent Gambrel

Printed Name

VP/GM Systems

Title

Authorized to execute agreements for:

Federal Signal Corporation

Name of Company

Note: Sample Certificate of Insurance and Additional Insured Endorsements attached.

ACORD

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)
Date of Completion

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME: This section must be completed
Agent/Broker Name & Address	PHONE (A/C, No, Ext): FAX (A/C, No):
	E-MAIL ADDRESS:
	PRODUCER CUSTOMER ID #:

INSURED	INSURER(S) AFFORDING COVERAGE	NAIC #
Vendor/Organization Name & Address	INSURER A:	
	INSURER B:	
	INSURER C:	
	INSURER D:	
	INSURER E:	
	INSURER F:	

COVERAGES **CERTIFICATE NUMBER:** **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
	GENERAL LIABILITY							
	[X] COMMERCIAL GENERAL LIABILITY						EACH OCCURRENCE	$ 1,000,000
	[ ] CLAIMS-MADE [X] OCCUR	Y	Y	Policy No.	Eff. Date	Exp. Date	DAMAGE TO RENTED PREMISES (Ea occurrence)	$ 50,000
							MED EXP (Any one person)	$ 5,000
							PERSONAL & ADV INJURY	$ 1,000,000
	GEN'L AGGREGATE LIMIT APPLIES PER:						GENERAL AGGREGATE	$ 2,000,000
	[ ] POLICY [ ] PRO-JECT [ ] LOC						PRODUCTS - COMP/OP AGG	$ 2,000,000
								$
	AUTOMOBILE LIABILITY							
	[X] ANY AUTO OR						COMBINED SINGLE LIMIT (Ea accident)	$ 1,000,000
	[X] ALL OWNED AUTOS						BODILY INJURY (Per person)	$
	[X] SCHEDULED AUTOS			Policy No.	Eff. Date	Exp. Date	BODILY INJURY (Per accident)	$
	[X] HIRED AUTOS						PROPERTY DAMAGE (Per accident)	$
	[X] NON-OWNED AUTOS							$
								$
	[X] UMBRELLA LIAB [X] OCCUR						EACH OCCURRENCE	$ 2,000,000
	EXCESS LIAB [ ] CLAIMS-MADE	Y		Policy No.	Eff. Date	Exp. Date	AGGREGATE	$ 2,000,000
	DEDUCTIBLE							$
	RETENTION $		Y					$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY						[X] WC STATU-TORY LIMITS [ ] OTH-ER	
	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? Y/N [N] (Mandatory in NH)	N/A	Y	Policy No.	Eff. Date	Exp. Date	E.L. EACH ACCIDENT	$ 500,000
	If yes, describe under DESCRIPTION OF OPERATIONS below						E.L. DISEASE - EA EMPLOYEE	$ 500,000
							E.L. DISEASE - POLICY LIMIT	$ 500,000
	Liquor Liability**			Policy No.	Eff. Date	Exp. Date		$1,000,000
	Property		Y	Policy No.	Eff. Date	Exp. Date		$Replacement Cost

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)
RE: Event & Dates. ADDITIONAL INSURED with respect to General Liability on a Primary & Non-Contributory basis: Village of Orland Park, its related entities and each of their respective officers, directors, employees and agents. WAIVER OF SUBROGATIOIN applies to General Liability, Workers Compensation & Property coverages. **Required if selling and/or serving alcohol; if applicable, the policy shall list Village of Orland Park & its related entities as the Named Insureds. Alternatively, an existing Liquor Liability policy must extend coverage to your operations at the Event, and shall name Village of Orland Park, its related entities and their respective officers, directors, employees & agents as Primary & Non-Contributory Additional Insureds.

CERTIFICATE HOLDER

Village of Orland Park
14700 Ravinia Avenue
Orland Park, IL 60462

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

This section is to be completed.

POLICY NUMBER:

COMMERCIAL GENERAL LIABILITY
CG 20 10 07 04

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

ADDITIONAL INSURED – OWNERS, LESSEES OR CONTRACTORS – SCHEDULED PERSON OR ORGANIZATION

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

SCHEDULE

Name Of Additional Insured Person(s) Or Organization(s):	Location(s) Of Covered Operations
Information required to complete this Schedule, if not shown above, will be shown in the Declarations.	

A. **Section II – Who Is An Insured** is amended to include as an additional insured the person(s) or organization(s) shown in the Schedule, but only with respect to liability for "bodily injury", "property damage" or "personal and advertising injury" caused, in whole or in part, by:

1. Your acts or omissions; or
2. The acts or omissions of those acting on your behalf;

in the performance of your ongoing operations for the additional insured(s) at the location(s) designated above.

B. With respect to the insurance afforded to these additional insureds, the following additional exclusions apply:

This insurance does not apply to "bodily injury" or "property damage" occurring after:

1. All work, including materials, parts or equipment furnished in connection with such work, on the project (other than service, maintenance or repairs) to be performed by or on behalf of the additional insured(s) at the location of the covered operations has been completed; or
2. That portion of "your work" out of which the injury or damage arises has been put to its intended use by any person or organization other than another contractor or subcontractor engaged in performing operations for a principal as a part of the same project.

POLICY NUMBER:

COMMERCIAL GENERAL LIABILITY
CG 20 26 07 04

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

ADDITIONAL INSURED – DESIGNATED PERSON OR ORGANIZATION

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

SCHEDULE

Name Of Additional Insured Person(s) Or Organization(s)
Information required to complete this Schedule, if not shown above, will be shown in the Declarations.

Section II – Who Is An Insured is amended to include as an additional insured the person(s) or organization(s) shown in the Schedule, but only with respect to liability for "bodily injury", "property damage" or "personal and advertising injury" caused, in whole or in part, by your acts or omissions or the acts or omissions of those acting on your behalf:

A. In the performance of your ongoing operations; or

B. In connection with your premises owned by or rented to you.

Policy Number:

COMMERCIAL GENERAL LIABILITY
CG 20 01 04 13

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

PRIMARY AND NONCONTRIBUTORY – OTHER INSURANCE CONDITION

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART
PRODUCTS/COMPLETED OPERATIONS LIABILITY COVERAGE PART

The following is added to the **Other Insurance** Condition and supersedes any provision to the contrary:

Primary And Noncontributory Insurance

This insurance is primary to and will not seek contribution from any other insurance available to an additional insured under your policy provided that:

(1) The additional insured is a Named Insured under such other insurance; and

(2) You have agreed in writing in a contract or agreement that this insurance would be primary and would not seek contribution from any other insurance available to the additional insured.

SAMPLE

COMMERCIAL GENERAL LIABILITY
CG 20 33 04 13

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

ADDITIONAL INSURED – OWNERS, LESSEES OR CONTRACTORS – AUTOMATIC STATUS WHEN REQUIRED IN CONSTRUCTION AGREEMENT WITH YOU

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

A. **Section II – Who Is An Insured** is amended to include as an additional insured any person or organization for whom you are performing operations when you and such person or organization have agreed in writing in a contract or agreement that such person or organization be added as an additional insured on your policy. Such person or organization is an additional insured only with respect to liability for "bodily injury", "property damage" or "personal and advertising injury" caused, in whole or in part, by:

1. Your acts or omissions; or
2. The acts or omissions of those acting on your behalf;

in the performance of your ongoing operations for the additional insured.

However, the insurance afforded to such additional insured:

1. Only applies to the extent permitted by law; and
2. Will not be broader than that which you are required by the contract or agreement to provide for such additional insured.

A person's or organization's status as an additional insured under this endorsement ends when your operations for that additional insured are completed.

B. With respect to the insurance afforded to these additional insureds, the following additional exclusions apply:

This insurance does not apply to:

1. "Bodily injury", "property damage" or "personal and advertising injury" arising out of the rendering of, or the failure to render, any professional architectural, engineering or surveying services, including:
   a. The preparing, approving, or failing to prepare or approve, maps, shop drawings, opinions, reports, surveys, field orders, change orders or drawings and specifications; or
   b. Supervisory, inspection, architectural or engineering activities.

   This exclusion applies even if the claims against any insured allege negligence or other wrongdoing in the supervision, hiring, employment, training or monitoring of others by that insured, if the "occurrence" which caused the "bodily injury" or "property damage", or the offense which caused the "personal and advertising injury", involved the rendering of or the failure to render any professional architectural, engineering or surveying services.
2. "Bodily injury" or "property damage" occurring after:
   a. All work, including materials, parts or equipment furnished in connection with such work, on the project (other than service, maintenance or repairs) to be performed by or on behalf of the additional insured(s) at the location of the covered operations has been completed; or
   b. That portion of "your work" out of which the injury or damage arises has been put to its intended use by any person or organization other than another contractor or subcontractor engaged in

POLICY NUMBER:

COMMERCIAL GENERAL LIABILITY
CG 20 37 07 04

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

ADDITIONAL INSURED – OWNERS, LESSEES OR CONTRACTORS – COMPLETED OPERATIONS

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

SCHEDULE

Name Of Additional Insured Person(s) Or Organization(s):	Location And Description Of Completed Operations
Information required to complete this Schedule, if not shown above, will be shown in the Declarations.	

Section II – Who Is An Insured is amended to include as an additional insured the person(s) or organization(s) shown in the Schedule, but only with respect to liability for "bodily injury" or "property damage" caused, in whole or in part, by "your work" at the location designated and described in the schedule of this endorsement performed for that additional insured and included in the "products-completed operations hazard".

Section 4: Bid Bond

Federal Signal's bid bond is included after this page.

CHUBB

Surety
202B Halls Mill Road, PO Box 1650
Whitehouse Station, NJ 08889-1650

O + 908.903.3485
F + 908.903.3656

Federal Insurance Company

Bid Bond

Bond No. N/A

Amount $ 10% of Amount Bid

Know All Men By These Presents,

That we, FEDERAL SIGNAL CORPORATION
2645 Federal Signal Drive, University Park, IL 60484

(hereinafter called the Principal),

as Principal, and FEDERAL INSURANCE COMPANY, a corporation duly organized under the laws of the State of Indiana, (hereinafter called the Surety), as Surety, are held and firmly bound unto

VILLAGE OF ORLAND PARK
14700 S. Ravina Ave., Orland Park, IL 60462

(hereinafter called the Obligee),

in the sum of Ten Percent of Amount bid Dollars
($ 10% of Amount Bid), for the payment of which we, the said Principal and said Surety, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

Sealed with our seals and dated this 4th day of March, 2022

WHEREAS, the Principal has submitted a bid, dated March 11, 2022
for All Hazards Public Alerting Outdoor Warning Siren System

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if the Obligee shall accept the bid of the Principal and the Principal shall enter into a contract with the Obligee in accordance with such bid and give bond with good and sufficient surety for the faithful performance of such contract, or in the event of the failure of the Principal to enter into such contract and give such bond, if the Principal shall pay to the Obligee the difference, not to exceed the penalty hereof, between the amount specified in said bid and the amount for which the Obligee may legally contract with another party to perform the work covered by said bid, if the latter amount be in excess of the former, then this obligation shall be null and void, otherwise to remain in full force and effect.

FEDERAL SIGNAL CORPORATION

By: Brent Gembrol, VP/GM Systems

FEDERAL SIGNAL CORPORATION Incorporated Under the Laws of the State of Principal DELAWARE

Federal Insurance Company

By: Susan A Welsh

Susan A. Welsh, Attorney In Fact

Chubb. Insured.™

CHUBB

Power of Attorney

Federal Insurance Company | Vigilant Insurance Company | Pacific Indemnity Company
Westchester Fire Insurance Company | ACE American Insurance Company

Know All by These Presents, that **FEDERAL INSURANCE COMPANY**, an Indiana corporation, **VIGILANT INSURANCE COMPANY**, a New York corporation, **PACIFIC INDEMNITY COMPANY**, a Wisconsin corporation, **WESTCHESTER FIRE INSURANCE COMPANY** and **ACE AMERICAN INSURANCE COMPANY** corporations of the Commonwealth of Pennsylvania, do each hereby constitute and appoint Corinne Chapman, Samantha Chierici, Jessica B. Dempsey, Derek J. Elston, Rachel Fore, Kristin L Hannigan, Jennifer L. Jakaitis, Nicholas Kertesz, Judith A. Lucky-Eftimov, James B. McTaggart, Sandra M. Nowak, Diane M. O'Leary, Nicholas Pantazis, Roger Paraison, Christina L. Sandoval, Bartlomiej Siepierski, Jean Torres, Christopher P. Troha, Aerie Walton, Susan A. Welsh and Sandra M. Winsted of Chicago, Illinois

each as their true and lawful Attorney-in-Fact to execute under such designation in their names and to affix their corporate seals to and deliver for and on their behalf as surety thereon or otherwise, bonds and undertakings and other writings obligatory in the nature thereof (other than bail bonds) given or executed in the course of business, and any instruments amending or altering the same, and consents to the modification or alteration of any instrument referred to in said bonds or obligations.

In Witness Whereof, said **FEDERAL INSURANCE COMPANY, VIGILANT INSURANCE COMPANY, PACIFIC INDEMNITY COMPANY, WESTCHESTER FIRE INSURANCE COMPANY and ACE AMERICAN INSURANCE COMPANY** have each executed and attested these presents and affixed their corporate seals on this **22nd** day of **September, 2021.**

Dawn M. Chloros
Dawn M. Chloros, Assistant Secretary

Stephen M. Haney, Vice President

STATE OF NEW JERSEY
County of Hunterdon ss.

On this **22nd** day of **September, 2021** before me, a Notary Public of New Jersey, personally came Dawn M. Chloros and Stephen M. Haney, to me known to be Assistant Secretary and Vice President, respectively, of FEDERAL INSURANCE COMPANY, VIGILANT INSURANCE COMPANY, PACIFIC INDEMNITY COMPANY, WESTCHESTER FIRE INSURANCE COMPANY and ACE AMERICAN INSURANCE COMPANY, the companies which executed the foregoing Power of Attorney, and the said Dawn M. Chloros and Stephen M. Haney, being by me duly sworn, severally and each for herself and himself did depose and say that they are Assistant Secretary and Vice President, respectively, of FEDERAL INSURANCE COMPANY, VIGILANT INSURANCE COMPANY, PACIFIC INDEMNITY COMPANY, WESTCHESTER FIRE INSURANCE COMPANY and ACE AMERICAN INSURANCE COMPANY and know the corporate seals thereof, that the seals affixed to the foregoing Power of Attorney are such corporate seals and were thereto affixed by authority of said Companies; and that their signatures as such officers were duly affixed and subscribed by like authority.

Notarial Seal

KATHERINE J. ADELAAR
NOTARY PUBLIC OF NEW JERSEY
No. 2316886
Commission Expires July 10, 2024

Notary Public

CERTIFICATION

Resolutions adopted by the Boards of Directors of FEDERAL INSURANCE COMPANY, VIGILANT INSURANCE COMPANY, and PACIFIC INDEMNITY COMPANY on August 30, 2016; WESTCHESTER FIRE INSURANCE COMPANY on December 11, 2006; and ACE AMERICAN INSURANCE COMPANY on March 20, 2009:

"RESOLVED, that the following authorizations relate to the execution, for and on behalf of the Company, of bonds, undertakings, recognizances, contracts and other written commitments of the Company entered into in the ordinary course of business (each a "Written Commitment"):

(1) Each of the Chairman, the President and the Vice Presidents of the Company is hereby authorized to execute any Written Commitment for and on behalf of the Company, under the seal of the Company or otherwise.

(2) Each duly appointed attorney-in-fact of the Company is hereby authorized to execute any Written Commitment for and on behalf of the Company, under the seal of the Company or otherwise, to the extent that such action is authorized by the grant of powers provided for in such person's written appointment as such attorney-in-fact.

(3) Each of the Chairman, the President and the Vice Presidents of the Company is hereby authorized, for and on behalf of the Company, to appoint in writing any person the attorney-in-fact of the Company with full power and authority to execute, for and on behalf of the Company, under the seal of the Company or otherwise, such Written Commitments of the Company as may be specified in such written appointment, which specification may be by general type or class of Written Commitments or by specification of one or more particular Written Commitments.

(4) Each of the Chairman, the President and the Vice Presidents of the Company is hereby authorized, for and on behalf of the Company, to delegate in writing to any other officer of the Company the authority to execute, for and on behalf of the Company, under the Company's seal or otherwise, such Written Commitments of the Company as are specified in such written delegation, which specification may be by general type or class of Written Commitments or by specification of one or more particular Written Commitments.

(5) The signature of any officer or other person executing any Written Commitment or appointment or delegation pursuant to this Resolution, and the seal of the Company, may be affixed by facsimile on such Written Commitment or written appointment or delegation.

FURTHER RESOLVED, that the foregoing Resolution shall not be deemed to be an exclusive statement of the powers and authority of officers, employees and other persons to act for and on behalf of the Company, and such Resolution shall not limit or otherwise affect the exercise of any such power or authority otherwise validly granted or vested."

I, Dawn M. Chloros, Assistant Secretary of FEDERAL INSURANCE COMPANY, VIGILANT INSURANCE COMPANY, PACIFIC INDEMNITY COMPANY, WESTCHESTER FIRE INSURANCE COMPANY and ACE AMERICAN INSURANCE COMPANY (the "Companies") do hereby certify that

(I) the foregoing Resolutions adopted by the Board of Directors of the Companies are true, correct and in full force and effect,
(II) the foregoing Power of Attorney is true, correct and in full force and effect.

Given under my hand and seals of said Companies at Whitehouse Station, NJ, this 3/4/2022

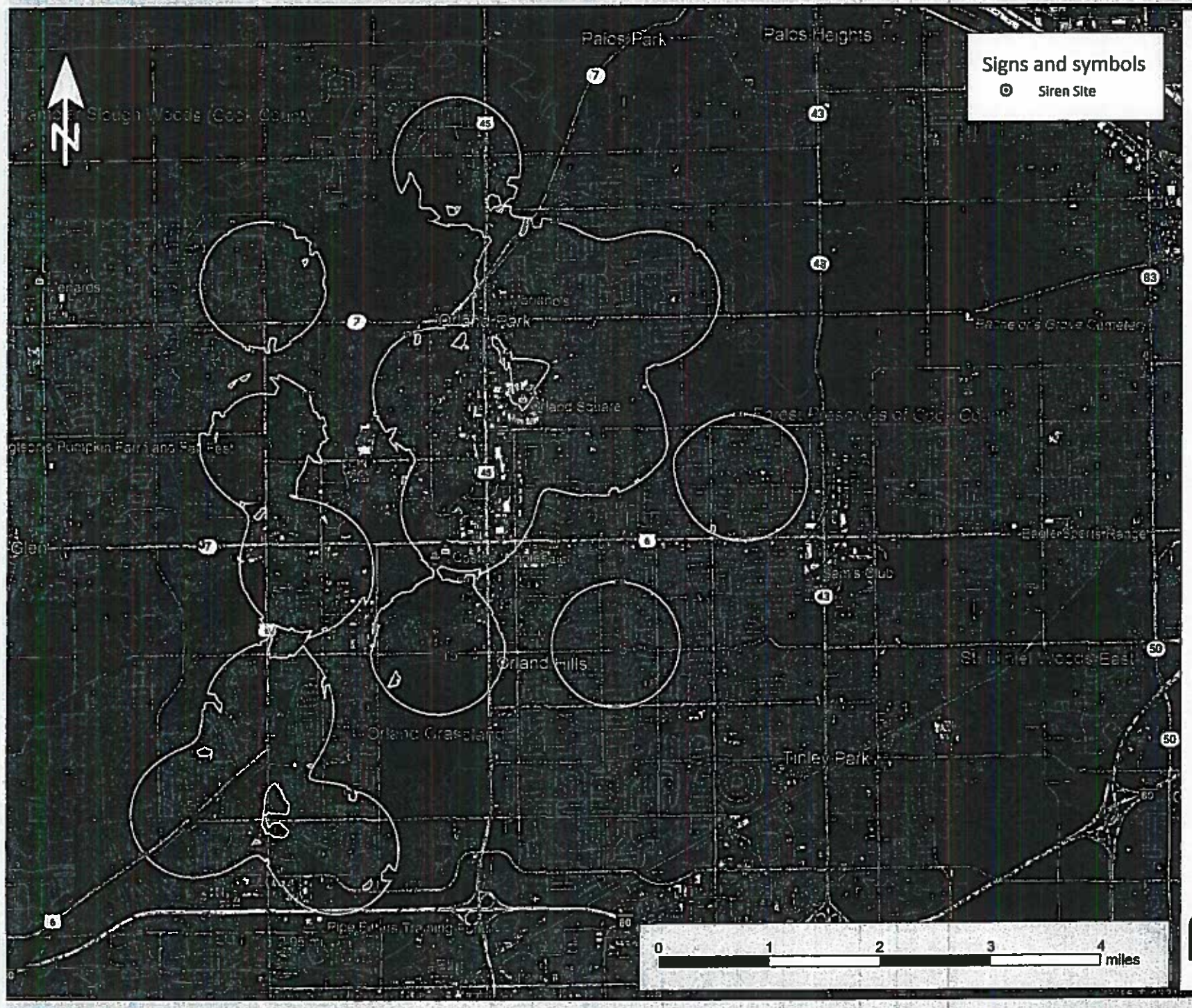
Dawn M. Chloros
Dawn M. Chloros, Assistant Secretary

IN THE EVENT YOU WISH TO VERIFY THE AUTHENTICITY OF THIS BOND OR NOTIFY US OF ANY OTHER MATTER, PLEASE CONTACT US AT:
Telephone (908) 903- 3493 Fax (908) 903- 3656 e-mail: surety@chubb.com

Section 5: Appendix

Appendix A – SoundPLAN Map
Appendix B – Compliance
Appendix C – ISO Certificate
Appendix D – UL Certificate
Appendix E – Terms and Conditions
Appendix F – Warranty
Appendix G – Test Report
Appendix H – Data Sheets
Appendix I – Manuals

Appendix A – SoundPLAN Map



Orland Park IL

Acoustic Analysis

ISO9613-2

MAP 001

Lmax
in dB(C)

= 80
= 75
= 70

FEDERAL SIGNAL
MOVES. CLEANS. PROTECTS

Appendix B – Compliance

FEDERAL SIGNAL CORPORATION
Integrated Systems

February 28, 2022

Ref : **RFP #20-008**
FSC Ref : **All Hazards Public Alerting Outdoor Warning Siren System Compliance**

Section	Paragraph Reference	Comply/Deviation Noted	Comment
1.0	**Scope of Work**		
1.1	The Village of Orland Park is seeking prospective bidders to provide pricing for the upgrading of the fourteen (14) sirens of the All Hazards Public Alerting Outdoor Warning Siren System, including the relocation of four (4) current sirens and the installation of one (1) additional siren to address coverage gaps for a total of fifteen sirens. Pricing shall be itemized to include: • The make and model of the siren • The cost of the pole and pole installation • The cost of the control box and necessary contents	Noted	
1.2	Outdoor Warning Siren Current Locations: 1) 140th Street & Concord Drive 2) 141st Street & Christina 3) 147th Street & West Avenue 4) 151st Street & 88th Avenue 5) Wheeler Drive & Hemlock Drive 6) 15800 block of 88th Avenue (Move to area 167th street/88th Ave. Fernway School) 7) Brook Hill Drive / Wolf Road (Move to area of 17100 Wolf Rd.) 8) 151st Street & Wolf Road 9) 15750 S. Ravinia Avenue 10) 10500 W. 163rd Place (Move to area 10900 159th Street/Near Century Junior High) 11) Eagle Ridge Drive & Voss Drive 12) Creek Crossing Drive & Brigitte Terrace (Move to 139th Street/Wolf Rd.) 13) 179th Street & Southwest Highway 14) 131st Street & Mill Road 15) NEW Location- Area of 10400 167th Street	Noted	
2.0	**General Requirements**		
2.1	• Bidder shall evaluate and verify siren locations to ensure outdoor warning coverage throughout the Village. (See Current Coverage Map)	Comply	A SoundPLAN map is located in Appendix A – SoundPLAN Map.
2.2	• The Village of Orland Park shall contact ComEd to request electrical service power disconnection at the removal sites if and as required. Any and all costs imposed by the utility company associated with the disconnection and removal of the existing overhead electrical service to the existing siren pole(s) shall be the responsibility of the Village of Orland Park.	Noted	
2.3	• Quantity of fifteen (15) AC/DC operated, rotating uni-directional, electromechanical outdoor warning sirens.	Comply	
2.4	• Each siren proposed must produce a minimum SPL (Sound Pressure Level) of 130 dBC at 100' on-axis, + 1dBC. Certification of SPL Rating shall be provided with the proposal.	Comply	
2.5	• The warning siren must produce a minimum of three (3) warning signals or tones plus a short growl test (1-2 second) and silent test capabilities.	Comply	

Federal Signal Corporation, Integrated Systems Group, University Park, Illinois, USA 60484
TEL: +1 708 534 3400 ■ FAX: +1 708 534 4887
Website: www.fedsig.com

Section	Paragraph Reference	Comply/Deviation Noted/	Comment
2.6	• Each siren must be able to operate on both AC and DC power. Primary AC operation from a 208 - 240VAC power source must facilitate complete siren operation without the use of the backup batteries.	Comply	
2.7	• During a power failure, automatic switchover to (DC) battery operation must occur to maintain the siren's normal operation.	Comply	
2.8	• Each siren must contain a battery backup (DC) power source/battery system consisting of four (4) batteries for siren and RF control system operation. The battery (DC) power source shall be pole mounted in an aluminum vented enclosure (NEMA 3X rated). Batteries must be deep cycle. Original and replacement batteries must be readily available at local retail sales establishments.	Comply	
2.9	• The warning sirens must include integrated SCADA (Supervised Control and Data Acquisition) Technology.	Comply	Note: Federal Signal proposed warning system is controlled, monitored and programmed via Federal Signal Commander Software
2.10	• Sirens must be programmable to automatically activate with the NWS warning polygons.	Comply	Note: Federal Signal proposed warning system has included licensing for Commander1 cloud service that directly communicates with AccuWeather© for Polygon alerting
2.11	• Warning sirens must comply with all applicable government regulatory specifications, particularly FEMA and OSHA.	Comply	
2.12	• Warning siren control equipment model proposed must be specifically listed by Underwriter's Laboratories, no exceptions will be allowed. Evidence of UL Listing shall be provided with the proposal.	Comply	Federal Signal's UL Certificate is provided in Appendix D – UL Certificate.
2.13	• Warning siren and siren control equipment proposed must include a minimum warranty of two-years for parts and factory-performed labor. The siren head must include a five-year warranty covering parts replacement. A copy of the warranty must be submitted with the proposal.	Comply	Federal Signal's standard warranty is located in Appendix F – Warranty.
2.14	• To insure quality and reliability, the siren manufacturer must be ISO 9001:2000 Certified, no exceptions. Evidence of certification must be supplied with proposal.	Comply	The current ISO version was updated to ISO 9001:2015 in 2015. Federal Signal's ISO 9001:2015 certificate is located in Appendix C – ISO Certificate.
2.15	• Siren control cabinets must be Aluminum in construction with a NEMA 4X rating.	Comply	
2.16	• Bidders must visit the proposed new equipment installation sites as well as the locations of the existing warning siren equipment to be removed as outlined in the Outdoor Warning Siren Locations list.	Comply	
2.17	• Expedient and reliable parts and local repair services must be available.	Comply	
2.18	• Equipment delivery from the siren equipment manufacturer/bidder shall be 30 days, ARO.	Deviation	Approximate equipment lead time is 12 weeks Lead time on steel pole approximately 14-16 weeks Lead time on composite poles approximately 10-12 weeks Lead time on concrete poles 10-12 weeks from pole approvals
3.0	**Minimum Standards**		
3.1	**SIREN HEAD ASSEMBLY SPECIFICATIONS**		
3.1.1	• The warning sirens shall produce a minimum of 130dBC, + 1dBC single tone format at 100 feet. All measurements shall be conducted in free-field conditions at a minimum of 50 feet above ground level on axis. Certified Test Results by an independent laboratory, including a contact person, must be submitted with this bid.	Comply	A test report is located in Appendix G – Test Report.
3.1.2	• Rotating speed shall not be less than 2.0 nor more than 4.0 revolutions per minute. Rotation speed must be constant and uniform and not vary in relation to sound or chopper motor speed.	Comply	
3.1.3	• Siren head rotation shall employ the use of a direct drive mechanism coupling the rotation motor and gear reducer assemblies and shall not utilize chains or belts.	Comply	

Section	Paragraph Reference	Comply/Deviation Noted	Comment
3.1.4	• Warning sirens shall comply with the FEMA Outdoor Warning Systems Guide, CPG1-17. This guide requires an ATTACK warning which is a 3 to 5-minute wavering tone, an ATTENTION or ALERT warning which is a 3 to 5-minute Steady signal. Once the ALERT signal attains a peak in frequency, the frequency of the signal shall not sweep or fluctuate.	Comply	
3.1.5	• All exposed metal surfaces, unless aluminum or stainless steel, shall be properly finished to inhibit deterioration and corrosion due to the weather and sun.	Comply	
3.1.6	• Sirens shall operate in temperature ranges of -30 degrees C to +60 degrees C while batteries are maintained at -18 degrees C or higher.	Comply	
3.1.7	• The effects of rain, ice, or snow shall not hinder operations.	Comply	
3.1.8	• All sirens shall have sufficient mechanical strength and sufficient torque to withstand and operate in winds speeds of up to 100 mph.	Comply	
3.1.9	• In compliance with FEMA CPG 1-17, the Outdoor Warning Systems Guide, the Warning Sirens shall not produce sound pressure levels greater than 123dB at ground level to prevent hearing damage. Sirens shall not produce potentially environmentally hazardous ultrasonic signals. This must be certified by the manufacturer.	Comply	
3.1.10	• Sirens shall include adjustable mounting brackets for varying size poles, and be easily removable for mounting on flat surfaces of roofs of buildings.	Comply	
3.2	**SIREN CONTROL UNIT SPECIFICATIONS**		
3.2.1	• The pole-mounted siren control system shall employ the use of Aluminum NEMA 4X rated enclosures and house all of the motor controls, battery chargers, RF Communications, integrated SCADA controls, sensors an automatically deployed backup battery system components.	Comply	
3.2.2	• The siren and control system shall primarily operate from a pole-mounted, AC transformer assembly with an integrated DC rectifier with an AC line current draw of less than 30 amperes at 240VAC during system activation and no more than 6 amperes in the standby mode.	Comply	
3.2.3	• The integrated battery backup system shall have the capacity to provide continuous siren operation at full power for a minimum of 15 minutes at a minimum of 130dBC, + 1dBC.	Comply	
3.2.4	• Each siren must employ the use of an integrated, automatically-deployed, battery backup (DC) system consisting of no more than four (4) 12V deep cycle batteries for siren and control system operation. Battery capacity shall be maintained by high quality regulated chargers. Each battery shall have an individual charger to minimize the effects caused by over/under charging. The integrated charging system shall be capable to recharge a set of fully discharged batteries within 12 hours.	Comply	
3.2.5	• The siren control equipment shall operate in temperature ranges of –30 degrees C to +60 degrees C while batteries are maintained at –18 degrees C or higher.	Comply	
3.2.6	• All internal wiring for siren operation shall be permanently secured and protected from direct precipitation. All wiring entranceways to enclosures housing electronic equipment shall not preclude wall mounting.	Comply	
3.2.7	• The control unit must provide reasonable lightning protection devices.	Comply	
3.2.8	• All enclosures shall have provisions for locking.	Comply	
3.2.9	• Cabinets for housing corrosive materials (i.e. batteries) shall not have common wall to any area housing electronic equipment for operation of sirens.	Comply	
3.2.10	• The siren control unit shall include features for on-site activation and battery testing.	Comply	
4.0	**INTEGRATED SCADA SYSTEM SPECIFICATIONS**		

Section	Paragraph Reference	Comply/Deviation Noted	Comment
4.1	**REMOTE TERMINAL UNIT**		
4.1.1	• Each remote siren site or RTU shall contain a two-way SCADA control system, utilizing a FSK/MSK protocol, which will receive and decode information sent from the central control and/or secondary control stations to activate the necessary warning signals.	Comply	
4.1.2	• The RTU shall be programmable for signal length, signal timing, alarm configuration and zone configuration via either on-site or "over the air" utilizing the RF network from the Central Control Unit.	Comply	
4.1.3	• The RTU(s) shall be capable of communicating with other remote sites functioning as a repeater for the purpose of transmitting activation command and status reporting to and from control point(s).	Comply	
4.1.4	• The RTU shall provide for user-configurable automatic report back for changes in status of low battery condition, local activation and cabinet intrusion.	Comply	
4.1.5	• The RTU shall be capable of responding to a minimum of six digital activation (siren function) codes.	Comply	
4.1.6	• The user shall be capable of activating each RTU as part of an All Call, Zone or Individual activation.	Comply	
4.1.7	• The RTU shall provide for diagnostic monitoring, utilizing integrated sensors, of the siren site to include battery voltage condition, siren head rotation, siren activation (chopper motor) current, control/battery cabinet intrusion and local activation.	Comply	
4.1.8	• Each RTU shall utilize a professional grade transceiver to communicate over the VHF RF network.	Comply	
4.1.9	• Each RTU shall include an antenna system, to include a 3dB gain omni collinear 152-156 MHz antenna, LMR400 coaxial cable and aluminum pole-mounting bracket and hardware.	Comply	
4.2	**CCU (CENTRAL CONTROL UNIT)**		
4.2.1	• The Central Control Unit (CCU) shall be installed at the Orland Park Police Department's Primary and Secondary Dispatch Centers, and shall facilitate activation and status monitoring of the siren system.	Comply	
4.2.2	• The CCU shall include a graphical user interface (GUI) SCDA software application. Bidder shall also supply a CCU PC consisting of the necessary hardware and software required to support the SCADA system.	Comply	
4.2.3	• The CCU shall also include an encoder/controller to facilitate interface to the existing RF network and backup activation of the siren system.	Comply	
4.2.4	• The CCU shall also include a wireline expansion module to facilitate siren system activation utilizing the existing dispatch consoles currently in use at the Orland Park Police Department.	Comply	
4.2.5	• The CCU GUI shall facilitate simple "point and click" activation of the siren system. The CCU GUI shall display detailed site maps with the siren sites represented by functional color-coded icons.	Comply	
4.2.6	• The CCU GUI shall allow provide for a minimum of 16 map views as well as allow for future user-additions of, and relocation of, siren site icons on each map.	Comply	
4.2.7	• The CCU GUI shall display current siren site status, as well as provide for system interrogation and activation from the Map screen(s).	Comply	
4.2.8	• The CCU GUI shall provide the ability to activate individual, zone or all sirens within the system.	Comply	

Section	Paragraph Reference	Comply / Deviation Noted	Comment
4.2.9	• The CCU GUI shall provide complete status detail of each siren site by clicking the corresponding color-coded icon on the map screen.	Comply	
4.2.10	• The CCU GUI must possess the ability to read and program (upload / download) RTU configuration, eliminating the need to visit sites for reprogramming.	Comply	
4.2.11	• The CCU GUI must provide 128-bit digital encryption to secure against spurious or mischievous activation as well as provide for optional, user-configurable additional security measures definable for individual sites.	Comply	Note: Federal Signal current version Commander software utilizes 128 bit encryption along with 256 AES Time Encryption
4.2.12	• The CCU GUI must provide a digital security key to allow multiple SCADA systems to function on a common, conventional RF Channel.	Comply	
4.2.13	• The CCU GUI must provide full status reports on Remote Site Parameters, System log entries, System Activation Records, System Configuration and RTU status. The software shall include a database configurator to allow the administrator to generate reports based on multiple or a single criteria point. These reports shall be capable of being viewed within the software, printed, or exported for manipulation within a standard database software package such as Microsoft Excel or Microsoft Access.	Comply	
4.2.14	• The CCU GUI shall provide 20 user configurable hotkeys for fast and accurate activation	Comply	
4.2.15	• The CCU GUI must facilitate multiple password securing to control access to system activation, configuration, and hotkey activation control.	Comply	
4.2.16	• The CCU GUI shall provide a demo mode which eliminates the risk of activation while training, but still allows users to poll the system and/or receive automatic change in status reports.	Comply	
4.2.17	• The CCU GUI shall provide for at least twenty (20) user configurable events and/or activations which can be scheduled daily, weekly or monthly. These events shall allow the user to program automatic monthly activation tests; daily, weekly or monthly quiet tests, and/or other regularly scheduled events.	Comply	
4.2.18	• The CCU GUI shall contain an auto-callout feature providing a customer-defined automatic sequential call-out list of up to 10 numbers that will be dialed in the event of a change in system status or alarm receipt. The system shall also allow users to call- in to the system to review and acknowledge system status reports.	Deviation	Note: Federal Signal Commander software can be configured to send e-mails to defined users for change of state or event.
4.2.19	• The CCU GUI shall contain an automatic, user-configurable email notification feature providing user-defined and filterable notification of a change in system status or alarm receipt.	Comply	
5.0	**EXISTING SIREN EQUIPMENT REMOVAL**		
5.1	• The successful bidder shall be responsible for the removal, as well as disposal of, the fourteen (14) existing warning sirens located throughout the Village of Orland Park.	Comply	
5.2	• Removal of the existing siren equipment shall include all related siren equipment and hardware excluding the removal of the existing wooden pole.	Comply	
6.0	**NEW EQUIPMENT INSTALLATION**		
6.1	• The Bidder/Installer must be an Authorized Installation and Warranty Service Center of the Siren Equipment Manufacturer, located within three (3) hours driving time of the Village of Orland Park.	Comply	Federal Signal is the OEM located 30 minutes from the Village of Orland Park at 2645 Federal Signal Drive, University Park, IL 60484. Federal Signal's factory trained installer, Braniff Communications, has a permanent place of business 15 minutes from the Village of Orland Park at 4741 136th St, Crestwood, IL 60445.
6.2	• The new Warning Siren Equipment shall be installed on either a 55', Class II treated wooden pole or a centrifugally cast reinforced concrete pole supplied by the bidder. Bidder must include all costs associated with the procurement, delivery and installation of each type of pole.	Comply	
6.3	• Poles shall be installed at a burial depth of a minimum of 8 feet.	Comply	

Section	Paragraph Reference	Comply / Deviation Noted	Comment
6.4	• The Warning Sirens must be installed as per Manufacturer's Recommendations as outlined in the Manufacturer-Provided Installation Manual.	Comply	
6.5	• Installation of the Siren Equipment shall be completed within 60 days after the equipment ship date by the equipment manufacturer.	Comply	
6.6	• Supplemental equipment required for the installation of the new warning sirens as referenced in the Manufacturer's Installation Manual including all wire, conduit, hardware, weatherproof service disconnects, electrical meter sockets, ground rod(s) and batteries must be provided as part of the installation proposal.	Comply	Data sheets and installation manuals are provided in Appendix H – Data Sheets and Appendix I – Manuals.
6.7	• The Bidder/Installer shall contact J.U.L.I.E. and exercise due care to prevent damage to utilities and surrounding facilities.	Comply	
6.8	• The Bidder shall coordinate with ComEd and be responsible for coordination of power activation at all siren pole locations. Any fees/charges related to the connection of electrical power shall be the responsibility of the Village of Orland Park.	Comply	
6.9	• The Bidder/Installer shall provide all labor services required to configure, program, install, interface, align and test all of the Central Control Unit (CCU) hardware and software. A point of termination for the RF network shall be provided by the Village of Orland Park to facilitate interface of the encoder /controller. Additionally, a point of termination for the dispatch console(s) shall be provided by the Village of Orland Park to facilitate interface of the interface adapter. All required console reprogramming and hardware/software upgrades required to facilitate interoperability between the adapter and the dispatch consoles shall be provided by the Village of Orland Park.	Comply	
6.10	• The Bidder shall provide both operator and administrative level training sessions for the Central Control Unit components. Hard copy reference material including, but not limited to, comprehensive system activation procedures, diagnostic procedures, technical manuals and software backups shall be provided by the bidder.	Comply	
7.0	**PRODUCT DOCUMENTATION**		
7.1	A complete set of documentation including Installation, Operation and Maintenance Manuals, Parts Lists, Schematics, Wiring Diagrams and Assembly Drawings must be provided, as well as submitted with the bid, for each system component.	Noted	Data sheets and installation manuals are provided in Appendix H – Data Sheets and Appendix I – Manuals.
8.0	**SIREN EQUIPMENT WARRANTY**		
8.1	The seller must warrant the electro-mechanical siren and control equipment, from the date of installation, for a period of not less than two (2) years for defects in electrical and mechanical components, covering parts and factory-performed labor when adequately maintained in accordance with the manufacturer's recommendations. In addition, the seller shall also warranty the siren head assembly (unit on top of pole) for a period of no less than 5 years from the date of installation covering parts replacement. A copy of the warranty must be submitted with the proposal.	Comply	Federal Signal's standard warranty is located in Appendix F – Warranty
9.0	**INSTALLATION WARRANTY**		
9.1	The Bidder / Installer must warranty the installation of the fourteen (15) warning sirens, the CCU (Central Control Unit) and the SCU (Secondary Control Unit) for a period of not less than one (1) year covering defects in installer-provided material and labor.	Comply	

Section	Paragraph Reference	Comply/Deviation Noted/	Comment
10.0	It is expressly understood and agreed to by both Parties that in no event shall the total amount to be paid by the Village for the complete and satisfactory performance of services, exceed the proposed amount. Said price shall be the total compensation for Contractor's performance hereunder including, but not limited to, all work, deliverables, materials, supplies, equipment, subcontractor's fees, and all reimbursable travel and miscellaneous or incidental expenses to be incurred by Contractor. In the event the Contractor incurs cost in excess of the sum authorized for service, the Contractor shall pay such excess from its own funds, and the Village shall not be required to pay any part of such excess, and the Contractor shall have no claim against the Village on account thereof. For the avoidance of doubt, in no event shall Contractor be entitled to receive more than the proposed amount and this amount includes all costs incurred by Contractor in connection with the work and services authorized hereby, including, but not limited to: (i) any known or unknown and/or unexpected condition(s); (ii) any and all unforeseen difficulties; (iii) any unanticipated rises in the cost of labor, materials or equipment, changes in market or negotiating conditions, and errors or omissions made by others; (iv) the character of the work and/or services to be performed; and (v) any overrun in the time or cost necessary for the Contractor to complete the work due to any causes, within or beyond its control. Under no circumstances shall the Village be liable for any additional charges if Contractor's actual costs and reimbursable expenses for such work, service or deliverable exceed the proposed amount. Accordingly, Contractor represents, warrants and covenants to the Village that it will not, nor will Contractor have anyone on its behalf, attempt to collect an amount in excess of the proposed amount agreed to by the Contractor.	Noted	

Appendix C – ISO Certificate

DNV·GL

MANAGEMENT SYSTEM CERTIFICATE

Certificate No:
CERT-08514-2006-AQ-HOU-ANAB

Initial certification date:
09 May, 1996

Valid:
23 December, 2020 - 22 December, 2023

This is to certify that the management system of

Federal Signal Corporation - University Park Facility

2645 Federal Signal Drive, University Park, IL, 60466-3195, USA

has been found to conform to the Quality Management System standard:
ISO 9001:2015

This certificate is valid for the following scope:
The design, manufacture, service, and marketing of audible and visual signaling products and systems for use by industrial and government customers worldwide

Place and date:
Katy, TX, 09 November, 2020

For the issuing office:
DNV GL - Business Assurance
1400 Ravello Drive, Katy, TX, 77449-5164, USA

Sherif Mekkawy
Management Representative

Appendix D – UL Certificate

CERTIFICATE OF COMPLIANCE

Certificate Number	20121212-E4813E
Report Reference	E4813-20020628
Issue Date	2012-DECEMBER-12
Issued to:	FEDERAL SIGNAL CORP SIGNAL DIV 2645 FEDERAL SIGNAL DR UNIVERSITY PARK IL 60484
This is to certify that representative samples of	AUDIBLE SIGNAL APPLIANCES, GENERAL SIGNAL Indoor/Outdoor DC Siren Controller, Model DCFCTB, DCFCB, and DCB may be followed by D, may be followed by L, H, U, or T, may be followed by A, S, or N, may be followed by L, H, U, or IP, may be followed by -240B. Control Cabinet rated for Indoor/Outdoor Use, Type 4 or 4X, IP66. Have been investigated by UL in accordance with the Standard(s) indicated on this Certificate.
Standard(s) for Safety:	UL 464, Audible Signal Appliances
Additional Information:	See the UL Online Certifications Directory at www.ul.com/database for additional information

Only those products bearing the UL Listing Mark for the US and Canada should be considered as being covered by UL's Listing and Follow-Up Service meeting the appropriate requirements for US and Canada.
The UL Listing Mark for the US and Canada generally includes: the UL in a circle symbol with "C" and "US" identifiers: c(UL)us the word "LISTED"; a control number (may be alphanumeric) assigned by UL; and the product category name (product identifier) as indicated in the appropriate UL Directory.

Look for the UL Listing Mark on the product.

William R. Carney

William R. Carney, Director, North American Certification Programs

UL LLC

Appendix E – Terms and Conditions

FEDERAL SIGNAL

SSG TERMS AND CONDITIONS OF SALE (Goods and Services)

Effective 11-22-2021

1. **DEFINITIONS.** In these Terms and Conditions of Sale, "Seller" means Federal Signal Corporation, including any division or subsidiary of Federal Signal Corporation; "Buyer" means the person or entity that placed the order or on whose behalf the order is placed; "Goods" means the goods identified in Seller's acknowledgment of Buyer's order; "Services" means the services identified in Seller's acknowledgment of Buyer's order; "Contract" means the written agreement (which shall include these Terms and Conditions) between Buyer and Seller for the supply of the Goods and/or provision of Services; and "Contract Price" means the price payable to Seller by Buyer for the Goods and/or Services.

2. **ORDERS; CONTRACT.** All orders must be in writing. The buyer understands and agrees that any order, upon Acceptance by Seller, shall be subject to these Terms and Conditions of Sale. Seller objects to and shall not be bound by any additional or different terms, whether printed or otherwise, in Buyer's order or in any other communication from Buyer to Seller, or any trade usage or course of dealing between Buyer and Seller, unless expressly agreed to in writing by Seller in Seller's acknowledgment of Buyer's order. If the details of the Goods or Services described in Seller's quotation differ from those set out in Seller's acknowledgment, the latter shall apply. Seller reserves the right to make minor modifications and/or improvements to the Goods before delivery provided that the performance of the Goods is not adversely affected and that neither the Contract Price nor the delivery date is affected.

3. **EFFECTIVE DATE; CANCELATION.** The Contract shall become effective only upon the date of acceptance of Buyer's order by Seller's written acknowledgment or upon Seller's commencement of performance, whichever is first ("Acceptance"). Buyer may not cancel or change an order after Acceptance by Seller without the written consent of Seller. Notwithstanding the foregoing, Seller may, in its sole discretion, agree to a written request from Buyer for cancelation of an open order under the following conditions: Seller shall be subject to cancelation charges equal to the greater of (i) 110% of the cost of work completed and/or custom materials purchased at the time the request is delivered, or (ii) a percentage of the canceled portion of the Contract calculated as follows:

   10% - if canceled more than 2 weeks from the Effective Date;
   20% - if canceled more than 4 weeks from the Effective Date;
   40% - if canceled more than 6 weeks from the Effective Date;
   80% - if canceled more than 8 weeks from the Effective Date.

   Cancelation Schedule - Services:
   If services are canceled within 1 week of the scheduled mobilization date; 110% of unrecoverable out-of-pocket costs + 50% of scheduled services will be charged. If services are canceled within 2 days of the scheduled mobilization date; 110% of unrecoverable out-of-pocket costs + 100% of scheduled services will be charged.

4. **PRICE AND PAYMENT TERMS.** Unless previously withdrawn, Seller's quotation is open for acceptance within the period stated therein or, when no period is so stated, within thirty days after its date of issuance to Buyer. Prices are subject to increase by Seller based on Seller's prices in effect at the time of shipment in all instances where the specified shipment date is more than 30 days from the date of the order from Buyer. Unless otherwise specified in the Contract or Seller's applicable price list, prices are FOB Seller's point of shipment, and the terms of payment are NET 30 days from the date of invoice. Amounts not paid when due shall bear interest for each day after the due date calculated at the annual rate of 18% or the highest rate permitted by law, whichever is less. Freight, packing and handling will be charged at Seller's standard rates, which are available upon request by Buyer. If the contract is for more than one unit of Goods, the Goods may be shipped in a single lot or in several lots at the discretion of Seller. In such event, each such shipment shall be paid separately and Buyer shall be responsible for all transportation charges. Seller may require full or partial payment or payment guarantee in advance of shipment whenever, in its opinion, the financial condition of Buyer so warrants. Payment by credit card may be subject to a service charge.

   Seller reserves the right to increase the quoted order price at any time before delivery to Buyer to reflect any increase in Seller's costs to manufacture or deliver the ordered product due to any factor beyond the reasonable control of Seller. Seller shall provide Buyer with prompt electronic notice of any such price increase. Buyer shall have five days from receipt of such notice to cancel its order, absent which Buyer shall be deemed to have consented to the price increase

5. **TITLE; RISK OF LOSS.** Title to, ownership of, and risk of loss or damage to the Goods shall pass to the Buyer, and Buyer shall be responsible for insurance of the Goods, upon delivery of the Goods to the carrier. Alternatively, if it is expressly stated in the Contract that Seller is to procure insurance for the Goods after delivery to the carrier, such insurance will be charged at the carrier's standard rates. "FOB" and any other delivery term used in the Contract shall be defined in accordance with the latest version of Incoterms. Buyer shall have sole responsibility for processing and collection of any claim of loss against the carrier.

6. **TAXES.** Prices do not include taxes. Buyer shall pay Seller, in addition to the price of the goods, any applicable excise, sales, use or other tax (however designated) imposed upon the sale, production, delivery or use of the Goods or Services ordered to the extent required or not forbidden by law to be collected by Seller from Buyer, whether or not so collected at the time of the sale, unless valid exemption certificates acceptable to the taxing authorities are furnished to Seller before the date of invoice.

7. **DELIVERY; FORCE MAJEURE**. Unless otherwise stated in Seller's quotation, all periods stated for delivery or completion run from the Effective Date and are to be treated as estimates only and are not guaranteed. If Seller is delayed in or prevented from performing any of its obligations under the Contract due to the acts or omissions of Buyer or its agents, the delivery/completion period and the Contract Price shall both be adjusted as necessary. If delivery is delayed due to any act or omission of Buyer, or if having been notified that the Goods are ready for shipment, Buyer fails to take delivery or provide adequate shipping instructions, Seller shall be entitled to place the Goods into storage at Buyer's expense. Upon placing the Goods into storage, delivery shall be deemed to be complete, risk in the Goods shall pass to Buyer and Buyer shall pay Seller accordingly. The Contract (other than Buyer's obligation to pay all sums due to Seller in accordance with the Contract) shall be suspended, without liability, in the event and to the extent that its performance is prevented or delayed due to any circumstance beyond the reasonable control of the party affected, including but not limited to: Act of God, war, armed conflict or terrorist attack, riot, fire, explosion, accident, flood, disease, health epidemic or pandemic, sabotage, governmental decisions or actions (including but not limited to prohibition of exports or re-exports or the failure to grant or the revocation of applicable export licenses), or labor trouble, strike, lockout or injunction. Seller shall have no obligation to deliver any hardware, software, services or technology unless and until it has received any necessary licenses or authorizations or has qualified for general licenses or license exceptions under applicable import, export control and sanctions laws, regulations, orders and requirements, as they may be amended from time to time (including without limitation those of the United States, the European Union and the jurisdiction in which Seller is established or from which the items are supplied). If for any reason any such licenses, authorizations or approvals are denied or revoked, or if there is a change in any such applicable laws, regulations, orders or requirements that would prohibit Seller from fulfilling the Contract or would in the reasonable judgment of Seller otherwise expose Seller to a risk of liability under applicable laws, regulations, orders or requirements, Seller shall be relieved without liability of all obligations under the Contract. If either party is delayed or prevented from performance of its obligations by reason of this clause for more than 180 consecutive calendar days, either party may terminate the then unperformed portion of the Contract by notice in writing given to the other party, without liability provided that Buyer shall be obliged to pay the reasonable cost and expense of any work in progress and to pay for all Goods delivered and Services performed as at the date of termination. Seller may deliver by installments, and each delivery shall constitute a separate Contract. Failure by Seller to deliver any one or more of the installments in accordance with their terms shall not entitle Buyer to terminate the whole Contract or treat it as Repudiated.

8. **INSPECTION**. Buyer shall inspect the goods immediately upon the receipt thereof. All claims for shortfalls in quantity or for incorrect delivery or for any alleged defect in Seller's performance under this Contract, capable of discovery upon reasonable inspection, must be fully set forth in writing and received by Seller within five days of Buyer's receipt of the Goods. Failure to make any such claim within said period shall constitute a waiver of such claim and an irrevocable acceptance of the Goods by Buyer.

9. **DEDUCTIONS AND RETURNS**. Buyer must contact the factory before returning any merchandise. Goods in new, unused and undamaged condition that are resalable as new products without modification or repackaging may be returned to Seller for credit only upon the Seller's prior written consent (such consent to be in the sole discretion of Seller) and upon terms specified by Seller, including prevailing restocking, freight, and handling charges. A Return Material Authorization (RMA) must be obtained before returning merchandise for credit. All returns are subject to inspection of merchandise and any defects in the units will be charged back to the Buyer at the cost of parts and labor. Credit deductions will not be honored unless covered by an RMA. Buyer assumes all risk of loss for such returned goods until actual receipt thereof by Seller. Agents of Seller are not authorized to accept returned goods or to grant allowances or adjustments with respect to Buyer's account.

10. **LIMITED WARRANTY**.

NOTICE: IF ANY GOODS, INCLUDING ANY COMPONENT PART OF ANY GOODS, OR SERVICES SOLD BY SELLER ARE ACCOMPANIED BY A SEPARATE MANUFACTURER'S WARRANTY COVERING SUCH GOODS OR SERVICES, THE TERMS OF SUCH WARRANTY, INCLUDING ALL IMITATIONS OF SUCH WARRANTY, SHALL GOVERN THOSE GOODS OR SERVICES, AND ANY WARRANTY OF SELLER OTHERWISE APPLICABLE TO SUCH GOODS OR SERVICES SHALL NOT APPLY.

A. Goods. Subject to the foregoing, Seller's limited warranty for any new Goods which are the subject of any Seller's acknowledgment of Buyer's order may be found at www.fedsig.com/SSG-Warranty, or maybe obtained by writing to Federal Signal Corporation, 2645 Federal Signal Drive, University Park, IL 60484; by email to info@federalsignal.com; or by calling 708/534-3400.

B. Services Seller warrants that Services provided by Seller will be performed with all reasonable skill, care and diligence and in accordance with standard industry practice. Seller will correct defects in Services provided by Seller and reported to Seller within ninety days after completion of such Services. Services corrected in accordance with this Section shall be subject to the foregoing warranty for an additional ninety days from the date of completion of correction of such Services.

11. **REMEDIES AND LIMITATIONS OF LIABILITY**. The remedies contained the preceding paragraph constitute the sole recourse against Seller for breach of any of Seller's obligations under the Contract, whether of warranty or otherwise. In no event shall Seller be liable for consequential damages nor shal Seller's liability on any claim for any direct, incidental, consequential or special damages arising out of or connected with the Contract, or the manufacture, sale, delivery or use of the Goods or Services exceed the purchase price of the Goods or Services. The term "consequential damages" shall include, but not be limited to, loss of anticipated profits, business interruption, loss of use, revenue, reputation and data, costs incurred, including without limitation, for capital, fuel, power and loss or damage to property or equipment. It is expressly understood that any technical advice furnished by Seller with respect to the use of the Goods is given without charge, and Seller assumes no obligation or liability for the advice given, or results obtained, all such advice being given and accepted at Buyer's risk.

12. **LIMITED INDEMNITY AGAINST INFRINGEMENT**. Seller shall, at its own expense, defend any litigation resulting from sale of the Goods to the extent that such litigation alleges that the Goods or any part thereof infringes any United States patent, copyright, or trademark, provided that such claim does not arise from the use of the Goods in combination with equipment or devices not made by Seller or from modification of the Goods, and further provided that Buyer notifies Seller immediately upon its obtaining notice of such impending claim and cooperates fully with Seller in preparing a defense. If Buyer provides to Seller the authority, assistance, and information Seller needs to defend or settle such claim, Seller shall pay any final award of damages in such suit and any expense Buyer incurs at Seller's written request, but Seller shall not be liable for a settlement made without its prior written consent. If the Goods are held to be infringing and the use thereof is enjoined, Seller shall, at its option, either (i) procure for the Buyer the right to use the Goods, (ii) replace the Goods with others which do not constitute infringement, or (iii) remove the infringing Goods and refund the payment(s) made therefor by Buyer. The foregoing states the Buyer's sole remedy for, and Seller's entire liability and responsibility for, infringement of any patent, trademark, or copyright relating to the Goods provided hereunder. **THIS LIMITED INDEMNITY IS IN LIEU OF ANY OTHER STATUTORY OR IMPLIED WARRANTY AGAINST INFRINGEMENT.**

13. **INTELLECTUAL PROPERTY RIGHTS.** All drawings, data, designs, tooling, equipment, procedures, engineering changes, inventions, trade secrets, copyrights, mask works, source code, object code, patents, patent applications, know-how, computer and/or product software and all parts thereof, trademarks and all other information, technical or otherwise which was developed, made or supplied by or for Seller in the production of any Goods or Services sold hereunder will be and remain the sole property of Seller (or its licensors, if any). Buyer agrees not to reverse engineer any Goods purchased Hereunder.

14. **EXPORT REGULATIONS.** Buyer agrees to comply fully with all laws and regulations concerning the export of goods from the United States, including, but not limited to Export Administration Rules ("EAR"), regulations of the Office of Foreign Asset Control ("OFAC"), International Traffic in Arms Regulations ("ITAR"), as well as Denial Order and Entry lists under EAR and Specially Designated Nationals and Blocked Persons list under OFAC regulations.

15. **INSTALLATION.** In those circumstances where Seller has agreed to install Goods for Buyer, the following provisions shall control:

A. Responsibility. Installation shall be by Buyer unless otherwise specifically agreed to in writing by Seller.

B. Receiving Product and Staging Location. Buyer is responsible to receive, store and protect all Goods intended for installation purposes, including, but not exclusively, siren equipment, poles, batteries, and installation materials. Materials received in cardboard containers must be protected from all forms of precipitation. Additionally, Buyer is to provide a staging area of an appropriate size for installation contractors to work from and to store equipment overnight.

C. Installation Methods & Materials. Installation is based on methods and specifications intended to meet applicable safety and installation codes and regulations. Design changes required by Buyer may result in additional charges. D. Radio Frequency Interference. Seller is not responsible for RF transmission and reception affected by system interference beyond its control.

E. Installation Site Approval. Buyer must provide signed documentation to Seller, such as the "WARNING SITE SURVEY FORM" or a document with the equivalent information, that Seller is authorized to commence installation at the site designated by Buyer before Seller will commence installation. Once installation has started at an approved site, Buyer is responsible for all additional costs incurred by Seller for redeployment of resources if the work is stopped by Buyer or its agents, property owners, or as the result of any governmental authority or court order, or if it is determined that installation is not possible at the intended location, or the site is changed for any reason by the Buyer.

F. AC Power Hookup. Buyer is responsible to coordinate and pay for all costs to bring proper AC power to the electrical service disconnect installed adjacent to the controller cabinet, unless these services are quoted by Seller. G. Permits & Easements. Seller will obtain and pay for electrical and right-of-way work permits as necessary for installations. Buyer is responsible for obtaining and payment of all other required easements, permits, or other fees required for installation, unless specifically quoted.

H. Soil Conditions Clause. In the event of poor site conditions including, but not limited to rock, cave-ins, high water levels, or inability of soil to provide stable installation to meet specifications, Seller will direct installation contractors to attempt pole installation for a maximum of 2 hours. Buyer approval will be sought when pole installation exceeds 2 hours and abandoned if Seller cannot obtain approval in a timely manner.

I. Contaminated Sites. Seller is not responsible for cleanup and restoration of any installation sites or installer equipment where contaminated soil is encountered. Seller will not knowingly approve installation at any site containing contaminates. Buyer must inform Seller when known or suspected soil contaminates exist at any intended installation site.

J. Site Cleanup. Basic installation site cleanup includes installation debris removal, general site cleanup, and general leveling of affected soil within 30' of the pole. Additional site restoration quotes are available.

K. Waste Disposal. Buyer is responsible for providing disposal of all packing materials including shipping skids and containers.

L. Work Hours. All installation quotes are based on the ability to work outdoors during daylight hours and indoors from 7 AM to 7 PM Monday through Saturday. Work restrictions or limitations imposed by Buyer or its agents may result in additional charges being assessed to Buyer for services.

M. Project Reporting. Installation & Service Progress Reports will be provided on a regular basis, normally every week during active installation, unless pre-arranged otherwise by mutual agreement.

N. Safety Requirements & Compliance. Seller requires that all subcontractors and their employees follow applicable laws and regulations pertaining to all work performed, equipment utilized and personal protective gear common to electrical and construction site work performed in the installation of Seller equipment. Additional safety compliance requirements by Buyer may result in additional charges assessed to Buyer for the time and expenses required to comply with the additional requirements.

16. **ASSIGNMENT AND SUBCONTRACTING.** Seller may assign its rights and obligations by giving Buyer written notice thereof but without being obligated to obtain Buyer's consent prior thereto. In the event of an assignment, Seller shall be discharged of any liability pursuant to those purchase orders which have been assigned or delegated. Customer may not assign its rights nor delegate its obligations under any or all of its purchase orders unless Seller's written consent is obtained prior thereto and any such assignment or delegation without such consent shall be void.

17. **DEFAULT, INSOLVENCY AND CANCELATION.** Seller shall be entitled, without prejudice to any other rights it may have, to cancel the Contract immediately, in whole or in part, by notice in writing to Buyer, if (a) Buyer is in default of any of its obligations under the Contract and fails, within 20 (twenty) days of the date of Seller's notification in writing of the existence of the default, either to rectify such default if it is reasonably capable of being rectified within such period or, if the default is not reasonably capable of being rectified within such period, to take and diligently continue action to remedy the default or (b) on the occurrence of an Insolvency Event in relation to Buyer. "Insolvency Event" in relation to Buyer means any of the following: (i) a meeting of creditors of Buyer being held or an arrangement or composition with or for the benefit of its creditors being proposed by or in relation to Buyer, (ii) a receiver, administrator or similar person taking possession of or being appointed over or any distress, execution or other process being levied or enforced (and not being discharged within seven days) on the whole or a material part of the assets of Buyer; (iii) Buyer ceasing to carry on business or being unable to pay its debts; (iv) Buyer or its equity holders or the holder of a qualifying floating charge giving notice of their intention to

appoint, or making an application to the court for the appointment of, an administrator; (v) a petition being presented (and not being discharged within 30 days) or a resolution being passed or an order being made for the administration or the winding-up, bankruptcy or dissolution of Buyer; or (vi) the happening in relation to Buyer of an event analogous to any of the above in any jurisdiction in which it is incorporated or resident or in which it carries on business or has assets. Seller shall be entitled to recover from Buyer or Buyer's representative all costs and damages incurred by Seller as a result of such default or cancelation, including all costs of collection and a reasonable allowance for overheads and profit (including but not limited to loss of prospective profits and overheads).

18. **SEVERABILITY**. If any term, clause or provision contained in the sales contract is declared or held invalid by a court of competent jurisdiction, such declaration or holding shall not affect the validity of any other term, clause or provision herein contained.

19. **NO WAIVER**. No waiver by either party with respect to any breach or default or of any right or remedy and no course of dealing or performance, shall be deemed to constitute a continuing waiver of any other breach or default or of any other right or remedy, unless such waiver be expressed in writing and signed by the party to be bound.

20. **NOTICES**. All notices and claims in connection with the Contract must be in writing.

21. **INTEGRATION**. These terms and conditions supersede all other communications, negotiations and prior oral or written statements regarding the subject matter of these terms and conditions.

22. **GOVERNING LAW AND LIMITATIONS**. The formation and performance of the sales contract shall be governed by the laws of the State of Illinois. Venue for any proceeding initiated as the result of any dispute between the parties that arises under this Agreement shall be either the state or federal courts in Cook or DuPage County, Illinois. Whenever a term defined by the Uniform Commercial Code as adopted in Illinois is used in these standard terms, the definition contained in said Uniform Commercial Code is to control. Any action by the Buyer for breach of the sales contract or any covenant or warranty contained herein must be commenced within one year after the cause of action accrued.

23. **U.N. CONVENTION**. Pursuant to Article 6 of the United Nations Convention on Contracts for the International Sale of Goods (the "UN Convention"), the Parties agree that the UN Convention shall not apply to this Agreement.

Appendix F – Warranty

FEDERAL SIGNAL

LIMITED WARRANTY POLICY

Effective October 11, 2021

Federal Signal Corporation ("Federal Signal"), subject to the terms, conditions and exceptions contained herein, warrants each NEW product to be free from defects in material and workmanship, under normal and proper use, care, maintenance and required service only. Start of Warranty, Warranty periods and exceptions to the foregoing Limited Warranty are contained on the Schedule of Products included in this document and are subject to change at the sole discretion of Federal Signal.

SPECIFIC EXCLUSIONS AND EXCEPTIONS

This Limited Warranty does NOT apply nor is it extended to products that are not manufactured by Federal Signal. These products may be covered by a separate limited warranty provided by the particular manufacturer and all claims and questions regarding the same are to be directed to the particular manufacturer. Goods sourced by Seller from a third party for resale to Buyer shall carry only the warranty extended by the original manufacturer.

Domes, lenses, lamps and batteries installed on Federal Signal products are specifically excluded. Repair or replacement of any product(s) or part(s) under this warranty does NOT extend the term of this warranty, and such product(s) or part(s) shall remain covered by the unexpired portion of the warranty period or for ninety (90) days from the date of return to Federal Signal, whichever is later. This limited warranty applies ONLY to the initial or first installation of the product. This limited warranty shall not apply to products (1) that have been subjected to neglect, abuse, misuse, improper installation, inadequate maintenance, or damage due to improper use of cleaning or cleaning materials or chemicals, or non-compliance with Federal Signal's storage, installation, operation, maintenance or environmental requirements; (2) that have undergone any modification or repair not previously authorized by Federal Signal in writing, or service, repair or modification by or from any facility other than an authorized Federal Signal service center or technician, or that use non-authorized software or spare or replacement parts; or (3) that fail due to reasonable and normal use or wear and tear, or materials made, furnished or specified by the Buyer or end user.

During the specific warranty periods set forth below, Federal Signal will, at its sole option, repair or replace the product(s) or particular part(s) that are found to be defective in either material or workmanship or, in its sole discretion refund the purchase price for such product(s) or part(s), which are returned or delivered, transport or shipping prepaid by the Buyer or end user, to either Federal Signal or its designated and authorized warranty service center. This limited warranty does not cover travel expenses, the cost of specialized equipment for gaining access to the product(s) or part(s), or labor charges for removal and re-installation of the product.

No person or affiliated company representative is authorized to alter the terms of this warranty, to give any other warranties, to extend the term or duration of this warranty, or to assume any other liability on behalf of Federal Signal in connection with the sale, servicing or repair of any product manufactured by the Federal Signal.

Federal Signal reserves the right to make design changes and improvements in its products without imposing any obligation upon itself to change or improve previously manufactured products.

The use in the product of any part other than parts approved by Federal Signal may invalidate this warranty. Federal Signal reserves the right to determine, in its sole discretion, if the use of non-approved parts invalidates this warranty.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, AND REGARDLESS OF ANY FAILURE OF ESSENTIAL PURPOSE. ALL OTHER WARRANTIES OF WHATSOEVER KIND AND NATURE, WHETHER EXISTING IN CONTRACT OR AT LAW, ARE HEREBY AND FOREVER DISCLAIMED.

UNDER NO CIRCUMSTANCES WILL FEDERAL SIGNAL BE LIABLE OR RESPONSIBLE FOR SPECIAL, COMPENSATORY, INCIDENTAL, CONSEQUENTIAL OR PUNITIVE DAMAGES, LOST PROFITS, LOST SALES, OR LOSS OF USE OR LOSS OF BUSINESS OPPORTUNITY BY OR THROUGH THE USE OF THE PRODUCT. FEDERAL SIGNAL'S SOLE AND MAXIMUM LIABILITY WITH RESPECT TO THE PRODUCT, OTHER THAN ITS OBLIGATIONS SET FORTH ABOVE, SHALL BE THE TOTAL PURCHASE PRICE PAID FOR THE PRODUCT.

FEDERAL SIGNAL

LIMITED WARRANTY— schedule of products

Federal Signal Corporation – Public Safety Systems Division (Police, Fire/EMS, Work Truck)

	Warranty Period for Parts replacement from the date of manufacture stamped on the product	Warranty period for Factory Labor from the date of delivery to the first user-purchaser
STANDARD WARRANTY COVERAGE		
AUDIBLE		
Mounts, brackets, all other products not specifically listed below	3 years	3 years
Speakers	2 years	1 year
Platinum 3000 Series	5 years	5 years
Pathfinder	5 years	5 years
LED Products		
All LED (Light Emitting Diode) products unless otherwise noted	5 years	5 years
LED rotating light assemblies from all light bars and beacons	5 years	5 years
MicroPulse LED lights (shipped prior to January 1, 2021)	3 years	3 years
MicroPulse LED lights (shipped on or after January 1, 2021)	5 years	5 years
416300 Series (shipped prior to January 1, 2021)	3 years	3 years
416300 Series (shipped on or after January 1, 2021)	5 years	5 years
MB1 LED Message Board	3 years	3 years
Commander Series Flex	2 years	2 years
COM550, COM750, COM1200	3 years	3 years
4200S, 8200S, 8200S SignalMaster, 8200S SignalMaster Arrow	3 years	3 years
STROBE PRODUCTS		
Strobe flash tubes	1 year	1 year
OTHER PRODUCTS		
Littlite Map lights	5-year warranty on LED components Limited lifetime warranty on mechanical components	5-year warranty on LED components Limited lifetime warranty on mechanical components
CAM Reverse Camera/Monitor Systems	3 years	3 years
Stinger Spike Systems	5 years	5 years
PBX Series	3 years	3 years
Perimeter Light Programmer	1 year	1 year
DOT Flasher	3 years	3 years
Atkinson Dynamics Intercoms	2 years	1 year

Note: Domes, lenses, lamps, and batteries are NOT covered under warranty.

FEDERAL SIGNAL

Federal Signal Corporation – Systems Division

PRODUCT*	WARRANTY PERIOD FOR PARTS REPLACEMENT AND FACTORY PERFORMED LABOR**
Mechanical Siren	5 years parts and labor from date of delivery, return to factory for service
2001-130 / 508-128 / Equinox	
Eclipse8 / Model 2	
ELECTRONIC SIRENS	
MOD1004B / MOD2008B / MOD3012B	2 years parts and labor from date of delivery, return to factory for service
MOD4036B / MOD5020B / MOD6024B	
MOD8032B	
DSA2/3/4/5/6	
CONTROLLERS	
SS2000+	2 years parts and labor from date of delivery, return to factory for service
FC Controllers	
DCFCTBD Controllers	
UV/UVRI / UVIC Controllers	
SIGNALING DEVICES	
Beacons / Speakers / Sounders	5 years parts and labor from date of delivery, return to factory for service
ECHO Intercoms	
SelecTone Controllers	
AudioMaster products	
Atkinson Products	2 years parts and labor from date of delivery, return to factory for service
MISCELLANEOUS	
IP Informers / Radio Informers	1 year parts and labor from date of delivery, return to factory for service
FT400BX	
OEM PRODUCTS (SUCH AS)	
PC Equipment	Federal Signal utilizes the original manufacturer's warranty
Field Devices	
Security and LPR products	
Batteries	
UPS Systems	
PABX Systems	
PAGA	
PAGA	18 months from shipment or 12 months from commissioning/system field acceptance whichever is sooner covering parts and labor, return to factory for service
SOFTWARE	
Commander (SFCD-XX)	Free from defects for 12 months from date of acceptance, Software Maintenance Agreements available
SmartMsg	

Federal Signal offers extended warranties and software maintenance agreements – contact Federal Signal for further information

****On-site services not included**

***** Domes, lenses, lamps and batteries installed on Federal Signal products are specifically excluded**

When Federal Signal has provided a turn-key installation including optimization and/or com-missioning services, Federal Signal will provide on-sit warranty service during the first 60-days after completion of the installation.

FEDERAL SIGNAL

Federal Signal Corporation – Signaling Division

PRODUCT TYPE	WARRANTY PERIOD FOR PARTS REPAIR OR REPLACEMENT
VISUAL SIGNALS	
Battery Powered Lights	5 years parts and labor from date of delivery. Return to factory for service.
Incandescent Beacons	
LED Beacons	
Panel Mount Lights	
Status Indicators/Stack Lights	
Strobe Beacons	
AUDIBLE DEVICES	
Back-up Alarms	5 years parts and labor from date of delivery. Return to factory for service.
Bells	
Horns	
Intercoms (excludes Atkinson Dynamics)	
Sirens (Model A, L, eSiren)	
Sounders	
Speakers	
Voice Guns	
MISCELLANEOUS	
Amplifiers	5 years parts and labor from date of delivery. Return to factory for service.
Audible/Visual Combination Signals	
Audible and Visual Accessories	
AudioMaster products	
Audio Routers	
Extension Ringers	
Fire Alarms	
Initiating Devices	
Mounts and Brackets	
Power Supplies	
SelecTone• Tone Modules, Connector Kits, Controllers and Command Units	
ATKINSON DYNAMICS	
Intercoms	2 years parts and labor from date of delivery. Return to factory for service.
Speakers	

FOR ALL RETURNS TO FACTORY FOR SERVICE, CONTACT FACTORY AT 708-534-4756, OR BY EMAIL IORDERSUO@FEDSIG.COM

Appendix G – Test Report

FEDERAL SIGNAL
Safety and Security Systems
Advancing security and well-being.

2645 Federal Signal Drive
University Park, Illinois 60484-0975
800.548.7229
alertnotification.com

MEMORANDUM

To: John Von Thaden

From: Scott Cassidy

Date: June 2, 2011

Subject: 2001-130 Acoustic Test Reports

John,

We have two test reports for the 2001-130 siren from Shiner and Associates, Inc (Acoustic Engineering Consultants, Chicago IL).

The May 27, 2010 test report was performed in a certified fully anechoic environment under controlled conditions. Anechoic chamber testing is the most reliable and repeatable method to measure an acoustic device and is accepted by FEMA. This test indicates that the Federal Signal 2001-130 siren produces a sound pressure level of 147 dBC at a distance of 10 ft which is equivalent to a sound pressure level of 130 dBC at a distance of 100 ft (outdoor).

The June 1, 2011 ANSI S12.14 outdoor test report test report was also created by Shiner and Associates. This test was conducted at both 100' and 300' on axis. The test indicates that the 2001-130 siren produces a sound pressure level of 119 dBC at a distance of 300 ft which is equivalent to a sound pressure level of 128.5 dBC at a distance of 100 ft (outdoor).

We attribute the difference in the two tests to be related the 3dB ground reflection added to the calculation for the 100' outdoor rating based on the 10' anechoic measurement. The 3dB ground reflection was not obtained at all in the 100' and only partially obtained in the 300' outdoor measurement. The lower outdoor readings are attributed to the tight radiation pattern of the 2001-130 that improves the long distance warning capability of the siren but diminishes the near field sound level and environmental effects of testing outdoors. Additional details are contained in the respective test reports.

SCassidy

Scott Cassidy

Director of Engineering

Federal Signal Corp.

Attachments:
June 1, 2011 2001-130 Test Report
May 27, 2010 2001-130 Test Report

Shiner + Associates, Inc.
Acoustical Engineers
225 W. Washington St. - Suite 1625, Chicago, Illinois 60606
Phone 312 849-3340 Fax 312 849-3344 www.shineracoustics.com

Federal Signal Corporation
2645 Federal Signal Drive
University Park, IL 60466

May 27, 2010

Attn: Mr. Scott Cassidy

Re: Witness of Acoustical Testing of a Federal Signal 2001-130 Siren in the Federal Signal Anechoic Chamber

Dear Mr. Cassidy:

Shiner + Associates, Inc. is an employee owned acoustical engineering firm established in 1973. We are an Illinois registered Professional Design Firm – Professional Engineering Corporation specializing in Environmental, Building and Industrial Acoustics.

On the morning of May 24, 2010, we witnessed the acoustical testing of a Federal Signal 2001-130 Electro-Mechanical Siren in the Federal Signal anechoic chamber located in the University Park, IL facility. The purpose of this testing was to verify anechoic chamber test results used to calculate outdoor siren performance on axis at a distance of 100 ft.

Executive Summary

The Federal Signal 2001-130 siren produces a sound pressure level of 147 dBC at a distance of 10 ft (anechoic) with a fundamental frequency of 788 Hz at an operating voltage of 46 VDC, which is equivalent to a sound pressure level of 130 dBC at a distance of 100 ft (outdoor).

Testing Procedure

The siren under test was placed inside the Federal Signal anechoic chamber. The measurement microphone was located on a microphone stand on-axis at the centerline height of the horn at a distance of 10 ft. Distance was measured from the siren horn to the microphone grid. Siren input voltage was adjusted to 46 VDC using a transformer and allowed to operate for a minimum period of one minute. Calibration of the instrumentation chain was verified using a pistonphone calibrator before and after the measurements. All personnel remained external to the chamber during the tests. Testing was repeated and results were replicated using Shiner + Associates, Inc. instrumentation.

The Federal Signal anechoic chamber is comprised of 18-inch fiberglass wedges installed on six sides of the room. The chamber measures 24x16x12 ft (tip to tip) with an effective volume of 4,600 cu ft. American National Standards Institute ANSI S1.13-1971, *Methods for the Measurement of Sound Pressure Levels* was referenced for the measurements.

The following Federal Signal instrumentation was used: B&K 4191 1/2" condenser microphone, extension cable, B&K 2636 measurement amplifier, B&K 4220 pistonphone and Maximum Length Sequential Spectrum Analyzer (CLIO). The following Shiner + Associates, Inc. instrumentation was used: Larson Davis 2900B real time analyzer, LD 2560 1/2" condenser microphone, LD 900B measurement preamplifier, LD CA-250 microphone calibrator. All instrumentation has been recently calibrated as labeled. The equipment meets the requirements specified by the American National Standards Institute ANSI S1.4-1983 (R2006)/ANSI S1.4a-1985 (R2006), *American National Standard Specification for Sound Level Meters* and (ANSI A 1.43-1997 (R2007), *Specifications for Integrating-Averaging Sound Level*

Meters.

Testing was conducted between 10:10 and 10:30 a.m. on Monday, May 24, 2010. Chamber temperature was 78° F and relative humidity was 60 %.

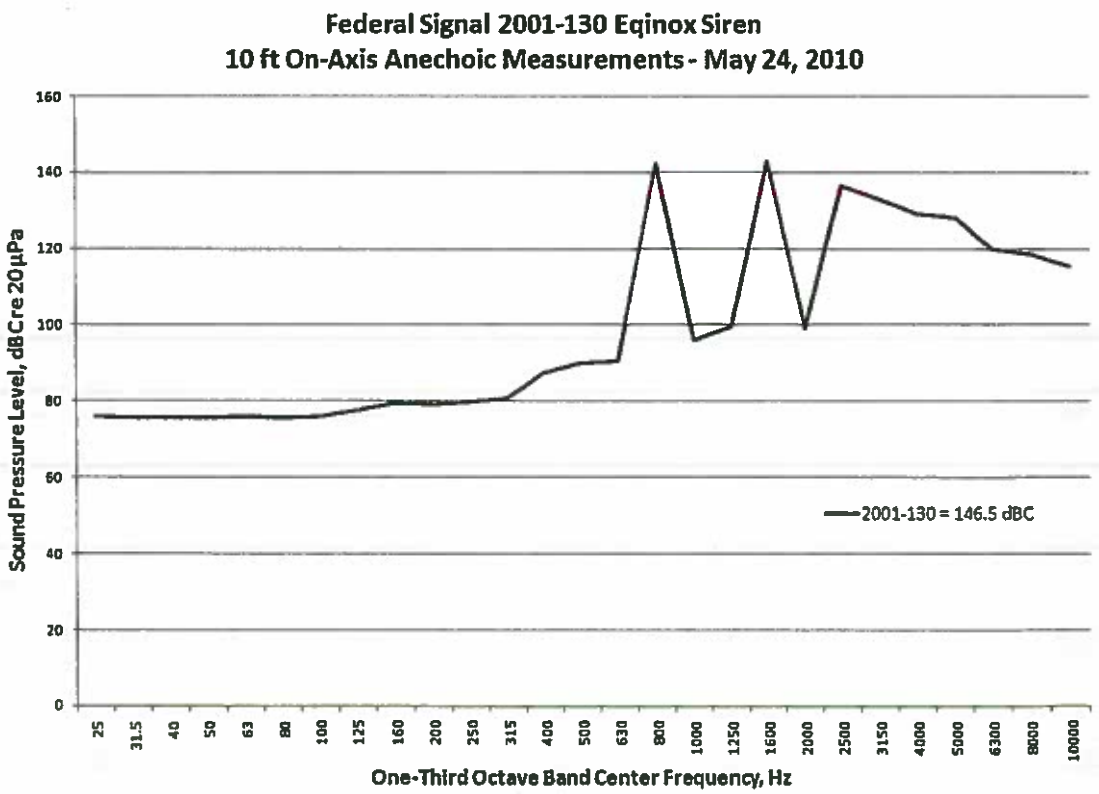
Methodology

Outdoor acoustical measurements are subject to external environmental effects (primarily wind and ground surface effects). Anechoic chamber testing is a highly recognized method for testing sound pressure levels since it results in true source output without any effect by the external environment or reflective surfaces.

Anechoic chamber test results can be extrapolated to ratings at distances of 100 ft or greater. A loss factor of 6 dB per doubling of distance is used for hemispherical sound propagation and a ground reflection factor of 3 dB is added to anechoic chamber results. Thus, 17 dB should be subtracted from measurements in an anechoic chamber at 10 ft to determine the 100 ft outdoor on-axis rating.

Results

One-third octave band center frequency spectra resulting from Shiner + Associates, Inc. testing are shown in the following figure:



The reported anechoic sound pressure level of 147 dBC at 10 ft represents the sum of energy in all frequency bands after the C-weighting correction has been applied.

If you have questions regarding this report, please do not hesitate to contact us.

Very truly yours,

Shiner + Associates, Inc.

Brian L. Homans

BLH/mo/07

Shiner+Associates, Inc.

Acoustical Engineers
225 W. Washington St. - Suite 1625, Chicago, Illinois 60606
Phone 312 849-3340 Fax 312 849-3344 www.shineracoustics.com

Federal Signal Corporation
2645 Federal Signal Drive
University Park, IL 60466

June 1, 2011

Attn: Mr. Scott Cassidy

Re: 2001-130 – Results of Acoustic Measurements

Dear Mr. Cassidy:

On the morning of May 27, 2011, we conducted acoustical measurements of a Federal Signal 2001-130 warning siren. The C-weighted sound pressure level of the DC electro-mechanical warning siren was measured in the paved employee parking lot on the property of the Federal Signal plant. On-axis readings were taken at an elevation of approximately 43 feet at separating distances of 300 and 100 feet. A boom lift was used to sample the data.

Test Siren

A Federal Signal model 2001-130 DC single tone rotating electro-mechanical warning siren was mounted on a telephone pole at an approximate height of 43 feet above ground level. This siren was operated from batteries for this test. The siren was stationary and was not rotated during these measurements. The siren was located approximately 330 feet east of the Federal Signal plant. The siren was activated from the control box at the base of the pole for periods of at least 3 minutes per test.

Instrumentation

A Norsonic model 140 precision sound level meter was used for this test. This meter conforms to Type 1 requirements of ANSI S1.4-1983. The Norsonic model 1255 1/2 inch condenser microphone and Norsonic model 1209 microphone preamplifier were connected to the meter via a 10 meter extension cable and protected with a 4 inch windscreen. The microphone and preamplifier were connected to an extendable fiberglass boom.

The sound level meter was programmed to continuously record data for a period of one minute. Several one minute readings were taken every time the siren was sounded. Every 1/4 second, the slow-weighted maximum and average (Leq) sound pressure level were logged in one-third octave bands over the frequency range of 6.3 to 20,000 Hz.

System calibration was verified before and after the siren measurements with a Norsonic model 1251 sound calibrator at a level of 114 dB at 1,000 Hz.

Weather Conditions

Wind was blowing approximately 6-8 mph from the north during the entire test. The skies were overcast and there was no precipitation. Temperature ranged from 50° to 52° F and the relative humidity remained constant at 65%.

Site Conditions

The measurements were conducted over the paved parking lot east of the Federal Signal plant in University Park, Illinois. The site has a permanently mounted telephone pole at this location.

A 30 foot high, 40 foot diameter water tank was located 25 feet south-southeast of the siren. Readings were taken southwest of the siren to minimize effects of the water tank.

Ambient Sound Conditions

The ambient sound level averaged 72 dBC before and 75 dBC after the testing and was due to the idling boom lift. Because this level is at least 10 dB below the level of the siren being measured, there was no contribution from the ambient environment.

Measurement Procedure

Measurements were conducted in accordance with ANSI S12.14-1992 (2007). In addition to readings taken at a 100 foot separation distance, 300 foot readings are also reported.

As permitted by ANSI S12.14, the microphone was slowly swept over a 2 foot radius in the vertical plane perpendicular to the siren in an attempt to find the maximum C-weighted sound pressure level. The boom lift was repositioned several times during the measurements.

Following the boom lift measurements, the sound level meter and microphone were held by hand at a height of 5 feet above ground level. The siren was sounded again and the observer walked slowly southwest from the base of the siren to the 100 foot boom lift measurement position. The distance where the maximum C-weighted sound level was reached was noted.

Results

Tables 1 and 2 present C-weighted sound pressure level measurements at an elevation of 43 feet and separating distances of 300 and 100 feet, respectively. Results for the bystander ground level tests are shown in Table 3.

Figures 1-2 present results at a separation distance of 300 feet and Figures 3-5 present results at a separation distance of 100 feet in terms of maximum C-weighted sound pressure level versus time. Figure 6 shows the bystander measurement results. The ANSI S12.14 data sheet is provided at the end of this report.

Table 1. Federal Signal 2001-130 Electro-Mechanical Siren
Measured On-Axis at 300 foot Distance
Elevated to Level of Siren (43 feet)

Position	Time	Maximum Sound Level (slow), dBC re 20 µPa
1	9:17:36	119
3	9:46:15	119

Table 2. Federal Signal 2001-130 Electro-Mechanical Siren
Measured On-Axis at 100 foot Distance
Elevated to Level of Siren (43 feet)

Position	Time	Maximum Sound Level (slow), dBC re 20 µPa
	10:30:53-10:30-54	
	10:30:58	
	10:31:20	
5	10:31:48	124
	10:32:01	
	10:32:15	
	10:32:40	

Table 3. Federal Signal 2001-130 Electro-Mechanical Siren Measured On-Axis at Varying Distances Measured at 5 feet above ground level

Position	Time	Maximum Sound Level (slow), dBC re 20 µPa	Distance at Which Maximum was Obtained, feet
7	10:50:46	122	74

Interpretation

ANSI S12.14 specifies a measurement distance of 100 feet to minimize the effects of the environment. The outdoor 100 foot measurement includes the direct on-axis sound plus the reflected sound bounced off the ground (typically 3 dB). We believe the relatively higher sound level measured at 300 feet compared to 100 feet is attributed to the additional ground reflection obtained at the 300 foot distance that was not obtained at the 100 foot distance.

Modern siren designs are optimized for long distance sound projection by concentrating sound in a directional pattern so energy is not wasted into the sky or to the ground in close proximity to the siren. A directional sound source will receive less ground reflection at 100 feet when compared to a wider dispersion sound source. Measuring a directional sound source at a greater distance and extrapolating back to 100 feet provides a way to compare both sound source designs.

At an outdoor receiver, sound is attenuated at a rate of 6 dB per doubling of distance without including the excess attenuation from environmental conditions. A 6 dB per distance doubled loss factor is appropriate for calculating the relative sound levels within 300 feet of the siren.

Conclusion

The maximum observed sound level at 300 feet and elevated to the height of the siren was found to be 119 dBC. This is equivalent to a sound level of 128.5 dBC at 100 feet. The lower measured sound level at 100 feet (124 dBC) may be attributed to incomplete beam formation from the direct and reflected pressure waves at this close distance.

Bystanders would be exposed to a maximum level of 122 dBC at a distance of 74 feet from the base of the siren.

If you have questions concerning this report, please do not hesitate to contact us.

Respectfully submitted,

Shiner + Associates, Inc.

Brian L. Homans

BLH/mo/07

Siren Sound Output Measurement Data Sheet

Siren Mfg: Federal Signal Model No: 2001-130 S/N:

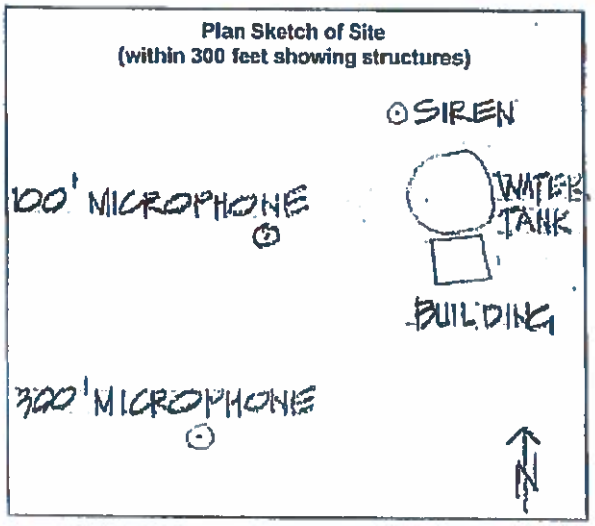
Description: Single tone electro-mechanical rotating warning siren

Meas. Loc. Federal Signal employee parking lot, southeast of plant

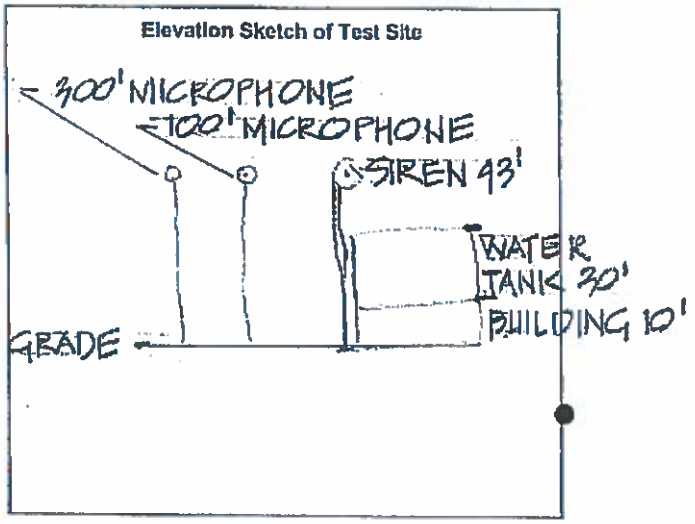
Date: May 27, 2011 Time: 9:11 to 10:52 By: Brian Homans Title: President

Temp 52 °F Wind speed: 6-8 mph Wind Dir: N Clouds 100 % Precip. (Y/N)? N

Plan Sketch of Site
(within 300 feet showing structures)



Elevation Sketch of Test Site



Mfg rec'd mtg. height: 40 feet Actual height: 40 feet Method: Pole Power correct (Y/N)? Y(46 VDC)

Ground type & cover between siren and meas. loc. Blacktop pavement with intermediate gravel median

Deviations from test procedure: The test data were recorded at 300 feet instead of 100 feet because of the highly directive sound pattern produced by the siren.

SLM Mfg: Norsonic	Model No: 140	S/N 1403593	Pri Cal Date: 7/16/2010
Filter Mfg: Norsonic	Model No: 140	S/N 1403593	Pri Cal Date: 7/16/2010
Calib Mfg: Norsonic	Model No: 1251	S/N 32398	Pri Cal Date: 7/16/2010

Field Calibration: Before 114.0 After 114.0

Max ambient: Before 72 dBC slow After 75 dBC slow

Ambient LEQ: (> 1 minute) 75 dBA slow

	Base Line Position	Secondary Position (if used)
Siren Sound:	Alert	Alert
MXSCL (max dBC, slow):	119 dBC @ 300'	
Average SCL(LEQ), dBC slow:	115 dBC @ 300'	
Max 1/3 octave band, Hz:	800	
MXSCL in max 1/3 octave band, dBC slow:	117 dBC @ 300'	
Average SCL in max 1/3 octave band, dBC slow:	113 dBC @ 300'	
Bystander MXSCL, dBC slow	122	
Dist of bystander MXSCL from mount, feet	74	

Siren Sound Output Measurement Data Sheet

Other pertinent information: The calculated equivalent 100 foot reading is obtained by adding 9.5 dB to 300 foot measured results based on the following formula:

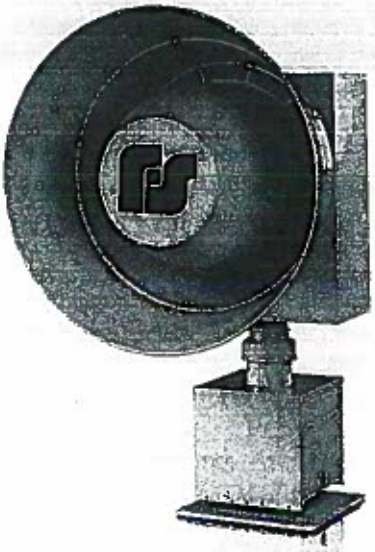
Change in sound pressure level = $20 \times \log_{10}(D_2/D_1)$

$9.5 \text{ dB} = 20 \times \log_{10}(300 \text{ feet}/100 \text{ feet})$

Therefore, the equivalent 100 foot rating based on the 300 foot measurement is: 119 dBC + 9.5 dB = 128.5 dBC.

Appendix H – Data Sheets

FEDERAL SIGNAL



▶ Model 2001-130 and Equinox

High Power, Directional Rotating Siren

The Federal Signal 2001-130 and Equinox sirens is a high power, rotating, unidirectional outdoor warning siren. The high-decibel output provides maximum coverage with minimum installation cost. Radio/cellular/satellite or wireless IP activation can further minimize installation costs by eliminating the need for leased dedicated control lines.

The siren's projector produces a 60-degree projection of sound which rotates at 3 RPM and can produce three distinct warning signals: steady, wail and fast wail. The siren will supply a minimum of 15 minutes of full power output from its batteries after AC power loss. The siren controls are available with battery operation, solar, AC operation, and AC operation with battery back-up, one-way and two-way radio control, wired or wireless Ethernet, satellite/cellular or landline. The 2001 Series is offered in low frequency (500 Hz) or mid-range frequency (790 Hz).

Ideal applications for this warning siren include hazardous weather conditions, fires, floods, chemical spills and other types of community or facility emergencies.

FEATURES

- High-powered rotating siren for maximum coverage
- Available in low and mid-range frequency
- Three distinct warning signals
- AC or Solar powered with battery operation or back-up
- Weather-resistant coating

High Power, Directional Rotating Siren (2001-130/Equinox)

SPECIFICATIONS

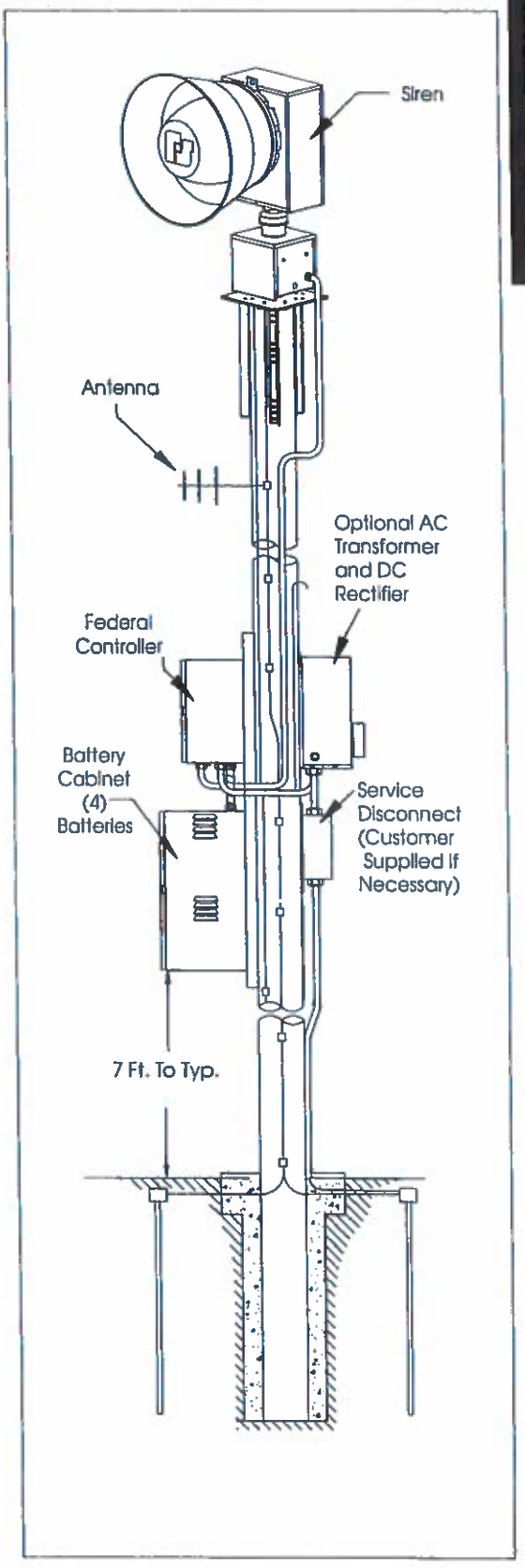
Power:[1]
Sirens can be powered from 120VAC, 240VAC, with battery back-up or battery operation. Solar powering can also be provided

Signal Information:	**2001-130**	**Equinox**
Signal /Sweep Rate	Frequency Range	500 Hz
Steady /Continuous	790 Hz	
Wail /10 sec.	470-790 Hz	180-500 Hz
Fast Wail /3.5 sec.	600-790 Hz	300-500 Hz
Coverage:[2]	**2001-130**	**Equinox**
70dB	Up to 6,500'	Up to 6,100'
60dB	Up to 13,200'	Up to 12,200'

Pole Mounts:
Wood, steel, composite or concrete poles can be provided. Contact Federal Signal for details

Communications:
Federal Signal can supply one-way and two-way communications. Radio, IP, Landline, Satellite and Cellular can be combined to provide a robust alerting solution

Operating Temperature:[3]	-22°F to 140°F	-30°C to 60°C
Dimensions H x W x D:		62" x 37" x 41" (157 cm x 94 cm x 104 cm)
Net Weight:	420 lbs	190 kg
Shipping Weight:	460 lbs	205 kg
Equinox Net Weight	390 pounds	159 kg
Equinox Shipping Weight	460 pounds	205 kg



HOW TO ORDER

Contact our Federal Signal Sales Engineers to design a system that meets your specific requirements.

Description	**Part Number**
Siren Ordering Information:	
Rotating electro-mechanical siren 130 dBc +/- 1dBc @ 100' (30.5m) 48VDC, pole mount included	**2001-130**
Rotating electro-mechanical siren, low frequency, 125 dBc +/- 1dBc @ 100' (30.5m) 48VDC, pole mount included	**Equinox**
Siren Control Ordering Information:	
One-way FC Controller, 120VAC operation	**FC/H/U**
Two-way FC Controller, 120VAC operation	**FCTBD/H/U**
One-way FC Controller, 120VAC to battery operation	**DCFCB/H/U[4]**
Two-way FC Controller, 120VAC to battery operation	**DCFCTBD/H/U[4]**
Command and Control for Multiple Siren Installation:	
Console for siren activation (R for rack mount)	**SS2000+/R**
Commander software for PC based siren activation, monitoring and control	**SFCD[5]**

[1] Contact Federal Signal for powering options
[2] Actual coverage is dependent on many factors, contact Federal Signal for sound analysis of your specific location
[3] The siren can operate throughout this temperature range provided that battery temperature is maintained at 18°C or higher
[4] Batteries not included
[5] See product page for additional information

FEDERAL SIGNAL

▶ SS2000+ Series C

Local Hardware Activation Point

The SS2000+ Series C web enabled controller is Federal Signal's most advanced stand-alone control unit. The SS2000+ typically interfaces to an analog or digital radio system to provide radio activation of sirens across a county, municipal, campus or industrial facility. The SS2000+ has 24 programmable activation button "hotkeys" secured with a keylock switch and 20 contact closure inputs for interfacing with remote control systems. The hotkeys can provide specific types of warnings or test activations to notify residents, employees or students. The 24 Hotkeys are now accessible from a variety of interfaces using a new web interface. The new web interface can provide improved redundancy allowing multiple SS2000+ units to be used as on-line back-ups. Advanced networking features enable the SS2000+ to be connected to Federal Signal's Commander® control and status monitoring software. In addition, the SS2000+ can now connect directly to Federal Signal's CommanderOne® cloud service for secure web access to hotkeys, messaging and automated activation from NOAA EAS events.

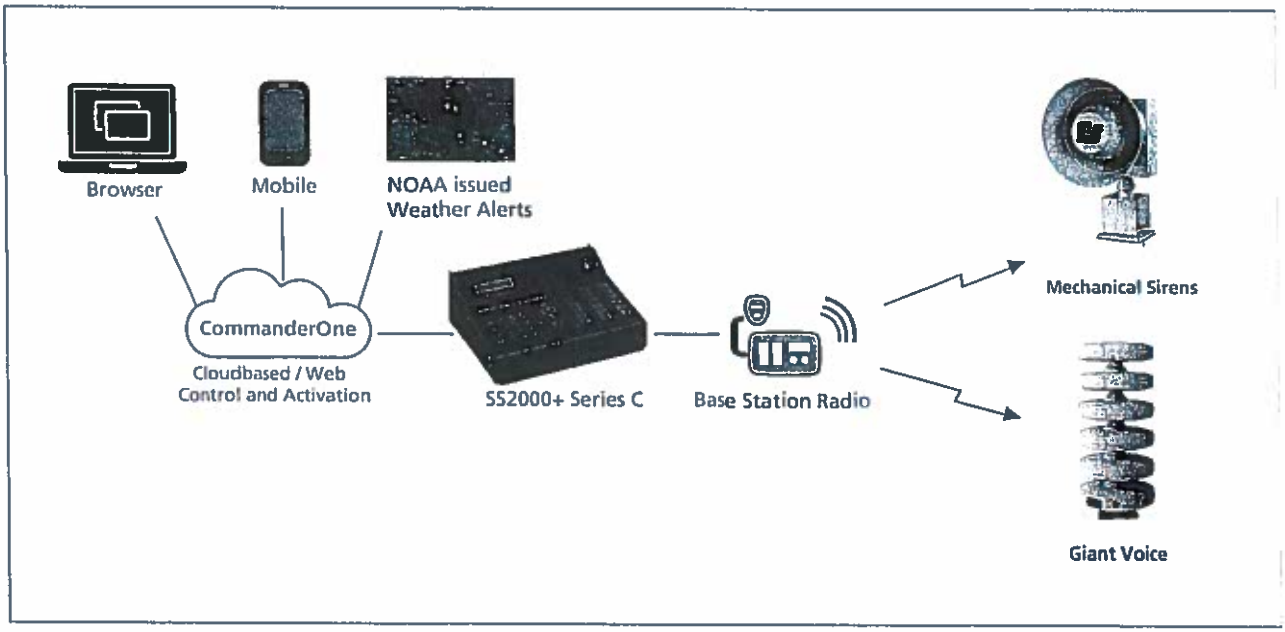
The SS2000+ can be used to as an encoder for one-way siren control. Previously using a SS2000+ allowed activation only from the front panel hotkeys, the physical interfaces or from a connected PC. The SS2000+ now provides siren activation from CommanderOne NOAA® EAS events/polygons, from a mobile app or from a web browser over the Internet.

FEATURES

- 24 command function hot keys with key-lock protection
- 20 remote activation inputs
- Dispatch console interface via URL
- Ethernet port for control over inter-company or intra-company LAN
- Interface to CommanderOne® web service for polygon and mobile activations
- MODBUS TCP Industrial Control Interface
- Microphone interface for Live PA
- Redundant source of command and control
- User Access Security with Digest Authentication
- Remote firmware update capability over LAN
- Computer Access Whitelist Feature
- SSL and AES data Encryption
- Compatible with radio two-tone EAS and DTMF, AFSK encoding
- Three Configurable Relay Outputs
- Streams WAV files from Commander® PC
- Built-in communication monitor speaker
- Radio level indicators simplify field adjustments
- Battery backed real time clock
- Back-lit LCD Display
- Desk and 19" rack mount versions available
- Offered in 120 and 240VAC, with EU or UK versions available

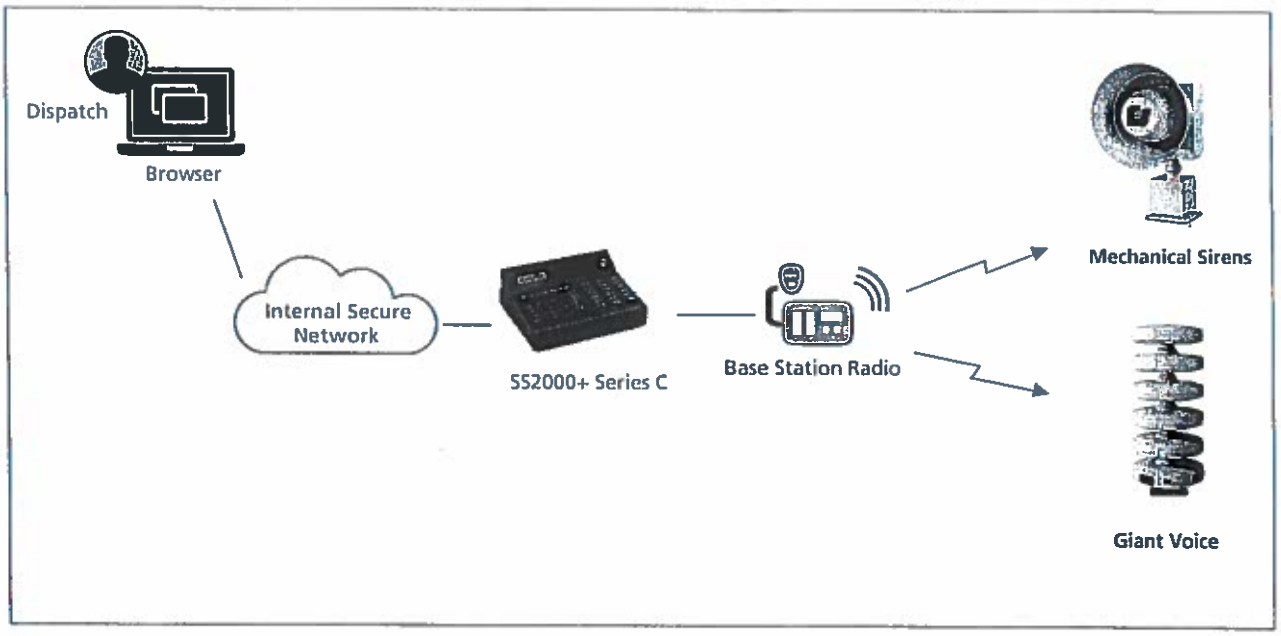
PC Freedom

Typical siren control systems rely on dedicated PC's or servers for activation. PC's can be difficult to maintain with updates and security concerns. Now you can have many of the features provided from a PC without the need to have a PC dedicated to activating your siren system. In addition, PC's can be a single point of failure within your siren control system. The SS2000+ can now interface to our CommanderOne control system and eliminate the need for a dedicated PC for siren control.



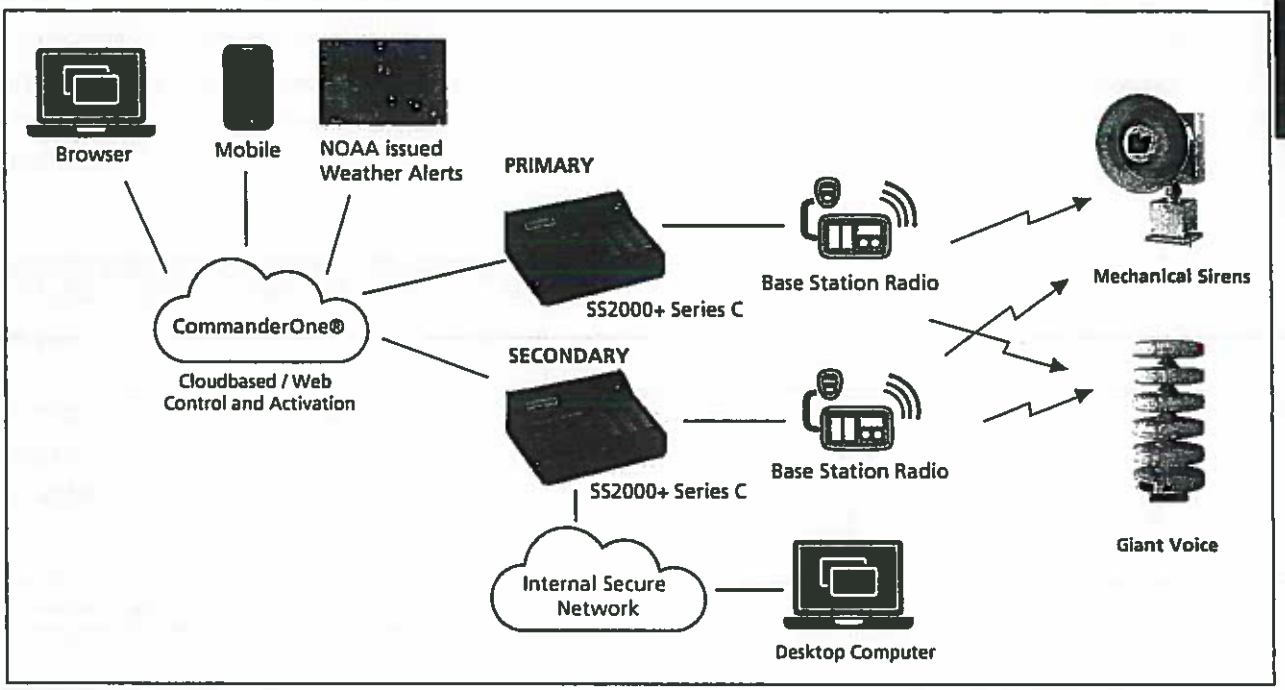
ACCESS VIA URL

Dispatch consoles can now access the SS2000+ from a new built-in web server that allows the SS2000+ to be controlled and configured over a LAN using standard web browsers. This interface can provide users within a secure company network to access the SS2000+ Hotkeys from standard web browsers (Chrome, Edge or Firefox) on the company local area network.



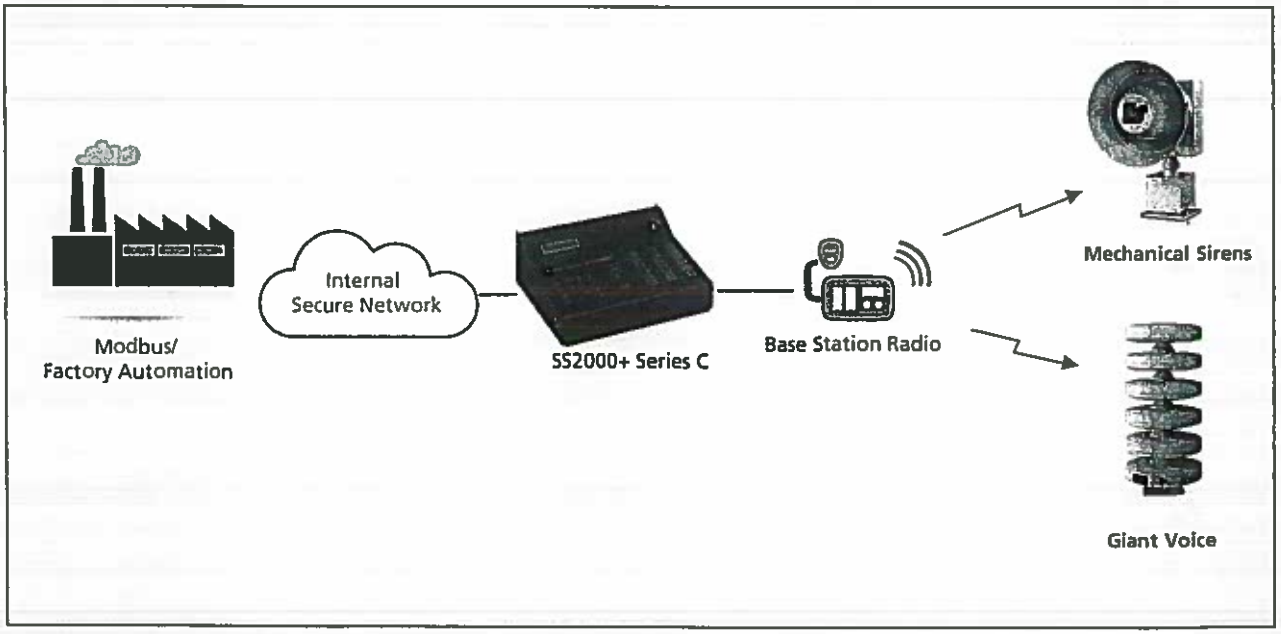
Web Enable Radio Controlled Sirens

The SS2000+ can be used to as an encoder for one-way siren control. Previously using a SS2000+ allowed activation only from the front panel hotkeys, the physical interfaces or from a connected PC. The SS2000+ now provides siren activation from CommanderOne NOAA EAS events / polygons, from a mobile app or from a web browser over the Internet.



MODBUS Control

The SS2000+ has a MODBUS interface to easily interface with Industrial Control Systems. MODBUS TCP is used to provide activations into an SS2000+ for specific warning announcements across an industrial plant. Users can activate the system using the SS2000+ or industrial control systems can activate the hotkeys.



SPECIFICATIONS

Operating Temperature:	32° F to 140°F	0° to 60°C
Line Input 120/240VAC* wall transformer power supply		
Power Supply Input Voltage:	12-30 VDC (12 VDC minimum)	
Input Current	300 mA (Standby 700 mA max.)	
Distortion	< 3.0%	
Ethernet	RJ-45 port, TCP/IP	
Microphone:		
Input Level	10mV - 150mV p-p	
Input Impedance	10k Ohms	
Input Jack	XLR Male	
Type	Dynamic	
Speaker:		
Power	1 watt	
Impedance	8 Ohms	
Audio Interface:		
Audio Output	Balanced 600 Ohms	
Audio Input	Balanced 600 Ohms	
Decode Sensitivity	< 8-10 dBc S/N or 12 dBc SINAD	
Relay Outputs	2A at 30VDC / 0.5 at 120VAC	
Dimensions H x W x D:		
Desk Mount	3.59" x 11.59" x 9.53" 91.8 mm x 294.4 mm x 242.1 mm	
3U Rack Mount	5.19" x 19" x 10.10" 131.8 mm x 482.6 mm x 256.5 mm	
Shipping Weight: Desk Mount	6 lbs	3 kg
Shipping Weight: Rack Mount	8 lbs	4 kg

* The SS2000+ Power Supply can be ordered with a US 120VAC or UK/EU 240VAC Power Cables, see description models.

HOW TO ORDER

Contact our Federal Signal Sales Engineers to design a system that meets your specific requirements.

Considerations for system configuration:

Description	Part Number
Desk mount Local Activation Point, US	**SS2000+**
Rack Mount Local Activation Point, US	**SS2000+R**
Desk Mount Local hardware activation point, EU	**SS2000+EU**
Desk Mount Local hardware activation point, UK	**SS2000+UK**
Noise Canceling Microphone	**MNC-MNS** [1]
CommanderOne Cloud Service	**COMMANDER1LE**

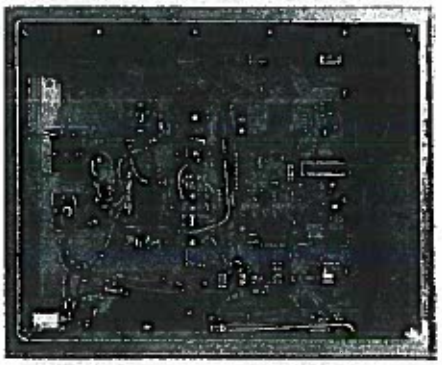
REPLACEMENT PARTS

Description	Part Number
SS2000+ Power Supply with US Cable	**Q-SSPWR**
UK 240VAC Power Cable [2]	**Q17501252A**
EU 240VAC Power Cable [2]	**Q17501253A**
SS2000+ Kenwood Radio Cable	**Q17500863-01**

[1] Noise canceling microphone model MNC-MNS replaces the microphone on early revision models of SS2000+. Model MNC-MNS is supervised for compatibility with UL2572.

[2] While there are no EU/UK rack mount models, the rack mount SS2000+R can be ordered with the appropriate replacement power cable, if needed.

FEDERAL SIGNAL



▶ Model DCFCTBD

Two-Way Digital Controller for Electro-Mechanical Sirens

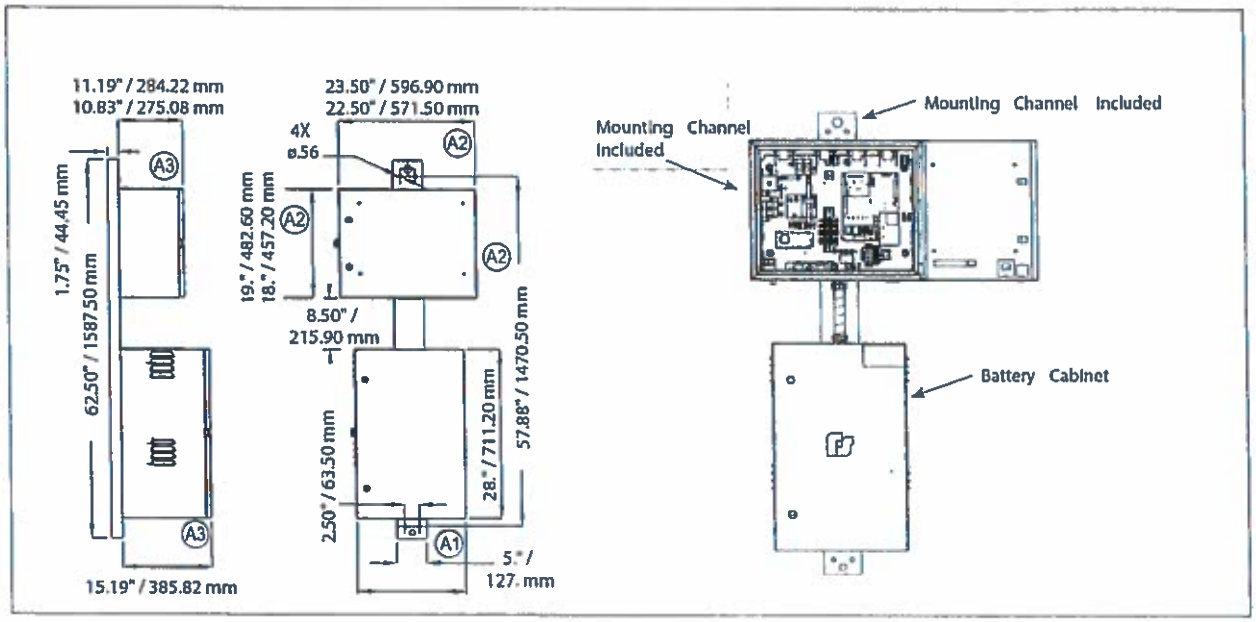
Federal Signal DCFCTBD siren controllers are two-way digital, battery-operated/back-up and status monitoring systems for use with the Federal Signal 2001-130, Equinox, 508-128 and Eclipse8 sirens. The DCFCTBD siren controller typically interfaces with off-the-shelf two-way radio transceivers and communicates to a base controller. DCFCTBD siren controllers can be used with radios utilizing single-tone, two-tone sequential, DTMF, POCSAG, AFSK, EAS and digital formats such as P25 and Tetra. The DCFCTBD controllers can be equipped with optional communications such as landline, IP, fiber, satellite, and cellular. This makes DCFCTBD siren controllers compatible with virtually any existing siren control system or communication method. There are four local inputs and four local push buttons for activation, plus a reset option.

DCFCTBD models come equipped with four independent relay outputs that can be programmed to activate with local inputs, local pushbuttons or via the communications channels. Activation codes, relay timing, and optional warning sounds are programmed into the unit through a standard RS232 serial port or over-the-air from the central control point. The DCFCTBD siren controller offers six user programmable functions in addition to the five pre-set functions (arm, disarm, report, growl test and master reset). These controllers include sensors to supply information on the following areas of operation: AC power status, communications status, low battery status, intrusion, siren activation, current intrusion, siren rotation and local activation.

FEATURES

- Two-way siren controller for 48VDC Sirens
- Two-way radio control and status monitoring
- Simultaneous two-tone sequential, DTMF, EAS, POCSAG, and digital AFSK decoding for security
- Able to utilize multiple communication paths for redundancy
- Controls mechanical sirens, including models 2001-130, Equinox, 508-128 and Eclipse8
- Solar options available
- Push buttons for local activation
- Landline, Ethernet (IP) or radio control
- UL Listed for general signaling
- DNV Certified

Two-Way Digital Controller for Electro-Mechanical Sirens (DCFCTBD)



SPECIFICATIONS

Operating Temperature:	-22°F to 149°F / -30°C to 65°C
AC supply voltage:	120VAC @ 4.0 Amps 240VAC @ 2.0 Amps
Battery Backup:	48VDC
Current Draw:	+/- 10%, 50/60 Hz, maximum standby current
DCFCTBD Power Supply:	6A @ 13.3VDC
Battery Backup:	48VDC
Current Draw:	< 0.2 amps in standby
Programmable Frequency:	Federal Signal can program your radio to your specific requirements
EAS:	Supports standard EAS codes and wildcards
POCSAG:	Supports binary AFSK 512 Baud numeric messages.
4 relay outputs:	SPST
Contact Rating:	(4 relays standard) 5A @ 28VDC – 8A @ 240VAC

Shipping Weight:

DCFCTB Total Weight (including batteries)	364 lbs	165 kg
Shipping Weight (excluding batteries)	300 lbs	136 kg
2001TRBP Net Weight	150 lbs	68 kg
2001TRBP Shipping Weight	190 lbs	86.2 kg

HOW TO ORDER

Contact our Federal Signal Sales Engineers to design a system that meets your specific requirements.

Description	Part Number
Two-way Controller DC Powered, no radio	**DCFCTBD**
Two-way Controller, Radio Controlled, DC Powered (H=high band, U=UHF)	**DCFCTBDH/U**
Two-way Controller, IP-enabled, DC Powered	**DCFCTBD-IP**

Note:

Antenna and cable are not included with radio activation control and must be ordered separately

Batteries required. Call for assistance with specific system requirements

OPTIONAL ACCESSORIES

Description	Part Number
Federal programming software (Non-digital applications)	**FSPWARE**
Commander® Software System, *10, 25, 255, or 512 Site License	**SFCD***
208-240VAC operation	**2001TRBP**
Activation system	**SS2000+**
Solar powered option	Contact Federal Signal
Antenna	Contact Federal Signal

FEDERAL SIGNAL

▶ Commander® On-Premises

Siren Control and Messaging System

The Commander siren control system offers both secure activation and status monitoring of any alert and notification system. From Giant Voice to Mechanical and Intelligent siren systems, Commander is designed to control, monitor, and link your warning system.

Federal Signal Commander continues to evolve to meet the challenging demands of customers throughout the world to provide a system unmatched in its features and ease of use. Commander offers Emergency Managers and system operators complete, secure activation and status monitoring of any siren system. From siren activation to in-building alerting, this system is designed to provide your facility with complete alert and notification capability.

From controlling 1 siren to 511, the system can expand to accommodate your changing needs. Federal Commander provides an easy to use activation screen. Administrators can program 50 Hotkeys to activate all sirens, zones, or individual sirens. Each Hotkey can be programmed to include a text, email, or voice message. A single Hotkey can activate sirens and send informational messages simultaneously.

Categorize hotkeys to activate as all sirens, zones, or individual sirens.

FEATURES

- Control of municipal, county and state siren systems
- Control of Giant Voice systems
- Control of Intelligent Systems
- PC or Server based system
- Controls up to 511 sirens
- Support for analog, digital (P25/Tetra), IP, cellular, satellite and landline communications
- Modbus compatible
- App and web based control using optional CommanderOne
- Secure communications with 128 & AES 256 encryption and time-based encryption
- Custom user interface for your specific application

Commander can be integrated as a fully compliant APCO Project 25 (P25) two-way communications outdoor/indoor warning system.

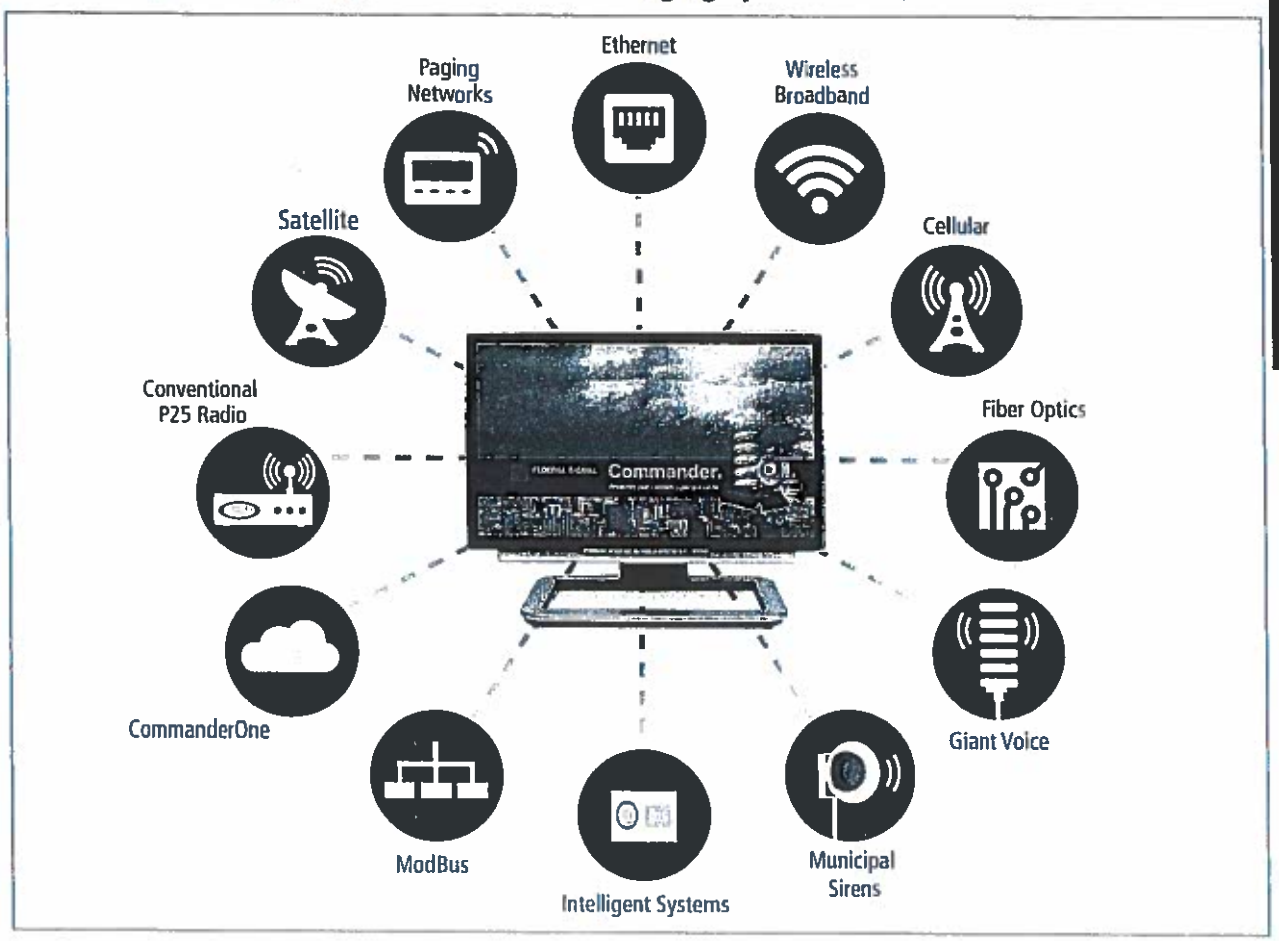
Commander has integrated networking and messaging capabilities.

- Networking allows the system to operate radio systems and IP systems simultaneously.
- Messaging provides personalized alerts to devices such as cell phone, computer, pager, handheld radio, etc. Messaging provides additional information to key personnel or to citizens.

Activation of sirens based on polygons from National Weather Service is provided using the CommanderOne web based control. CommanderOne integrates automatically with your local siren activation system to provide "anywhere" activation, control and monitoring.

Siren Controllers are available for both electronic sirens, speakers, and electromechanical sirens. These controllers come equipped with over-the-air programmability via secure digital technology.

Commander® On-Premise Siren Control and Messaging System (SFCD)



SPECIFICATIONS

RTU Capacity: Up to 511 siren RTU's

Communications: Analog, Digital, P25 radio systems Cellular, satellite, IP networks, Landline communications

Security: Time based encryption,128 bit/256 bit AES encryption. User, password and role based security.

Hardware Activation: SS2000+ local activation point. Siren activations using Intelligent System Informers

RTU types: Mechanical, Ultravoice giant voice systems, and Intelligent Systems using Informer product line

Giant Voice: Live PA, Text-to-speech and WAV file broadcasts

Intelligent Systems: Informer product line Desk / Wall / Rack / Outdoor Systems Two-way Intercom and recording Custom and specialized alert and notification systems

Zoning: Unlimited zone creation

System: Alarm logging and reporting of siren activation and monitoring using customized maps

Language: English default with optional multi-language support

System Backup: Create and restore system back up files

HOW TO ORDER

Description	Part Number
Windows application software:	
for up to 10 sites	SFCD10
for up to 25 sites	SFCD25
for up to 255 sites	SFCD255
for up to 511 sites	SFCD512

OPTIONAL ACCESSORIES

Description	Part Number
Warranty, up to 10 sites	SFCD-W10
Warranty, up to 25 sites	SFCD-W25
Warranty, up to 255 sites	SFCD-W255
Warranty, up to 511 sites	SFCD-W511
Upgrade, to 25 sites	SFCDUPI
Upgrade, to 255 sites	SFCDUPII
Upgrade, to 511 sites	SFCDUPIII
TCP/ IP client software (5 seats)	SFCDCLNT
Client software extended one-year warranty	SFCDCLNT-W
Modem	MODEM-MSK
Server with Windows®, 22" flat screen monitor	X-PCS-1
120V Uninterruptible Power Supply	X-UPS
Desktop Controller	SS2000+

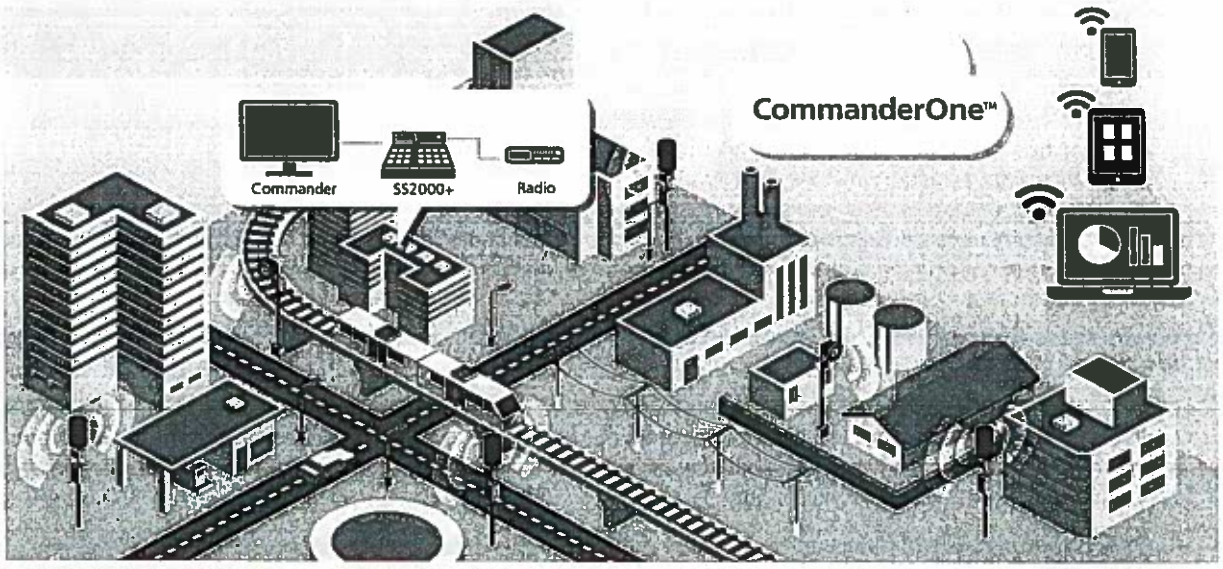
FEDERAL SIGNAL

▶ CommanderOne®

Cloud-Based Control for Warning Systems

CommanderOne® is the latest innovation that allows you to connect with your most critical asset anytime, anyplace. The CommanderOne cloud-based platform enables you to monitor and control your warning sirens from any desktop or mobile device. It offers real-time data with actionable insights, enabling you to make important decisions quickly.

We understand that replacing a legacy infrastructure with new smart devices may be cost prohibitive, therefore, CommanderOne leverages your existing Federal Signal warning system and makes it smarter. With its simple dashboard and intuitive interface, CommanderOne is designed to make your mission successful in critical moments. CommanderOne is easily integrated with your existing Commander On-premise system. CommanderOne communicates with your system through a secure network communications interface. As changes occur with the On-Premise system those changes are mirrored on the cloud-based control system. Siren activation and monitoring can occur from anywhere from virtually any device. The map interface provides status indications with manual activations or user-defined polygons. Automatic or prompted weather based polygons siren activation is available for all CommanderOne users.



User Experience – The Intuitive Interface is simple to set up, always up-to-date, and connects to your on-premise Commander control system.

Map-based Activation – Location of sirens and their status is critical. Use the geo-intelligent interface to see an overview of your system.

Desktop Freedom – Access your system from any computer connected to the internet.

Mobile – A user-friendly app for iOS and Android. It has a web-based console with a mobile responsive GUI.

Security – We understand that security is your top priority. CommanderOne utilizes IPSEC over SSL with a multi-layered authentication mechanism.

Weather Activation – All CommanderOne systems will have access to activate sirens based on weather-based polygons.

Auto-Sync Hotkeys – No need to keep multiple locations synchronized, your Hotkey activation settings are automatically created in CommanderOne.

Messaging – Keep in contact with employees and first responders via email, SMS, and voice. Create on the fly messages or templates to streamline your workflow.

Scalability – CommanderOne platform is scalable from a few devices to hundreds of devices. It leverages a global network of data centers to maintain availability while securing your data.

CommanderOne® Cloud-Based Control for Your Warning Systems

Desktop and Mobile

Desktop

The dashboard is designed to give you the status of the system in seconds. It utilizes Bing Maps, and its responsive design enables colored icons to reflect the status of each site and control point. Each status monitor is color-coded to quickly gain insight about your system.

Mobile

Native iOS and Android apps let you control and monitor your system from virtually anywhere. It shows all the alarms by a single click. Just like other apps, the system can be refreshed with a slide of a finger.

Security

CommanderOne is secure by design. We use One Time Passwords, Token-Based Security and industry standard SSL to secure your communications.

Our new Multi-User Authentication takes security to the next level by allowing you to configure Hotkeys, Macros or Functions with an authorization level, which require varying levels of authorization: from simple passwords to app-based authentication. This means that you can set-up CommanderOne so that no one activates a function without another person verifying that activation, like two people needing their keys turned at the same time to open a locked door.

Weather

CommanderOne Accuweather® brings automatic and prompted activation based on weather events. Using a simple 'if this then that' interface, you choose them from events, such as a 911 telephone outage to a Winter Weather Advisory and the actions associated with them. From the Accuweather interface, you can send a simple message to your staff when watches are posted in surrounding counties, or activate the sirens when National Weather Service posts a Tornado Warning.

FEDERAL SIGNAL

CommanderOne® Cloud-Based Control for Your Warning Systems

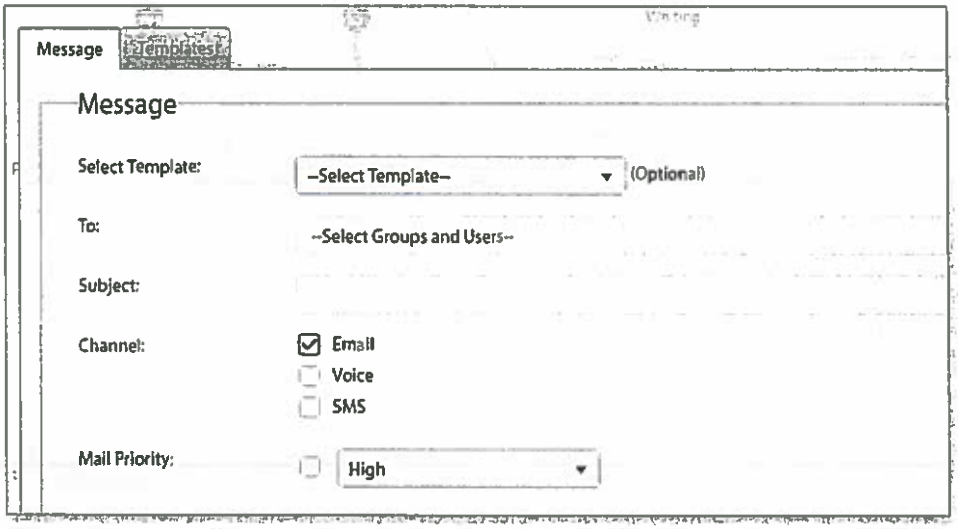
Messaging

CommanderOne Messaging is a new addition to the CommanderOne Cloud-Based Control system. Messaging adds the ability to quickly and easily contact your employees using our CommanderOne activation systems, either via the web or mobile app, on your smartphone.

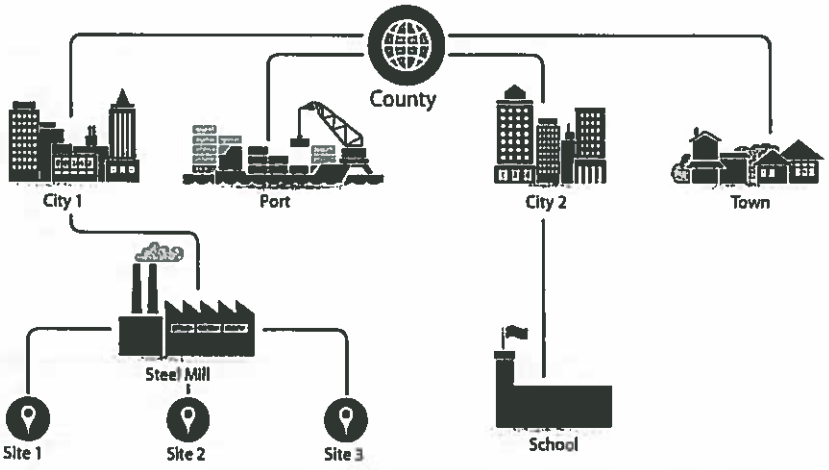
Messaging allows users to create templates, ad-hoc messages and even dynamically add phone numbers or emails at the time of message creation. Utilizing CommanderOne macros, you can activate a siren Hotkey and at the same time, a messaging template. Templates allow for operators to create scenarios ahead of time, adding all users and information in a ready-to-go, one-button activation.

Messaging add-on is designed around you and your first responders, by keeping it simple and easy for you to message your crew while activating the sirens. With simple, easy to understand plans, administrators can add messaging to their existing CommanderOne systems.

Messaging builds upon the strengths of the CommanderOne platform and can allow administrators to send out operational alerts and automated messages the moment NOAA issues alerts.



Scalable Centralized Command and Control



CommanderOne is designed for a centralized command and control by managing disparate systems. Whether you have one site or multiple sites, you need a single dashboard to monitor and manage your network.

CommanderOne® Cloud-Based Control for Your Warning Systems

CONTROL

Select CommanderOne Model for Annual Subscription

	Standard	Professional	Enterprise
Model Number*	COMMANDER1-S	COMMANDER1-P	COMMANDER1-E
Number of Users[1]	5	20	Per quote
Number of Organizations	1	2-5	5+
Accuweather included	Yes	Yes	Yes
In Release Commander Upgrade	Yes	Yes	Yes

*Includes Remote Implementation Support. For on-site support and training, contact your Federal Signal representative for a quote.

CommanderOne with Messaging Annual Subscription

	Standard
Model Number*	COMMANDER1-SM
Users[1]	5
Messaging Recipients[2]	200
Messages Per Month	500

*Includes Remote Implementation Support. For on-site support and training, contact your Federal Signal representative for a quote.

[1] Users: Users defined as full ability to activate and create messages also includes CommanderOne APP. (Admin has ability to control USER rights)

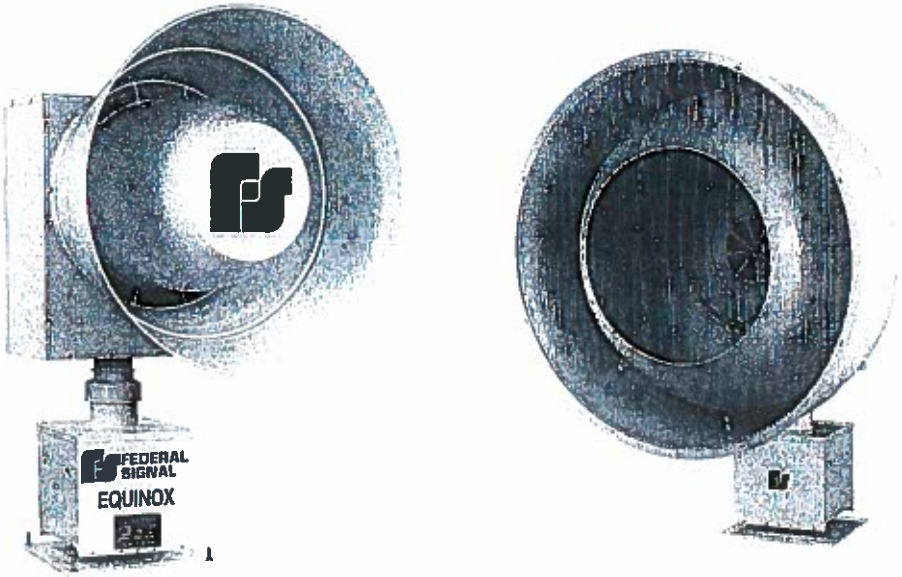
[2] Recipient: Recipient defined as having the ability to receive messages via text or email.

US - 2645 Federal Signal Dr., University Park, IL 60484 | Tel: +1 708.534.3400 | 1.800.548.7229 | Email: customersupport@fedsig.com | www.fedsig.com

Appendix I - Manuals

FEDERAL SIGNAL
Safety and Security Systems

Models 2001-130, Equinox, and 508-128 Sirens



Description, Specifications, Installation, and Service Manual

25500289
Rev. A6 1217
Printed in U.S.A.

Limited Warranty

This product is subject to and covered by a limited warranty, a copy of which can be found at www.fedsig.com/SSG-Warranty. A copy of this limited warranty can also be obtained by written request to Federal Signal Corporation, 2645 Federal Signal Drive, University Park, IL 60484, email to info@fedsig.com or call +1 708-534-3400.

This limited warranty is in lieu of all other warranties, express or implied, contractual or statutory, including, but not limited to the warranty of merchantability, warranty of fitness for a particular purpose and any warranty against failure of its essential purpose.

FEDERAL SIGNAL
Safety and Security Systems

2645 Federal Signal Drive
University Park, Illinois 60484-3617

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Customer Support	800-548-7229 • +1 708 534-3400
Technical Support	800-524-3021 • +1 708 534-3400

Contents

Figures

Tables

Safety Messages

⚠ WARNING

It is important to follow all instructions shipped with this product. This device is to be installed by trained personnel who are thoroughly familiar with the country electric codes and will follow these guidelines as well as local codes.

Listed below are important safety instructions and precautions you should follow.

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 manual has been carefully checked and is believed to be accurate; however, no responsibility is assumed for any inaccuracies.

Publications

Federal Signal recommends the following publications from the Federal Emergency Management Agency for assistance with planning an outdoor warning system:

- The "Outdoor Warning Guide" (CPG 1-17)
- "Civil Preparedness, Principles of Warning" (CPG 1-14)
- FEMA-REP-1, Appendix 3 (Nuclear Plant Guideline)
- FEMA-REP-10 (Nuclear Plant Guideline).

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.

- 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.

Installation and Service

- Electrocution or severe personal injury can occur when performing various installation and service functions such as making electrical connections, drilling holes, or lifting equipment. Therefore only experienced electricians should install this product in accordance with national, state and any other electrical codes having jurisdiction. Perform all work 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.

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.

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

Pay careful attention to the notices located on the equipment.

General Description

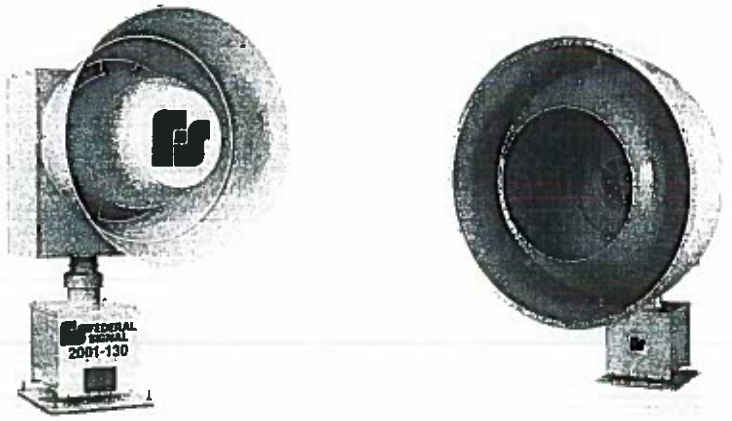
This manual describes the features, specifications, installation, service and maintenance of the Models 2001-130, Equinox, and 508-128 Sirens.

Models 2001-130, Equinox, and 508-128 Sirens are electro-mechanical, DC, rotating sirens that are capable of producing high intensity warning signals over a large area. A highly efficient design enables the siren to produce a high sound level, while making moderate demands on the power source. The Equinox Siren is identical to the Model 2001-130 Siren except the stator is 8 ports instead of 12 ports.

Each siren is available for use with through-the-pole wiring. Through-the-pole wiring is typically used with concrete, steel, or composite type poles where wiring can be managed through the center of the pole. This type of mount allows wiring to be brought from the inside of the pole through the bottom of the siren mounting plate up to the wiring box.

To order models that allow wiring through the center of the pole, use the following part numbers: 2001-130-C, Equinox-C, and 508-128-C. See the Through-the-Pole Mount section for more information.

Figure 1 Models 2001-130 and 508-128 Sirens



Siren Description

Models 2001-130, Equinox, and 508-128 Sirens are single tone sirens capable of producing a 130 dB, 125 dB, and 128 dB sound level respectively at 100 feet for a minimum of 15 minutes, when using the DCB series Control Cabinet and Battery Cabinet with fully charged, standard, deep-cycle, marine batteries. Up to thirty minutes continuous operating time is available with the 2001TRBP option. This option supplies DC current directly to the siren from a 208/220/240 Vac, optionally 480 Vac line.

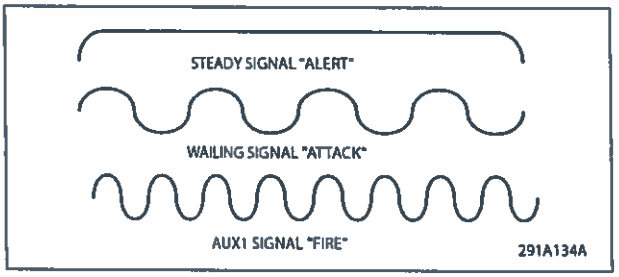
The sirens use two motors. One to create the siren signals, the other one to rotate the siren assembly. The first motor, which produces the sound energy, is attached to a stator with a rotor mounted on the motor shaft concentric to the stator. The rotor and stator each contain one row of ports. As the motor rotates the rotor, air is drawn into the rotor and passes through the rotor and stator ports in pulses. These pulses are produced when the rotor alternately opens and closes the stator ports. The pulses of air produce sound at a

frequency (pitch) that is dependent upon the rotational speed of the motor and the number of ports in the rotor-stator combination.

Signal Description

The sirens are capable of producing a steady single frequency signal, a wailing rising and falling frequency signal and a fast wailing signal. The steady signal is frequently used as a civil defense "Alert" or weather emergency signal. The wailing signal is often used as a civil defense "Attack" signal. The fast wail or fire signal is used as a fire signal to summon the local fire department. You can use any of the signals for any desired application. These signals are shown graphically in the following figure.

Figure 2 Signal Characteristics



Specifications for Model 2001-130

Table 1 Power Requirements*

Siren Motor	48 V (DC or full wave rectified AC) 100 amps (nom.)
Rotator Motor	48 V (DC or full wave rectified AC) 1 amp (nom.)

Table 2 Wiring

Siren Motor	2 AWG minimum, 2 wires
Rotator Motor	14 AWG minimum, 1 wire

Table 3 Motor Type

Siren	Series Wound DC 6.5 Hp (nom.)
Rotator	Permanent Magnet DC 1/8 Hp

Table 4 Signal Information

Signal	Frequency Range	Sweep Rate
STEADY	790 Hz	N.A.
WAIL	470 to 790 Hz	10 seconds
FAST WAIL	600 to 790 Hz	3.6 seconds
Signal Duration	3 min. (programmable)	
Sound Output (SPL)	130 dBc +/-1 dBc (on axis) at 100 ft (30.5 m)	
Rotation	3 RPM	

Table 5 Dimensions

Height x Width x Depth	62 in x 37 in x 41 in
	1574 mm x 940 mm x 1041 mm

Table 6 Weight

Shipping Weight	490 pounds (204 kg)
Siren Weight	420 pounds (190 kg)

Table 7 Environmental

Operating Temperature	-30°C to +60°C**

Table 8 Wind Loading

EPA at 40 feet	9.53 ft^2
Wind Load (130 mph, 40 feet above ground)	613 lbf

* Power requirements refer to the power supplied by the batteries or optional AC operation with battery backup.

** The siren can operate throughout this temperature range provided the battery temperature is maintained at -18°C or higher.

Specifications for Equinox

Table 9 Power Requirements*

Siren Motor	48 V (DC or full wave rectified AC) 115 amps (nom.)
Rotator Motor	48 V (DC or full wave rectified AC) 1 amp (nom.)

Table 10 Wiring

Siren Motor	2 AWG minimum, 2 wires
Rotator Motor	14 AWG minimum, 1 wire

Table 11 Motor Type

Siren	Series Wound DC 6.5 Hp (nom.)
Rotator	Permanent Magnet DC 1/8 Hp

Table 12 Signal Information

Signal	Frequency Range	Sweep Rate
STEADY	500 Hz	N.A.
WAIL	180 to 500 Hz	10 seconds
FAST WAIL	300 to 500 Hz	3.6 seconds
Signal Duration	3 min. (programmable)	
Sound Output (SPL)	125 dBc +/-1 dBc (on axis) at 100 ft (30.5 m)	
Rotation	3 RPM	

Table 13 Dimensions

Height x Width x Depth	62 in x 37 in x 41 in
	1574 mm x 940 mm x 1041 mm

Table 14 Weight

Shipping Weight	460 pounds (209 kg) w/mtg. legs
Siren Weight	390 pounds (159 kg)

Table 15 Environmental

Operating Temperature	-30°C to +60°C**

Table 16 Wind Loading

EPA at 40 feet	9.53 ft^2
Wind Load (130 mph, 40 feet above ground)	613 lbf

* Power requirements refer to the power supplied by the batteries or optional AC operation with battery backup.

** The siren can operate throughout this temperature range provided the battery temperature is maintained at -18°C or higher.

Specifications for Model 508-128

Table 17 Power Requirements*

Siren Motor	48 V (DC or full wave rectified AC) 120 amps (nom.)
Rotator Motor	48 V (DC or full wave rectified AC) 1 amp (nom.)

Table 18 Wiring

Siren Motor	2 AWG minimum, 2 wires
Rotator Motor	14 AWG minimum, 1 wire

Table 19 Motor Type

Siren	Series Wound DC 6.5 Hp (nom.)
Rotator	Permanent Magnet DC 1/8 Hp

Table 20 Signal Information

Signal	Frequency Range	Sweep Rate
STEADY	500 Hz	N.A.
WAIL	180 to 500 Hz	10 seconds
FAST WAIL	300 to 500 Hz	3.6 seconds
Signal Duration	3 min. (programmable)	
Sound Output (SPL)	128 dBc +/-1 dBc (on axis) at 100 ft (30.5 m)	
Rotation	3 RPM	

Table 21 Dimensions

Height x Width x Depth	70.1 in x 53.4 in x 43.1 in
	1780.5 mm x 1356.4 mm x 1094.7 mm

Table 22 Weight

Shipping Weight	590 pounds (268 kg) w/mtg. legs
Siren Weight	430 pounds (195 kg)

Table 23 Environmental

Operating Temperature	-30°C to +60°C**

Table 24 Wind Loading

EPA at 40 feet	17.40 ft²
Wind Load (130 mph, 40 feet above ground)	1,104 lbf

* Power requirements refer to the power supplied by the batteries or optional AC operation with battery backup.

** The siren can operate throughout this temperature range provided the battery temperature is maintained at -18°C or higher.

Installation Instructions

Determining a Suitable Location

⚠ WARNING

The output level of an the sirens are capable of causing permanent hearing damage. To prevent excessive exposure, carefully plan the siren location and post warnings where excessive levels may be encountered. Refer to OSHA 29 CFR 1910.95 for safe exposure limits.

Do not expose personnel to sound levels above 123 dBC.

Careful consideration of the factors affecting the propagation of sound from the siren and the response of the human ear to the sound will optimize the ability of the siren to effectively warn the community. Follow Federal Emergency Management Agency (FEMA) guidelines when designing the warning system.

The reduction of signal intensity as distance from the siren increases and the minimum desired signal level at the fringe of the area to be covered are important considerations when choosing a siren installation site. As the distance from the siren increases, sound level losses accumulate. These losses are a result of weather conditions, the terrain, obstructions in the sound path, and the pitch of the sound and the height of the siren.

Optimum sound propagation conditions occur when no obstructions exist in the sound path, the terrain is hard and flat, and the air is blowing away from the source. Under these conditions, you can expect a 6 dB loss per distance doubled. A loss per distance doubled of 10 dB is typically experienced because atmosphere is rarely calm, terrain may not be flat, and buildings or other obstructions are frequently present in the sound path.

Using a 10 dB per distance doubled loss factor, the following sound levels are predicted for the sirens in the following table.

Table 25 Sound levels predictions

Distance	2001-130	Equinox	508-128
100 feet (30.5 m) the sound level is	130 dB	125 dB	128 dB
200 feet (61 m) the sound level is	120 dB	115 dB	118 dB
400 feet (122 m) the sound level is	110 dB	105 dB	108 dB

FEMA studies indicate typical ambient sound levels vary by location as follows:

- Industrial Areas: 70+ dBC
- Urban Areas: 60 dBC
- Rural Areas: 50 dBC

Assuming a typical 10 dB loss per distance doubled and a 70 dB minimum sound level required to warn a typical urban area, the effective range is as follows:

- Model 2001-130 Siren is approximately 6,400 feet.
- Equinox Siren is approximately 4,525 feet.
- Model 508-128 siren is approximately 5,572 feet.

Optimum warning is obtained when the warning signal is at least 10 dB above ambient. Do not expose personnel to sound levels above 123 dBC.

Wind speed and direction often affects the propagation of sound from the siren. Consequently, the direction of the prevailing wind may be a significant factor to consider when selecting the installation site(s) of a small, one or two site siren system. For example, if the prevailing wind is from the west, it may be desirable to install the siren toward the western edge of the area to be covered.

Other factors to consider when selecting the installation site(s) include the availability of suitable electrical power, the access to and ease of installation and maintenance, the height of surrounding obstructions, and security against vandalism.

Installing the Sirens

⚠ DANGER

Electrocution or severe personal injury can occur when making electrical connections, drilling holes, or lifting equipment. Therefore, installation should be performed by experienced electricians in accordance with national and local codes.

Most siren installations are one of two types: Pole Mount or Flat Surface Mount. These two configurations make it possible to install a siren in almost any situation. If the installations in this manual are not suitable, modification of one of the configurations may be practical.

A siren is typically installed 40 to 50 feet above the ground. If the installation is located less than 40 feet above the ground, the sound intensity at close range may increase, but at the same time the effective range of the siren may be reduced. Conversely, if the siren is located more than 50 feet above ground, the effective range of the siren may increase, but the sound may skip over areas closer to the siren. These variables may make it desirable to test the sound coverage of the siren at various heights and locations whenever possible.

Pole Installation

The 2001-130, Equinox, and 508-128 Sirens come standard with mounting hardware for wood pole deployment. Federal Signal also offers models designed for mounting through the center of the pole. Typically, through-the-pole wiring is used with concrete, steel, or composite type poles where wiring can be managed through the center of the pole. To order models that allow wiring through the center of the pole, use the following part numbers: 2001-130-C, Equinox-C, and 508-128-C. See the Through-the-Pole Mount section for more information.

A typical siren pole-mounted installation is shown in Figure 3. The siren is mounted on a Southern Yellow Pine, Douglas Fir or equivalent Class 2 utility pole 40 to 50 feet above the ground. It is attached to the pole by means of legs, as shown in Figure 4.

Figure 3 Typical Pole Installation (Model 508-128 shown)

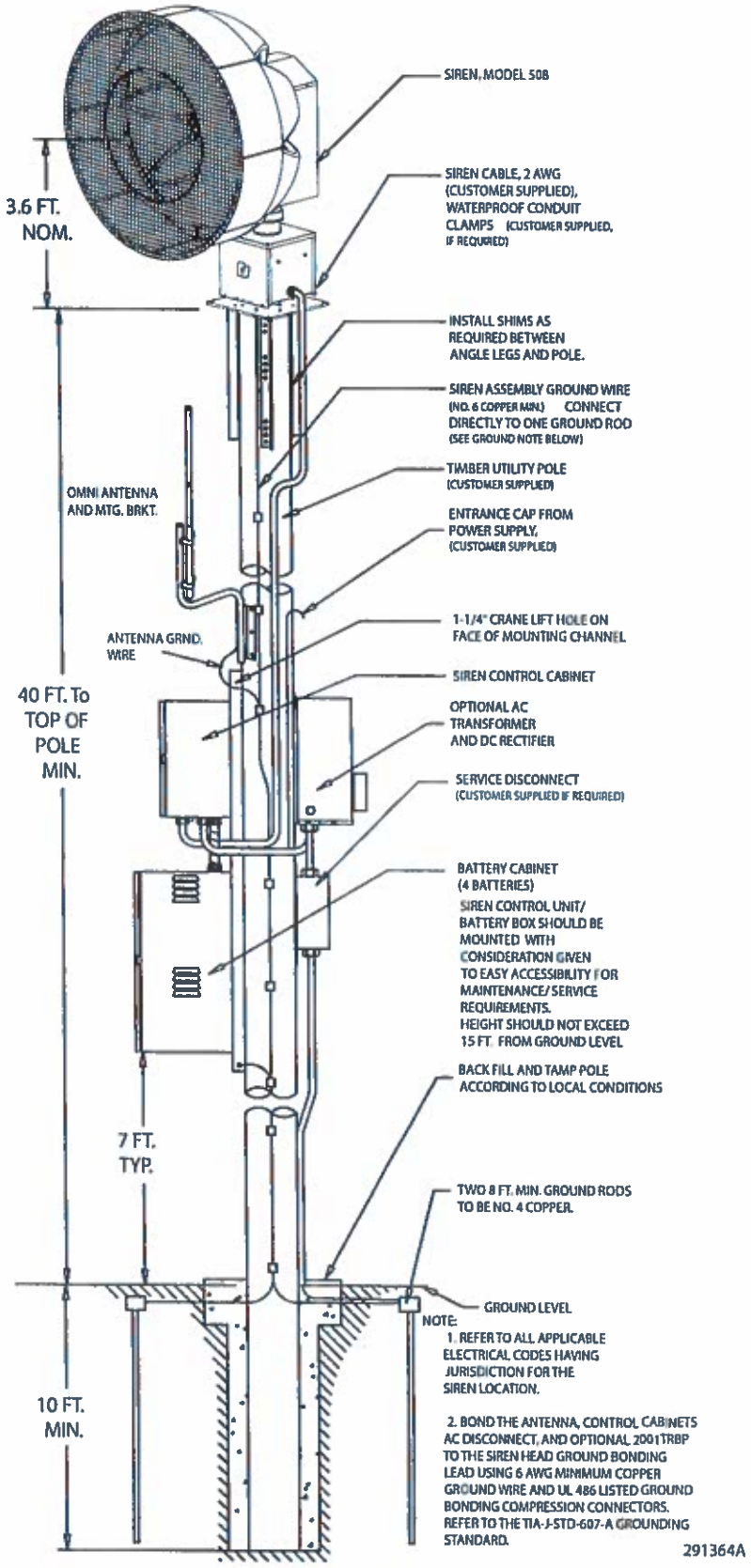
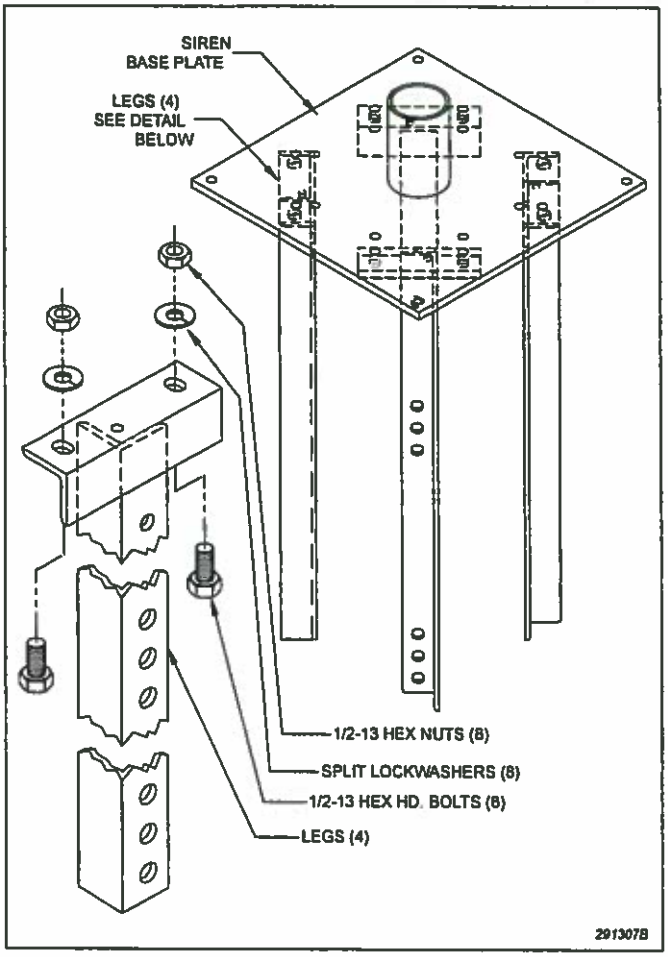


Figure 4 Siren Leg Assembly



Using the 3 feet long angle iron legs, the siren is mounted on the Class 2 utility pole as follows:

1. Uncrate the siren and remove the nuts that hold the siren on the shipping base. Lift the siren approximately 3-1/2 feet with a crane or hoist.
2. Install the four legs on the siren mounting plate, as shown in Figure 4. Use two 1/2-inch bolts, nuts and lock washers (provided) for each leg. Do not tighten the bolts completely.

⚠ WARNING

The lifting bracket does NOT have sufficient strength to support the combined weight of the siren and a utility pole. Therefore, do NOT attempt to erect the pole and siren together using the bracket as a lifting point.

3. Erect the utility pole in accordance with accepted practices (refer to warning above). Be sure the pole extends at least 40 feet above the ground.
4. Raise the siren to the necessary height, and lower it over the pole.
5. Adjust the legs and insert shims, if necessary, between the siren legs and pole.

The legs adjust to a diameter between 7.53 in and 12.25 in (Figure 5). Bolt the siren to the pole using two 5/8 in galvanized lag bolts with washers and split lock washers per leg. At least four inches of lag bolt must be screwed into the pole. Tighten all bolts.

Figure 5 Leg Assembly Diameters

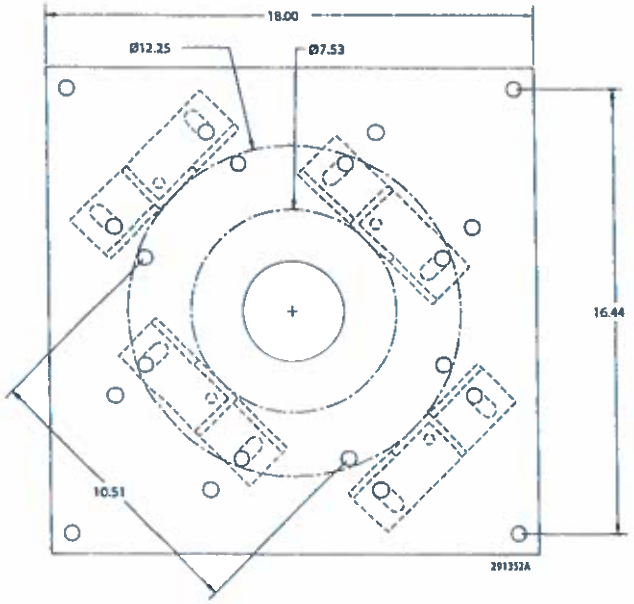
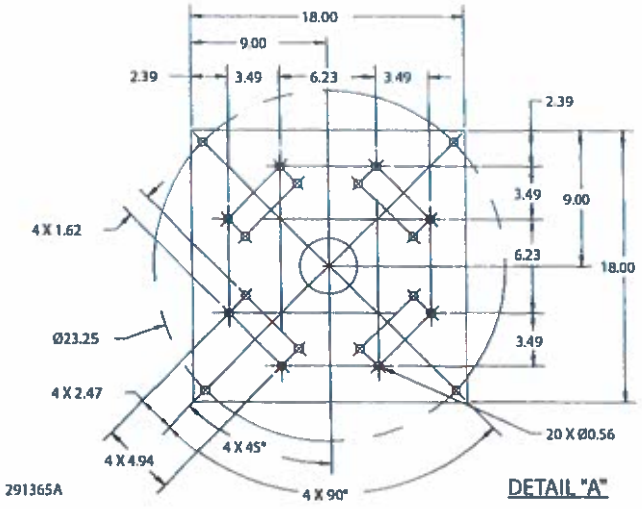


Figure 6 Mounting Plate Dimensions



Through-the-Pole Mount

Through-the-pole mounting allows you to wire through the center of the pole and through the bottom plate of the siren into the lower box. Typically, through-the-pole wiring is used with concrete, steel or composite type poles. These models are the following: 2001-130-C, Equinox-C, and 508-128-C.

NOTE: The siren leg assemblies are not included with the -C version models.

1. Erect the utility pole in accordance with accepted practices and FEMA guidelines.
2. Uncrate the siren. Remove and dispose of any hardware that holds the siren on the shipping base. Lift the siren with a crane or hoist to the necessary height and lower it over the pole. Maintain tension on lifting chain until all bolts are tightened.

NOTE: Siren cable is run through the center of the mounting plate when using the through-the-pole modes. Siren cable can be pre-assembled through the center of the bottom mounting plate for a no conduit installation.

⚠ WARNING

The eyebolt does NOT have sufficient strength to support the combined weight of the siren and a utility pole. Therefore, do NOT attempt to erect the pole and siren together using the eyebolt as a lifting point.

Flat Surface Mount

Flat surface mount installation is practical when the installation site is on a flat roofed building. A weight distribution mat is often required to safely distribute the siren's weight on the roof. A Structural Engineer is required to specify the appropriate mounting method to safely mount the siren on a roof.

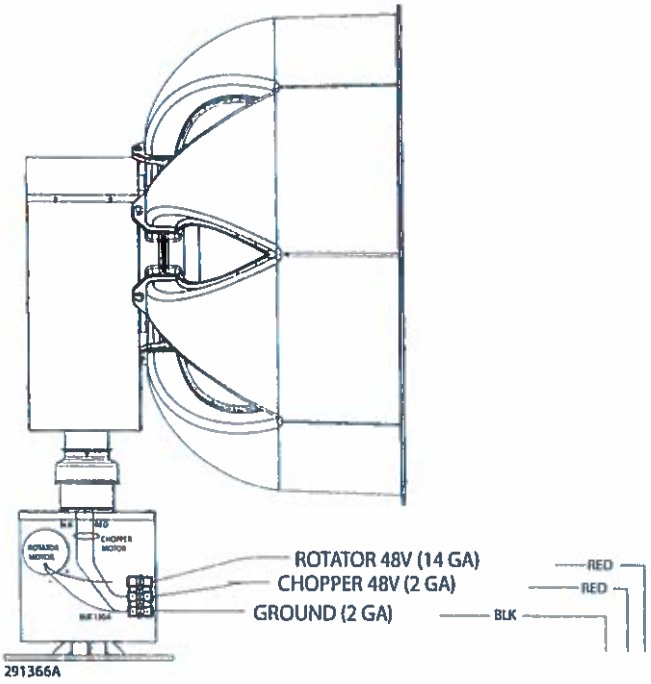
Post high sound level warning signs at all roof entry points and be sure that the siren is not blocked by parapets or other obstructions in the siren's sound path.

Wiring the Siren

Each siren is predrilled on two sides for connecting a 1 inch conduit to either side. The siren enclosure is rain resistant. To maximize the longevity of the siren, rigid watertight conduit connections are recommended between the siren and the controller.

Three wires are required to operate the siren. One #2 AWG red wire from the 48 Vdc chopper control contactor output of the controller provides positive power to the chopper motor. One #14 AWG red wire (minimum) from the rotator control contactor output of the controller provides positive power to the rotator motor. One #2 AWG black wire provides a common 48 Vdc negative ground between the ground plane of the control cabinet and siren motors. See Figure 7 for the wire connections in the siren. Consult the manual for the controller being used to connect the wires from the head.

Figure 7 Wiring for rotator motor



Treat all wire connections with anti-oxidant to prevent corrosion from moisture and natural processes. Take care to insure that all wire connections are firmly tightened. To properly tighten the wire connections in the terminal block, insert the wire, firmly tighten the setscrew, move the wires to loosen and repeat the process until the wires are securely tightened.

Pre-operation Checkout

After the siren has been completely installed, perform the following checks before putting the siren into service.

⚠ WARNING

The output sound level of a siren is capable of causing severe hearing discomfort or permanent hearing damage. Therefore, ALWAYS wear hearing protection when performing tests or maintenance on the siren.

Table 26 Pre-operation checklist

Check	Action Item
	All air intakes and sound outlets are not obstructed.
	All connections in the Control Cabinet Battery Cabinet are correct and properly tightened.
	All people and animals are at least 40 feet away from the siren in every direction to avoid hearing damage.
	Activate all siren tones to verify they are operating properly. The siren should remain rotating during all alert tones
	After the installation is complete and it has been established that the siren is operating properly, Federal Signal recommends that all control devices be padlocked to discourage tampering and vandalism.

Service and Maintenance

⚠ DANGER

Service should be performed by qualified personnel familiar with the siren, associated controls, and power sources being used. The siren has moving parts, high operating currents, explosive gases, and corrosive materials that could cause severe personal injury, electrocution, or death. Before servicing or maintaining, ensure that remote activation cannot occur and disconnect power to the siren and its controls.

⚠ WARNING

The output level of a siren is capable of causing permanent hearing damage. Therefore, ALWAYS wear hearing protection when performing tests or maintenance on the siren.

To prevent the siren from sounding or rotating, always turn off the power to the siren at the disconnect switch and remove the 48 Vdc, 4 AWG red wire in the Battery Cabinet before inspecting or maintaining the siren.

Testing and Inspecting the Siren

Test the siren for proper operation at least once a month. A daily test at noon, curfew, or other selected time is preferred. This not only enhances the usefulness of the siren, but also instills public confidence in the reliability of the warning system.

In order to minimize the possibility of siren failure, annual inspection and maintenance is desirable. Replace batteries approximately every three to five years. This schedule is only a suggested guideline. It may be necessary to vary the schedule if the siren is used frequently or if it is used in an extreme climate. Also, verify that Battery Terminal Protector is on battery terminals.

To inspect the siren, do the following:

1. Verify that the siren is rotating and the chopper motor is operating. Follow your company's safety guidelines (that is, wear hearing protection) when operating siren locally.
2. Turn off the AC power to the siren at the disconnect switch. Disconnect the 48 Vdc battery power to the siren (if applicable) by turning off the disconnect switch in the Battery Cabinet.
3. Inspect the siren installation to be sure that it is vertically oriented. Take corrective action if a pole-mounted installation is more than five degrees from vertical or if a roof or flat surface mount is more than ten degrees from vertical. This will prevent lubrication losses and excessive motor bearing wear.
4. Inspect all electrical and mechanical connections. Make sure that all fasteners are properly tightened.
5. Inspect brushes on the chopper motor for wear and operation. (See Maintaining the Chopper Motor Brush.)
6. Inspect all painted surfaces and repaint as necessary.
7. For Model 508-128 Siren, inspect and repair horn screen as required.
8. For Models 2001-130 and Equinox Sirens, remove back and top housing covers to view collector housing opening (access hole). Replace blue plug or tape with black plug on collector housing opening. (See Replacing the Blue Plug/Tape Over Collector Access Hole procedure.)
9. Preform a pull test on horn assembly. Verify 40 to 45 lb (if unable to achieve a minimum of 40 lb, see the Adjusting the Clutch and Alarm Verification procedure).
10. Replace all covers. Turn on the AC power to the siren at the disconnect switch.
11. Verify siren operation.

NOTE: Both the rotator motor and siren motor have sealed and pre-lubricated bearings. Therefore, neither of these motors requires any additional lubrication.

Servicing the Siren

This section includes procedures and illustrations to adjust, repair, and replace various siren components.

⚠ WARNING

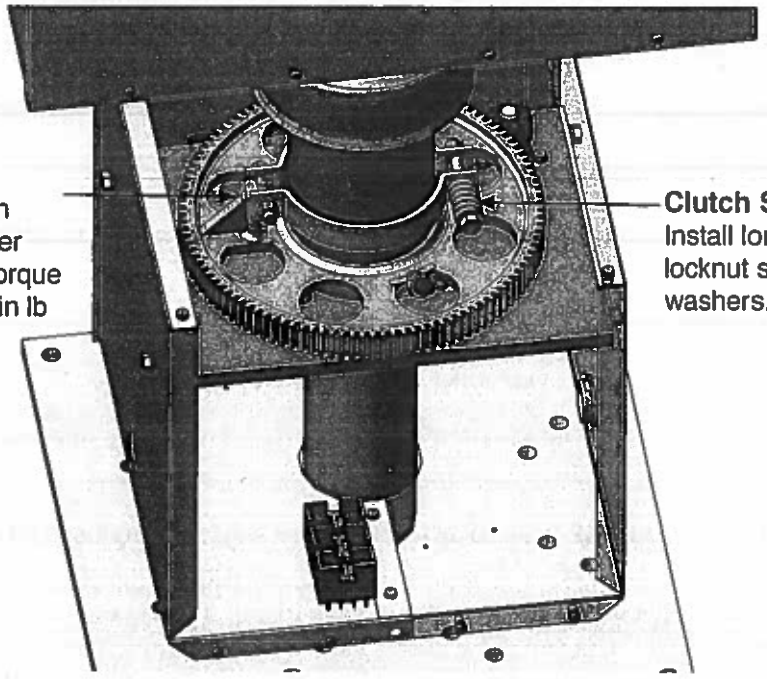
To prevent siren from sounding or rotating, always turn off power at the disconnect switch and disconnect the 48 Vdc, 4 AWG red wire in the Control Cabinet before performing any maintenance on the siren.

Adjusting the Clutch and Alarm Verification

To adjust the rotation clutch assembly, do the following:

1. Turn off power to the siren at the disconnect switch.
2. Turn off battery switch in the Battery Cabinet.
3. Remove the 48 Vdc, 4 AWG red wire in the Control Cabinet (to stop chopper from activating).
4. Remove the panels on the rotator housing.
5. Loosen the clutch using the cross bolt with the spring (Figure 8). This allows the siren to rotate freely. If the siren does not rotate freely, attach a spring scale to measure the rotation force required. The force to rotate the siren is less than 10 pounds. If the force required to rotate the siren is greater than 10 pounds, contact Federal Signal Technical support for additional information.

Figure 8 Rotator Assembly Interior

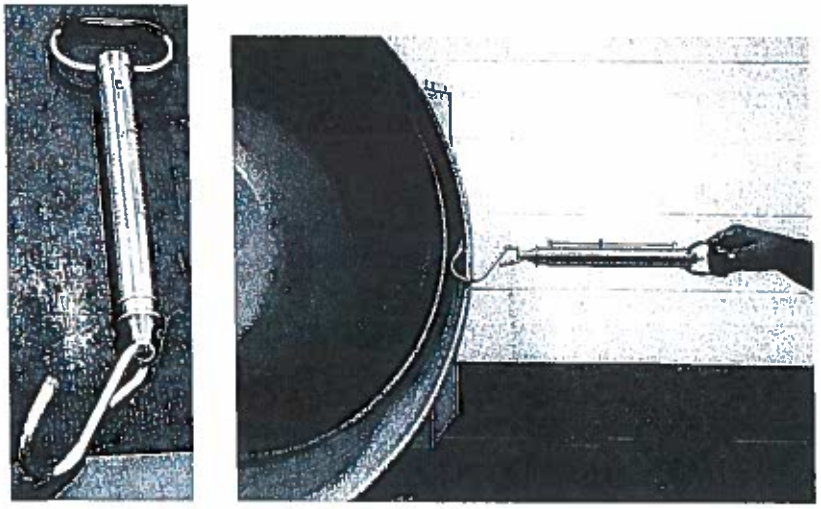


6. Tighten the Clutch Spur Bolt (Figure 8). This requires tightening the Clutch Spur bolt (bolt opposite spring) to 75 to 80 in lb. This secures the clutch bracket to the gear spur.

7. Attach a spring scale having a capacity of at least 50 pounds (22 kg) to the horn of the siren. (Figure 9)

   NOTE: The spring scale needs to be perpendicular to the front of the siren's horn when pulling.

Figure 9 Spring Scale Attachment to Siren



8. Tighten the Clutch Spring Bolt (Figure 8) until the pull test in Figure 9 achieves a minimum of 40 pounds (18 kg). If you are unable to tighten the Clutch Spring bolt to reach minimum 40 pounds, contact Federal Signal Technical Support. (Possible cause is grease on clutch bands or clutch may require replacement.)

   NOTE: To replace the clutch band, order the Clutch Replacement Kit.

9. Replace the panel(s) on the rotator housing.

10. Turn on power to the siren by re-attaching the 48 Vdc, 4 AWG red wire in the Control Cabinet.

11. Turn on battery switch in the Battery Cabinet.

12. Turn on power to the siren at the disconnect switch.

13. Activate the rotation of the siren and verify that the siren is operating properly. If the siren fails to rotate contact Federal Signal Technical Support.

Optional test to verify non-rotation alarm (requires two-way rotate sensor)

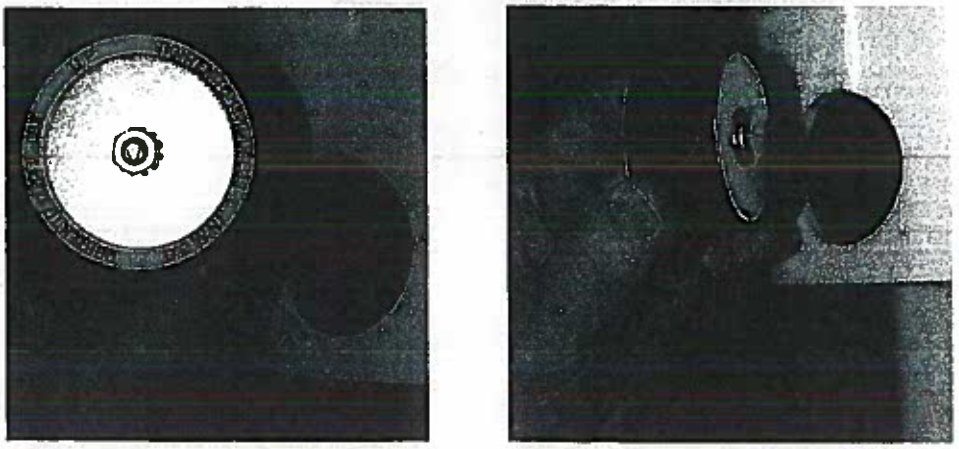
14. While siren is rotating, stop siren horn from rotating by obstructing or holding the siren horn. This causes the clutch to slip, causing the rotate motor to draw current above "normal." Current draw above normal, causes the system to report a rotate failure. If a failure is not reported, contact Federal Signal Technical Support.

Replacing the Blue Plug/Tape Over Collector Access Hole

To replace the blue plug or tape over the collector housing opening, do the following:

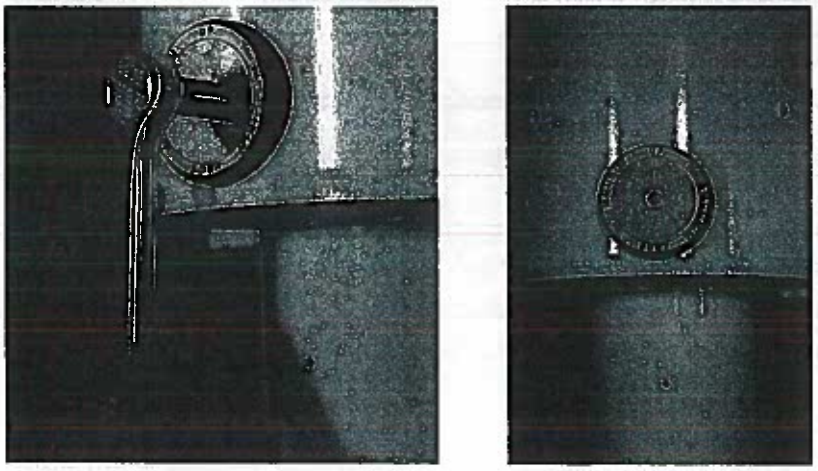
1. Remove and discard blue plug or tape.
2. Scrap off blue RTV (if applicable) from collector housing opening (access hole). Degrease surface with dry towel and alcohol, alcohol wipes, or degreaser.
3. Place rubber plug over access hole to ensure sealing against water ingress. Place the word UP at the top and the word DOWN at the bottom. (Figure 10)

Figure 10 Placing rubber plug over access hole



4. Tighten 1/4"-20 Keps nut to 11-14 in lbs using a 7/16" socket wrench. (Figure 11)

Figure 11 Tightening rubber plug



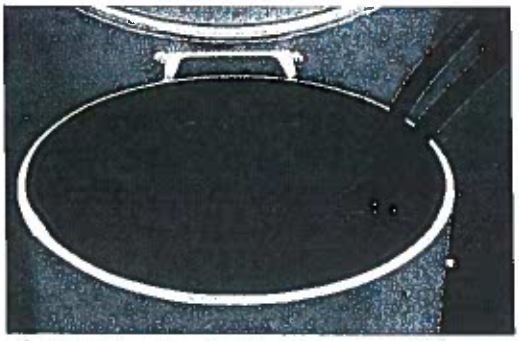
5. Rotate siren head to ensure no noticeable resistance to rotate siren.

Replacing the Collector Ring, Brush Holder Assemblies, and Black Cover

To replace the brush holder assembly, do the following:

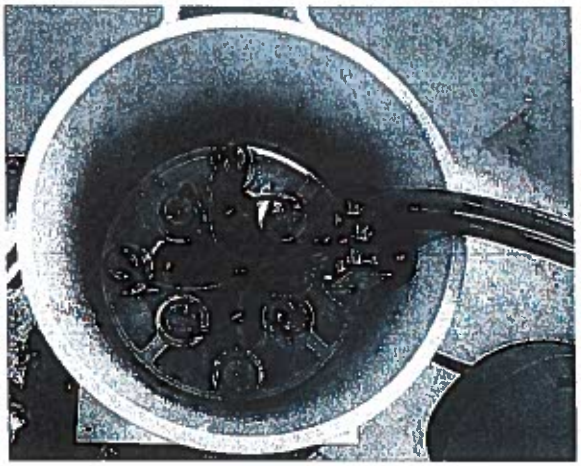
1. Remove the cover (if red, discard) from the top of the collector housing.
2. Note the wiring location before removing the wires. (Figure 12)

Figure 12 Collector Ring Housing



3. Remove the terminal block inside collector ring by removing two Keps nuts using 7/16 inch nut driver.
4. Remove the four bolts on the side of the collector housing assembly (Figure 13) and remove the brush assembly. **NOTE:** Press down on brush assembly while removing the four bolts. Brush assembly is under spring tension while in position.

Figure 13 Installation/Removal Brush Assembly



5. Remove lead wire from brush holder. Remove the worn brush from the brush holder in the brush holder plate. (Figure 14)

Figure 14 Brush Holder Assembly

K-BRSH1
Includes: 8 position brush holders, 8 brushes, 8 brush holders, set-screws and wires

6. Insert the replacement brush into the brush holder. Connect the lead wires to the brush holder.

Removing the Collector Ring Assembly

To remove the collector ring assembly, do the following:

1. Remove the brush assembly as described above.
2. Disconnect the three wires from the terminal block (TB5) inside the rotator housing and begin feeding wires up into the siren shaft (Figure 8).
3. Loosen the rotator drive band to rotate the siren during removal of the collector ringbolts.

⚠ CAUTION

To prevent damage to the cover assembly, use a piece of wire to secure the cover in an open position before removing the housing's back panel.

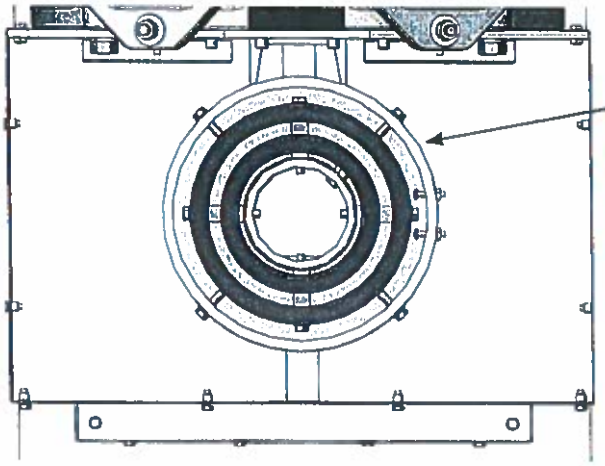
4. Remove the back panel to expose the aluminum tape, blue plug, or black plug on the collector housing assembly.
5. Remove the aluminum tape, blue plug, or black plug.

6. Manually rotate the siren and remove each of the four bolts that hold in the collector rings (Figure 15). Access to these bolts can be gained through the access hole.

Figure 15 Collector Housing Opening

7. Remove the collector rings with stand-offs and cables still attached (Figure 16).
8. Reassemble the collector rings, stand-offs, and cables before re-installation.

Figure 16 Collector Rings



K-COLL1
Includes: Collector ring, 4 each insulators, miscellaneous hardware and 36-inch red and black wires

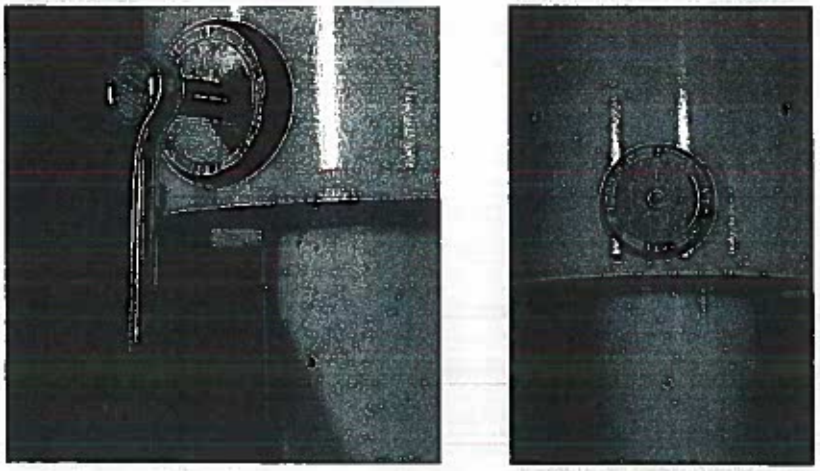
9. To replace collector ring assembly, align the stand-offs before replacing the four bolts removed in step seven above.
10. Ensure that collector rings are concentrically aligned before replacing the brush assembly.
11. Replace the brush assembly.
12. Look through the access hole and ensure that brushes are contacting the proper collector rings.

13. Install the black plug. Place rubber plug over access hole to ensure sealing against water ingress. Place the word UP at the top and the word DOWN at the bottom. (Figure 17)

Figure 17 Placing rubber plug over access hole

14. Tighten 1/4"-20 Keps nut to 11-14 in lbs using a 7/16" socket wrench. (Figure 18)

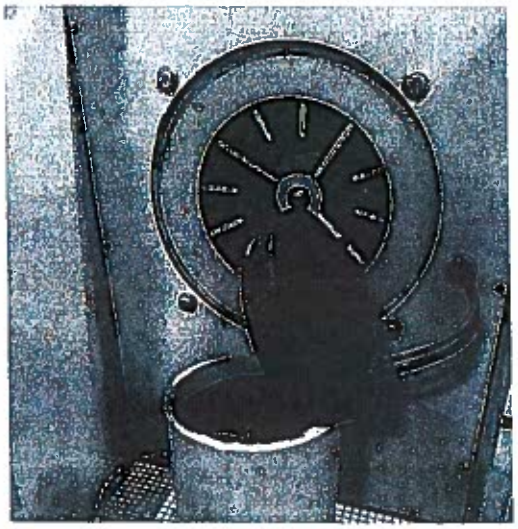
Figure 18 Tightening rubber plug



15. Rotate siren head to ensure no noticeable resistance to rotate siren.

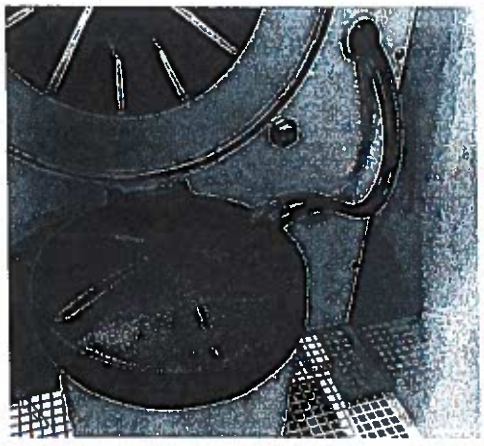
16. Install the black cover by inserting the red and black motor wires through the cover and attaching the wires to the terminal block. Place a 2- to 3-inch bead of RTV Silicone at three locations to secure the black cover to collector housing. Install and gently tap cover to seat on collector housing. (Figure 19)

Figure 19 Installing new black cover



17. Wrap nylon wire ties around each four gauge wire and place firmly against black cap. Remove excess wire ties. Position motor wires with drip configuration as shown. (Figure 20)

Figure 20 Wire ties around four gauge wires



18. Replace the back panel.

Inspecting and Servicing the Chopper Motor Brushes

The chopper motor is designed to be maintenance free. Federal Signal recommends inspection of motor brushes and commutator every three years.

Accessing the Motor

To access the motor on the 2001-130 and Equinox Sirens, do the following:

1. Remove the inner cone by removing the four ¼-20 hex head screws at the back of the cone.
2. Set aside cone and bolts.

To access the motor on the 508-128 Siren, do the following:

1. Remove the rear covers.
2. Set aside covers and screws.

Inspecting the Chopper Motor Brushes

You need the following equipment.

Table 27 Tools/Parts

Description
Compressed Air
5/16 inch Nut driver
Scotch-Brite™ pad
Replacement Brushes (includes 4 brushes) Part Number: K-BRSH2

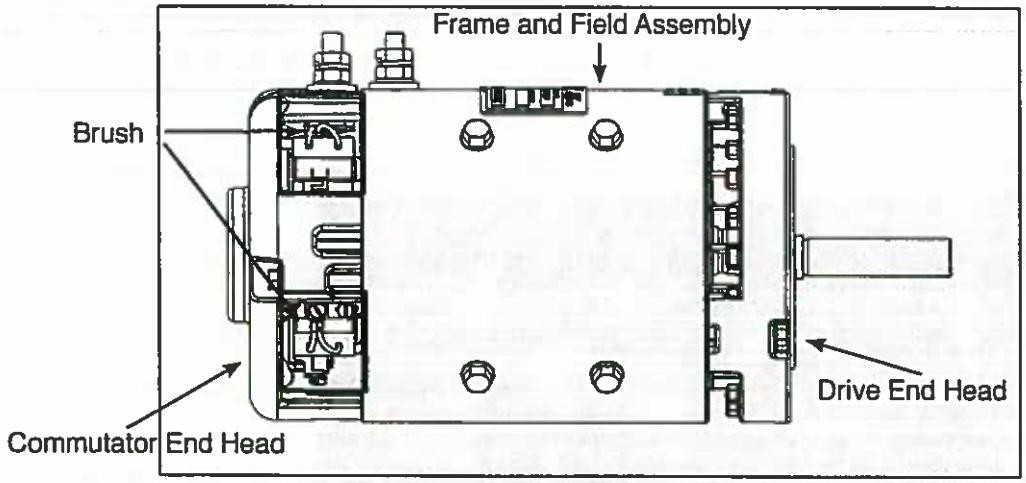
⚠ CAUTION

Wear eye protection during any maintenance operation.

To inspect the chopper motor brushes, do the following:

1. Reference Figure 21 and become acquainted with the labeled motor components.

Figure 21 Motor Components



2. Locate the four openings that expose the brushes at the commutator end head of the motor. Figure 21 outlines two of the four openings in the commutator end head in red.

3. Visually inspect the motor at the commutator end head for excess brush dust. If excess dust is seen, use clean, oil free, compressed air to carefully blow out accumulated brush dust and dirt from the commutator end head and the frame and field assembly.

   NOTE: Carbon dust inside the motor can be messy when removed with compressed air.

⚠ CAUTION

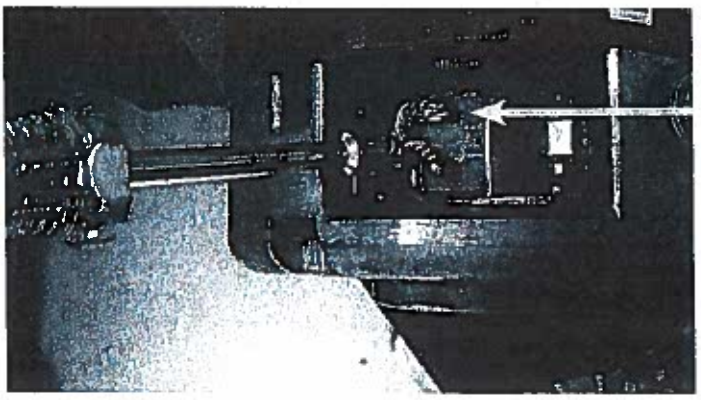
When using compressed air, follow all safety instructions, including wearing eye and respiratory protection.

4 Continue using compressed air on the motor at all four openings in the commutator end head until brush dust is no longer visible exiting the motor.

5. After removing dust from the motor, measure brush length by removing the brush from the motor. Remove all four brushes.

6. To remove the brushes, first remove the 8-32 x .50-inch bolt from the back of the brush shunt using a 5/16-inch driver (Figure 22).

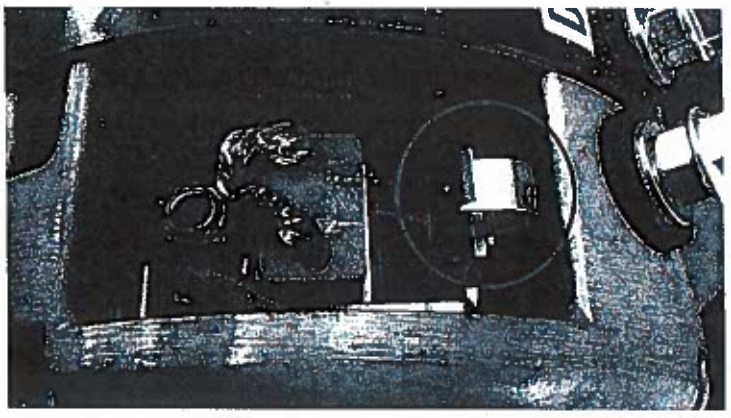
Figure 22 Removing Brush Shunt Bolt



Brush Shunt

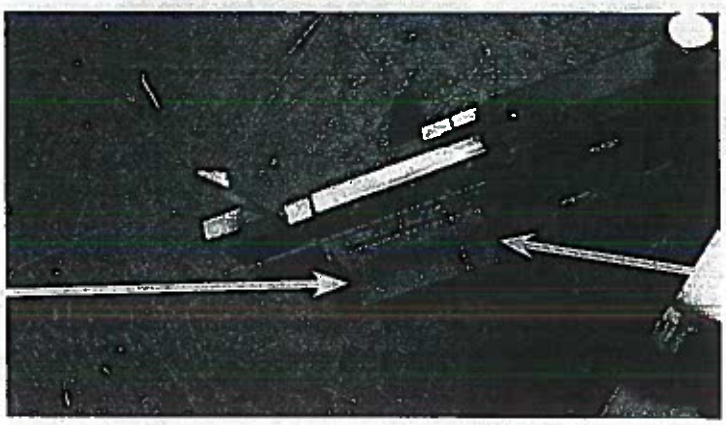
7. After the bolt is removed, pull back the brush spring. Pull the brush spring back and latch it on the post (Figure 23).

Figure 23 Brush Spring Latched on Post



8. Once the brush spring is secured on the post, the brush can be removed and measured.
9. To measure the brush length, using a caliper, measure from the radius of the commutator side of the brush to the flat of the shunt side (Figure 24).

Figure 24 Brush Spring Measurement



11. See minimum brush length in the table below.

Table 28 Brush Length

Maximum Brush Length	1.30 inches/33 mm
Minimum Brush Length	0.62 inches/16 mm

12. If brush lengths are found to be less than the specified minimum length, remove and replace all brushes with new brushes.

NOTE: If brushes are stuck in the brush holder, attempt to remove brushes from brush holder. If you are able to remove brushes, continue to inspect the commutator. Federal Signal recommends replacing of all four brushes. If unable to remove brushes, contact Federal Signal technical support.

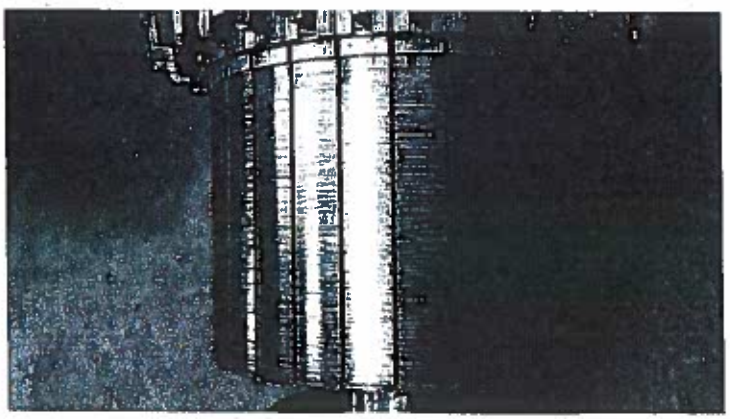
Inspecting the Commutator

To inspect the commutator, do the following:

1. While the brushes are removed from the motor, visually inspect the commutator.
2. The commutator should have a uniform gray/charcoal colored film covering the copper bars where the brushes make contact.

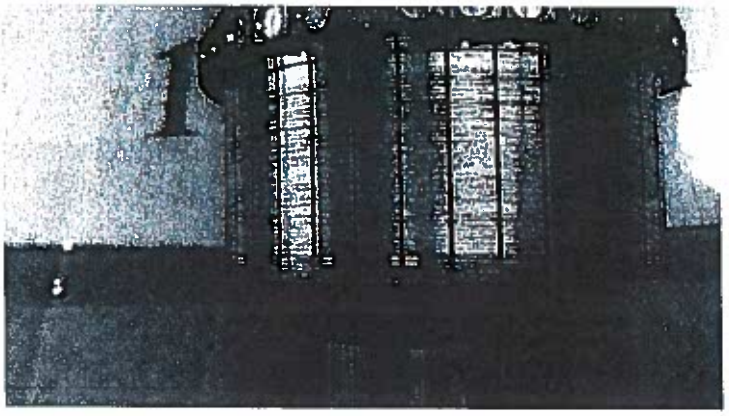
3. The Figure 25 displays an example of an acceptable commutator with uniform wear.

Figure 25 Uniform Brush Film



NOTE: Motors with limited run time in the field may exhibit streaks in the film on the commutator. This is common on newer motors and will eventually become more uniform when the motor has more run time and the brushes become fully seated. The Figure 26 depicts a commutator with streaky film due to limited run time.

Figure 26 Streaky Brush Film



4. Replace commutators that exhibit pitting or excessive wear. Figure 27 shows an example of a commutator with pitting and Figure 28 shows an example of a commutator with excessive wear.

Figure 27 Pitting on Commutator

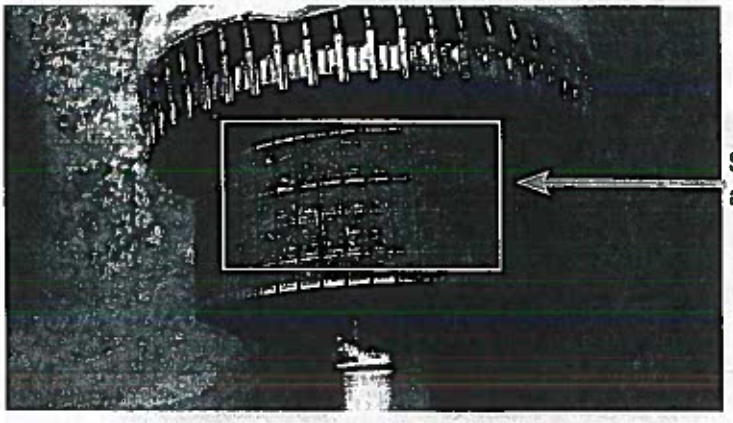
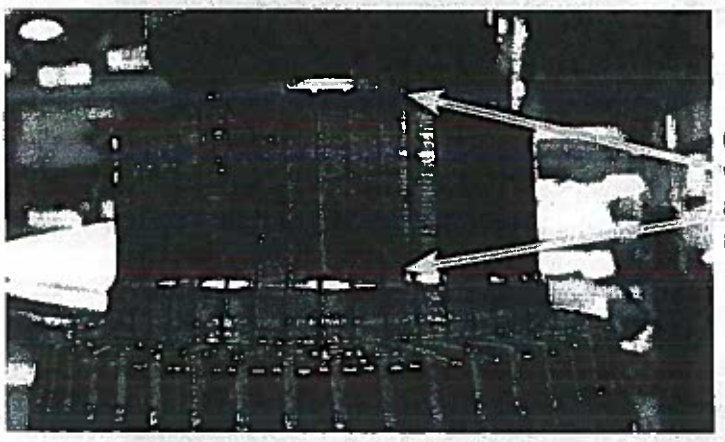


Figure 28 Commutator Wear



NOTE: If pitting or wear on the commutator is found, remove the motor from service and inspect and rebuild by an experienced motor rebuilder or manufacturer.

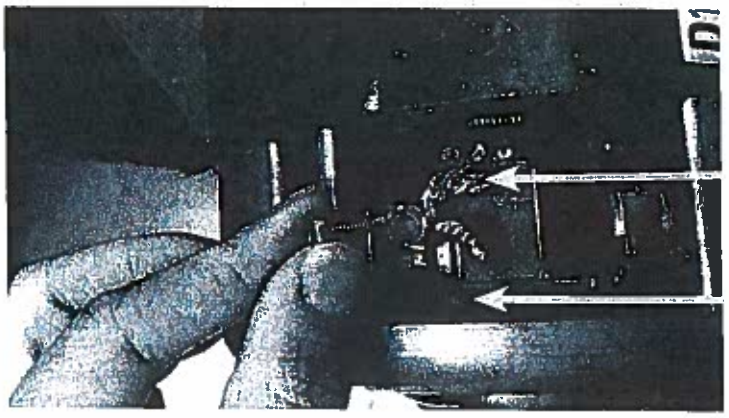
Installing New Brushes

To install new brushes, do the following:

1. After each brush is removed from the motor, carefully blow any remaining brush dust out of the brush holders on the brush box with clean, oil free, compressed air.
2. Inspect the brush holder for any debris or contamination. If the brush holder has contamination, use a Scotch-Brite pad to clean the holder.
3. If re-using existing brushes, inspect brushes for any contamination. Replace brushes if they have any sign of contaminations.
4. Verify all brush holders are clean and dust free. Using a brush, ensure brushes are able to move freely in brush holder.
5. Blow out the remaining contaminates using clean, oil free, compressed air.

6. Once the brush holders are clean, install brushes and the bolts that held the original brushes in place.
7. Place one brush into the brush holder.
8. Place one of the bolts through the hole in the brush shunt, the lead wire (if applicable), and the corresponding hole in the brush box (Figure 29).

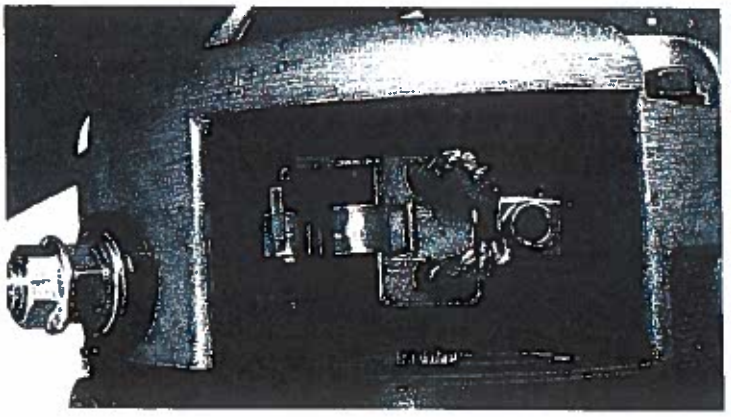
Figure 29 Replacing Brush Shunt Bolt



9. Tighten the bolt down using a 5/16-inch driver.
10. Unlatch the brush spring from the post such that it is resting on the back of the brush.

    NOTE: Center brush spring between brush shunts. Do not misalign or contact the shunts. This allows the brush to remain in contact with the commutator and wear consistently throughout the motor's lifespan (Figure 30).

Figure 30 Placing the Brush Spring



11. Repeat steps 7-10 with the remaining brushes.
12. Inspect motor to ensure all brushes are installed, all bolts are present, and all brush springs are engaged.
13. Re-install all covers and test operation of the chopper motor.

Replacing the Rotator Motor

To replace the rotator motor, do the following:

1. Remove the two rotator housing panels (Figure 8).
2. Replace the rotator motor (K-GEAR1). Approximately a 1/64 inch gap between the teeth of the two gears is required to avoid binding. Re-tighten rotator motor bolts to a torque of 45 in. lb.
3. Wire rotator motor and terminal block as shown in Figure 7.
4. Grease all gear surfaces with a lithium based grease.
5. Replace housing panels.

Replacing the Chopper Motor for the Models 2001-130 and Equinox Sirens (K-CHPR1)

To replace the chopper motor, do the following:

1. Remove the inner cone by removing the four ¼-20 hex head screws at the back of the cone.
2. Remove the top housing.
3. Remove the 3/8 bolt holding rotor to the motor shaft.
4. Remove the rotor using a wheel puller.
5. Remove wires from motor terminals.
6. Replace motor by removing four ¼-20 bolts. Secure motor.
7. Replace wiring, rotor, and housings.

Replacing the Chopper Motor for the Model 508-128 Siren (K-CHPR1)

To replace the chopper motor, do the following:

1. Remove the horn screen.
2. Remove the top two housings.
3. Remove the 3/8 bolt holding rotor to the motor shaft.
4. Remove the rotor using a wheel puller or two 3/8-16 screws min. 4 inch long.

   NOTE: Using the screw method for removal, remove the two short screws from the back of the stator.
5. Remove wires from motor terminals.
6. Replace motor by removing four ¼-20 bolts. Motor must be secured.
7. Replace wiring, rotor, housings, and short screws on back of stator.

Replacing the Screen/Hardware for the Model 508-128 Siren

In the original Model 508-128 siren head, the brackets holding the screen on the front could become loose or damaged. The initial release had a two-hole design for the brackets that kept the screen attached to the siren head. In February of 2013, Federal Signal began shipping all Model 508-128 siren heads with a new three-hole design.

If you have the two-hole design and the hardware becomes damaged or loose, Federal Signal recommends upgrading the screen and kit. The Q-508SCREEN model consists of the following hardware.

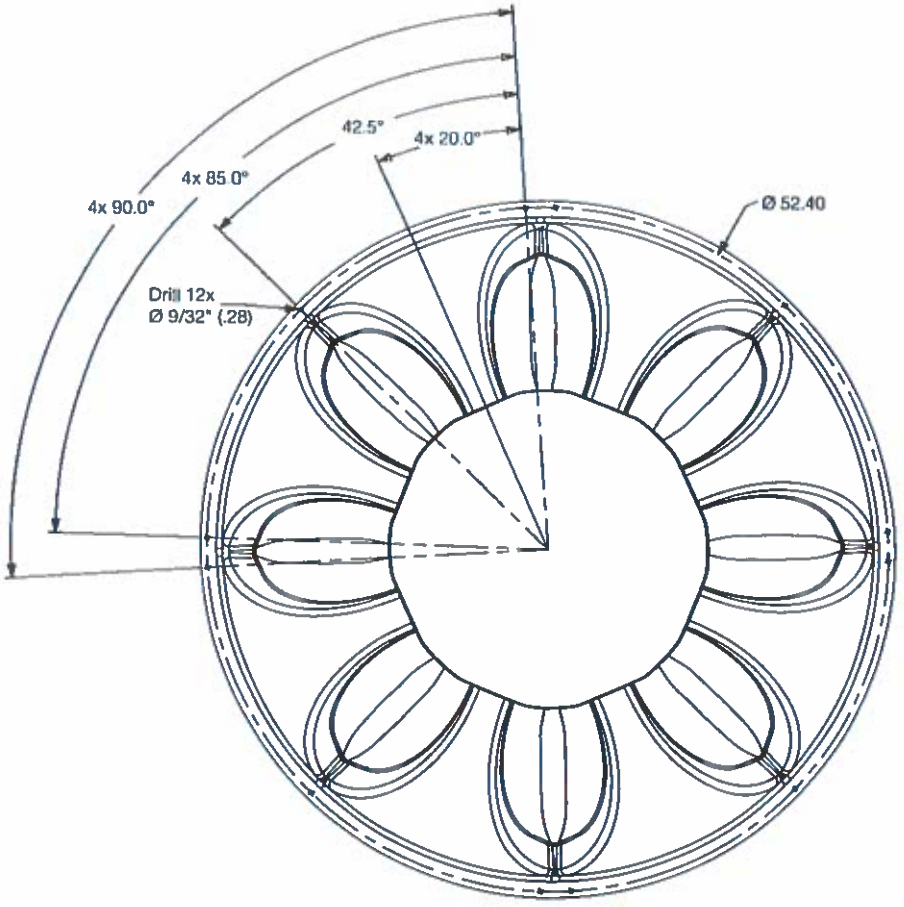
Table 29 Q-508SCREEN Hardware

Qty.	Description	Part Number
4	Brackets	8402224B
12	¼-20 Stainless Steel screws	7000A345-16
12	Flat washers	7072A024
12	¼-20 nylon lock nuts	7058A010

To replace screen and hardware on Model 508-128 siren, do the following:

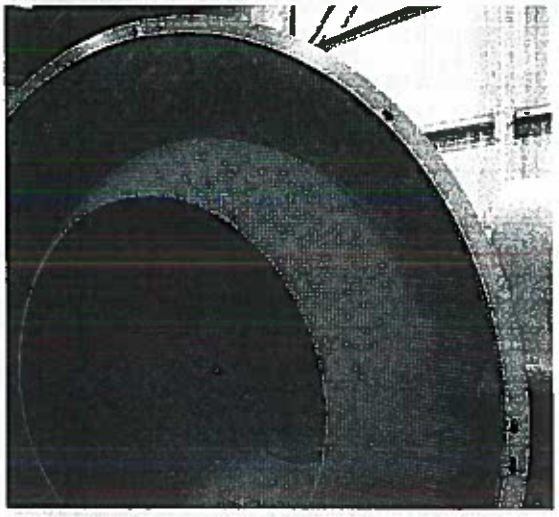
1. When replacing the two slot pattern retaining bracket with three slot pattern retaining bracket (8402224B), drill the horn flange. (See Figure 31.)

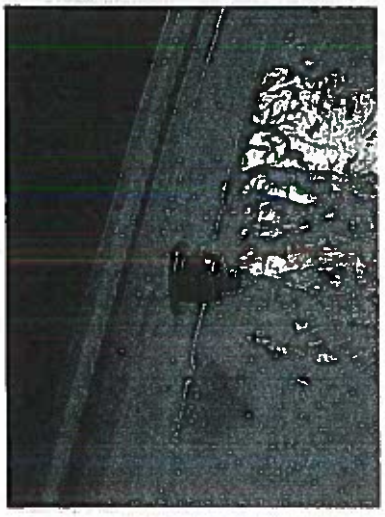
Figure 31 Drill horn flange for Model 508-128 Siren



2. Secure bracket (8402224B) with C-clamps and mark drill pattern.
3. Drill new holes using 9/32 drill bit.
4. Attach each of the four (8402224B) brackets against the back side of fiberglass flange using three supplied ¼-20 stainless steel screws (7000A345-16), three flat washers (7072A024), and three ¼-20 nylon lock nuts (7058A010).

Figure 32 New screen installed





Ordering Replacement Parts for Siren Head

To order replacement parts, call Customer Care. See Getting Service.

Table 30 Replacement Parts for Siren Head

Description	Part Number
Clutch Replacement Kit	K-CL1
Brush Holder Assembly	K-BRSH1
Collector Ring Assembly	K-COLL1
Rotator Motor	K-GEAR1
Chopper Motor with key	K-CHPR1
Chopper Motor Brushes (Includes 4 brushes)	K-BRSH2
Black Cover	840200276
Black Plug	840200279

Table 31 Replacement Parts for Model 508-128 Siren Head only

Description	Part Number
Screen and hardware	Q-508SCREEN
Screen only	Q-8402220A

Getting Service

If you are experiencing any difficulties, contact Federal Signal Customer Care at: 800-548-7229 or 708-534-3400 extension 5822 or Technical Support at: 800-524-3021 or 708-534-3400 extension 7329 or through e-mail at: techsupport@fedsig.com. For instruction manuals and information on related products, visit: http://www.fedsig.com/

FEDERAL SIGNAL
Safety and Security Systems

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Technical Support	800-524-3021 • +1 708 534-3400

FEDERAL SIGNAL
Safety and Security Systems

DCB, DCFCB, and DCFCTB Models

Battery Operated
Mechanical Siren Control System

Description, Specifications, Installation, Operation, and Service Manual

255360
Rev. L9 0620
Printed in U.S.A.

Limited Warranty

This product is subject to and covered by a limited warranty, a copy of which can be found at www.fedsig.com/SSG-Warranty. A copy of this limited warranty can also be obtained by written request to Federal Signal Corporation, 2645 Federal Signal Drive, University Park, IL 60484, email to info@fedsig.com or call +1 708-534-3400.

This limited warranty is in lieu of all other warranties, express or implied, contractual or statutory, including, but not limited to the warranty of merchantability, warranty of fitness for a particular purpose and any warranty against failure of its essential purpose.

FEDERAL SIGNAL
Safety and Security Systems

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Customer Support 800-548-7229 • +1 708 534-3400
Technical Support 800-524-3021 • +1 708 534-3400

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⚠ WARNING

It is important to follow all instructions shipped with this product. This device is to be installed by trained personnel who are thoroughly familiar with the country electric codes and will follow these guidelines as well as local codes and ordinances, including any state or local noise control ordinances.

Listed below are important safety instructions and precautions you should follow:

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 manual has been carefully checked and is believed to be accurate; however, no responsibility is assumed for any inaccuracies.

Publications

Federal Signal recommends the following publications from the Federal Emergency Management Agency for assistance with planning an outdoor warning system:

- The "Outdoor Warning Guide" (CPG 1-17)
- "Civil Preparedness, Principles of Warning" (CPG 1-14)
- FEMA-REP-1, Appendix 3 (Nuclear Plant Guideline)
- FEMA-REP-10 (Nuclear Plant Guideline).

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, be 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. Review and comply with any local or state noise control ordinances as well as OSHA noise exposure regulations and guidelines.
- 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.

- 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.

Installation and Service

- Electrocution or severe personal injury can occur when performing various installation and service functions such as making electrical connections, drilling holes, or lifting equipment. Therefore, only experienced electricians should install this product in accordance with national, state and any other electrical codes having jurisdiction. Perform all work 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. Review and comply with any local or state noise control ordinances as well as OSHA noise exposure regulations and guidelines.
- 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. Give a copy to anyone who is going to service or repair the sirens.

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.

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

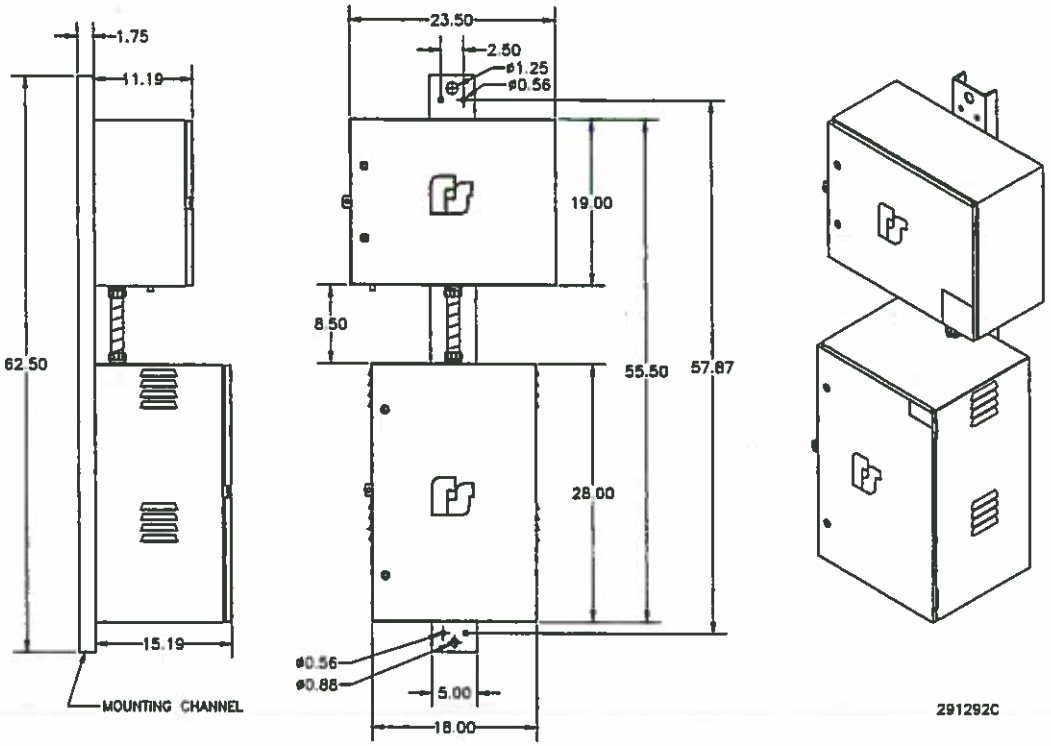
Pay careful attention to notices located on the equipment.

General Description

Introduction

This manual describes the features, specifications, technical description, installation, operation, maintenance, and options of the Federal Signal two-way controller (model DCFCTBD). Federal Signal DCFCTBD siren controllers are two-way digital, battery-operated/back-up and status monitoring systems for use with the Federal Signal 2001-130, Equinox, 508-128, and Eclipse8 sirens.

Figure 1 DCB, DCFCB, and DCFCTB Battery and Control Cabinets



Overview

The DC Series Siren Control System contains the following components:

- Aluminum Control Cabinet and Battery Cabinet (optional 304 or 316 stainless steel cabinets)
- 48 Vdc battery charging system
- Motor Contactors
- Fusing

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

DCB Model

The DCB controller includes the following:

- Control Cabinet and Battery Cabinet
- 48 Vdc charging system
- Contactors (Chopper and Rotator)
- Fusing
- DIN rail terminal block
- Battery disconnect switch
- Wiring for components

DCFCB Model

The DCFCB controller includes all the components of the DCB controller plus an FC control board that can be equipped with a one-way receiver. IP board and landline board is optional. The following lists the DCFCB part numbers.

Table 1 DCFCB Models

Part Number	Description
DCFCB	Controller with FC Control Board, radio not included
DCFCBH	Controller with FC Control Board and High Band 148-174 MHz radio
DCFCBU	Controller with FC Control Board and UHF Band 403-470 MHz radio

For special orders contact Federal Signal. See "Getting Service" on page 69 for contact information.

DCFCTB Model

The DCFCTB controller includes all the components of the DCB controller plus additional wiring for two-way status monitoring of the DC Cabinet. The DCFCTB can be equipped with a two-way radio transceiver. IP board, landline board, and a one-way receiver are all optional. The following lists the standard DCFCTB part numbers.

Table 2 DCFCTBD Models

Part Number	Description
DCFCTBD	Two-way Controller with FC Control Board, radio not included
DCFCTBDH	Two-way Controller with FC Control Board and High Band 148-174 MHz radio
DCFCTBDU	Two-way Controller with FC Control Board and UHF Band 403-470 MHz radio
DCFCTBD-IP	Two-way FC Controller, IP-enabled

For special orders contact Federal Signal. See "Getting Service" on page 69 for contact information.

Table 3 Accessories

Description	Part Number
Federal programming software (Non-digital applications)	FSPWARE
Commander® Software System, *10, 25, 255, or 512 Site License	SFCD*
240 Vac operation	2001TRBP
Activation system	SS2000+
Solar powered option	Contact Federal Signal
Antenna	Contact Federal Signal

Control/Battery System

The Control/Battery System consists of two cabinets, which are channel mounted for ease of installation. (See "Figure 1 DCB, DCFCB, and DCFCTB Battery and Control Cabinets" on page 12.) The upper NEMA 4 cabinet houses the necessary electronics and controls for producing the siren signals, and the charging system for the four 12-Volt batteries.

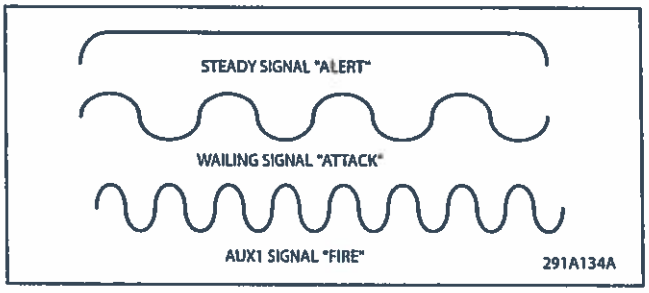
The lower vented NEMA 4X style enclosure houses four user-provided rechargeable batteries with optional lead-acid, AGM, or gel batteries. The lower and upper cabinets are interconnected through Liquid-Tight conduit, which is sealed to prevent harmful vapors from entering the control area. The four batteries are connected in series to provide 48 Vdc operating power to the siren, while the charger in the upper cabinet operates on 120 Vac to keep the batteries charged. This arrangement continues to provide power to the siren in the event of a power failure. The controller works primarily off the AC input voltage. In the event of an AC power failure, the controller automatically obtains power from a 48 V to 12 V DC-to-DC converter powered by the four 12 V batteries.

DCB and DCFCB Controller

The DCB and DCFCBs are one-way controllers. They have separately fused circuits to protect the siren controller. Two AC power fuses (F1 and F2) protect the charger and optional battery warmers respectively. The main siren motor is protected by a 200 A DC fuse. An in-line fuse connected to K1 fuses the rotator motor. The contactor coils are fused with in-line fuses. The charger output is protected with in-line fuses. (See "Figure 5 Battery Positioning and Wiring" on page 42, "Figure 12 DCB Wiring Diagram" on page 73 and "Figure 13 DCFCB Wiring Diagram" on page 74.)

The Models DCB and DCFCB siren controllers are capable of producing a steady signal, wailing signal, and a fast wail or fire signal. The steady signal is frequently used as a civil defense "Alert" signal. The wailing signal is often used as a civil defense "Attack" signal. The fast wail or fire signal is often used to summon the local fire department. You can use any of the signals for any desired application. These signals are shown graphically in the following figure.

Figure 2 DCB and DCFCB Signal Characteristics



One-Way Radio Control

You can remotely activate the siren by a radio signal when an optional radio receiver/decoder is incorporated with the DCFCB System. The advantage of radio control activation is that control lines are not required between the siren control site and the siren location. For units equipped with the optional integral radio receiver, the RF Frequency configuration parameter sets the frequency of the radio channel. Changing this parameter from its factory setting requires re-alignment of the radio for maximum performance. The value entered must fall within the range specified for the receiver band equipped.

DCFCTB Controller

The DCFCTBs 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 through either DTMF or FSK signaling depending on the model purchased.

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

The digital DCFCTBs 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 DCFCTBD series models. You can upgrade the DTMF version of the DCFCTB to the digital version DCFCTBD with a software update. All DCFCTB models come equipped with two useable relay outputs, which you can program independently to activate with various codes. Relay #3 is wired as a normally closed contact and is used to force the system into battery mode during a growl test (if applicable). Relay #4 is reserved for a low voltage disconnect.

There are also four inputs and four local buttons, which you can use to activate and cancel the unit.

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

The DCFCTBs contain six user programmable functions in addition to the five preset functions: ARM, DISARM, REPORT, QUIET TEST/GROWL TEST, MASTER RESET.

The DCFCTBs 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 Current
- Intrusion into Control Cabinet and Battery Cabinet
- Siren Rotation
- Charger Status

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 OK." 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 two-tone, DTMF, POCSAG, MSK Digital functions decoded, and the current software revision. The display constantly scrolls through the display items.

Two-Way Radio Control

The Federal Signal DCFCTBs are available in VHF and UHF models transceivers to provide two-way signaling capabilities. Other radio types are available. Contact Federal Signal Sales for additional information. Refer to the radio instruction manual for details concerning operation, specifications, and maintenance.

Features

The DCFCTB Controller has the following features.

- Two-way siren controller for 48 Vdc Sirens
- Two-way radio control and status monitoring
- AFSK Two-way signaling format
- Simultaneous single tone, two-tone sequential, and DTMF decoding
- Able to use multiple communication paths for redundancy
- Controls mechanical sirens, including models 2001-130, Equinox, 508-128 and Eclipse8
- Solar options available
- Buttons for local activation
- Landline, ethernet (IP) or radio control
- UL Listed for general signaling
- DNV Certified

Specifications

Controllers Specifications

Table 4 Input Power Requirements

Input Power Requirements	
AC Voltage	120 Vac +/- 10%, 50-60 Hz, 240 Vac +/- 10%, 50-60 Hz
Current draw	4.0 A at 120 Vac (nominal) 7 A with HTR4 option (not available with direct 240 Vac operation

Table 5 AC Power

2001TRB/TRBP/120246F-AC	AC Primary Operation
Input Voltage	208/220/240 Vac single phase
Input Current	30 A (approx.)
Output Voltage	46 Vdc/115 Vac (50 A service recommended, to be fused with 35 A Slo-Blow)
Output Current	120 A dc/10 A ac
Dimensions (H x W x D)	25.75 x 10.75 x 10.5 inches (654.05 x 273.05 x 266.7 mm)
Weight	150 lb (68 kg)

Table 6 Battery Warmer

HTR4: Battery Warmers	
Input Voltage	125 Vac single phase
Power Rating	80 watts each

Table 7 System Operating Power from the 4 Battery System

System Operating Power from the 4 Battery System	
Output Voltage	48 Vdc (nominal)
Operating Current during an activation	115 A (nominal)
Continuous Full Output Signaling Time	20 minutes (minimum)
Stand-by time on Reserve Battery Capacity that provides a full 3-minute siren activation	5 days minimum

Table 8 Charging System

Chargers (one for all four batteries)	
Charger Output Voltage	54.0 Vdc at 100 mA
Charger Output Current	4 A maximum

Recommended Batteries (user supplied)

Refer to Federal Signal Website (http://www.fedsig.com/) for current recommended batteries. Use of batteries other than those specified may degrade the operation of this product and void the warranty.

Table 9 Dimensions

Dimensions (H x W x D)	
Control Cabinet (NEMA 4)	19 x 23.5 x 11.19 inches (483 x 597 x 284 mm)
Battery Cabinet (Vented NEMA 4X)	18 x 28 x 15.19 inches (457 x 711 x 386 mm)
Overall (including channel)	62.5 x 23.5 x 16.94 inches (1588 x 597 x 430 mm)
Total Weight (including batteries)	364 lb (165 kg)
Shipping Weight (excluding batteries)	300 lb (136 kg)

Table 10 Environmental

Environmental	
Operating Temperature	-30°C to +65°C / -22°F to 149°F (with batteries maintained at -18°C minimum)
Humidity	0-98% non-condensing

Control Board Specifications

Table 11 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 max.

Table 12 Backup Battery

Backup Battery	**DC Current Draw (Nominal 48 Vdc)**
FC PCBA	150 mA Standby (without two-way radio)
Two-way Radio*	Current draw is at the following: • Standby is at 350 mA • Active/Transmit is at 8 A nominal

*Typical current draw for a radio. Refer to radio manufacturer's manual for specific ratings.

Table 13 Serial Communications

Serial Communications	
Serial Port Configuration	RS232C 1200, N, 8, 1

Signaling Format Specifications

Six user programmable functions in addition to the five preset functions: ARM, DISARM, REPORT, GROWL TEST, and MASTER RESET. Wildcard options for each of the DTMF strings.

Table 14 Two-Tone Sequential

Frequency range	282 Hz - 3000 Hz
Tone timing	First Tone – 0.5 second minimum Second Tone – 0.25 second minimum 8 seconds maximum for both tones
Intertone Gap	400 ms (maximum)
Tone Accuracy	+/- 1.5%
Tone Spacing	5.0% preferred, 3% minimum

Table 15 Single Tone

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

Table 16 DTMF

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

Table 17 FSK

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

Table 18 EAS

EAS	Supports standard EAS codes and wildcards.

Table 19 POCSAG

POCSAG	Supports Binary frequency shift keying 512 Baud numeric messages.

Inputs and Outputs

Table 20 Relay Outputs

Four relay outputs	Normally Open or Normally Closed
Contact Rating	240 Vac, 5 A or 24 Vdc, 8 A

Table 21 Audio Output (Optional)

Output Voltage	> 2 V_{p-p}
Maximum Load	8 ohms
Total Harmonic Distortion	< 10% at 1 kHz Sine wave

Table 22 Remote Activation Inputs

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

Transceiver Specifications

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

Technical Description

Control Board Theory of Operation

Power Supply

MOVs V5, V6, and V7

The control unit can be powered by either 110 Vac or 220 Vac (on JP22). The control unit is protected by MOVs V9, V10 and V11, resistors R150 and R151 and by fuse F3. These absorb spikes and limit over-voltages. The power is stepped down by the transformer, rectified by D82 and filtered by C112. The voltage at this point is about 24 volts DC. Tranzorb D83 blows fuse F1 if the voltage exceeds 33 Vdc. This voltage is regulated to 12 Vdc by switching regulator U35. This voltage turns on Q11 through R133. The collector of Q11 sends a low to U34 pin 8 indicating the presence of AC Power.

DC Power Input and Low Voltage Cutout

U35 can also be powered by up to 75 Vdc through JP5 pin 9 from an external DC source. The 12 Vdc from U35 turns on Q10 through R130. This pulls the gate of switch Q9 low allowing it to pass voltage from the 12 volt battery through Q9 to the rest of the board if needed due to a power failure. The passed battery voltage turns on Q12 through R137 and Zener diode D72. Q12 also pulls the gate of Q9 low turning it on. If AC power fails, Q10 releases its low to Q9. Then if the battery voltage drops below about 9.6 Vdc, Q12 releases its low to Q9. This turns off the power to the board, which stays off until AC power is restored.

Regulated Supplies

U32 regulates the voltage further to 8 Vdc. U33 regulates the voltage further to 5 Vdc and U30 regulates it to a further 3.3 Vdc. An LED (D26) is tied to the 5 volts supply and indicates power. The regulated 12 volts passes through 12 volt regulator U44, which acts to limit the maximum voltage supplied to U40 and U43. U43 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 (D77) is also tied to this point and indicates isolated 5 volt power.

U40 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. An LED (D79) is also tied to this point and indicates isolated 12 volt power. The Heartbeat signal from the processor passes through C107 and D80 keeping C110 charged and Q14 on. This keeps Q15 on allowing power to pass to U43, which powers the relay outputs. If the processor stops running, R148 will discharge C110 and turn off Q14 and Q15. This removes power from the relays so they cannot activate.

U41 monitors the voltage of the 5 volt power. If the power supply voltage falls below 3.3 volts, U14 resets the microprocessor.

CPU

The CPU is comprised of a microprocessor with 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 is held while the FLASH is the non-volatile memory where the main program is held. U31 allows the microprocessor to communicate over serial port JP8 for programming.

For FSK and two-way DTMF units, the unit contains a ten position dip switch for setting the unit's site address.

Remote Activation, Sensor, and Battery Back-up Voltage Input

The remote activation inputs are available on connector JP10. Grounding any one of these pins activates the function associated with it. The inputs are protected by limiting diodes and are optically isolated. There is also a button on the board for each of these functions that activate 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 U15 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.

The TR Voltage sensor input is an analog voltage that is buffered by U38 and then passed on the A to D convertors in the processor to be read. It is not optically isolated and is referenced to ground.

For an External Transceiver

The receive audio, from P1 pin 2 (the two-way connector) is routed to the output which is set to 1 V_{pp} at TP6 using R27. The CTCSS decoder option, if installed, gates U11:C on and allows audio to pass. U1B forms a highpass filter. This strips out any audio frequencies below 300 Hz. This filtered audio is then fed to the various decoders.

For an Onboard One-Way Receiver

The receive audio enters through U9:C and R60 to Carrier Detect Gate U11A and then to U1A. The output is about 1 V_{pp} at TP6. The CTCSS decoder option, if installed, gates U11:C on and allows audio to pass. U1B forms a highpass filter. This strips out any audio frequencies below 300 Hz. 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 passes 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 D9 setting the output of U10:B high and turning on audio gate U11:D. This allows the received audio to pass through U11:D to U1A; the output goes to the decoder circuits. The high from U10:3 also passes through R25 to U10:B, which forces audio gate U11:A off thus 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 D4 setting the output of U10:B high and turning on audio gate U11:A. This allows the received audio to pass through U11:A to U1A; the output goes to the decoder circuits. The high from U10:4 also passes through R25 to U10:A, which forces audio gate U11:D off, preventing audio from the external transceiver from coming through.

VOX

JP3 which can be jumpered to provide VOX carrier detect for radios that do not provide carrier detect. Receive audio is routed from the external transceiver connector to buffer amplifier U2A, which drives RMS to DC converter U4B. The DC voltage at the cathode of D6 represents the level of the incoming receive audio. U4A acts as a comparator whose output pulls low when the receive audio exceeds about 45 mV_{pp} or about 750 Hz of deviation (350 Hz for narrowband systems). This passes to JP3, which can be jumpered to provide VOX carrier detect for radios that do not provide carrier detect.

DTMF

Receive audio enters the DTMF decoder IC (U14) from the high pass filter through C51 and R64. When a proper DTMF digit is being decoded, TP8 will go low and a binary output will appear on pins 18, 19, 20, and 20 of U14.

Tone Decode

Receive audio from the high pass filter U1B, is passed on to low pass filter U1C. These form a band pass filter from 300 to 3000 Hz. When the processor is decoding a tone greater then 2100 Hz, it turns Q1 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 then 500 Hz, it turns Q2 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 U1D and then passed to U3B, 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 TP5.

EAS Decode

Receive audio from the high-pass filter U1B is passed on to low-pass filter U1C. These form a band-pass filter from 300 to 3000 Hz. After the band-pass filter, the tones are amplified by U1D then passed to U3B, 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 TP5.

POCSAG Decode

All POCSAG messages contain a 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 responds to a message.

The Standard Format for Federal Signal POSAG codes consists of a five character numeric message preceded by a bracket "[" and followed by a bracket "]" for a total of seven characters. The first three numbers are the unit number. Any unit number less than 300 activates only that unit number. A unit number of 300 activates all units. Unit number of 301 to 316 activates all units in zones 1 to 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 activates functions one through six. 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 U5A. R11 and C35 average the DC voltage present on U5A pin 1 and pass it to U5B pin 6. U5B acts a comparator converting the audio present on pin 5 into square waves. This is fed to the processor for decoding.

Digital

The receive audio is fed to the digital decoder IC (U12). U12 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.

Transmit Audio and PTT

The transmit audio is generated by U14 (the DTMF encoder), U12 (the digital encoder) and the CTCSS board (if present). PTT is generated by the processor taking pin 44 low. This gates U11:B on allowing the transmit audio to pass out to the transmitter.

The PTT also sets the collector of Q4 high, which allows R47 to turn on Q3 through R44. Q4 pulls the PTT line low and activates TRANSMIT LED D18. The collector of Q4, being high, also allows R48 to begin charging C15. When this exceeds 5 volts, U3A forces its output to ground and shuts off Q3. This provides a time-out timer to prevent the transmitter from getting stuck in transmit.

The PTT signal also sets the output of U17F high turning on Q5. This sends a ground to the CTCSS board, telling to encode rather than decode.

Serial Ports

Transmit serial data from pin 3 of the micro (U28) passes through switch U24 to U31 - 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 through switch U24 to the micro on pin 2.

Transmit serial data from pin 13 of the micro (U28) and RTS from pin 14, pass to U42 - pins 7 and 10, which converts the TTL levels to +/- 12 volts RS232 levels and passes them to auxiliary serial port JP16. Receive data and CTS from JP8 are likewise converted from RS232 levels to TTL levels and sent to the micro on pins 12 and 15.

Relay Outputs

There are four relay outputs that are controlled by the processor. They are driven through opto-isolator U37 and spike protected to prevent voltage spikes from affecting the unit. The outputs appear on a connector at the bottom of the board with contact ratings up to 5 A and 240 Vac RMS. K3 and K4 outputs have jumpers to select if they are to be operated only when the unit is Armed (the unit has been activated) or anytime without being Armed.

Speaker Output

The microprocessor (U28) generates warning sounds, on pin 26, which are routed out through amplifier U16 to the speaker output JP2.

Software Description of FCTBD Encoding Format

The FCTBD Controller Board encodes a nine-digit DTMF string that includes the RTU's unit type, ID number, function status, and sensors status.

Table 23 FCTBD Encording Format

Digit #	Description
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 "*"

Table 24 Conversion of DTMF Digit to BCD

DTMF Character	BCD equivalent
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

DTMF Character	BCD equivalent
#	1 1 0 0
A	1 1 0 1
B	1 1 1 0
C	1 1 1 1
D	0 0 0 0

Table 25 Unit Types

DTMF Character	FCTBD types
A	Single motor mechanical
B	Three motor mechanical
C	2001AC or DCB

Table 26 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 reports current sensor status. Depending on the type of unit selected the sensors required vary.

Table 27 Digit 7

Digit 7	DCB or 2001AC	Single Motor Siren	Three Motor Siren
Bit 1 (LSB)	Rotation	N/A	Rotation
Bit 2	Intrusion	Intrusion	Intrusion
Bit 3	Not used, always 1	Not used, always 1	Not used, always 1
Bit 4	AC power	AC power	AC power

Table 28 Digit 8

Digit 8	DCB or 2001AC	Single Motor Siren	Three Motor Siren
Bit 1	Battery voltage*	Battery voltage*	Battery voltage*
Bit 2	AUX 1	AUX 1	Blower motor
Bit 3	Activation current	Activation current	Activation current
Bit 4	Not used, always 1	Not used, always 1	Not used, always 1

* Battery voltage refers to the 48 V siren voltage

Table 29 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
Local activation occurred	Local activation did not occur

Example

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

where:

* Starting character

C Unit type FCTBD 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 (0101)

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

Chopper Motor Current Sensor Theory of Operation

Overview

The adjustable current sensor 2001062B is a window comparator device that uses a current sensor and window comparator. The output is opto-coupled and the circuit is powered by a voltage regulator. 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 results turning on the opto-coupled output, indicating that the sensed current is within the acceptable range.

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 voltage regulator. The regulated 8 Vdc output of IC1 is applied to the dual op amp at pin 8 and also to the Hall-Effect current sensor 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 outputs 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 A in sensed current results in a change of 1.0 volt at the output, and a change of 1.0 A results in a change of 0.01 volts at the output. Using this calibration, you can adjust the POT1 and POT2 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 A, and a lower current threshold of 50 A.

Using these values, the voltage at TP1 corresponding to 300 A is the following:

```
4.0 V + (300 A * 0.01 V/A) = 7 V
```

The voltage at TP1 corresponding to 50 A is the following:

```
4.0 V + (50 A * 0.01 V/A) = 4.5 V
```

Adjusting POT1 sets the upper current threshold voltage of 7 V at TP2, and adjusting POT2 sets the lower current threshold voltage of 4.5 V at TP4. With a sensed current value between 50 and 300 A, the voltage at TP1 is 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) is 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) is also 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 is a logic high, approximately 8 volts. 8 volts applied through R1 to the input (pin 1) of opto-coupler IC4 causes the output transistor of IC4 to be saturated and a logic low is 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

is 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 yields a logic low at the output of IC3, which causes the output transistor of IC4 to be cut off and a logic high is 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 is 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.

Rotator Motor Current Sensor Theory of Operation

Overview

The Current Sensor board is a convenient snap-track mountable way to measure DC currents in the 0 to 10 ampere range. 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
- Jumper selectable fixed window comparator, no adjustment needed
- UNDER, GOOD, and OVER indication LEDs
- Accurate to +/- 5% at 2 to 8 ampere DC

Electrical Specifications for Rotator Motor Current Sensor

Table 30 Electrical Specifications for Rotator Motor Current Sensor

Input Voltage	12.5-20 Vdc
Input Current	< 80 mA maximum
Measurement Accuracy	+/-10% at 0.5-1.0 A +/- 5% at 2-8 A
Measurement Current Ranges	0-10 A, 0-10 Vdc at TP3
Window Comparator Thresholds	Selectable: from 0.33-5.0 A for the minimum to 2.0-10.0 A for the maximum
Window Comparator Output	Open collector, sink </= 10 mA

Table 31 Environmental and Physical for Rotator Motor Current Sensor

Environmental	
Operating Temperature	-30°C to +65°C / -22°F to 149°F
Humidity	0-98% non-condensing
Size	2 x 3 in
Weight	< 6 oz

Connections for Rotator Motor Current Sensor

Table 32 Connectors for Rotator Motor Current Sensor

JP1	Current Measurement Pass-Through 2(+) voltage source 1 0-10 A output to motor
JP2	Lower Threshold Selection 15 and 16 0.33 A 13 and 14 1 A 11 and 12 1.5 A 9 and 10 2.0 A 7 and 8 2.5 A 5 and 6 3 A 3 and 4 4 A 1 and 2 5 A
JP3	Upper Threshold Selection 19 and 20 2 A 17 and 18 3 A 15 and 16 4 A 13 and 14 5 A 11 and 12 6 A 9 and 10 7 A 7 and 8 8 A 5 and 6 9 A 3 and 4 10 A 1 and 2 Disable Upper Threshold
JP4	Ground Select Jumpered ties isolated ground to circuit ground
JP5	Interface, Power In and Signal Output 1 Circuit Ground 2 Window comparator output, open collector, pulls low when current is above min and below max current 3 DC supply voltage input (12-35 Vdc) 4 Iso Ground

Circuit Description

Power Supply

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

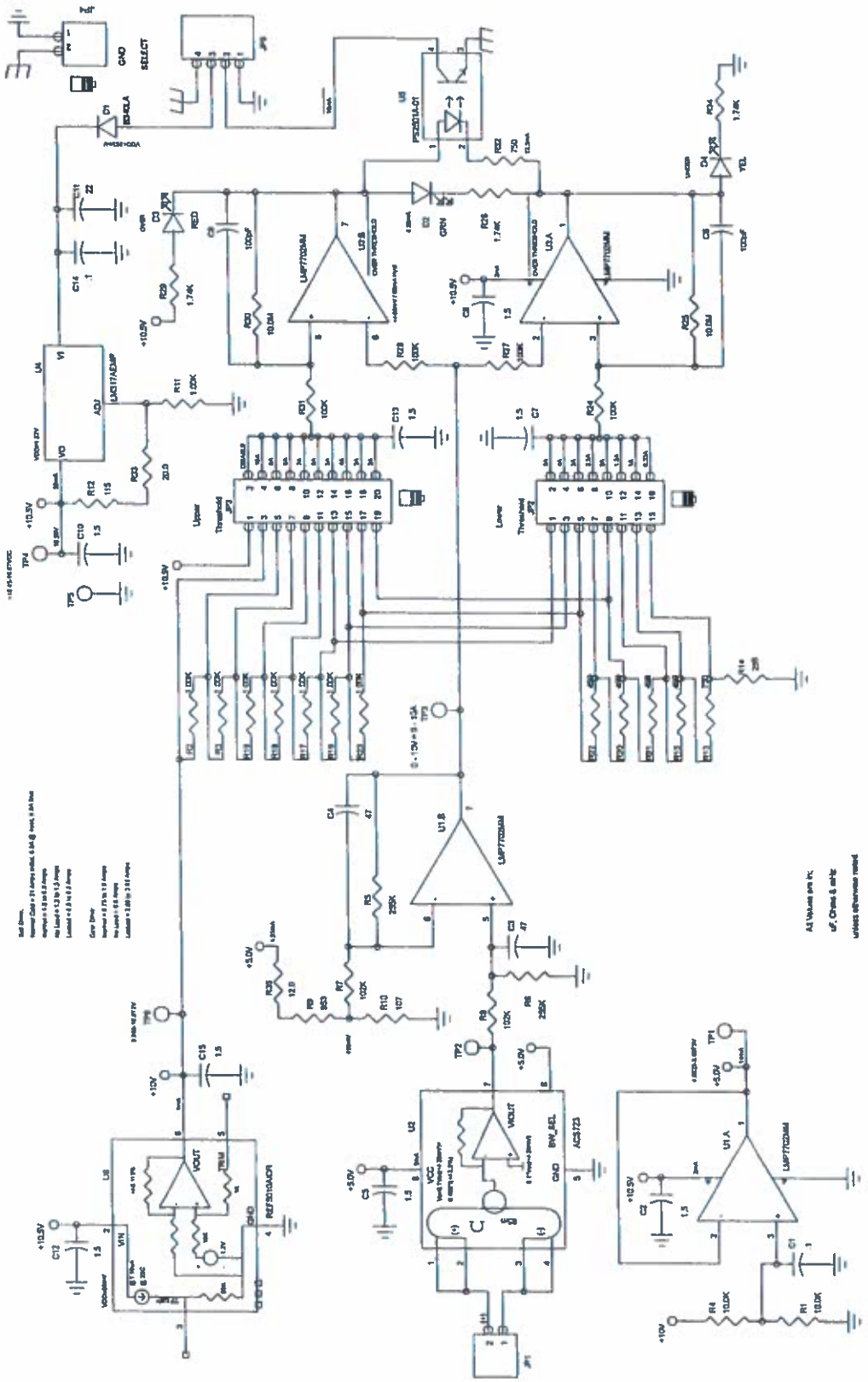
Current Measurement Path

The current sensor, U1, outputs a fixed DC voltage (2.5 V) plus a variable voltage representing the current being measured. For the 0 to 5 ampere input a 2 ampere 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 ampere of current being measured = 1 Vdc at TP3 (3 A = 1 Vdc for the 0-15 A input).

The output of window comparator U2A and 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 3 Schematic Rotation Current Sensor Board 2005221C



Battery Charger Theory of Operation

Overview

The charger features a switch mode voltage/current regulator to improve efficiency and reduce heat. The charger incorporates a three-stage charge algorithm to charge four series 12 volt batteries without gassing and maintain the batteries at the optimum charge level.

The charger delivers a constant 2 A trickle charge until the batteries reach 40 volts. The charger then raises the charge voltage until the charge current increases to 4 A. This is the bulk charge. This is maintained until the batteries' voltage reaches the float voltage of 54 volts. The float voltage is temperature compensated to prevent over charging the batteries during hot conditions.

The charger also incorporates a temperature sensor that limits the charge current to 2 A if the ambient temperature of the charger reaches 105°C.

The charger monitors for faults. If the charger has AC power and is producing charge voltage and if no fault is detected, the charge status output is on. If the charger is in trickle or bulk mode and the charge current is low (not charging) a fault is detected. If the battery voltage is at least 1/2 volt lower than the charger voltage (blown fuse), a fault is detected. If the charge voltage is too high (charger regulation failure), a fault is detected. If a fault is detected, the FAULT LED lights and the charge status output is off.

Electrical Specifications for Battery Charger

Table 33 Electrical Specifications for Battery Charger

AC Power	108-132 Vac, 120 Vac nominal, 2.4 A nom. 216-264 Vac, 240 Vac nominal, 1.3 A nom.
Bulk Charge Current, I_{BULK}	4 A, +/- 10% at 25°C
Float Charge Voltage	V_{FLOAT} Jumper Selectable from 52.8 to 55.2 V, +/- 0.75%
Trickle Charge Current	2.0 A, +/- 20%

Table 34 Connectors for Battery Charger

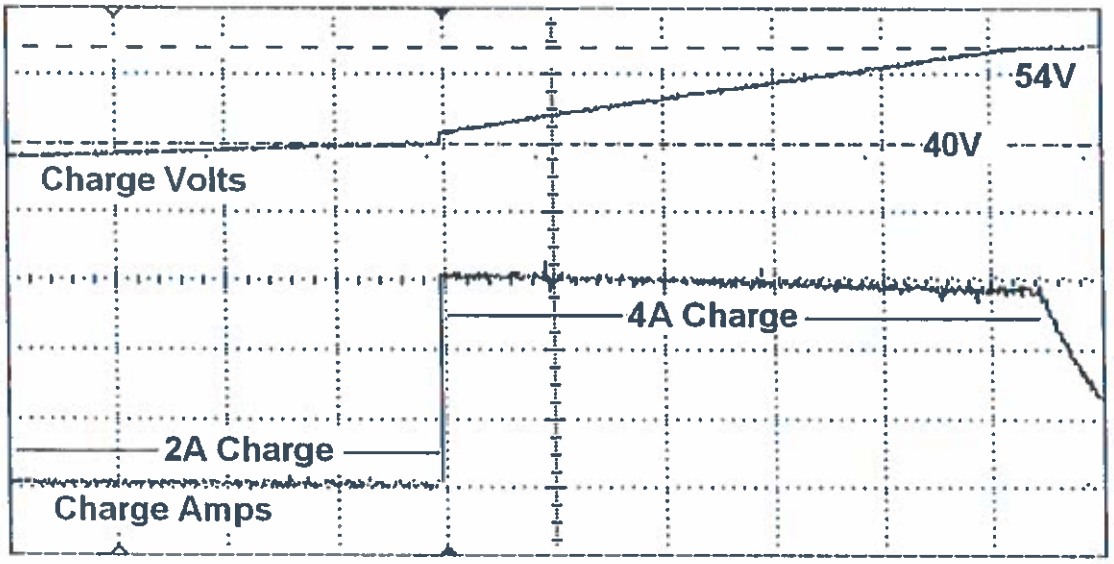
JP7	Select the float voltage for batteries	
	Jumper pins 1 and 2	13.2 V
	Jumper pins 3 and 4	13.3 V
	Jumper pins 5 and 6	13.4 V
	Jumper pins 7 and 8	13.5 V – Default Position
	Jumper pins 9 and 10	13.6 V
	Jumper pins 11 and 12	13.7 V
	Jumper pins 13 and 14	13.8 V

The AC power enters through fuses F1 and F2.
These are FS# 148186-02, BUSSMAN # GDC-5A, 5 A, 250 Vac, 5 x 20 mm fuses with cULus, IMQ, MITI/JET approvals.

The power from the charger to the batteries passes out through F3.
This is FS# 148A142A-06, LITTLE FUSE # 287015, 15 A, 32V, Blade ATO/ATC automotive fuse.

Circuit Description

The charger implements a three-stage charging algorithm. The three stages are trickle charge, bulk charge, and float charge. The stages operate as follows.



Trickle Charge

In the trickle charge state, the charger supplies a steady 2 A current to the batteries until they reach 40 V. The purpose behind trickle charging is to prevent a potentially hazardous condition caused by continuously pumping bulk charge current into a damaged battery. Too heavy a charge when a battery is in this severely discharged state can cause gassing, which is corrosive, explosive, and shortens the life of the battery. When the batteries reach 40 V the charger enters the bulk charge state.

Bulk Charge

In the bulk charge state, the charger sets the charge voltage to 60 volts and limits the charge current to 4 A. When the voltage has reached 99% V_{FLOAT}, the charger switches to the float charge state.

Float Charge

In the float charge state, the charger sets the charge voltage to the selected float voltage (adjusting for battery temperature). While in the float state, the charger supplies up to 7.35 A to a load and the battery. The charger remains in the float charge state until the voltage of the batteries drops below 90% V_{FLOAT} at which time it switches back to the bulk charge state.

Current Limiter

The circuit monitors the current output of the charger by watching the voltage develop and limits the current to 4 A. If the voltage is less than 40 V, the circuit changes the current limit to 2 A.

Thermal Limiter

A circuit monitors the temperature of the PC board. If the temperature exceeds 105°C, the circuit changes the current limit to 2 A. This helps prevent the charger from overheating.

Charge Voltage Temperature Compensation

A thermostat monitors the temperature of the batteries. Its resistance changes with temperature.

This circuit adjusts the output charge voltage reducing it during hot conditions to prevent the batteries from being overcharged. The output charge voltage is listed below.

- 54.00 V =/< 30°C
- 53.56 V at 31°C
- 53.48 V at 32°C
- 53.44 V at 33°C
- 53.36 V at 34°C
- 53.28 V =/> 35°C

Fault Detection

If the output voltage is less than 10 V, this indicates that the regulator may have failed.

The charger's output current is monitored. If the charge current drops below 1/2 A, the circuit allows it only if the charger is in trickle or bulk mode. The result being that, if the charger is in trickle or bulk mode and there is little or no charge current, indicating that the regulator may have failed and that the batteries are being under-charged, a fault condition is indicated.

The circuit monitors the output voltage of the charger and the battery voltage on either side of the fuse. If the battery voltage is 1/2 V or more less than the charger output voltage, indicating a blown fuse, a fault condition is indicated.

The circuit monitors the output charge voltage. If it exceeds 2.3 V per cell, indicating that the regulator may have failed and that the batteries are being overcharged, a fault condition is indicated.

Fault conditions are indicated with a fault indicator light on the board.

Installation

⚠ DANGER

ELECTROCUTION HAZARD: 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.

EXPLOSION HAZARD: 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.

For installation instructions on the Yagi and Omni Antennas, go to the Federal Signal's website.

Locating the Control/Battery System

First consider the siren location and method of activation before determining Control/Battery System location. You can activate the DCFCB and DCFCTB system remotely through radio or landline controls and locally using buttons provided in the Control Cabinet. Refer to the Landline Control section for additional information on remote activation using landline controls.

Since the controls are in a NEMA 4 rated enclosure and the batteries are protected, you may install the controls indoors or outdoors. If you install indoors, ensure adequate ventilation is provided for the four lead acid batteries to prevent buildup of explosive gas.

To ensure proper siren power is maintained, it is recommended that the Control/Battery System location be within a 50 feet wire run to the siren. If a longer run is necessary, use a 1 AWG or larger wire for the siren motor.

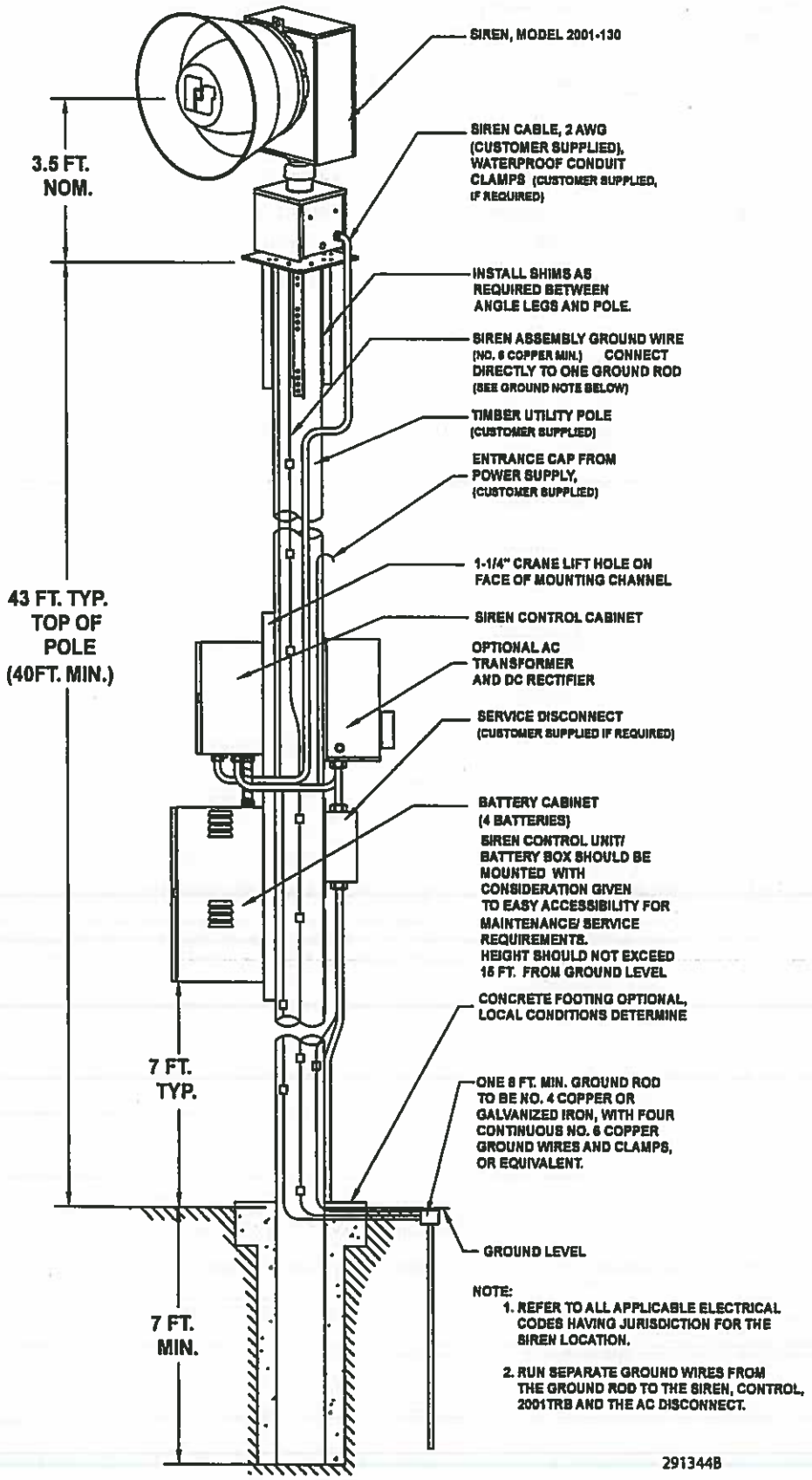
When mounting the Control/Battery System, it is recommended that the units be out of reach to avoid vandalism but accessible to service personnel. Both cabinets come equipped with padlock hasps. Use these for added security.

The Control and Battery Cabinets are shipped mounted on an aluminum channel with four mounting holes for 1/2-inch bolts. The total weight of the Control/Battery System is approximately 364 pounds including the batteries. Therefore, ensure that the mounting surface and fasteners can safely sustain the weight of the assembly and any additional environmental stresses placed on it.

See "Figure 4 Typical DCFCB or DCFCTB with 2001TRBP Installation Drawing" on page 36.

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

Figure 4 Typical DCFCB or DCFCTB with 2001TRBP Installation Drawing



Installing the Control/Battery System

The Control Cabinet and Battery Cabinet is attached to a length of 5-inch channel. There are five pre-drilled holes in the channel:

- One 1-1/4-inch convenient lifting point
- Four 5/8-inch mounting holes

The total weight of the Control/Battery System including batteries is approximately 364 lb (165 kg). Therefore, 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.

Installer Supplied Material List

The following is a general list of material required to install the model DCB/DCFCB/DCFCTB with a mechanical siren (2001-130, Equinox, 508-128, and Eclipse8) and the 2001TRBP option. This list varies depending on mounting methods, length of pole, other options, local electrical codes, etc. Therefore, use this list as a reference guide only. Stainless steel hardware is recommended.

Table 35 Installer Supplied Material List

Material Description		QTY
1. 240 Vac, 1 phase/3 wire, fused disconnect		1 each
2. FRN 30, 30 A time delay fuse		2 each
3. 100 A meter socket	(if required)	1 each
4. 1-inch meter hub	(overhead service only)	1 each
5. 1-inch service entrance	(overhead service only)	1 each
6. Fork bolt	(overhead service only)	1 each
7. 1/2-inch Liquid-Tight, 90 degree connectors	(2001TRBP option primary feed)	2 each
8. 1-inch Liquid-Tight 90 degree connector	(2001TRBP option secondary feed)	1 each
9. 1-inch Liquid-Tight 45 degree connector	(2001TRBP option secondary feed)	1 each
10. 1/2-inch EMT compression box connector	(disconnect/meter ground)	1 each
11. 1-inch heavy wall compression fittings	(rotator cabinet/OH meter)	1 each
12. 1/2-inch Liquid-Tight flexible conduit	(2001TRBP option primary feed)	18 inches
13. 1-inch Liquid-Tight flexible conduit	(2001TRBP option secondary feed)	7½ inches
14. 1/2-inch EMT thin wall conduit	(disconnect/meter ground)	10 feet
15. 1-inch aluminum rigid	(if applicable in your area/cabinetry-siren raceway)	50 feet
16. 1/2-inch nail drive straps	(securing ½ inch ground pipe)	4 each
17. 1/2-inch jiffy straps	(substitute for nail straps)	4 each
18. 1-inch heavy wall 2-hole straps	(1 inch raceway clamping)	15 each
19. 1-inch lock rings	(1 inch raceway tightening)	5 each
20. 1-inch plastic bushings		2 each
21. 1/2-inch plastic bushings		2 each
22. 1-inch close nipple	(1 inch raceway/cabinet-siren)	1 each
23. 1-inch chase nipple	(1 inch LB-cabinet connection)	1 each

Material Description		QTY
24. 1-inch LBs with gaskets and covers	(1 inch raceway/cabinet-siren)	2 each
25. Split bolts, 10 AWG wire	(2001TRBP option primary connection)	2 each
26. Mechanical lugs, 2 AWG wire	(2001TRBP option/siren motor feed)	6 each
27. Mechanical lugs, 6 AWG wire	(system ground)	4 each
28. #6 copper ground wire	(system ground)	75 feet
29. 5/8 x 8 inch Copper Ground rod	(system ground)	1 each
30. Ground rod connector cold water type/ acorn style	(system ground)	1 each
31. 1-1/4 inch to 1 inch Reducing washer	(meter socket/O.H. service)	2 each
32. 1-1/4 inch Galvanized staples	(securing ground wire to pole)	30 each
33. 3/4-inch Galvanized staples	(securing antenna cable)	30 each
34. 12 AWG THHN stranded CU wire	(orange/rotator motor feed)	40 feet
35. 14 AWG THHN stranded CU wire	(black/charger circuit)	40 inches
36. 14 AWG THHN stranded CU wire	(white/charger circuit)	40 inches
37. 10 AWG THHN stranded CU wire	(black/TR option primary)	30 inches
38. 16 AWG THHN stranded CU wire	(optional, black/proximity sensor)	45 feet
39. 16 AWG THHN stranded CU wire	(optional, brown/proximity sensor)	45 feet
40. 16 AWG THHN stranded CU wire	(optional, blue/proximity sensor)	45 feet
41. 2 AWG, 600V, stranded CU wire	(optional, 2001TRBP 48 V and ground)	12 feet
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 each
49. Ring crimp connector	(1/4 inch stud size 12 ga. wire/rotator feed)	1 each
50. 1/4 x 20-3/4 inch hex head bolt	(ground connection on siren leg)	1 each
51. 1/4 x 20 standard flat washer	(ground connection on siren leg)	1 each
52. 1/4 x 20 inch intern/ extern star washer	(ground connection on siren leg)	1 each
53. 1/4 x 20 split washer	(ground connection on siren leg)	1 each
54. 1/4 x 20 hex head nut	(ground connection on siren leg)	1 each
55. 5/16 hex head nut	(ground connection on Control Cabinet)	1 each
56. 1/2 x 4 inch hex head lag bolt	(securing TR option to utility pole)	3 each
57. 1/2 x 6 inch hex head SS lag bolt	(securing siren/Control Cabinet to utility pole)	16 each
58. 1/2 inch SS (stainless steel) flat washers	(backing ½ inch lag bolts)	19 each
59. 10 x 1 inch hex head, slotted, sheet metal screws (securing straps/equip to pole)		1 box
60. 10 x 2 inch hex head, slotted, sheet metal screws (securing straps/equip to pole)		1 box
61. 10 x 3 inch hex head, slotted, sheet metal screws (securing straps/equip to pole)		1 box

Pole Mounting

To install the Control/Battery System to a pole:

1. Remove any batteries from the Battery Cabinet before lifting the Control/Battery System.
2. Use a crane to lift the Control/Battery System to the desired mounting height along the pole.
3. Use the crane to hold the Control/Battery System against the pole so that the four mounting holes on the mounting channel can be used as a template to drill four 3/8-inch holes at least 3-1/2 inches deep.
4. Attach the Control/Battery System to the pole using four user supplied 1/2 by 5 inch lag bolts. Slide a user supplied 1/2 inch 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.
5. Mount a user supplied fused disconnect switch on the pole beneath or opposite the Control/Battery System assembly in accordance with Local and National Electrical Codes.
6. If the optional Transformer/Rectifier is required, drill three 3/8-inch holes at least 3-1/2 inches deep using the Transformer/Rectifier as a template. Attach the cabinet to the pole using three user-supplied 1/2 by 5 inch lag bolts. Slide a user-supplied 1/2 inch flat washer onto each bolt before threading into pole.

Flat Surface Mounting

To install the Control/Battery System to a flat surface:

1. Remove any batteries from the Battery Cabinet before up righting the Control/Battery System.
2. Prepare the mounting surface for hanging the assembly using the steel channel as a template.
3. Attach the Control/Battery System to a wall or other substantial vertical surface using the four 5/8-inch mounting holes.
4. Mount a user-supplied, fused disconnect switch in accordance with Local and National Electrical Codes.
5. If the optional Transformer/Rectifier is required, attach the 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.

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 system 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 system to ground.

Connecting the Siren

The complete system wiring diagrams are shown in "Figure 12 DCB Wiring Diagram" on page 73, "Figure 13 DCFCB Wiring Diagram" on page 74, and "Figure 14 DCFCTB Wiring Diagram" on page 75. All interconnections between the Siren and Control System 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. There are two terminal blocks 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. These points provide convenient locations for making connections. See "Options" on page 62 for wiring of options.

Interconnecting the Siren to the Control Cabinet

To connect between the siren and the Control Cabinet:

1. Install a 1-inch user-supplied electrical conduit fitting in the bottom of the Control Cabinet and in the bottom of the siren rotator housing.
2. Install 1-inch 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 Cabinet.
3. Route the interconnecting wiring (user-supplied) from the siren rotator housing to the Control 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-inch 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 A fuse (148A147A) using a 1/4-inch ring terminal (user-supplied). See "Figure 12 DCB Wiring Diagram" on page 73, "Figure 13 DCFCB Wiring Diagram" on page 74, and "Figure 14 DCFCTB Wiring Diagram" on page 75.
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 inch backplane ground stud in the Control Cabinet (labeled GND) using a 5/16 inch ring terminal (user-supplied).
7. Ground the Siren and Control System 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.

Connecting to AC Power

To connect the wires in the Control Cabinet:

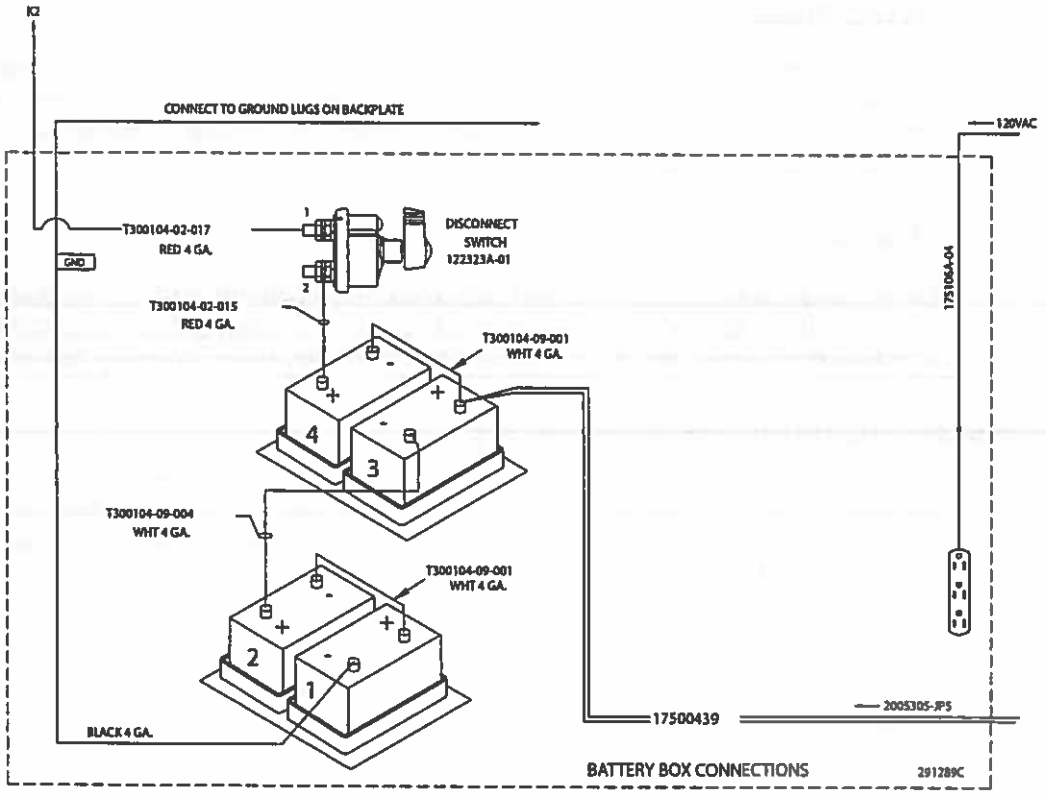
1. As shipped from the factory, the Control Cabinet is configured for 120 Vac operation. Set the AC selector switch, S7 on the siren control board and charger, to the appropriate voltage.
2. After drilling or punching an appropriate sized hole in the bottom of the Control Cabinet, install a user supplied 1/2-inch electrical conduit fitting. Route 1/2-inch conduit (steel preferred) between a user-supplied fused disconnect switch and user-supplied conduit fitting in the bottom of the Control Cabinet.
3. Route three user-supplied wires through the conduit that was just installed between the Control Cabinet 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 Cabinet. (See "Figure 12 DCB Wiring Diagram" on page 73, "Figure 13 DCFCB Wiring Diagram" on page 74, and "Figure 14 DCFCTB Wiring Diagram" on page 75).
5. Connect Line (black wire) from service disconnect to F2 on the DIN rail in Control Cabinet. (See "Figure 12 DCB Wiring Diagram" on page 73, "Figure 13 DCFCB Wiring Diagram" on page 74, and "Figure 14 DCFCTB Wiring Diagram" on page 75.)
6. Connect Ground (green wire) from service disconnect to the green ground block on the DIN rail in Control Cabinet. (See "Figure 12 DCB Wiring Diagram" on page 73, "Figure 11 DCFCB Wiring Diagram" on page 51, and "Figure 14 DCFCTB Wiring Diagram" on page 75.) 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 A max.

Installation and Wiring the Battery

To install the batteries and connect the wiring:

1. Install the batteries in the Battery Cabinet, per illustration Figure 5 Battery Positioning and Wiring, taking care not to touch the battery terminals against cabinet. It may be necessary to temporarily relocate the wiring in the enclosure before installing the batteries. The polarity of the battery terminals is clearly marked on the battery case. See "Figure 5 Battery Positioning and Wiring" for correct orientation. (For optional battery warmers, see "Model HTR4 (Battery Warmers)" on page 66 and "Figure 11 HTR4 Wiring Diagram" on page 67.)
2. There are several wires entering the Battery Cabinet: a red 4 AWG, a black 4 AWG, and a multiple conductor cable. The red and black 4 AWG wires provide 48 Vdc operating power to the siren. The multiple conductor cable provides the charge current for the batteries. Several white wires with lugs on each end are also packaged with the batteries. These white wires are used to connect the batteries in series.
3. Connect the wires to the batteries using "Figure 5 Battery Positioning and Wiring" and securely fasten all connections.
4. Apply user-supplied silicon grease or other oxide inhibiting compound to the battery terminals.

Figure 5 Battery Positioning and Wiring



Landline Control

You may activate the controller by applying contact closures to the remote activation inputs. See "Landline and Local Button Activation" on page 61 for a functional description and details on interfacing and wiring connections.

Installing the Antenna

⚠ WARNING

ELECTROCUTION HAZARD: 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.

A factory installed internally wired Type N bulkhead is provided on the bottom side of the Control Cabinet 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.

For installation instructions on the Yagi and Omni Antennas, go to the Federal Signal's website.

Pre-operational System Testing

⚠ WARNING

SOUND HAZARD: 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 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.

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.

Rotation Current Sensor

Locate the rotation current board (2005221) on the backplane of the Control Cabinet with the blue current sensor. (See "Figure 14 DCFCTB Wiring Diagram" on page 75.) 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 JP5-2 is high (4 Vdc to 5 Vdc).
2. Activate a siren function by momentarily depressing one of the function 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 (0.8 Adc, +/- .3 A).
4. Verify the output JP5-2 is low (0-1 Vdc) for the duration of the siren function.

Chopper Current Sensor

Locate the chopper current board (2001062) on the backplane of the Control Cabinet. (See "Figure 14 DCFCTB Wiring Diagram" on page 75.)

Adjustment Procedure

To adjust the chopper current board, do the following while the system is in idle mode:

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 buttons on the controller board. Verify that input #4 indicator on the controller board turns on for the duration of the siren function.

AC Power Sensor

Verify that the AC power indicator 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 (using service disconnect), the AC power indicator is off.

Intrusion Sensor

With one cabinet door open, verify that the intrusion indicator is ON. Press the intrusion switch located on the cabinet door. With the switch pressed, confirm that the intrusion indicator is OFF. Verify the switches on both cabinet doors operate correctly.

NOTE: A jumper preset at JP9 also causes all of the LEDs to go dim when the intrusion switch is pressed.

Measuring Battery Voltage

To measure the battery voltage:

1. Allow the batteries to charge for 24 hours to ensure they are fully charged.
2. Turn off AC power to the battery charger by disconnecting power at the service disconnect or opening F1 and F2 in the Control Cabinet.
3. Using a digital multimeter (Fluke model 75 or equivalent), measure the batteries individually inside the Battery Cabinet. (See "Figure 14 DCFCTB Wiring Diagram" on page

75 for details.) Each battery should measure approximately 13.5 Vdc.

Voltage reflects battery float voltage and varies depending on state of charge.

4. While monitoring the voltage in at TB4-1, manually activate a steady siren function by depressing the appropriate function button on the controller board. If the measured voltage drops below 40 Vdc, it is an indication of weak batteries and causes the controller to terminate the siren function. If a low battery condition is indicated, follow up by load testing each battery with an automotive type battery load tester (180 A load recommended).
5. Turn AC power on by connecting F1 and F2 and turning on the service disconnect switch.

Measuring Battery Charger Voltage

To measure the charger output voltage, it must be connected to the batteries. Since the battery's state of charge affects the output voltage of the charger, the measured voltages varies. Use a digital multimeter to measure the charger at TB1-4; the voltage should be between 53.6 Vdc and 54.4 Vdc when connected to fully charged batteries.

2001TRBP Transformer/Rectifier 48 Vdc testing (optional)

To test the 2001TRBP Transformer/Rectifier, do the following:

1. With the AC service turned on, measure for 46.0 Vdc, +/- 0.5 Vdc between K3-3 and chassis ground. (See "Figure 9 Transformer Rectifier Wiring to Control Cabinet" on page 65.)
2. Confirm that K3 is energized.
3. Shut off the AC service disconnect and confirm that K3 de-energizes.

Manual Siren Activation

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

Landline 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.

Transceiver Audio Level Adjustments and 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.

DTMF Transmit Level Adjustments (DTMF versions of DCFCTB only)

To adjust the DTMF transmit level:

1. To transmit and generate a DTMF test tone, apply a jumper across JP15 on the FCT controller board.
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 R61 on the controller board for the required deviation.
3. Using an Inline 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%. See "Installation" on page 35 if the VSWR is excessive.

Adjusting the FSK Transmit Level (Digital FSK versions of DCFCTDB only)

To adjust the FSK transmit level:

1. To Transmit and generate an FSK modem tone, apply a jumper across JP15 on the FCT controller board.
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 R57 on the controller board for the required deviation. If CTCSS is used, set the CTCSS level to 0.75 kHz.
3. Using 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%. See "Installation" on page 35 if the VSWR is excessive.

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

Adjusting the Receive Level

To adjust the receive level:

1. Inject a 100 µV 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 TP6 on the controller board and confirm a clean, undistorted sine wave of 1 V_{p-p}. The level has been pre-set at the factory; however, if adjustment is required, set R27 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.

Testing Two-tone and DTMF Controller Sensitivity

To test two-tone and DTMF controller sensitivity:

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 µV carrier signal.

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

3. Encode the appropriate DTMF strings and or two-tone tones required to activate the desired siren function. Confirm reliable decoding of at least ten of ten tries.
4. Plug JP21 back in.

Confirming Controller Auto-Reporting

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

Intrusion

Press the intrusion switch for at least 5 seconds. Release the switch. Verify the door closed and door open reports we received at the SS2000+/R.

AC Line Voltage

Remove AC power at the service disconnect to confirm that a report is generated within 5 minutes. Confirm that another report is generated when power is restored.

⚠ WARNING

SOUND HAZARD: 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.

Test Activation Codes

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.

Operations

System Operating Description

Siren Activation

The DTMF versions of DCFCTBs 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 DCFCTBs do not use the ARM function.

Activation Using the ARM function

To start siren activation through 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 remains ARMed for 255 seconds or 4.25 minutes. Upon activation of the siren, it runs until the function times out, is canceled, or is reset. If the siren function is greater than 4.25 minutes, you must send another ARM command prior to sending a CANCEL command to shut off the siren. The ARM command is not required prior to sending a RESET command.

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

Site Status Monitoring (DTMF only)

The siren controller reports when polled from the SS2000+/R 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 SS2000+/R to decode, format, and time and date stamp the received string. For detailed information about the DTMF coding format, see "Software Description of FCTBD Encoding Format" on page 24.

Automatic Reports

The DCFCTB automatically sends back a report if one of the following sensors has a change of state: AC, Low Battery, Intrusion, Stuck Relay detected, Motor Fuse fail, 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 DCFCTBD systems. The DCFCTB is equipped with a carrier detect transmit hold off that causes the unit to wait until the channel is clear before an automatic report is transmitted.

The thresholds are in the following table.

Table 36 Thresholds

Input	Threshold	Time
AC fail internal	57 Vac +/- 5%	57 sec +/- 1
AC fail external TR	40 Vrms +/- 1%	2.2 sec + 1 sec x site #
Battery 12 V	12.7 V +/- 3%	20 sec
Battery 48 V	43.5 V +/- 3%	20 sec
Intrusion	Door Open	555 ms
Stuck Relay Detect	relays off & current = 50 300 A	222 ms
Motor fuse	1.0-3.4 V	5 sec
Local Activation	Button	10 sec

Growl Test

The Standard Growl Test runs 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.

Control Cabinet Functional Descriptions

The DC Control Cabinet has the following main parts:

- Motor Contactors
- Battery Charger
- Power Distribution and Fusing
- Radio Transceiver (optional)
- FC Controller Board (optional)

Motor Contactors

Two 200 A motor contactors are used for switching the 48 Vdc power to the siren motor through K2, and the rotator motor through K1. The contactors are controlled by the relay outputs on the controller.

A third optional contactor, K3, is used to switch between the rectified 48 Vdc provided by the 240 Vac transformer option and the 48 Vdc provided by the four batteries in the Battery Cabinet. The switching occurs automatically when the 48 Vdc provided by the 240 Vac transformer fails.

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

Battery Charger

One charger is used to charge all of the batteries in the Battery Cabinet. The charger is connected to all four series connected batteries to provide 48 Vdc to the siren and rotator motors. The charger has a built-in 15 A fuse, and the charger wire is fused with a 10 A fuse within the Battery Cabinet.

Power Distribution and Fusing

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

Table 37 Terminals at the DIN rails

Terminal	Description	
TB6	4	+48 Vdc, from Charger
TB2	1	Ground
	2	Ground
	3	Ground
TB3	1	12 Vdc from Converter
	2	12 Vdc from Converter
TB4	1	48 Vdc
TB5	F1	10 A fuse for 120 Vac Neutral
	F2	10 A fuse for 120 Vac Line
	1	FUSED AC Neutral
	2	FUSED AC Neutral
	3	Ground
	4	FUSED AC Line
	5	FUSED AC Line

Radio Transceiver

When a radio transceiver is equipped, the transceiver is factory installed, programmed and aligned to work with Federal Signal DCFCTB. The 12 V transceiver is powered by the 48 V to 12 V DC-to-DC converter. The converter is powered by the four 12 V batteries that continue to run the controller in case of a power failure. Consult the radio's operating manual for further operating details.

FC Controller Board

The FC Controller Board is located on the backplane of the Control Cabinet. This board controls all functions of the DCFCB and DCFCTB. The board consists of seven main sections:

- Transceiver Interface
- Digital Inputs
- Relay Outputs
- Speaker Output
- Landline and Local buttons
- Power Inputs and Power Supply
- Encoder and Decoder Sections

FC Controller Board Indicators

The following table provides a description of LED indicators on the FC Controller Board.

Table 38 FCTBD Controller Board Indicators

Component Number	Description	Indication
D25	CPU LED	Microprocessor Heartbeat
D12	RECEIVE LED	RF Carrier Indicator on with carrier
D18	TRANSMIT LED	Transmit
D60	RELAYS ARMED	Power to relays on
D62	RELAY #1 LED	Relay #1 closed
D63	RELAY #2 LED	Relay #2 closed
D65	RELAY #3 LED	Relay #3 closed
D66	RELAY #4 LED	Relay #4 closed, or PA mode
D20	PRESSURE LED	Pressure Sensor input
D21	INTRUSION LED	Intrusion Sensor input
D19	CURRENT LED	Current Sensor input
D22	ROTATION LED	Rotation Sensor input
D23	LOW BATTERY LED	Low Battery Sensor (internal)
D24	AC POWER FAIL LED	AC Power Fail Sensor (internal)
D26	POWER LED	+5 V Operating Power
D79	ISO +12 V	Isolated 12 V power
D77	ISO +5 V	Isolated 5 V power
U18	LCD Display	Displays Function Counters, Decodes and Software Revision

The following tables provide descriptions of the FC Controller Board connectors, selections, and switches.

JP1	SINAD 1 Receiver module carrier detect, short to pin 2 when using SINAD board along with both sides of JP4 2 External transceiver carrier detect
JP2	Test Speaker 1 0 to 2 Vp-p, Audio Source: Receiver Audio during P.A. functions, Siren Audio during Electronic Siren functions 2 Ground
JP3	Short For VOX Carrier Detect Short pins 1 and 2 for VOX carrier detect
JP4	Test Speaker 1 VCC, +5 V 2 VCC, +5 V 3 Short pins 1 and 3 to give priority to the external transceiver 4 Short pins 2 and 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 at 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
JP6	Speaker Mute gate bypass Short pins 1 and 2 to bypass speaker mute gate, allow monitoring of radio channel with local speaker
JP7	Receiver Module for one-way receiver
JP8	Serial and FLASH programming Port
JP9	LEDs on with Intrusion

JP10	Remote Activation and Sensor Inputs (#1 at 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
JP11	Used for special applications 1 and 2 See Options for JP11 3-8 Not used 9 and 10 See Jumper pins 9 and 10 (Normally Jumpered)

Options for JP11

Jumper pins 1 and 2

Table 39 2001 DC Solar mode

AC (Power)	AC power and external power or 50 Vdc (AC power or 48 V battery/charger) latching
Battery	>12.7 V (DC-DC) and > 43.7 V (48 V battery)
Pressure	Motor fuse (low = pass)

Table 40 2001 DC Non-Solar mode

AC (Power)	AC power and external AC power (not looking at 48 Vdc)
Battery	>12.7 V (DC-DC) and > 43.7 V (48 V battery) (either 12 or 48 fail will cause a fail) Transfer switch low voltage detect (External AC input Sense2, low=voltage pass)
Pressure	Motor fuse (low = pass)

Table 41 FCD Repeater Solar mode

AC (Power)	AC power and external power or 50 Vdc (AC power or 48 V battery/Charger) latching
Battery	12.7 Vdc (connects to 12 V battery or DC-DC convertor)
Pressure	Charger = External charger sense contact (low = pass)

Table 42 FCD Repeater Non-Solar mode

AC (Power)	AC and external power or 50 Vdc (AC power or 48 V battery/charger) latching
Battery	12.7 Vdc (connects to 12 V battery or DC-DC convertor)
Pressure	Charger = External charger sense contact (low = pass)

Jumper pins 9 and 10 for NXDN Mode or Transformer Rectifier and Control Mode

NXDN Mode

When the NXDN mode is polled, the system responds over the port which received the poll request only.

Transformer Rectifier and Control Mode

Use relay number 3 to switch from Transformer Rectifier (TR) to batteries in order to conduct a battery test. Remote AC power sense debounce fixed at 4 seconds (normally 28 seconds).

Standby:

- If low voltage occurs, JP10 on pins 11 and 12 get an open contact from the TR contactor.
- If the voltage is normal, TR gives a contact closure across JP10 on pins 11 and 12.

JP12	SINAD 1 Directly to processor pin #58 (ADC7) 2 Ground
JP13	CTCSS Encoder/Decoder 1 Receive audio, not DC isolated, set to 1 Vp-p with 1 kHz tone at 3 kHz deviation for wideband 1.5 kHz deviation for narrowband 2 Ground 3 +8 Vdc, < 100 mA current 4 Decode not & PTT line, low with decode, set low by processor during transmit 5 Transmit audio, 0 to 2 Vp-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	Aux Serial Port 1 2 TXD, standard RS232 levels 3 RXD, standard RS232 levels 4 Ground 5 CTS 6 RTS

JP21	Relay Outputs, 3 A, up to 240 Vac, (#1 at 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 and 2 120 or 240 Vac +/- 10%, 60 Hz (Set S7)
JP23	TR Sensor Input 1 Ground 2 TR voltage input, 0-50 Vdc, 0-79.4 Vp full wave rectified AC
JP24	Charger Disable Output 1 Isolated Emitter, pulls to isolated Ground to disable 2 Isolated Open Collector
JP25	Charger Status Input 1 Isolated active low input, pulls to isolated Ground when status is OK 2 Isolated Ground
JP26	Relay Output #3 Arm Select Jumper pins 1 and 2, no Arm required (not need a function activated to run) Jumper pins 2 and 3, requires Arm (a function must be activated) to work
JP27	Digital Receive Disable Jumper pins 1 and 2 to disable receiving AFSK digital signals
JP28	Relay Output #3 Arm Select Jumper pins 1 and 2, no Arm required (not need a function activated to run) Jumper pins 2 and 3, requires Arm (a function must be activated) to work
JP29	Fast DTMF Decode Jumper pins 1 and 2 to enable decoding of fast DTMF
JP30	Option header Jumper pins 1 and 2 to enable option #1 Jumper pins 3 and 4 to enable option #2 Jumper pins 5 and 6 to enable option #3 Jumper pins 7 and 8 to enable option #4
JP31	Disable Transmit Time-Out-Timer Jumper pins 1 and 2 to disable transmit time-out-timer
JP32	I^2C Port 1 +5 V 2 SDA / SCL 3 SCL / SDA 4 INT input, active low 5 Ground 6 Ground

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 Vdc, 100 mA max, 2 A with battery 6 Carrier Detect not, set low (< 0.65 V) during receive 7 No connection 8 Ground 9 Ground

TP1	Two-Tone Decoder, HighPass Filter Enable Goes high when processor is decoding a tone > 2100 Hz
TP2	Two-Tone Decoder, LowPass Filter Enable
	Goes high when processor is decoding a tone < 400 Hz
TP3	Receive audio to Two-Tone Decoder Audio at last stage before two-tone comparator, 1 to 3 V_{p-p}
TP4	Transmit audio 0.1 to 3 V_{p-p}
TP5	Receive audio from Two-Tone Decoder to processor Audio after two-tone comparator, square waves to processor, 0 to 5 V_{p-p}
TP6	Receive audio level set External transceiver receive audio set to 1 V_{p-p} using R27
TP7	RX Data Receive data from digital modem IC, 0 to 5 volts
TP8	DTMF Decoder STD Goes low whenever a DTMF digit is being decoded
TP9	Voltage at 48 volt Battery Input 0 – 70 Vdc = 0 – 5 Vdc
TP10	Voltage at 12 volt Battery Input 0 – 20 Vdc = 0 – 5 Vdc
TP11	Ground
TP12	5 V, +/-2% Regulated power supply
TP13	2.5 V, +/-2%, Regulated reference supply
TP14	3.3 V, +/-5%, Regulated power supply
TP15	TR sense input, 0-50 Vdc or 0-79 Vp (full wave rectified AC) = 0-5 Vdc
TP16	Incoming unregulated 17 volt power supply, 14.4-75 Vdc
TP17	8 V, +/-5%, Regulated power supply
TP18	12 V, +/10%, Regulated power supply
TP19	Isolated Ground
TP20	Isolated +12 V, +/10%, Regulated power supply
TP21	Isolated +5 V, +/10%, Regulated power supply

Switches

Switches provide the following: local activation via on-board button, master reset, site address, and AC voltage selection.

S1	Local Activation #4 Press and hold for 1/2 second, Activates Functions under code 4
S2	Local Activation #2 Press and hold for 1/2 second, Activates Functions under code 2
S3	Local Activation #3 Press and hold for 1/2 second, Activates Functions under code 3
S4	Site Address Switch Sets units site number
S5	Processor Reset
S6	Local Activation #1 Press and hold for ½ second, Activates Functions under code 1
S7	120/240 Vac Selector switch

Speaker Output

R27	External transceiver receive audio set to 1 Vp-p at TP6
R76	Test Speaker output level set
R58	MSK modem transmit deviation level set
R63	DTMF transmit deviation level set

Assigning Site Address (S4)

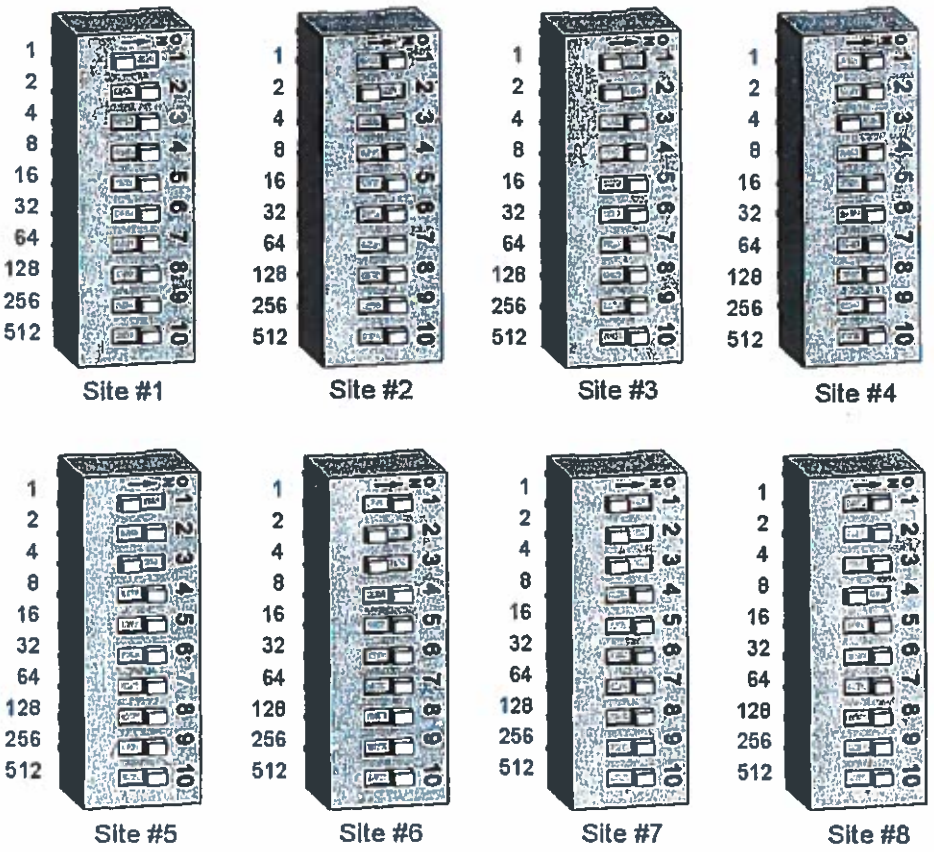
The site address switch gives each FCTBD controller in a two-way system its unique unit number.

For use with Commander: In order for the siren to report back with its identity, define the site address by setting dip switches located on the board. The dip switches have values of 1, 2, 4, 8, 16, 32, 64, 128 256, 512. Add appropriate dip switch values to define the site number address.

Example

To define the board for Site #1 toggle first dip switch to the left. All other dip switches are to the right. For Site #2 toggle the second dip switch to the left. For Site #3 toggle the first and second dip switch to the left. For Site #4 toggle the third dip switch to the left. For Site #5 toggle the first and third dip switch to the left. Continue this method to define other site number addresses.

Figure 6 Setting the Switch Number Example



Switch number	1	2	3	4	5	6	7	8	9	10
Binary number	1	2	4	8	16	32	64	128	256	512

Example: Switch numbers 1, 2, and 3 are binary numbers 1, 2, and 4.

Add 1 + 2 + 4 = 7; 7 is the unit address

NOTES:

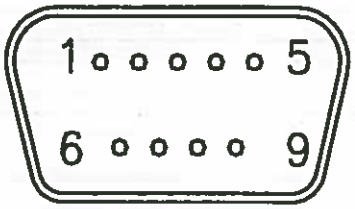
- Set site address to one to program controller card with firmware (HEX code).
- To program a non-digital unit using FSPWARE Software, set site address to one. When programming is completed, change the dip switch setting to the actual site address.
- The site address is stored at power up of the controller. If the site address is changed, cycle all power to the card (battery and AC).

Transceiver Interface

You can interface a transceiver through the male DB9 connector, P1.

Position	Description
1	Transmit Audio
2	Receive Audio
3	PTT
4	Ground
5	12 Vdc (unregulated)
6	Carrier Detect
7	Not used
8,9	Ground

Figure 7 Transceiver Interface Connector P1



Transmit Audio

You can adjust the encoded audio from 0 to 1.2 V_{pp} (O.C.) using the DTMF Deviation Potentiometer, R63 and Digital Deviation Potentiometer, R58. Use to set the audio output level to the transceiver. You can connect the transmit audio to the radio's line level (flat) audio input or its mic (pre-emphasized) audio input, but the flat or non-pre-emphasized input is preferred and is easier to adjust. The transmit deviation is adjusted as follows:

- DTMF–Adjust R63 for 3 kHz deviation (add 0.75 kHz deviation if CTCSS is used)
- Digital–Adjust R58 for 3 kHz deviation (do not exceed 4 kHz)

NOTE: Deviation levels are cut in half when using 12.5 kHz channel spaced radios.

The transmit audio is generated by U14 (the DTMF encoder), U12 (the digital encoder) and the CTCSS board (if present). PTT is generated by the processor taking pin 44 low. This gates U11:B on allowing the transmit audio to pass out to the transmitter.

The PTT also sets the collector of Q4 high, which allows R47 to turn on Q3 through R44. Q4 pulls the PTT line low and activates TRANSMIT LED D18. The collector of Q4, being high, also allows R48 to begin charging C15. When this exceeds 5 volts, U3A forces its output to ground and shuts off Q3. This provides a timeout timer to prevent the transmitter from getting stuck in transmit.

The PTT signal also sets the output of U17F high turning on Q5. This sends a ground to the CTCSS board, telling to encode rather than decode.

Receive Audio

Connect the receive audio to the radio's de-emphasized audio out. You can adjust the audio level of an external transceiver by R27 and when receiving a properly modulated signal as described above, adjust to 1 V_{pp} at TP6.

PTT

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

+12 Vdc

The +12 Vdc is an unregulated, 1.0 A supply that can vary from 11.5 to 13.6 Vdc.

Carrier Detect

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

Sensors and Sensor Inputs

The FC Controller Board comes with the following inputs to work with external sensors and two 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

AC Sensor

During normal operation (when AC is present) the built-in AC sensor does not light. If AC is lost, the AC LED lights. 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 is sent. A loss of AC is not reported immediately. The controller makes sure the loss lasts at least 2 seconds then it adds (1 second * Site #) before reporting. Each siren with an AC failure reports by site number in sequential order with a two second delay between sites. Once AC is restored, another automatic report is sent in the same order to show change of state. If AC is restored before the automatic report is sent, the report is canceled.

Low Battery Sensor

The low battery sensor input measures the voltage across the four series batteries. If the battery voltage goes below ~44 V for 20 seconds, the controller reports a low battery condition. The controller does not automatically report when the battery voltage returns to normal to eliminate the possibility of multiple reports when a battery is very weak. The low battery condition remains latched in memory until the controller is reset or a function is run and the battery voltage is restored.

Digital Inputs for Rotation Sensor

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.
- Proximity Switch Rotation Sensor Input: JP5-7 is used to connect a proximity switch to detect siren rotation. You may leave this input 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, provides active low pulses. Once this input receives more than 11 low pulses during a siren activation, this input will latch active until a reset command is received.

Digital Input for Current Sensor

Use JP5-5 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 a siren activation. If this input is pulled low for 1/4 second, the input is latched active until another activation command is received or a Reset command is sent.

Digital Input for Intrusion Sensor

Use JP5-3 to detect an intrusion into the Control Cabinet. With the Control Cabinet closed, the intrusion switch is in a normally closed position. If the intrusion condition changes state for more than one second, an auto-report is sent.

Digital Input for Pressure Sensor (not used with 2001-130 sirens)

Use JP5-1 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.

Relay Outputs

There are four relay outputs on the FC Controller Board, 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 lights. The FC Controller Board comes standard with two DPST relays. Relay #3 is reserved for testing the system while using batteries. Relay #4 is reserved for the low voltage cutoff feature.

Speaker Output

You can use the speaker output at JP2 to monitor received audio, route remote P.A. or provide signal out when the tone generator option is used. You can adjust speaker output up 2.0 V_{pp} into an 8-ohm load using R61.

Monitor Received Audio

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

Remote Public Address

You need to program the P.A. as a function through the software if it is to be used. When the P.A. function is activated, the FC Controller Board routes the received audio to the speaker output as long as the carrier is detected. If the carrier drops out for more than 15 seconds, the unit goes back to standby mode.

Audio Function Generator Option

To use this feature, you need to program one of the standard signals or a custom signal through 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.

Landline and Local Button Activation

You can activate the first four pre-programmed functions l
the FC Controller Board, or remotely by grounding one of
at JP10 for at least one second. The remote inputs are prc
cannot exceed 5.1 Volt. Each button is labeled with its ass

Control Board Power Input

The FC Controller Board has a switch selectable nominal
the proper voltage is applied, the POWER LED is lit. Set S
input level. Verify charger is also set accordingly. See "Ins
installation details.

DTMF Decoding and Encoding Formats

Decoding Format

DTMF

Receive audio enters the DTMF decoder IC (U14) from the
R64. When a proper DTMF digit is being decoded, TP8 w
appear on pins 18, 19, 20, and 20 of U14.

Two-Tone

The FC Controller Board decodes two-tone codes with tc
must be at least 80% of what has been programmed. The
than 400 milliseconds. The recommended minimum tone
timings between 0.5 seconds and 8 seconds for the A to
and 8 seconds for the B tone.

DTMF Encoding Format

The FC Controller Board encodes a nine-digit DTMF strir
type, ID number, function status, and sensors status. Refe
DCFCTB Encoding Format section for detailed informatic

Programming Software

FSPWARE

FSPWARE is software for two-tone and DTMF controlled
direct connection between the siren and the computer's
PCB universal cable adapter.

The Commander® Digital System Software (SFCDW

Commander (SFCDWARE) software is used to control, m
controller. The software communicates with the siren co
to the Help menu provided with the software for operati

ntenance

NING

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

personnel familiar with the siren, associated controls, and power being used, should perform service or maintenance.

ervicing or maintaining, ensure that remote activation cannot occur and ct power to the siren and the associated control equipment.

tenance

that the warning system is fully operational and to maintain the highest possible liability, perform the following monthly testing and annual inspection. In order to he integrity of the warning system, prompt investigation of any reported failures esearched and corrected promptly.

ving is a typical monthly test outline:

all sirens to clear latched sensor status inputs (DTMF systems only).

te one of the siren functions (3 minute activation recommended). If the 240 Vac ormer/rectifier option is used, test both AC and DC operation. Test sirens using y power. Ensure transfer relay operation is successful.

e system for siren status reports.

ne each site report for any failed condition. If you detect a failure condition, noti- ignated service personnel.

ne pre-operational system test procedure on an annual basis. See "Pre- al System Testing" on page 43 for details.

TRBP is a transformer/rectifier for primary system power with battery back up s the siren to operate from a 208, 220, or 240 Vac power source when AC available. During normal operation, the 2001TRBP maintains a charge to the batteries. During an AC power failure, an automatic switch to battery operation maintain the siren's normal operation. Specify the AC line voltage when

TRBP has a 115 Vac secondary tap to provide power to the siren Control Cabinet.

Location

e transformer assembly as close as possible to the Control/Battery System to ling distance as short as possible.

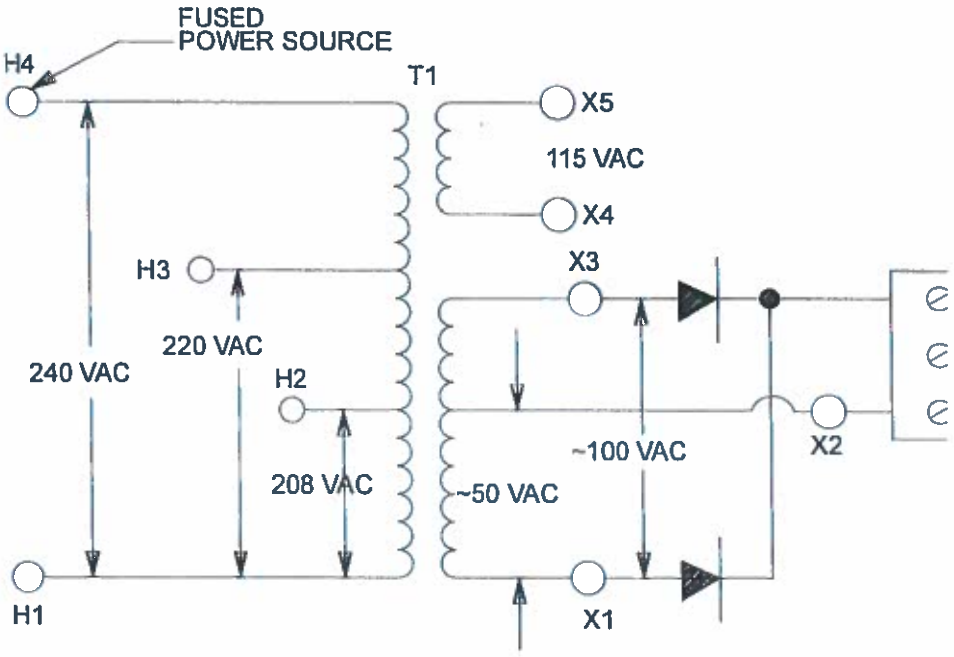
2001TRBP Wiring

⚠ DANGER

ELECTROCUTION HAZARD: Electrocution or severe personal i when making electrical connections, drilling holes, or lifting eq only experienced electricians should install this product in acc and National Electrical Codes.

NOTE: Federal Signal recommends using wire no smaller than 3 AW transformer and the Control/Battery System. To perform the wiring, p (See "Figure 8 Schematic Diagram 2001TRBP" on page 63 and "Figu Rectifier Wiring to Control Cabinet" on page 65.)

Figure 8 Schematic Diagram 2001TRBP



⚠ DANGER

When wiring the Model 2001TRBP to the Control Cabinet, the wiring instructions as in Figure 10 Transformer Rectifier Wirir damage may occur to Control System and/or batteries.

Preparation

To wire the 2001TRBP:

1. See "Figure 4 Typical DCFCB or DCFCTB with 2001TRBP Instal page 36, "Figure 12 DCB Wiring Diagram" on page 73, "Figure Diagram" on page 74, and "Figure 14 DCFCTB Wiring Diagram"
2. Remove the 2001TRBP transformer from its shipping crate and on its top to expose the inspection covers located on the botto 2001TRBP Transformer Rectifier" on page 66.)
3. Remove the four 3/8-inch hex head bolts that secure the inspec move the inspection covers from the transformer.

4. Pull the four primary lines marked H1, H2, H3, and H4 and secondary lines X4 and X5 from the inside of the transformer.
5. Punch or drill the plate, use one 1/2-inch conduit for AC in and one 1-inch conduit for 120 V and 48 V out to the controller.
6. Install a 1-inch 45 degree Liquid-Tight connector into the 1-inch opening on the transformer. Face the connector to the rear of the transformer and tighten the 1-inch lock ring. Put a 1-inch plastic bushing over the exposed thread end on the 1-inch connector.
7. Cut a section of 1-inch Seal-Tight, 7 inches in length. This provides raceway for the 48 Vdc secondary and for Control Cabinet 120 Vac input.
8. Cut a section of 1/2-inch Seal-Tight 18 inches in length. This provides A/C input voltage from the AC disconnect to the transformer. If the AC disconnect does not have 120 Vac available, the X4 and X5 taps in the 2001TRBP may be used to provide AC voltage to the Control Cabinet. In this case, run the Seal-Tight between the 2001TRBP and the siren controller.

Table 43 Transformer Wiring

Transformer Primary	(2 each) 10 AWG, CU, stranded, black 40 inches in length
Rectifier Output	(1 each) 2 AWG, CU, Black, 30 inches in length–48 Vdc Negative
	(1 each) 2 AWG, CU, Red, 40 inches in length–48 V dc Positive
Control Cabinet	(1 each) 14 AWG, CU, stranded, black 60 inches in length–120 Vac Line
	(1 each) 14 AWG, CU, stranded, white 60 inches in length–Neutral

To connect the transformer wiring:

1. The (2 each) 40-inch black 10 AWG lines provide 208/220/240 Vac for transformer primary input.
2. The 60-inch black and 60-inch white lines 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 unless the X4 and X5 taps are used in the 2001TRBP. (See "Figure 4 Typical DCFCB or DCFCTB with 2001TRBP Installation Drawing" on page 36, "Figure 12 DCB Wiring Diagram" on page 73, "Figure 13 DCFCB Wiring Diagram" on page 74, and "Figure 14 DCFCTB Wiring Diagram" on page 75.)

   The 60-inch black and 60-inch white lines provide the 120 Vac input to the DC Control Cabinet. It connects the terminal block in the 2001TRBP labeled X4 and X5 to TB5 F1 and F2.
3. The 30-inch black 2-AWG line provides the 48 Vdc negative to the DC Control Cabinet. It connects the terminal block in the 2001TRBP labeled "-" and the 5/16-inch ground stud on the backplane of the siren controller.
4. The 40-inch red 2 AWG line provides 48 Vdc positive voltage to the DC Control Cabinet. It connects to the terminal block in the 2001TRBP labeled "+" and to the labeled terminal (#3) at K3.

AC Line Wire Terminations

Table 44 AC Line Wire Terminations

	Service disconnect	Trans
240 Vac operation Transformer Primary: 2 each #10 black wires	L1 L2	H1 H4
220 Vac operation Transformer Primary: 2 each #10 black wires	L1 L2	H1 H3
208 Vac operation Transformer Primary: 2 each #10 black wires	L1 L2	H1 H2
115 Vac Tap Transformer Secondary		X4 X5

NOTE: Cap all unused taps with wire nuts

Figure 9 Transformer Rectifier Wiring to Control Cabinet

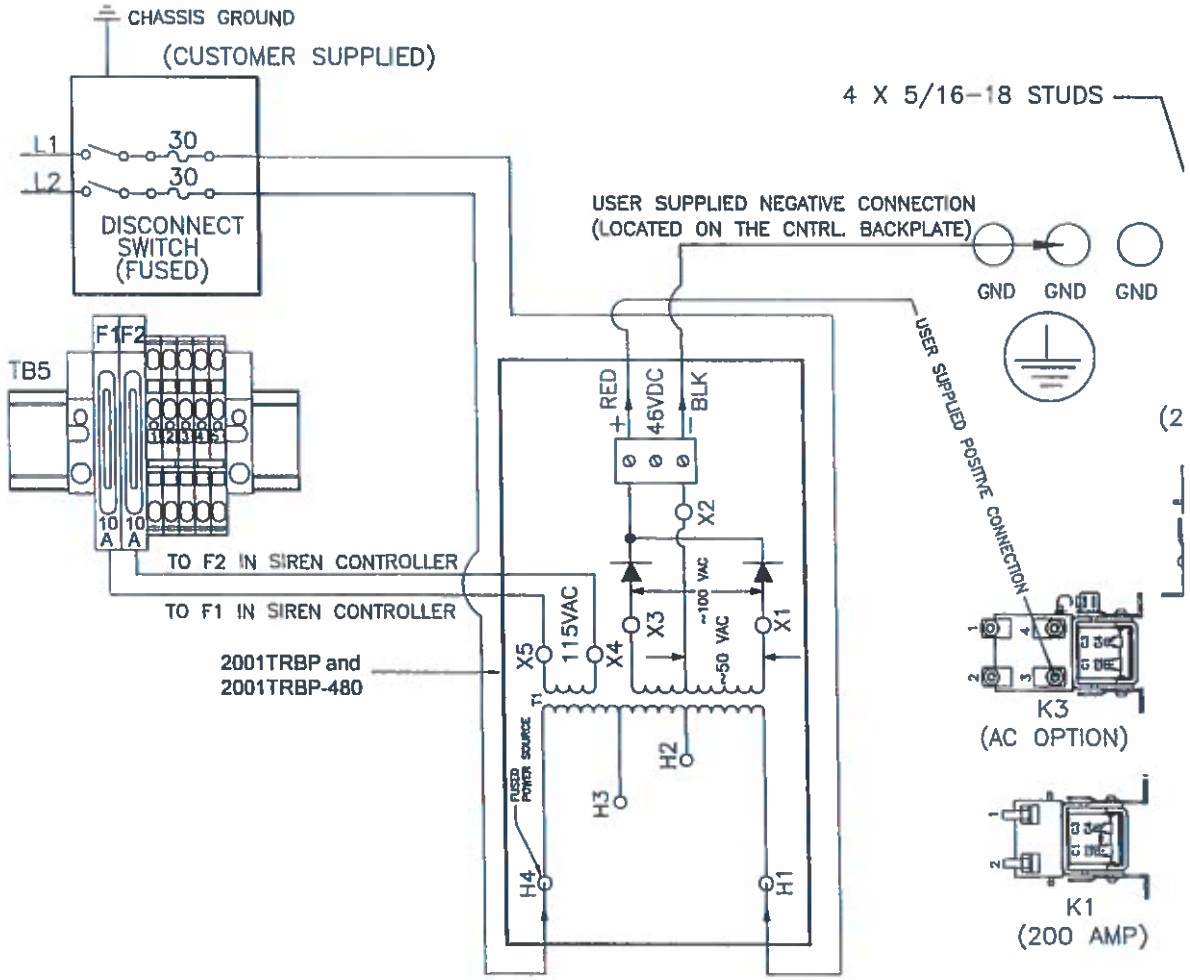
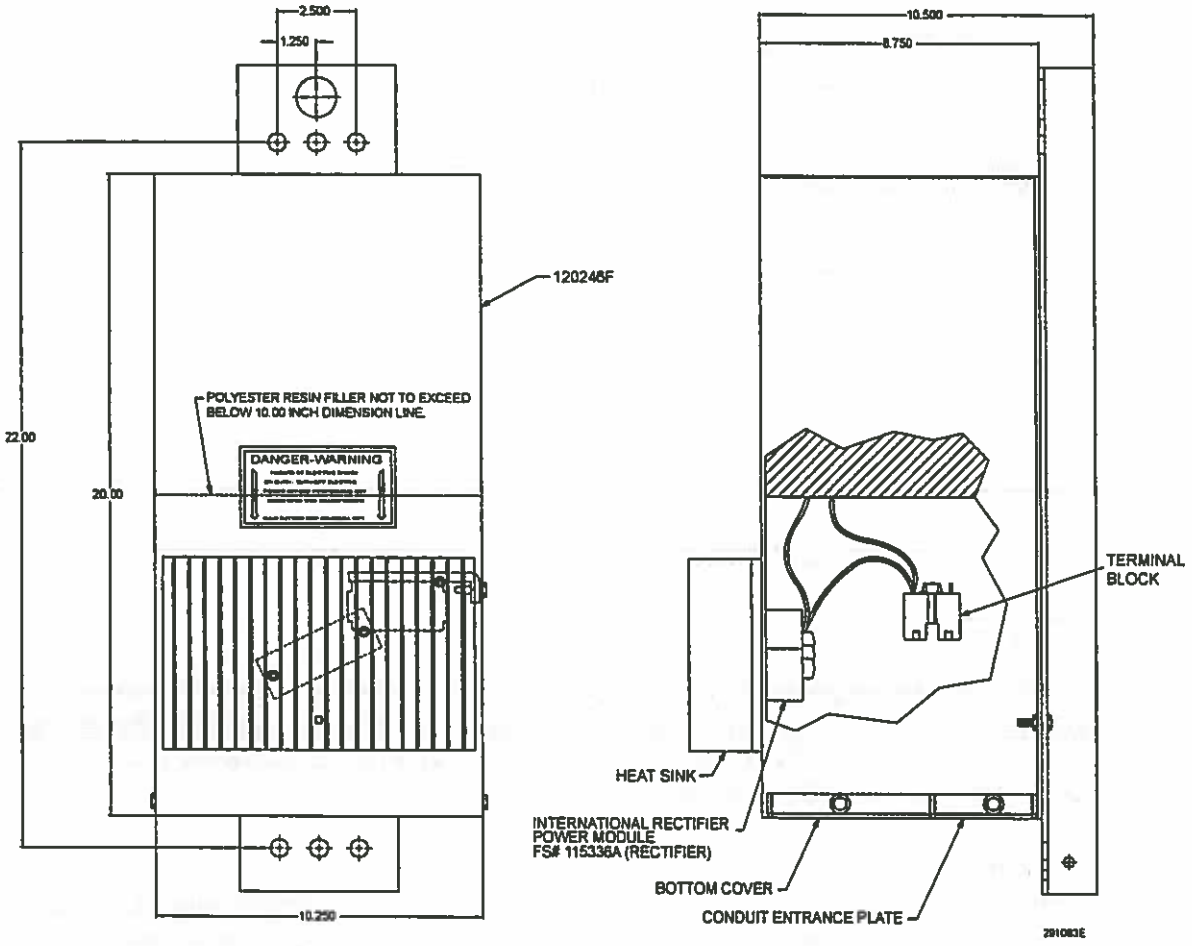


Figure 10 2001TRBP Transformer Rectifier



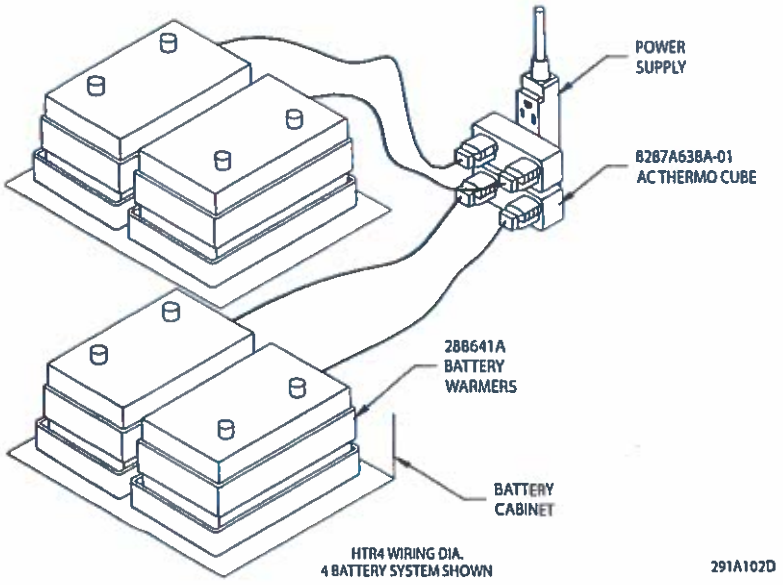
Model HTR4 (Battery Warmers)

⚠ CAUTION

Battery warmers require 120 Vac. If 240 Vac is used to power the FC board and charger directly, battery warmers are not allowed.

In locations where temperatures may drop below freezing for extended periods, the optional battery warmers are recommended to maintain battery efficiency. A thermostat provides on/off control of the warmers that senses the inside temperature of the Battery Cabinet. The battery warmer option is equipped with four battery warmers that are wrapped around each of the four batteries in the Battery Cabinet. The warmers are plugged into the cube taps, which plug into the thermostat cube, which is plugged into a 120 Vac outlet that is provided for in the Battery Cabinet. No other connection or mounting is required for this option.

Figure 11 HTR4 Wiring Diagram



⚠ DANGER

ELECTROCUTION HAZARD: Electrocution or severe personal injury can occur when making electrical connections, drilling holes, or lifting equipment. Therefore, only experienced electricians should install this product in accordance with national and local electrical codes.

Model 2001HR (Holding Relay)

This option enables the control of both of the siren motors from a single contact closure on one-way models. This feature is typically required for telephone line control systems and is only required if an FC is not purchased. The 2001HR is a holding relay, which holds the rotator motor on for 15 seconds after the control contact is released, keeping siren rotation active during wail signals. The control contact is wired between K2-C1 and ground.

Solar Power

When purchased, the solar option allows the siren to operate in areas where AC power is not available. You can also use the solar option in locations where AC power is available. In the event that AC power is lost, the solar option serves as a backup power source. The solar option maintains a battery charge until the AC power is restored. The PVS220W-48 model for the DCFCB and DCFCTB controllers includes a solar regulator and solar panel kit. When installed, the batteries are charged by the photovoltaic charging system, instead of a battery charger, to provide operational power to the siren. See the Solar Power Option Manual (255379) for drawings.

Model DCFCTBD-IP

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.

Ethernet Board Specifications

Table 45 Ethernet Board Specifications

Electrical	
Input Voltage	10.5 to 95 Vdc
Current Draw	< 150 mA
Serial Port	
Serial Port Protocol	RS232C, N, 8, 1 baud rate configurable
Ethernet Port	
Protocol	IEEE 802.3, 10 Base-T connection
600 Ohm Audio Output Port	
Protection	MOV and Transorb surge protection
Impedance	600 ohms
Audio Output Level	Adjustable from 0.30 to 3.00 V_{p-p}, (-17 dB to +2.7 dB) into 600 ohms
Environmental	
Operating Temperature	-30°C to +65°C
Humidity	0 to 95% non-condensing
Physical	
Dimensions (H x W x D)	~ 2 x 4 x 6.5 inches
Weight	< 2 lb

Connections

Table 46 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 and 2 for flat audio output. Jumpers pins 2 and 3 for expanded dynamic range audio output.
JP4	RS232 Serial Port
JP5	FLASH Programming and Converter Configuration Port

JP6	10.5-95 Vdc Power Input
JP7	Resets board back to factory default settings
J1	Ethernet Network Port

Table 47 Indicators

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

Table 48 Controls

R1	600 ohm audio output level set.

Network Information

Protocols Supported

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

IP Ports Used

- 16887 (SmartMsg 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	150 K baud per connection
Siren Activation	50 bytes per connection
Siren Poll Response	74 bytes per connection

Getting Service

If you are experiencing any difficulties, contact Federal Signal Customer Support at 800-548-7229 or 708-534-3400 extension 7511 or Technical Support at 800-524-3021 or 708-534-3400 extension 7329 or through e-mail at: techsupport@fedsig.com. For instruction manuals and information on related products, visit http://www.fedsig.com/

Appendix A Stainless Steel Care and Maintenance

Type 316 Stainless Steel is a durable material with strong anti-corrosion properties. With proper care and maintenance, it maintains an optimal appearance over a long service life. Exposure to high-saline environments, chlorides, abrasive chemicals, or carbon steel diminishes its anti-corrosion properties and increase the risk of damage.

⚠ CAUTION

Improper care of stainless steel diminishes its anti-corrosion properties and may result in surface damage.

- Use only stainless-steel components (that is, washers, bolts, etc.) and tools when installing stainless steel products.
- Never use carbon steel or galvanized fasteners to install stainless steel products.
- Do not use cleaning products containing chlorides (that is, hydrochloric acid) or other abrasive chemicals.
- When power washing nearby surfaces, wrap stainless steel to prevent contact with concrete detergents.
- If chloride solutions or concrete detergents contact stainless steel, immediately rinse away with water.
- Always wear clean gloves when handling stainless steel products.
- Do not use abrasive brushes or scouring pads to wipe stainless steel.
- Unless otherwise specified, apply all cleaners and polishers with a soft, lint-free cloth or soft nylon brush. For heavier rust deposits, a nylon scouring pad may be required; however, buffing with nylon pads may alter stainless steel finishes. To minimize alteration, use only "ultra-fine" nylon pads and rub with the grain. Avoid excessive scrubbing.
- Do not clean stainless steel in direct sunlight or excessive temperatures.
- Do not weld, cut, drill, or grind carbon steel near stainless steel. Resulting particles will contaminate and rust stainless steel.
- Stainless steel care and maintenance may require the use of harmful chemicals. Follow all use and safety instructions provided with cleaning or polishing agents. Ensure personal protective equipment is worn in accordance with occupational health and safety guidelines stipulated by your local governing authority.

Cleaning

Routine cleaning with soap and water is usually sufficient to maintain the corrosion resistance and appearance of 316 Stainless Steel. Use a soft nylon brush to remove any accumulated dirt. Wash with mild soap or detergent, then rinse in clean water and wipe dry with a soft cloth.

Iron or Carbon Steel Contamination

Passivated stainless-steel surfaces can be compromised by contact with iron or carbon steel products. This can result from exposure to nearby welding, cutting, drilling, or grinding of carbon steel. Grit from iron or carbon steel will quickly rust in the presence of moisture. If left unattended, contaminates may compromise passivation, leading to stainless steel rust. To remove contaminants from stainless steel surfaces, use a soft cloth to apply a solution of Oxalic Acid. Leave solution on surface for a few minutes to dissolve contaminating particles. Once clean, thoroughly rinse away all residual solution with clean water.

Corrosion

Type 316 Stainless Steel does not corrode with proper care. If signs of corrosion appear, clean immediately.

- Minor: Use an all-purpose lubricant, such as WD-40, to wipe affected stainless steel. Domestic stainless steel cleaners containing calcium carbonate or citric acid, such as Citisurf 77 Plus, can also be used. Rinse thoroughly with clean water. If rust remains, treat as moderate. If rust returns in a short time, treat for iron or carbon steel contamination.

- Moderate: Use E-NOX CLEAN or another Phosphoric Acid based stainless steel cleaner. Spread cleaner evenly over the surface, wait 30-60 minutes, and then neutralize the acid with an alkaline cleaner like UNO S F. Thoroughly rinse away all residue with clean water. If rust remains, stainless steel may need to be treated for severe corrosion or be replaced. If rust returns in a short time, treat for iron or carbon steel contamination.

- Severe: Due to the highly corrosive nature of severe rust treatments, and the inherent risks to personnel and surrounding environments, a professional service provider is recommended. Severe rust is treated with a pickling bath, typically containing highly corrosive hydrofluoric acid. Once treated, stainless steel can be passivized with mild nitric acid.

Mortar and Cement Spatter

If mortar or cement comes into contact with stainless steel, remove immediately. Use E-NOX CLEAN or another Phosphoric Acid based stainless steel cleaner. Spread cleaner evenly over the surface, wait 30-60 minutes, and then neutralize the acid with an alkaline cleaner like UNO S F. Thoroughly rinse away all residue with clean water.

Graffiti Removal

Remove graffiti from stainless steel with a biodegradable graffiti-cleaning spray or wipe. Avoid using knives or hard scraping tools to remove graffiti, as these may damage stainless steel surfaces.

Oil and Grease Marks

Remove oil or grease from stainless steel with hydrocarbon solvents such as methylated spirit (Bartoline is a common brand), isopropyl alcohol (that is, rubbing alcohol) or acetone. Apply solvent several times with a clean, non-scratching cloth until all oil or grease is removed.

Heavily Neglected or Tarnished Surfaces

Use domestic metal polish to improve the appearance of tarnished stainless steel. Chrome polishes for automotive parts are suitable for stainless steel and are widely available. Treat entire stainless-steel surface to avoid discolored patches.

Heavily Damaged Products

To avoid progression of damage, identify and address problems as early as possible. Heavy damage includes structural compromises such as visible dents, cracks, breaks and rust that can undermine the integrity of a product. Heavily damaged products should be removed from service until a repair or replacement can be made. To prevent worsening of damage, remove any significant rust as soon as possible.

NOTICE

This content is provided for informational purposes only. Any mention of a specific product is not a guarantee of quality or effectiveness. Federal Signal is not responsible for any improper use or handling of hazardous chemicals.

Appendix B Drawings

Figure 12 DCB Wiring Diagram

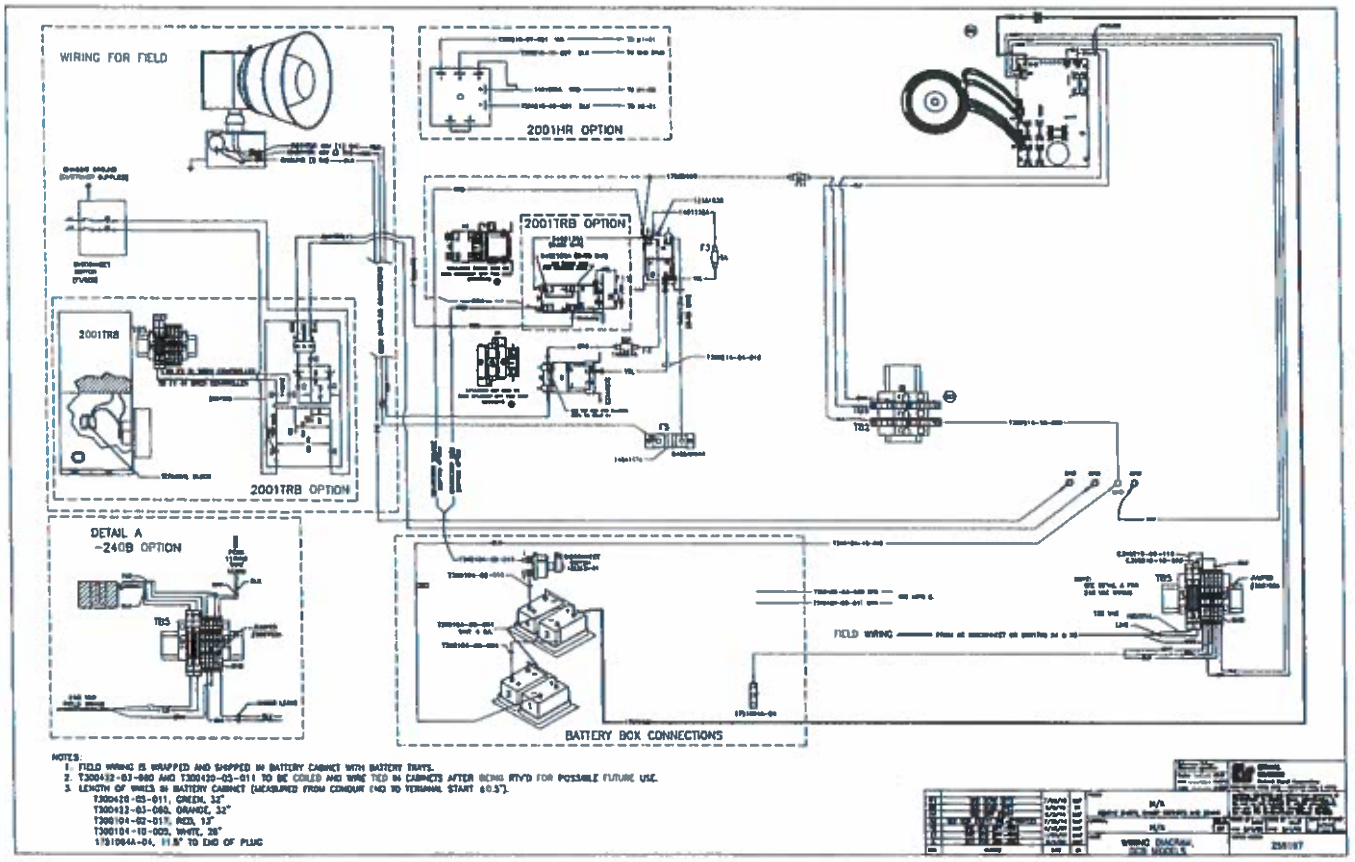


Figure 13 DCFCB Wiring Diagram

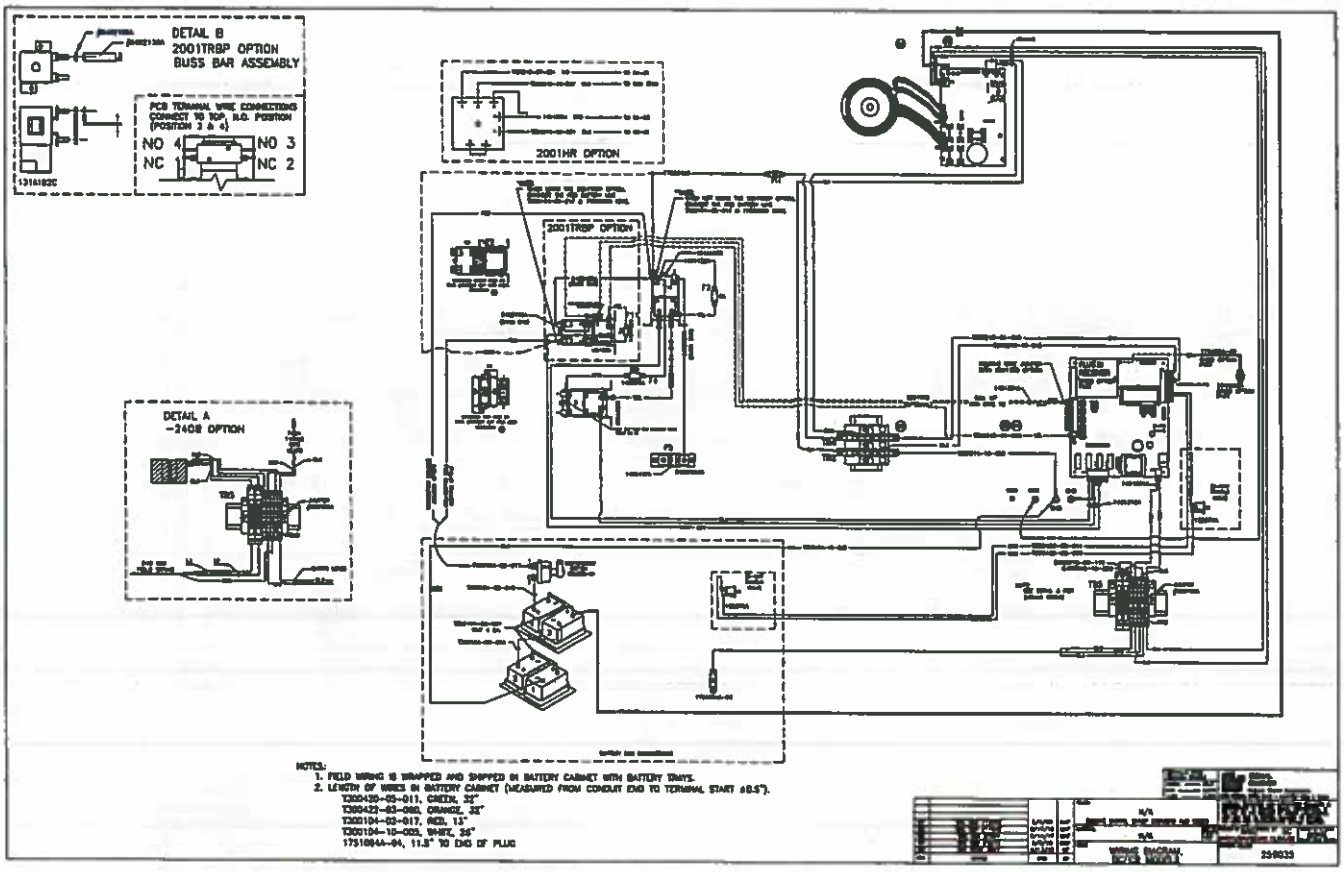


Figure 14 DCFC1B Wiring Diagram

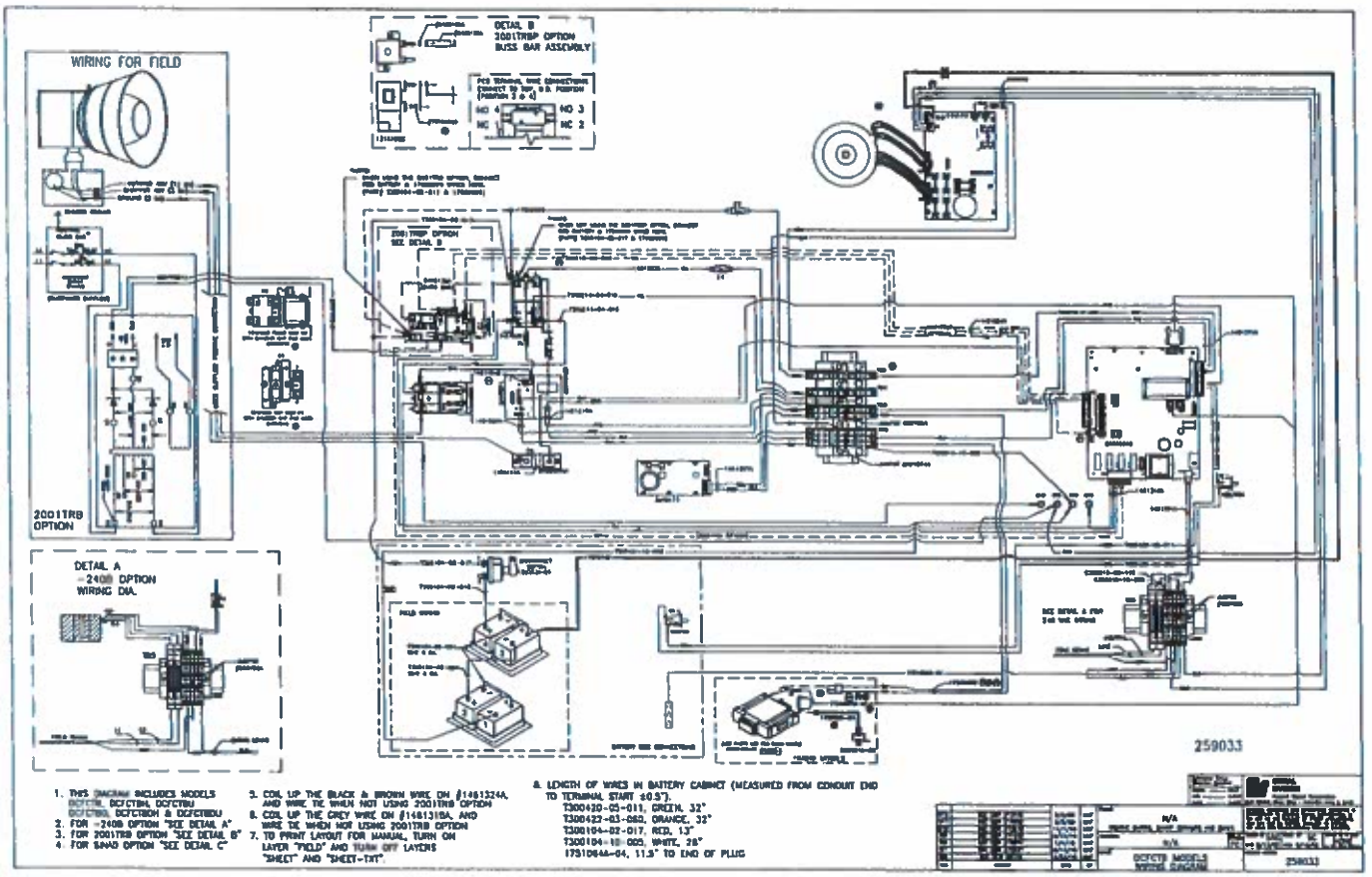
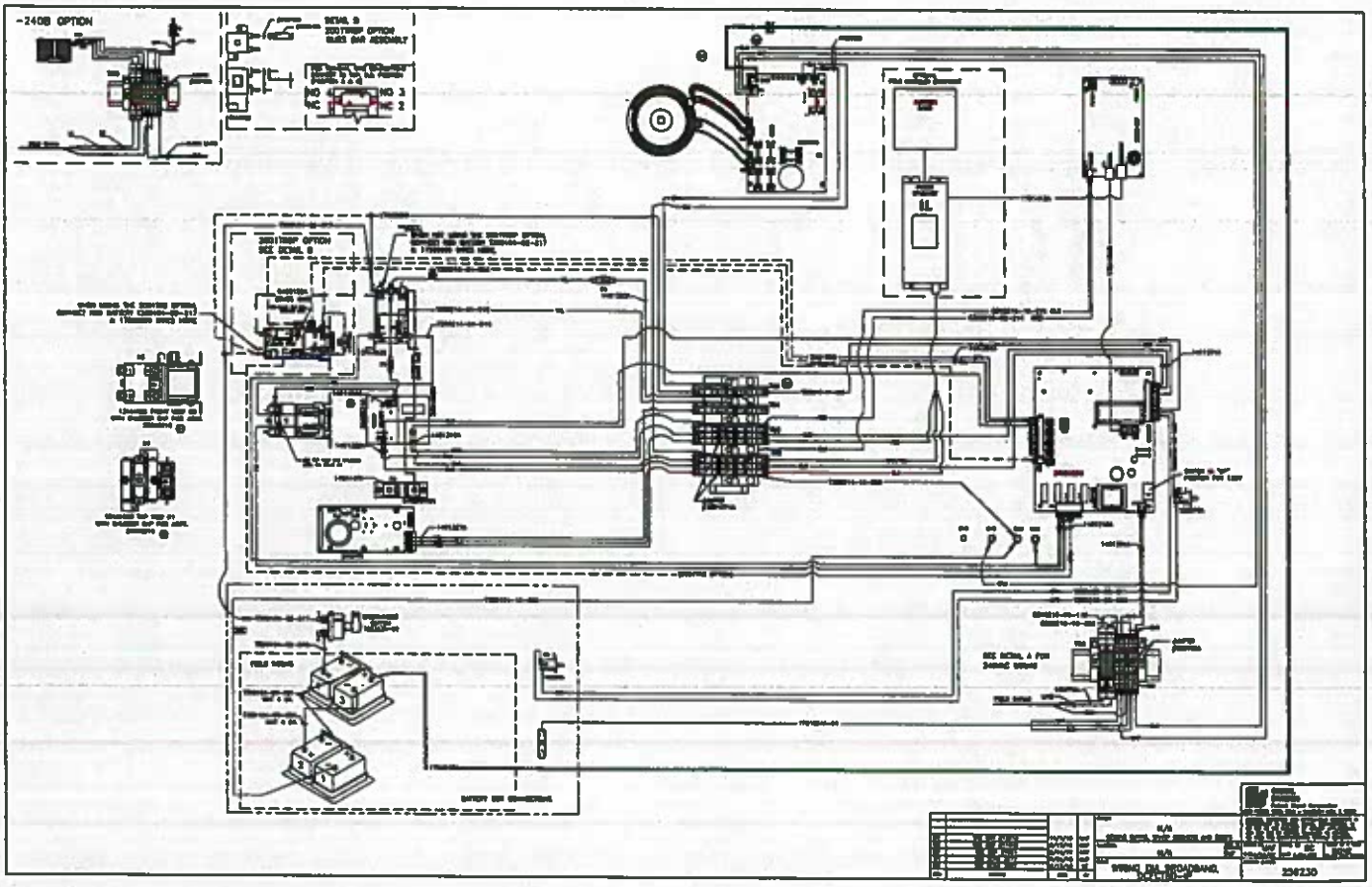
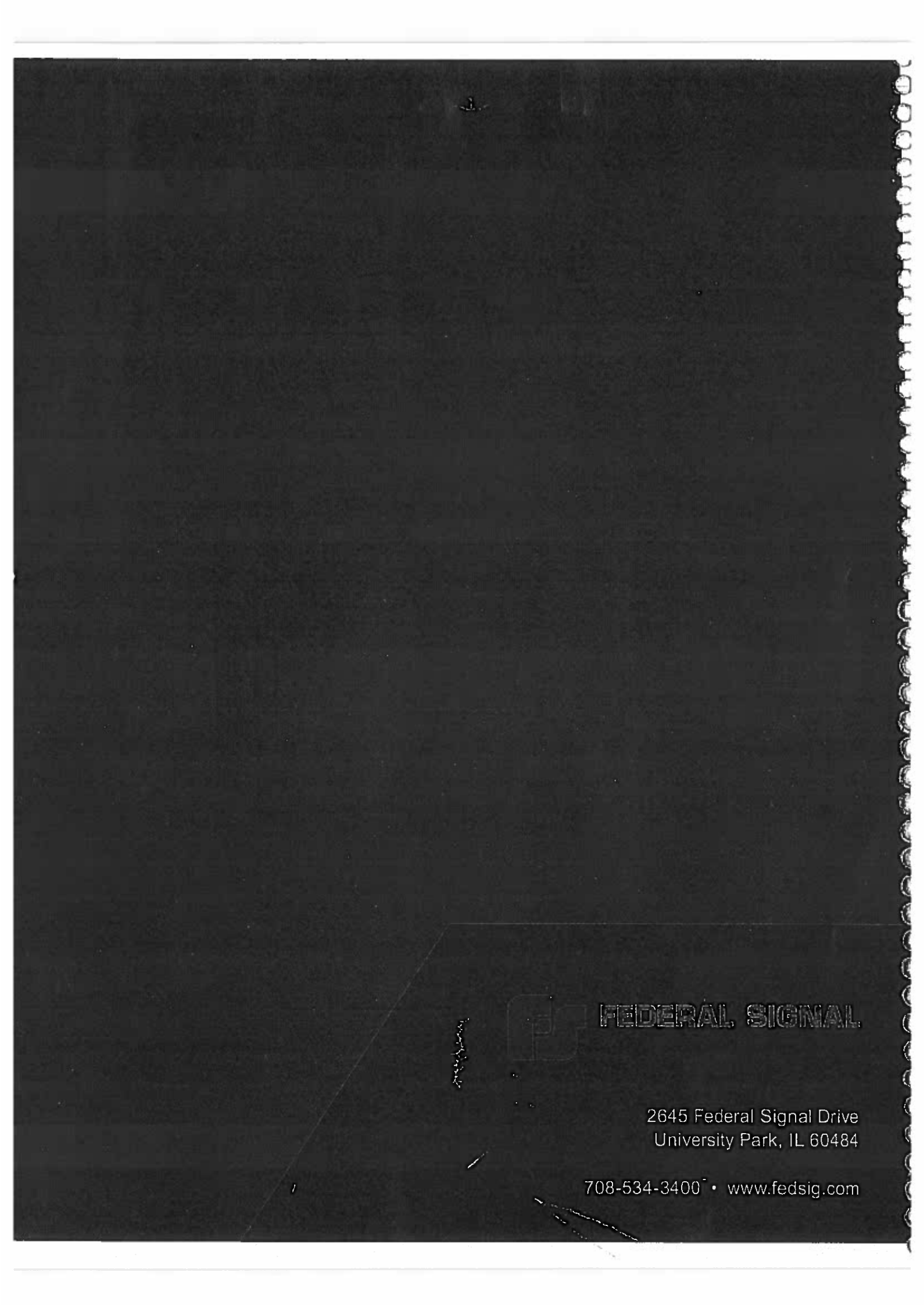


Figure 15 DCFCTB-IP Wiring Diagram





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