



L. W. BILLS COMPANY

DIVISION OF B & B ENGINEERING CORPORATION

7-9 Park Street, PO Box 7

Georgetown MA 01833-0007

(978) 352-6660

fax (978) 352-6639

e-mail: lwills@comcast.net

Employee Owned and Operated Since 2014

Customer
Attn:
Address
State

**DTX-16 ZONE
STATE BID PRICING**

Date

Dear :

We are pleased to submit this proposal for a Signal Communications radio box to report a fire alarm activation to _____ Fire Department via a radio signal. The box is to be located at _____.

Prices listed reflect cost per State Bid Contract #FIR04

1 - DTX 16-zone radio box (DTX L1R1-N1016)	\$3,906.00 less 25% =	\$2,929.50
1 - low band antenna w/tape (IK-A72 MB)	746.00 less 25%	559.50
1 - Adaptor tube and wall mount bracket (IK-AW-18)	162.00 less 25%	121.50
1 - Flush mount trim ring (if flush mounting box 890-1780)	\$135.00 less 25%	101.25
100' RG213 antenna cable with connectors	\$389.00 less 25% =	291.75
1 Ditek 110 volt Surge Protector	\$75.00 less 25%	56.25
1 - Limit Switch	\$75.00 less 25%	56.25
Box checkout and programming		495.00
Shipping and handling fees		105.00
Optional Installation as described below		\$3,195.00

Optional installation - We would mount the radio box and the antenna, run the cable to the antenna and the fire alarm panel, hooking up to one zone to report the fire alarm. This is based on a 100' distance between radio box, fire alarm panel, and antenna. All dry closure contacts needed from the fire alarm panel are to be provided by the fire alarm panel owner. This would be an additional cost.

On all new construction and/or building renovations, the electrical contractor is responsible for all conduit runs and roof penetrations. All fire alarm panel upgrades are an additional cost.

If installed by others, mounting of radio box, antenna, and antenna cable to be done by others. Also, all dry closure alarm contacts must be identified and provided by others before checkout can be done.

If you return your old master box to us, we will give you a credit of \$50.00. Please note: Pricing is good for 30 days from the date of this quotation.

Please note items you are ordering, sign the bottom of this quotation, and return it. We will then order your radio box and estimated delivery is two to four weeks. Thank you for the opportunity to quote.

Please feel free to call if you have any questions regarding the antenna and radio box installation.

Sincerely,

Janet Dalton
System Administrator

Signed: _____

Date: _____



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Company
Attn:
Street
Address

STATE BID PRICING
DTX SOLAR POWERED
(3 BUTTON)

Date

Dear

We are pleased to submit this proposal for a three-button, solar powered, radio box to report a fire/medical/police alarm activation to the _____ Fire Department via a radio signal. The box is to be located at _____

Prices listed reflect cost per State Bid Contract #FIR04

1 – DTX 4 zone solar powered radio box (DTS-L1R1-P304)	\$5,350.00 less 25%	\$4,012.50
1 – installation kit (DTS-IK-02)	\$940.00 less 25%	\$ 705.00
1 – 18 watt solar panel and mounting kit (DTS-IK-18)	\$1,104.00.00 less 25%	828.00
1 - 5" x 11'5" aluminum pole (190-0819)	\$1495.00 less 25%	1,211.25
2 – Horse shoe solar box mounting brackets (pair)	\$219.00 less 25%	164.25
4 - 3/4-10x18 anchor bolts (190-0819-M) (part of aluminum pole kit)	\$130.00 less 25%	97.50
1 – wooden bolt template (part of aluminum pole kit)	\$33.00 less 25%	24.75
Box checkout and programming		495.00
Shipping and handling fees		295.00
OPTIONAL: Installation as described below		\$2,650.00
Applicable sales tax (if exempt, we need a copy of exempt certificate)		

Optional installation - We would mount the radio box and the antenna, and do all the programming. This would be an additional cost **as listed above**.

Sub-base is to be mounted by others.

Please note: Pricing is good for 30 days from the date of this quotation.

Please note items you are ordering, sign the bottom of this quotation, and return it with your deposit. We will then order your radio box and estimated delivery is eight to ten weeks. Thank you for the opportunity to quote. Please feel free to call if you have any questions regarding the antenna and radio box installation.

Please contact the local Fire Prevention office regarding any local requirements.

Sincerely,

Janet Dalton
System Administrator

Signed: _____

Date: _____



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 Employee Owned and Operated Since 2014

Customer
 Attn:
 Street
 City State Zip

DTX 4-ZONE Date
STATE BID PRICING

Dear :

We are pleased to submit this proposal for a Signal Communications radio box to report a fire alarm activation to the _____ Fire Department via a radio signal. The box is to be located at _____

Prices listed reflect cost per State Bid Contract #FIR04

1 - DTX 4-zone radio box (DTX L1R1-N104)	\$ 3,360 less 25% =	\$2,520.00
1 - low band antenna w/ tape (IK-A72 MB)	\$746.00 less 25%	559.50
1 - Adaptor tube and wall mount bracket (IK-AW-18)	\$162.00 less 25%	121.50
1 - flush mount trim ring (if flush mounting box) (890-1780)	135.00 less 25% =	101.25
100' RG213 antenna cable with connectors	389.00 less 25% =	291.75
1 Ditek 110 volt Surge Protector	75.00 less 25%	56.25
1 Limit Switch	75.00 less 25%	56.25
Box checkout and programming		495.00
Shipping and handling fees		105.00
Optional Installation as described below		\$3,195.00
Applicable sales tax (if exempt, we need a copy of exempt certificate)		

Optional Installation - We would mount the radio box and the antenna, run the cable to the antenna and the fire alarm panel, hooking up to one zone to report the fire alarm. This is based on a 100' distance between radio box, fire alarm panel, and antenna. All dry closure contacts needed from the fire alarm panel are to be provided by the fire alarm panel owner. This would be an additional cost as listed above.

On all new construction and/or building renovations, the electrical contractor is responsible for all conduit runs and roof penetrations. All fire alarm panel upgrades are an additional cost.

If installed by others, mounting of radio box, antenna, and antenna cable to be done by others. Also, all dry closure alarm contacts must be identified and provided by others before checkout can be done.

If you return your old master box to us, we will give you a credit of \$50.00. Please note: Pricing is good for 30 days from the date of this quotation.

Please note items you are ordering, sign the bottom of this quotation, and return it. We will then order your radio box and estimated delivery is two to four weeks. Thank you for the opportunity to quote.

Please feel free to call if you have any questions regarding the antenna and radio box installation.

Sincerely,

Janet Dalton
 System Administrator

Signed: _____

Date: _____



L. W. BILLS COMPANY
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July 28, 2020

Waterville Fire Department
Attn: Fire Alarm Bid
7 College Street
Waterville ME 04901

To Whom It May Concern:

L.W. Bills Company is pleased to submit a proposal for equipment and labor to upgrade your existing municipal fire box receiving equipment. The proposed equipment will decode the existing 100 mili amp fire boxes, Signal Communications solar street boxes and 4 & 16 zone master radio boxes. Please see the equivalency/exception insert with this proposal. The equipment list below is broken down by fire department equipment, police dispatch equipment and repeater equipment, if needed. We will perform a radio propagation test to determine if the repeater will be needed if awarded the contract.

Fire Department Equipment

1 – TRX50 Server	\$ 8,750
1 – TRX50 User Interface with 22" Monitor	165
1 – TRX50 Radio Module	1,890
1 – TRX50 Charger Module	1,470
2 – 12 VDC 26 AH Batteries	125
1 – TRX50 Telegraph Decoder Module	735
1 – Telegraph Transmitter Relay Interface	125
1 – Telegraph Retransmission Box	2,888
2 – Low Band Antennas with Tubes	598
2 – Lightning Protection Polyphasers and Ground Bar	125
1 – TRX50 Power Conditioner	138
1 – 5.25" x 19" Monitor Mount	125
1 – FCC/IMSA License	625
1 – Miscellaneous Electrical, Cables and Number Keypad	125
Equipment List Price	\$17,884.00
Labor to Install, Program and Training	\$ 6,500.00
Fire Department Equipment Total	\$24,384.00

Police Dispatch Equipment

1 – TRX50 Server	\$ 8,750
1 – TRX50 User Interface with 22" Monitor	165
1 – TRX50 Radio Module	1,890
1 – TRX50 Charger Module	1,470
2 – 12 VDC 26 AH Batteries	125
1 – TRX50 Power Conditioner	138
1 – Antenna with Tube	299

2 – RDS – Remote Dispatch Positions	\$ 2,590
2 – RDS – User Interface with 22" Monitor	420
1 – RDS Router (Up to 3 Operators)	27
2 – RDS UPS Backup	175
1 – 5.24" x 19" Server Monitor Mount	125
1 – Thumb Drive and Software Package	188
1 – Miscellaneous Electrical, Cables and Number Keypad	<u>188</u>
Equipment List Price	\$16,550.00
Labor to Install, Program and Training	<u>\$ 6,500.00</u>
Police Dispatch Equipment Total	\$23,050.00

Dual-Redundant Repeater System (If Needed)

2 – Repeater Alarm Boxes	\$ 5,775
2 – Antennas with Tubes	1,031
2 – Antenna Mounting Hardware	313
2 – Antenna Cable and Connectors	375
1 – Miscellaneous Electrical Supplies	<u>63</u>
Repeater Equipment List Price	\$ 7,557.00
Antenna Labor	3,000.00
Equipment Labor	<u>2,500.00</u>
Total Repeater Cost	\$13,057.00

Fire Department Cost	\$24,384.00
Police Dispatch Cost	\$23,050.00
Repeater Site Cost	<u>\$13,057.00</u>
Total Project Cost	\$60,491.00

The Signal Communications system does not need to have boxes installed to build a network, but as requested, here is a price per box with installation. See typical quote form following for radio box pricing.

1. DTX 4 Zone
2. DTX 16 Zone
3. DTX Solar Street Box

L.W. Bills hourly labor rates, portal to portal, are as follows
Regular working hours Monday – Friday - \$129.00/hour
Time and a half after hours Monday – Friday and Saturday - \$193.50/hour
Double time Sunday and Holidays - \$258.00/hour

This quote includes a two-warranty per request.

If you have any questions or require additional information, please do not hesitate to contact me. Thank you for the opportunity to quote

Sincerely,



Dan Dinwiddie
President

DD/dmr
Enclosures



CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)
12/27/2019

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 have ADDITIONAL INSURED provisions or 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 Fred C. Church Insurance 41 Wellman Street Lowell MA 01851	CONTACT NAME: Sharon Lambert PHONE (A/C, No, Ext): 800-225-1865 FAX (A/C, No): 978-454-1865 E-MAIL ADDRESS: slambert@fredcchurch.com	
	INSURER(S) AFFORDING COVERAGE NAIC #	
INSURED B & B Engineering Corporation dba L. W. Bills Comp PO Box 7 7-9 Park Street Georgetown MA 01833	INSURER A : Safety Indemnity Insurance Company 33618	
	INSURER B : MA Trade Self-Insurance Group Inc.	
	INSURER C : Clear Blue Specialty Insurance Company	
	INSURER D :	
	INSURER E :	

COVERAGES **CERTIFICATE NUMBER:** 242968063 **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 INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
C	COMMERCIAL GENERAL LIABILITY <input type="checkbox"/> CLAIMS-MADE <input checked="" type="checkbox"/> OCCUR <input checked="" type="checkbox"/> Errors and Omissions GEN'L AGGREGATE LIMIT APPLIES PER: <input type="checkbox"/> POLICY <input checked="" type="checkbox"/> PROJECT <input type="checkbox"/> LOC <input type="checkbox"/> OTHER:			WCSECGL000022501	1/1/2020	1/1/2021	EACH OCCURRENCE	\$ 1,000,000
							DAMAGE TO RENTED PREMISES (Ea occurrence)	\$ 100,000
							MED EXP (Any one person)	\$ 5,000
							PERSONAL & ADV INJURY	\$ 1,000,000
							GENERAL AGGREGATE	\$ 2,000,000
							PRODUCTS - COMP/OP AGG	\$ 2,000,000
							Errors & Omissions	\$ 1,000,000
A	AUTOMOBILE LIABILITY <input type="checkbox"/> ANY AUTO <input type="checkbox"/> OWNED AUTOS ONLY <input checked="" type="checkbox"/> SCHEDULED AUTOS <input checked="" type="checkbox"/> HIRED AUTOS ONLY <input checked="" type="checkbox"/> NON-OWNED AUTOS ONLY			5900095	1/1/2020	1/1/2021	COMBINED SINGLE LIMIT (Ea accident)	\$ 1,000,000
							BODILY INJURY (Per person)	\$
							BODILY INJURY (Per accident)	\$
							PROPERTY DAMAGE (Per accident)	\$
								\$
C	<input checked="" type="checkbox"/> UMBRELLA LIAB <input checked="" type="checkbox"/> OCCUR <input type="checkbox"/> EXCESS LIAB <input type="checkbox"/> CLAIMS-MADE DED RETENTION \$			WCSECEL000022601	1/1/2020	1/1/2021	EACH OCCURRENCE	\$ 1,000,000
							AGGREGATE	\$ 1,000,000
								\$
B	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below	Y/N N	N/A	021004100096119	1/1/2020	1/1/2021	<input checked="" type="checkbox"/> PER STATUTE <input type="checkbox"/> OTHER E.L. EACH ACCIDENT	\$ 1,000,000
							E.L. DISEASE - EA EMPLOYEE	\$ 1,000,000
							E.L. DISEASE - POLICY LIMIT	\$ 1,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

CERTIFICATE HOLDER Evidence of Insurance	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



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EQUIVALENCY/EXCEPTIONS TO THE TOWN'S SPECIFICATIONS

L.W. Bills Co. is proposing a Signal Communications alarm receiver that decodes both Gamewell wired boxes and Signal Communications radio boxes and is approved for NFPA 72 Chapter 27 criteria. L.W. Bills Co. is performing this application in over 100 cities and towns (copy enclosed). Signal Communications Corp. (SigCom) and L.W. Bills Co. are leaders in this application in New England. The proposed equipment is also being used to retransmit alarms to remote dispatch centers, police and regional centers.

Signal Communications Corporation's (SigCom) origins date back to the late 1960's. SigCom is a leading supplier of system solutions for incident and alarm reporting, emergency communications and mass notification systems. We manufacture a comprehensive line of commercial fire and industrial signaling products. SigCom alarm and communications products are sold throughout the world. Our customers include many of the world's recognized corporations. SigCom system installations protect the smallest towns to the largest cities and military installations. We design and produce solutions, not merely systems. Some of our projects include:

- United States Coast Guard Academy
- United States Naval Academy
- Walter Reed Army Medical Center
- Over 100 municipal and proprietary systems throughout New England and across the country

System Equipment Radio Receiving Equipment Specifications

Signal Communications TRX50 Supervisory System is Factory Mutual Approved for NFPA 72 Chapter 27, Public Emergency Alarm Reporting Systems. The systems hardware and software are designed and manufactured by Signal Communications Corporation, therefore no need for third-party substructure. Per NFPA72 Chapter 27, the TRX50 Radio Module comes with a LED signal strength meter, audio speaker and volume control to allow the dispatcher to see and listen to the incoming signals.

The system is easy to operate and requires minimal training. Operating procedures are structured in an organized hierarchy. This, along with activity summaries appearing on the monitor, streamlines dispatcher interactions. The equipment is rack mountable 19" EIA and can be installed in desktop, counters or standalone, in various configurations.

The proposed SigCom system operates in the 72/76 MHz range for municipal and 138/172 for military applications, utilizing frequency modulation (FM) private line (KPL) E coding. The transmission of alarms is based on a single transmission path from the radio master box to the dispatch center; the single path reduces failure points and signaling delays.

FCC licensing is coordinated through IMSA Spectrum Watch. The system will be licensed under the name Waterville, Town of, renewable every 10 years. For security reasons, the radio box system's keys are coordinated and only the AHJ are given keys. All radio boxes are shipped locked from the factory with instructions to see the AHJ prior to installation.

The proposed TRX50 supervisory system will decode SigCom's DTX series radio boxes and Gamewell 100 milliamp master boxes. The system will not decode other manufacturers radio boxes listed in RF FIR04. SigCom will not assume responsibility and reliability of other manufacturers equipment and Factory Mutual does not approve mix systems.

Standard Specifications

Listings	FM Approved
System Primary Power	110 VAC w/20 Amp Breaker (min)
Ventilation	No Special Air Conditioning Required (Normal Cabinet Ventilation)

System Processor

Power Supply	.05 Amps (max) @ 110 VAC, 60Hz
Operating Voltage	24 Volts DC
Standby Current	.075 Amps @ 24 VDC
Battery Back-Up Time	24 Hours Nominal (12, 48 and 72 Hours Available)
Back-Up Battery Size	24 V, 26 AH (24 Hour Back-up)
Individual Points Supported	1,000 min, up to 10,000 w/Memory Option
Maximum Number of Boxes	500 per Radio Channel per NFPA 72, Chapter 27
Communications Ports	6 Serial RS232 plus 6 USB Ports
Radio Channels	One Standard, Four Optional
Operating Temperature	32 Degrees to 125 Degrees F

Dimensions

Rack Mount	5.25" x 14" d, 19" EIA Rack
Desktop	11.75" h x 19.75" w x 18" d

Weight

Rack Mount	25 lbs.
Desktop	52 lbs.

Radio Module

Operating voltage	24 VDC Nominal (from System Processor and Supervised)
Power Consumption	0.25 Amps (max) @ 24 VDC
Number of Channels	1 Standard (2 max)
Operating Temperature	32 Degrees to 125 Degrees F

Dimensions

Rack Mount	5.22" h (3U) x 12" d, 19" EIA Rack
Desktop	Can Fit in with System Processor in a Case with Dimensions 17" h x 19.5" w x 18" d

Weight	15 lbs. (max)
RF Connections	PL 259 Female (Poly Phaser) (1)

Charger Module

Power Supply 110 VAC 60 Hz

Power Consumption

TRX50-CM01 1.3 Amps (max) @ 110 VAC
Operating Voltage 28 VDC Nominal
Operating Temperature 32 Degrees to 125 Degrees F

Dimensions

Rack Mount 10.47" h (6U) x 5.62" d, 19" EIA Rack
Desktop 10.47" h (6U) x 5.62" d x 19" w
Weight 7.5 lbs.

Software Packages

Database Manager Software

SigCom's TRX50 Dbm software allows the system manager/alarm superintendent to create and maintain the systems box database. The software can be loaded on any Windows-based PC or laptop (XP or higher operating systems). Changes to the database can be done locally or remotely of the TRX50 and transferred to the system processor via a thumb drive.

RDS Operator Positions

SigCom's remote operator software is designed to allow the dispatcher to Acknowledge and End calls on the system from a PC platform remotely of the server. The software has other features such as putting boxes in and out of service, ring station bell and with command and control option, ring remote station bells. The dispatcher will see the Box and Zone Numbers Call Message "BOX ALARM" and up to 11 lines of extended information. The software has a log file for retrieving call data and is automatically stored daily.

Options

The TRX50 modular platform allows flexibility and covers endless configurations, such as command and control for multiple applications, regional dispatching, mass notification and remote station house bell alerting as well as automatic pump activation and more.

Radio Fire Alarm Box Specifications

The proposed radio master box is SigCom's DTX series; they are Factory Mutual (FM) Approved for NFPA 72, Chapter 27. The boxes come with four and sixteen supervised dry contact initiation circuits. Depending on the FACP, the DTX can also interface with a serial port (RS232 or RS485) connection from a control panel for point transmission. The DTX can transmit up to 32 different event types and are viable in two-way configurations. If needed, the DTX can be configured as a radio box repeater and monitor up to four supervised zones.

Specifications

Listings FM Approved
Zone Inputs 4 or 16
Zone Displays LED – Red for Alarm and Yellow for Trouble
Serial Port One RS232 or RS485
Enclosure Sheet Metal NEMA 1 (14" h x 12" w x 6" d)
Enclosure Outdoor Cast Metal NEMA (21" h x 16" w x 9 7/16" d)
Temperature Range -40 Degrees to 160 Degrees F
Electronics Conformal Coated
Radio Transmitter 1 Watt (72-76 MHz) Frequency Modulated (FM)

Power Supply	120 VAC
DC Power	12 VDC
Battery	12 Volts 7.5 AH
Back-Up	Minimal 72 Hours Fully Configured Two-Way and 144 Hours One Way

The SigCom radio box does not have protocols to interface to competitors alarm receivers and vice versa. It is similar to commercial fire alarm. For example, Simplex smoke detectors do not communicate with a Firelite fire alarm panel. These types of protocols require extensive testing and approvals and with the technology changes occurring constantly between competitors, there would be compatibility problems occurring on a regular basis, lending all parties to potential lawsuits if a failure occurred.

SigCom is constantly coming up with new and innovative ideas and always sending to Factory Mutual for full testing and approvals to be used for public emergency alarm reporting, NFPA 72, Chapter 27.

In the 18 years as a distributor and representative for SigCom, we have never had issues with protocols. An example of this is in Concord, MA, where two manufacturers of Radio Boxes had major formatting issues years ago causing major problems with master boxes working correctly. After many months of research and troubleshooting, the problem was finally corrected. Luckily, no major incident occurred.

L.W. Bills Co. and public safety agencies around the country have had great success with SigCom equipment due to the special attention to testing and obtaining the proper approvals for a public emergency reporting system.

Radio Box Programing

SigCom supplies a full software package for the programming and testing of the radio boxes. A laptop plugs into the motherboard, giving you a much higher level of diagnostic testing and troubleshooting than built-in buttons and LED's can provide as your spec states. The programming software allows the AHJ to back-up critical box programming data and restoral. Almost all modern electronics are programmed, tested and operated by some form of computer rather than only local buttons and LED's.

L.W. Bills Co. and SigCom offer training continuously upon request as needed. L.W. Bills Co. conducts two municipal fire alarm classes per year in Georgetown, MA at no charge to municipal and fire personnel. The instructors are SigCom factory representatives and Dan Dinwiddie, who is the IMSA Level 2 Municipal Fire Alarm instructor.

Notes

1. Per the walk-through, the fire department and Hussey Communications will mount the antennas and run the antenna cable. The fire department and Hussey will provide the antenna cable and connectors.
2. The new TRX50 alarm receivers will replace the Digitize 3505. The TRX50 is capable of decoding the telegraph boxes and radio boxes at the same time.
3. The TRX50 system will not need any fiber optic connections. All signals will be received via radio signals. The telegraph boxes will be retransmitted via radio signal to the police department TRX50 receiver.
4. All Signal Communications receivers and radio box transmitters are approved for public alarm reporting systems per NFPA 72 (Chapter 27 Public Reporting and Chapter 26 Central Station).

5. L.W. Bills Co. has installed and maintains over 100 cities and towns, including the city of San Francisco, CA.

6. Only one repeater site would be needed to guarantee 100% coverage. A mesh network is not needed for this system. The hospital on the ridge would make a good repeater site. All boxes come in directly and the repeater would back up the signals from the radio boxes if needed.

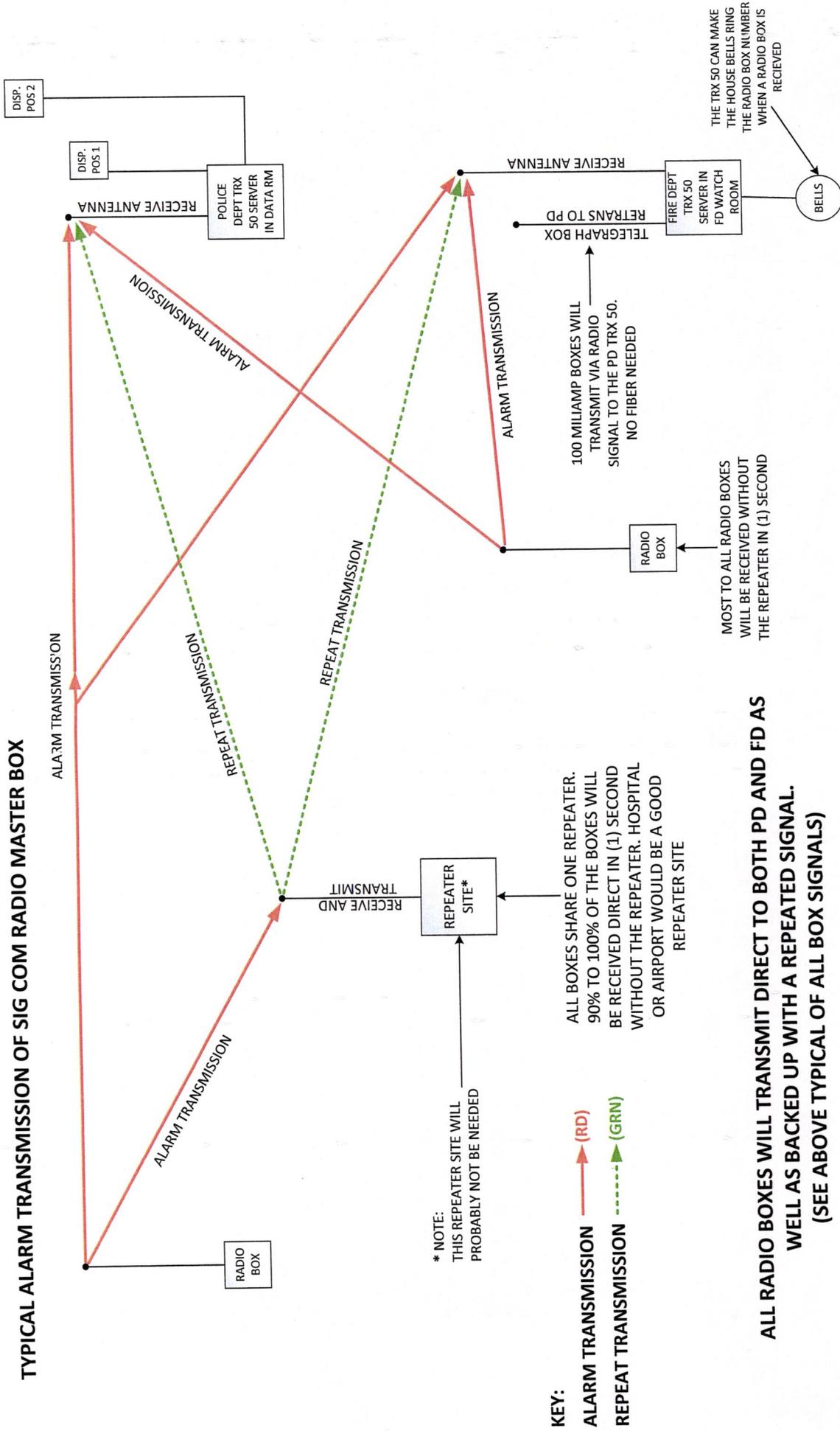


Daniel R. Dinwiddie, President

July 29 2020

Date

TYPICAL ALARM TRANSMISSION OF SIG COM RADIO MASTER BOX



ALL RADIO BOXES WILL TRANSMIT DIRECT TO BOTH PD AND FD AS WELL AS BACKED UP WITH A REPEATED SIGNAL. (SEE ABOVE TYPICAL OF ALL BOX SIGNALS)



TRX50

Emergency Reporting and
Wide Area Mass Notification System



Signal Communications

Advanced Solutions for Emergency Centers

For over 35 years, Signal Communication's emergency reporting and notification systems have been used to protect thousands of buildings and many thousands of people from coast to coast.

Municipalities, government facilities, military bases, college campuses, and other large multi building complexes rely on Sigcom's systems, products, and people to support their community's life safety efforts.

TRX50 – Modular, Scalable, Secure

Sigcom's TRX50 system offers a fully integrated software and hardware platform for monitoring, reporting, and management of major emergencies that endanger people and property. Each system is customized to meet the needs of the community, the local responders, and the central dispatch operation. Options include support for combined hardware (Telegraph) and radio box networks, ability to manage and dispatch calls at multiple stations in the emergency center, and ability to add integrated wide area mass notification to the platform.



A two level visual dispatch display can include a virtual printer detailing all alarms and trouble activity - eliminating the need for a paper printer.

Supports Existing Telegraph and Managed Transition to Radio

Sigcom TRX50 system is unique in its ability to enable municipalities and others to cost effectively and safely transition to a modern radio network. TRX50 accepts signals from 100 mA Telegraph Boxes and Sigcom Radio Boxes simultaneously. This facilitates a managed switch over on a flexible schedule. TRX50 gives municipalities a solution for service-intensive legacy fire alarm networks that can be implemented at a reasonable pace and cost to ultimately improve public safety.



Sigcom Radio Boxes are the ideal replacement for service intensive hardware connected Master boxes like the one shown here

NFPA 72 Chapters 27 and 26 Approved for Both Public Reporting and Supervising Station

Other systems claim to have NFPA approval, but is it the right NFPA 72 standard for your application? Sigcom's TRX50 System has been tested and approved to be compliant with the rigorous requirements of both Chapter 27 – *Public Emergency Alarm Reporting Systems* - and Chapter 26 – *Supervising Station Alarm Systems*. TRX50 is one of very few systems to be compliant with both Chapter 27 and Chapter 26.

Superior Long Range Radio Technology

At the heart of the TRX50 platform is Sigcom's proven and versatile long range radio communication technology. Sigcom radio networks are installed and maintained by authorized partners and the network is owned and managed by the emergency operation. Sigcom long range radio networks deliver many significant advantages over the alternative radio technology considered for similar applications – Mesh Radio.

Sigcom's Advantages over Mesh Radio

- **Mesh Radio not approved for Public Reporting** – Mesh Radio systems do not meet the requirements for the only national standard developed for municipal applications - NFPA 72 Chapter 27.
- **Much longer range, up to 25 miles per radio.** Typical range for a Mesh radio is only 2-5 miles. Mesh Networks require many repeater radios to achieve the same range as Sigcom.
- **End to end secure radio communication – no IT support needed.** All signals in a Mesh radio system must be converted to internet data. All Mesh systems require at least two internet connections for code compliance and to assure signal delivery.
- **Two-way command and control.** Unlike Mesh radio, Sigcom radio technology enables the dispatch center to control virtually any device or system in any location at any time (e.g. shut down the HVAC system if a fire signal is received).
- **Live voice communication over radio network.** Using the Sigcom radio network, a dispatcher can pick up a microphone at the TRX50 head end and deliver live messages to all or part of the population at any time.



Sigcom DTX Series Solar powered Radio Box can replace City Master boxes virtually anywhere

Scalable to Add Wide Area Mass Notification

TRX50's modular platform is also a perfect solution for military bases, municipalities, and other large complexes that want a comprehensive ability to inform and instruct large populations in many buildings to manage dangerous events in real time. The same long range radio network that delivers emergency signals to and from fire and security alarms can also carry live voice to an array of in-building and outdoor appliances and systems as part of an integrated wide area mass notification system. When integrated with Sigcom's MNS-100 mass notification system, TRX50 meets the stringent requirements of UTC 4-021-01.



TRX50 System head end including Mass Notification Module with microphone





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Email – sales@sigcom.com | www.sigcom.com

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170824r1.0/TRX50Bro

APPENDIX XX: Comparison of Sigcom Radio Box System Technology with AES Mesh Radio Networks for Municipal Fire Alarm Applications

Sigcom's TRX50 radio box system is designed specifically for fire alarm signal communication across a single municipality or military base.

AES radio systems and products are designed for large geographic areas – many systems communicate across multiple states to a central station – for the monitoring of mostly burglar alarms as well as, to a smaller extent, fire alarm systems.

Quotes from AES IP Link data sheet

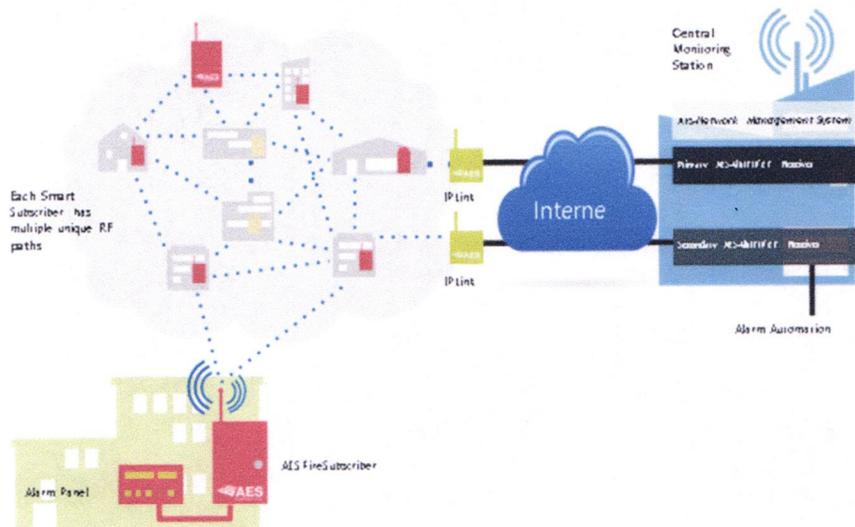
Wireless mesh networking is an innovative technology adopted by many industries with applications that need to communicate data over a large geographic area...

Plus

AES 7170 Remote RF/IP Transceiver allows central stations to monitor one or more AES-MultiNet Radio networks from a single location anywhere on the globe!

Sigcom's TRX50 radio box system features end to end radio communication – signals transmitted from a Radio Box travel directly to a Dispatch Center antenna connected to Sigcom's head end in Dispatch. The system is owned and maintained by the Fire Department.

All signals in an AES mesh radio system are converted to internet data. AES promotes the system as *Wireless-to-Internet Alarm Transmission*. As result, all mesh radio systems can require significant IT resources for installation and support to install and maintain.



The illustration above is from AES data sheet for Remote IP Link Receiver. It details signal transmissions being converted to internet in order to enable communication to the central monitoring station receivers.

CONTINUED

Unlike AES Mesh Radio Systems, Sigcom Radio Box Technology enables Fire Department Dispatch to control virtually any device or system in any remote location with a Radio Box (e.g. shut down the HVAC system if a fire signal is received, control bells and/or lights).

Unlike AES Mesh Radio Systems, using the Sigcom Radio Box Technology a Fire Department Dispatcher can pick up a microphone at the TRX50 head end and deliver live messages to all or part of the Radio Box population at any time.

AES Mesh Radio Systems claim to have NFPA approval. But is it the right NFPA 72 standard for Municipal Fire Alarm? Sigcom's TRX50 System has been tested and approved to be compliant with the rigorous requirements of both Chapter 27 – *Public Emergency Alarm Reporting Systems* - and Chapter 26 – *Supervising Station Alarm Systems*. TRX50 is one of very few systems to be compliant with both Chapter 26 and Chapter 27. AES Mesh Radio Systems are approved for NFPA Chapter 26 which is consistent with its primary market focus – alarm central stations.



DTX Series Long Range Radio Alarm Transceiver

Description

SigCom's DTX Series is a family of extremely versatile and cost effective Alarm Reporting/Command & Control Transceivers. The DTX may be configured to operate as a one-way radio transmitter, or a two-way radio transceiver. The two-way configuration allows the system to be used for command/control functions that are well suited for industrial, institutional and military applications including Mass Notification Systems. Each means of communications is independent of the other, providing maximum reliability.

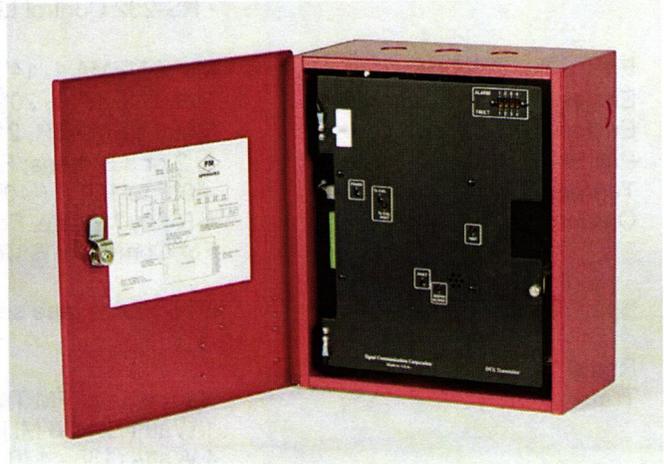
When combined with SigCom's TRX50 System Processor, all of the DTX configurations are Factory Mutual (FM) Approved as both Public and Proprietary Alarm Reporting Systems (NFPA 72, Chapters 26 & 27).

The DTX is available with 4 or 16 supervised, dry contact inputs that can be used for zone alarm reporting and/or other status reporting functions as needed per application requirements. There is also an additional input used for external, user operated alarm activation. The DTX can also interface with a serial port (RS-232 or RS-485) connection from a control panel. Zone input circuits and external switch contacts can be assigned with up to 32 different event types.

The relay option provides 4 relays with Form C contacts that can be programmed to operate by that DTX, by remote control from the TRX50 System Processor (in a two-way system), or combinations of local and remote control. These relays can be programmed to operate upon receipt of a specific local zone alarm and / or trouble event.

When used with the TRX50-MNS Mass Notification System, the DTX can activate live or prerecorded voice communication to outdoor areas, specific buildings, groups of buildings or throughout an entire military complex, campus or industrial/ institutional facility.

Serial data interfaces are also available for enhanced functionality including mass notification, command and control.



Features

- One-Way, Two-Way and Voice Options
- Four or Sixteen Supervised Initiation Circuits
- Prioritized Alarm & Trouble Messages
- Transmits 32 Different Event Types

Options:

- Serial Port for Data Communications with Intelligent Panels and Devices
- 4 Command /Control Relays (Form C)
- Mass Notification
- Weatherproof Enclosure (NEMA 3R)

Specifications

DTX Series Transceivers

Listings:	FM Approved, NFPA 72, Chapters 26, 27
Zone Inputs:	4 or 16
Zone Display:	Alarm & Trouble per Zone
Serial Ports, up to 2:	<ul style="list-style-type: none">• RS-232 or RS-485, Full Data for Compatible Alarm Panels 99 Loops, 32 Functions, 999 Devices per Loop (Contact SigCom for List of Compatible Alarm Panels)• RS-232 Control Link to Mass Notification System
Enclosure, Indoor:	Metal NEMA 1, 14"h x 12"w x 6"d (35.5 x 30.5 x 15.2 cm)
Enclosure, Indoor, Large:	Metal NEMA 1, 20"h x 16"w x 6.5"d (50.8x40.7x16.5 cm)
Enclosure Outdoor:	Metal NEMA 3R, 21"h x16"w x 9 7/16"d (53.3 x 40.6 x 24 cm)
Pull Station Option:	1, 2 or 3 Buttons; Fire / Medical / Police (Customization available)
Temperature Range:	-40°F to 150°F (-40°C to 65°C)
Output Relays Option:	4-Relay Module, Form C For Command & Control, etc
Solar Option	DTS Series, see separate data sheet
<u>Radio</u>	
Transmitter:	Narrowband FM Transmission 1 Watt (72 - 76 MHz) 4 Watts (138 - 170 MHz)
Radio Receiver Options:	Control Channel Receiver Voice Channel Receiver
<u>Power Supply</u>	
Primary Power:	120 / 240VAC, 50/60 Hz.
DC Power:	12VDC
Battery:	12 V, 7AH
Back Up:	Minimum 72 hours with fully configured system Up to 144 hours depending on configuration
<u>Ordering – Contact Sales@sigcom.com for quote</u>	
DTX Options	
Transmitter Frequency	72 - 76 MHz; 138 - 170 MHz
Box Size, Type	Indoor NEMA1, Standard or Large size; Outdoor NEMA 3R, large size
Number of Zones	4 or 16
Output Relays	0 or 4
2-Way Options:	Control Channel Receiver; Voice Channel Receiver
Serial Ports	0, 1 or 2 ports
Installation Kit, "DTX-IK" Series	Includes Antenna, Coax Connectors, Antenna Wall Mount Hardware (order coax cable separately)

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DTX Transceiver Data Sheet –br-d • Dec 2017



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4 Wheeling Avenue • Woburn, MA 01801
Tel.: 781 933 0998 • Fax.:781 933 5019 • www.sigcom.com



DTS Series Solar-Powered Radio Alarm Box

A Fully Wireless, Proven Alternative to Wired Systems

Overview

SigCom's DTS Solar Radio Alarm Box is powered by the sun to provide public emergency communications - no power / now wires required. Alarm messages are reported within two seconds. When combined with SigCom's TRX50 or Vision21 System Processor, all of the DTX configurations are Factory Mutual (FM) Approved as both Public and Proprietary Alarm Reporting Systems (NFPA 72).

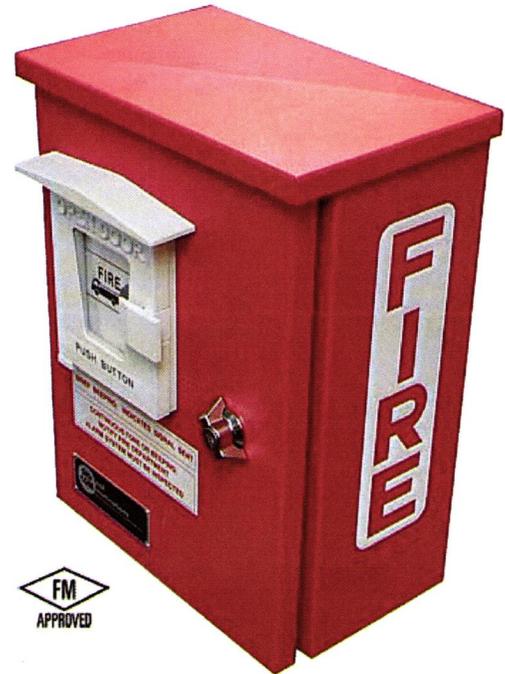
The DTS operates independently from commercial power or telecommunications lines. It is the modern alternative to aging telegraphic street boxes and is ideal for remote locations that lack access to power or public utilities.

The DTS Radio Alarm Box can be configured to operate as a one-way radio transmitter, a two-way, or a combination of both radio configuration. The two-way configuration allows the system to be used for command/control functions that are well suited for the industrial, institutional and military applications including Mass Notification Systems. Each means of communications is independent of the other, providing maximum reliability.

In addition to reporting public emergencies such as fire, police or medical there are 4 supervised, dry contact inputs that can be used for zone alarm reporting and or other status reporting functions as needed per application requirements. Zone input circuits and external switch contacts can be assigned with up to 32 different event types.

The relay option provides 4 relays with Form-C contacts that can be programmed to operate by that DTS, by remote control from the TRX50 or Vision 21 System Processor (in a two-way system) or combinations of local and remote control. These relays can be programmed to operate upon receipt of a specific zone alarm and/or trouble event.

When used with our optional Mass Notification Software, the output relays can be used to activate live or prerecorded voice communications.



Features

- Up to 3 buttons- Fire, Police, Medical, etc.
- ADA compliant
- Four or Sixteen Supervised Initiation Circuits
- Prioritized Alarm & Trouble messages
- Transmits 32 Different Event types
- Daily Self-test One or Two-Way Radio

Options

- Serial Port for Data Communications
- 4 Command/Control relays (Form C)
- Mass Notification
- Repeater

Specifications

Specifications are subject to change without notice due to product improvements.

Zone Inputs	4	Power Supply	
Serial Input	RS-232 or RS-485	Primary Power	Photovoltaic Panel
96 Zones, 32 Functions, 999 Devices per Zone		DC Power	12VDC
Zone Display	Alarm & Trouble per Zone	Battery	12V, 26AH
Weather Enclosure	NEMA 3R (16" h x 13" w x 6 1/2" d)	Back Up	Minimum 15 Days with no Solar
Temperature Range	-40°F to 150°F (-40°C to 65°C)	Installation	
Radio Transmitter		Pole Mount	11 1/2' Aluminum Pole
72-76/138-170 MHz	1 Watt	Foundation	18" x 36" min. concrete base (depth dependent on location)
138-170MHz	4 Watts	Approvals/Listings	FM Approved



Ordering Information

Description

Solar-Powered Alarm Box

Model

DTS-*Contact Us for Details*



4 Wheeling Avenue; Woburn, MA 01801
 Phone – (781) 933-0998 | Fax – (781) 933-5019
 Email – sales@sigcom.com | www.sigcom.com

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03042019ROC



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office@lwbills.com - www.lwbills.com

ESOP Since 2014

MUNICIPAL CUSTOMERS USING SIGNAL COMMUNICATIONS EQUIPMENT

MASSACHUSETTS

Abington	Jun 1995	Mansfield	Jun 2000
Acton	Dec 2004	Marblehead	June 2013
Andover	Sep 2002	Marshfield	May 1997
Arlington	Apr 2009	Mattapoissett	May 2002
Attleboro	Mar 1979	Maynard	Sep 2012
Avon	Mar 2002	Medford	May 2012
Ayer	Jun 2005	Medway	Oct 2018
Berkley	Oct 2000	Middleboro	Mar 1994
Beverly	Mar 2005	Middleton	Aug 2020
Blackstone	Oct 2001	Millis	Oct 2016
Boxborough	Feb 2002	Nantucket	May 2007
Brookline	Jun 2007	Nashoba Valley Reg	May 2013
Burlington	Dec 2008	Needham	May 2016
Canton	Dec 2004	New Bedford FD	Sep 2008
Canton Hosp School	Nov 2012	New Bedford PD	Jun 2013
Carlisle	Nov 2013	North Andover	July 2007
Chelsea	Aug 2020	North Attleboro	May 2006
Chicopee	May 2005	Norton FD	April 2020
Danvers	Jun 2017	Onset	Jan 2012
Dracut	Apr 2020	Palmer	Mar 2009
Easthampton	Feb 2002	Plainville	Jul 2000
Easton	Oct 1999	Plymouth	May 2010
Essex County Reg.	Jul 2014	Raynham	Nov 1989
Everett	Jan 2010	Revere	Jan 2016
Fairhaven	Oct 2006	Revere Regional	Jan 2016
Falmouth	Jan 2017	Rockport	Apr 2004
Franklin	Jun 2001	Rockland	Sep 2004
Gardner	Jul 2013	Salem	Jan 2004
Harvard	Aug 2001	Salem State Univ.	Oct 2015
Holyoke	Jul 2001	Saugus	Aug 2006
Holbrook Regional	Aug 2012	Seekonk	Dec 20
Hopedale	Mar 2013	Shirley	Dec 2015
Hull	Aug 2000	Somerset	Jun 2001
Ipswich	Jan 2020	Somerville	Jun 2001
Lakeville	Aug 2000	Springfield	Aug 1999
Lancaster	Sep 2018	Stoneham	May 2017
Lexington	Jul 2005	Sudbury	Oct 2012
Lincoln	Jan 2004	Swampscott	Mar 2007
Lynn	Aug 2006	Swansea	Jan 1996

Massachusetts continued:

Taunton	Dec 1998
Tewksbury	Dec 2004
Wakefield	Jan 2003
Walpole	Dec 2003
Ware	Mar 2003
Wayland	Mar 2009
Wenham	Jul 2014
West Springfield	2007
Westborough	Apr 2005
Westfield	1979
Westwood	Oct 2009
Wilmington	2009
Winthrop	1995
Woburn	1971
Wrentham	Sep 1997

CALIFORNIA

San Francisco	2004
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CONNECTICUT

Hamden	Mar 1997
Manchester, 8 th	Jun 1984
Manchester Ctr	May 1993
Middletown	Sep 1984
Willimantic	Aug 1977

MAINE

Biddeford	Dec 1970
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NEW HAMPSHIRE

Keene	Mar 2017
Seabrook	Sept 2018

NEW JERSEY

Teaneck	Sep 1995
---------	----------

NEW YORK

Johnstown	Sep 2004
Rome	Dec 1995
Schenectady	2000

OHIO

Warren	Jan 1992
--------	----------

Pennsylvania

Warren	Apr 1975
--------	----------

RHODE ISLAND

Barrington	Oct 2000
Burrillville	May 2002
Coventry	Jul 1996
E. Providence	Sep 1977
Exeter	Dec 1990
Foster	Aug 1987
Gloucester	Feb 2003
Johnston	May 1997
Little Compton	Nov 2015
Lincoln	June 1989
Manville	Aug 1993
Newport	Jan 1975
N Kingstown	May 1998
Pawtucket	Sept 1978
Portsmouth	Nov 1993
Scituate	Sep 1991
Tiverton	Sep 2002
Warren	Feb 2003
Warwick	Aug 1986
W. Greenwich	Jan 1990
Woonsocket	Nov 1974

VERMONT

Brattleboro	2019
Burlington	1988 DTX



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TOWNS USING TRX-50

REGIONAL

- | | |
|-------------------------------------|-----------|
| 1. MECC REGIONAL - NORFOLK | JULY 2019 |
| 2. SOUTH EASTERN REGIONAL - FOXBORO | AUG 2019 |
| 3. AYER/SHIRLEY REGIONAL - AYER | JAN 2020 |
| 4. NORTHERN ESSEX RECC – TEWKSBURY | MAY 2020 |

TOWNS

MASSACHUSETTS

- | | |
|-------------------|------------|
| 1. ACTON | JUNE 2018 |
| 2. ANDOVER | APRIL 2019 |
| 3. BLACKSTONE | MAY 2019 |
| 4. BROOKLINE | DEC 2019 |
| 5. CHELSEA | AUG 2020 |
| 6. DANVERS | MAY 2018 |
| 7. DRACUT | APRIL 2020 |
| 8. FAIRHAVEN | OCT 2019 |
| 9. GARDNER | JUNE 2018 |
| 10. LAKEVILLE | AUG 2019 |
| 11. MEDWAY | OCT 2018 |
| 12. MIDDLETON | SEPT 2020 |
| 13. NORTH ANDOVER | MAY 2019 |
| 14. NORTON FD | APRIL 2020 |
| 15. SOMERVILLE | OCT 2018 |
| 16. STONEHAM | MAY 2019 |
| 17. WALPOLE | AUG 2018 |
| 18. WAYLAND | DEC 2019 |
| 19. WESTFIELD | OCT 2019 |
| 20. WILMINGTON | DEC 2019 |

VERMONT

- | | |
|----------------|------------|
| 1. BRATTLEBORO | APRIL 2019 |
| 2. BURLINGTON | JAN 2019 |

NEW HAMPSHIRE

- | | |
|-------------|----------|
| 1. SEABROOK | MAY 2019 |
|-------------|----------|

CALIFORNIA

- | | | |
|------------------|----------|-----------|
| 1. SAN FRANCISCO | NOV 2019 | 7/28/2020 |
|------------------|----------|-----------|

Electrical Signaling

Electrical protective signaling systems are configurations of components used to produce alarm signals indicative of fire, smoke, sprinkler waterflow or other emergency and to produce supervisory signals indicative of conditions needing attention with respect to protection equipment or watch service. System configurations are classified according to where and how the signals are received. The categories are commonly designated as local, municipal, remote station, proprietary, emergency voice/alarm communication, emergency communication, and central station. Auxiliary systems are either local or proprietary systems interconnected with a municipal system.

This category presents the major system component categories and the integrated system configurations. The selection of components to form a hybrid system should be made only by those skilled in system design. Also, the suitability of any system application should be judged on the basis of the hazard(s) being protected.

Public Fire Alarm Reporting Systems

This signaling equipment transmits fire alarms and other emergency calls to the municipal fire headquarters from the public. The municipality controls the installation, use and maintenance of the system, as well as alarm retransmission (to fire stations) if that is necessary. Equipment identifies and automatically records each signal.

Products identified with the **GREEN** symbol have attributes that are considered to be "sustainable" by certain outside organizations. FM Approvals verifies the presence of these attributes. Specific attributes for specific products are listed in the individual listings. To facilitate a search for these products in the Approval Guide, first search by the product type you desire and then refine your search to products with the **GREEN** symbol.

Alarm Applications Inc Box 297, Colchester, Connecticut 06415, USA

Product	Listing Country	Certification Type
Model CMB-1	United States of America	FM Approved

King-Fisher Co Inc 81 Old Ferry Rd, Lowell, Massachusetts 01854, USA

Product	Listing Country	Certification Type
Coded Radio Public Reporting System, REAMS Radio Emergency Alarm Monitoring System, STAR Radio Fire ...	United States of America	FM Approved
Multi-Communications Receiving & Reporting Console (MCR2)	United States of America	FM Approved

Monaco Enterprises Inc E 14820 Sprague Ave, Spokane, Washington 99216, USA

Product	Listing Country	Certification Type
D-21, D-21G, D-21M Public Reporting Coded Radio Alarm Systems	United States of America	FM Approved

Signal Communications Corp Div Gulf Industries Inc 4 Wheeling Ave, Woburn, Massachusetts 01801, USA

Product	Listing Country	Certification Type
Coded Radio Public Reporting System. System utilizes redundant Vision 21 Processors	United States of America	FM Approved
DTX System for Fire Alarm Reporting	GREEN United States of America	FM Approved
The TRX-50 System	United States of America	FM Approved

Electrical Signaling

Electrical protective signaling systems are configurations of components used to produce alarm signals indicative of fire, smoke, sprinkler waterflow or other emergency and to produce supervisory signals indicative of conditions needing attention with respect to protection equipment or watch service. System configurations are classified according to where and how the signals are received. The categories are commonly designated as local, municipal, remote station, proprietary, emergency voice/alarm communication, emergency communication, and central station. Auxiliary systems are either local or proprietary systems interconnected with a municipal system.

This category presents the major system component categories and the integrated system configurations. The selection of components to form a hybrid system should be made only by those skilled in system design. Also, the suitability of any system application should be judged on the basis of the hazard(s) being protected.

Proprietary Signaling Systems

A proprietary system is owned or leased by the owner of the protected property who is responsible for system operation and maintenance. Applications requiring proprietary type signaling systems usually involve the supervision of several phases of plant protection, including sprinkler waterflow, watchman service and fire alarm. The headquarters of a proprietary system must be constantly attended by trained operators, where all signals are received and automatically recorded. A proprietary system is required to have at least 24 hours of standby power.

Products identified with the **GREEN** symbol have attributes that are considered to be “sustainable” by certain outside organizations. FM Approvals verifies the presence of these attributes. Specific attributes for specific products are listed in the individual listings. To facilitate a search for these products in the Approval Guide, first search by the product type you desire and then refine your search to products with the **GREEN** symbol.

The TRX-50 System

The TRX50 system consists of the TRX50-SP System Processor module, the TRX50-RM Radio Module, the TRX50-MNS Mass Notification Module, the TRX50-TM Telegraph Module, and the TRX50-CM Charger Module. TRX50-SP Client stations connect to a TRX50-SP System Processor in a network configuration. The TRX50-SP hardware includes an industrial grade computer with a windows embedded operating system, a power supply system which includes DC/DC regulators, and I/O board, and all the necessary interconnecting cables. Each module, except the Charger Module, is supplied in a 3U rack mountable enclosure or can also be fitted into a desktop cabinet.

The TRX50-SP System Processor interfaces with the DTX Decoder module to receive, decode, and process one-way and two-way DTX series radio fire alarm boxes. It also interfaces with the Vision 21SP System Processor and V21RM Radio Module for processing 8MTJA-16 series radio boxes. The TRX50-SP System Processor also interfaces with the TRX50-TM 15 circuit telegraphic decoder which allows displaying and processing of telegraphic boxes. The TRX50-SP connects to the TRX50-CM Charger Module/Battery for its secondary backup power. The Backup power supports the operation of the TRX50 system for a period of up to 24 hours.

The TRX50-MNS option allows the system to activate a radio transmitter to transmit live or prerecorded voice messages to designated buildings in an installation and to activate messages stored at the remote locations. The TRX50-MNS module hardware consists of a radio voice transmitter, antenna, interface card, and local microphone.

Company Name:	Signal Communications Corp Div Gulf Industries Inc
Company Address:	4 Wheeling Ave, Woburn, Massachusetts 01801, USA
Company Website:	http://sigcom.com
New/Updated Product Listing:	No
Green Product:	No
Listing Country:	United States of America
Certification Type:	FM Approved

Electrical Signaling

Electrical protective signaling systems are configurations of components used to produce alarm signals indicative of fire, smoke, sprinkler waterflow or other emergency and to produce supervisory signals indicative of conditions needing attention with respect to protection equipment or watch service. System configurations are classified according to where and how the signals are received. The categories are commonly designated as local, municipal, remote station, proprietary, emergency voice/alarm communication, emergency communication, and central station. Auxiliary systems are either local or proprietary systems interconnected with a municipal system.

This category presents the major system component categories and the integrated system configurations. The selection of components to form a hybrid system should be made only by those skilled in system design. Also, the suitability of any system application should be judged on the basis of the hazard(s) being protected.

Public Fire Alarm Reporting Systems

This signaling equipment transmits fire alarms and other emergency calls to the municipal fire headquarters from the public. The municipality controls the installation, use and maintenance of the system, as well as alarm retransmission (to fire stations) if that is necessary. Equipment identifies and automatically records each signal.

Products identified with the **GREEN** symbol have attributes that are considered to be "sustainable" by certain outside organizations. FM Approvals verifies the presence of these attributes. Specific attributes for specific products are listed in the individual listings. To facilitate a search for these products in the Approval Guide, first search by the product type you desire and then refine your search to products with the **GREEN** symbol.

DTX System for Fire Alarm Reporting

The DTX System for Fire Alarm Reporting uses DTX-XXXX-XXXX indoor and outdoor transmitters which are equipped for two independent means of communications: radio and fiber optics (see Manual for list of part numbers). A Fiber Optic Interface Module is located between the transmitter network and the Vision 21 System Processor. Includes DTX Programmer Software, Version 1.2.01. The transmitter boxes monitor four or sixteen initiating device circuits for alarm and trouble conditions. The transmitters are powered by 120 V ac and by 12 V dc batteries rated at 7.2 AH which provide at least 72 hours of standby power. The DTX Solar transmitter powered by a solar panel model 290-0838-18 replacing the 120 Vac, and a larger 12 Vdc 26 Ah battery providing up to 15 days of power without input from the solar panel communicates with a Vision 21 with software 2.13L. The transmitters use the same enclosures as described above, and operating temperatures are also the same.

Up to three 15-circuit telegraphic decoder/encoder boards (692-0463A) can be connected to the Vision 21 to interpret alarm signals from telegraphic fire alarm boxes. The board is powered from the regulated 24 V dc auxiliary power from the Vision 21. Supervision of, and power for, the fire alarm boxes must be maintained via the Form 4 equipment, not a part of the Vision 21 System, and the Form 4 equipment must remain in place.

A max of 500 boxes is permitted on each transmission frequency. Vision 21 consists of a V21SP-X system processor (with required built-in thermal printer), a V21CM-XY charger module with a min of 25 AH batteries for a minimum of 24 hours of standby power; and at least one V21RM-XXXXYZ radio module which contains one or two receivers. The extended memory option to increase processor capacity is designated 693-0400-X. The Vision 21 is suitable for indoor use at 32° to 125°F (0° to 52°C). Class III computer-aided dispatching service, as defined by NFPA Standard 1221, can be provided by Vision 21 using Rapid Response 1.1 software and an IBM compatible personal computer (386 or higher). The firmware for the Vision 21 is designated 2-1060-011-00 #1 and 2-1060-011-00 #2. Vision 21 system and 8MTJ-A radio boxes with interrogate/response option, P/N 693-0427 in Vision 21 and P/N 692-0425 in the box, uses firmware 2-1060-011-01A #1 and #2. The system database is set up and operated by the Vision 21 Database Manager software, version 1.0.

Coded Radio Public Reporting System. The 8MTJ-A-16S programmable solar powered auxiliary or master box is similar to the 8MTJ-A radio box except that the primary power supply is a solar panel instead of 120 V ac. Solar panels are selected according to the geographical location and are rated from 4.5 to 60 watts of peak power. Solarex MSX-5, MSX-10, MSX-18, MSX-30, MSX-40, MSX-53 or MSX-60 photovoltaic modules are used. The panels are mounted vertically and facing true south. The programmable 8MTJ-A1-16S auxiliary box and the 8MTJ-A2-16S master box use EPROM P/N 2-1050-031-00 for normally open input circuit option or P/N 2-1050-041-00 for normally closed input circuit option when there is no monitoring of the solar panel cut (zone 16 is a regular zone). EPROM P/N 2-1050-031-01 is used for normally open input circuit option and P/N 2-1050-041-01 is used for normally closed input circuit option when solar panel cut is monitored. The 8MTJ-A-16S uses P/N 291-3305 12 V, 26 AH battery for 360 hours of standby power.

GREEN - This product is powered by solar energy.

Company Name:	Signal Communications Corp Div Gulf Industries Inc
Company Address:	4 Wheeling Ave, Woburn, Massachusetts 01801, USA
Company Website:	http://sigcom.com
New/Updated Product Listing:	No
Green Product:	Yes
Listing Country:	United States of America
Certification Type:	FM Approved

location, as required by 26.6.6.1, in addition to the time and date the signal was received.

- (3) Failure of an operator to acknowledge or act upon a change of status signal shall not prevent subsequent alarm signals from being received, indicated or displayed, and recorded.
- (4) Change of status signals requiring action to be taken by the operator shall be displayed or indicated in a manner that clearly differentiates them from those that have been acted upon and acknowledged.
- (5) Each incoming signal to a DACR shall cause an audible signal that persists until manually acknowledged.

Exception: Test signals required by 26.6.4.1.5(6) received at a DACR.

26.6.7 Testing and Maintenance Requirements for All Transmission Technologies. Testing and maintenance of communications methods shall be in accordance with the requirements of Chapter 14.

Chapter 27 Public Emergency Alarm Reporting Systems

27.1 Application.

27.1.1 The provisions of this chapter apply to the proper configuration, performance, installation, and operation of public emergency alarm reporting systems and auxiliary alarm systems. Public emergency alarm reporting systems shall consist of alarm boxes and alarm processing equipment that communicate on a wired or wireless network(s), one-way or two-way, meeting the requirements of this chapter. This shall include systems that use a communications infrastructure that is publicly owned, operated, and controlled or where public emergency alarm reporting systems and equipment are used in other applications.

27.1.2 The installation and use of public emergency alarm reporting systems and auxiliary alarm systems shall comply with the requirements of this chapter.

27.1.3 The requirements of this chapter shall apply to systems and equipment for the transmission and reception of alarm and other emergency signals, including those from auxiliary alarm systems, connected to the public emergency alarm reporting system.

27.1.4 The requirements of Chapters 10 and 14 shall apply unless otherwise noted in this chapter.

27.1.5 Only those requirements from Chapter 7 that are required by Chapter 14 shall apply.

27.1.6 The requirements of this chapter shall not apply to Chapter 29 unless otherwise noted.

27.1.7 The application of public emergency alarm reporting systems and auxiliary alarm systems to provide defined reporting functions from or within private premises shall be permitted where approved by the authority having jurisdiction.

27.1.8* Where a protected premises fire alarm system or other emergency system at the protected premises has its signals sent to a communications center via public emergency alarm reporting system, the protected premises system shall become an auxiliary alarm system.

27.2 General Fundamentals.

27.2.1* Public emergency alarm reporting systems shall be designed, installed, operated, and maintained in accordance with this chapter to provide reliable transmission and receipt of alarms in a manner acceptable to the authority having jurisdiction.

* **27.2.2** A public emergency alarm reporting system, as described herein, shall be permitted to be used for the transmission of other signals or calls of a public emergency nature, provided that such transmission does not interfere with the transmission and receipt of fire alarms.

27.2.3* All devices shall be designed to function satisfactorily under the climatic and environmental conditions to which they could be exposed.

27.2.3.1 All devices shall be identified as suitable for the location and conditions for which they are installed.

27.2.4 All circuits, paths, and equipment necessary for the receipt of signals from a protected premises shall be monitored for integrity.

27.3 Management and Maintenance.

27.3.1 All systems shall be under the control of a designated jurisdictional employee.

27.3.2 Maintenance by an organization or person other than from the jurisdiction or an employee of the jurisdiction shall be by written contract, guaranteeing performance acceptable to the authority having jurisdiction.

27.3.3 Where maintenance is provided by an organization or person(s) other than the jurisdiction or its employees, complete written records of the installation, maintenance, test, and extension of the system shall be forwarded to the designated employee in a time period and manner approved by the authority having jurisdiction.

27.3.4 All equipment shall be installed in locations accessible to the authority having jurisdiction for the purpose of maintenance and inspection.

27.3.5 Records of wired public emergency alarm reporting system circuits shall include all of the following:

- (1) Outline plans showing terminals and box sequence
- (2) Diagrams of applicable office wiring
- (3) List of materials used, including trade name, manufacturer, and year of purchase or installation

27.3.6 Public emergency alarm reporting systems as defined in this chapter shall, in their entirety, be subject to a complete operational acceptance test upon completion of system installation.

27.3.6.1 The test(s) required by 27.3.6 shall be made in accordance with the requirements of the authority having jurisdiction; however, in no case shall the operational functions tested be less than those stipulated in Chapter 14.

27.3.6.2 Operational acceptance tests shall be performed on any alarm-reporting devices, as covered in this chapter, that are installed or modified subsequent to the test required by 27.3.6.

27.3.7 Personnel Qualification. Personnel shall be qualified and experienced in accordance with the requirements of 10.5.6.

27.4 Communications Methods.

27.4.1 Application.

27.4.1.1 A public emergency alarm reporting system shall include wired or wireless network(s), for one-way signaling or two-way command and control communications between alarm boxes, alarm processing equipment, and the communications center.

27.4.1.2 A public emergency alarm reporting system shall be permitted to be used with emergency communications systems covered under Chapter 24.

27.4.2 **Wired Network(s).** The terms *wired network* and *public cable plant* shall be considered the same and interchangeable throughout this chapter.

27.4.2.1 All wired networks or public cable plants shall meet the requirements of Section 27.7.

27.4.2.1.1 Fiber-optic cabling shall be considered an acceptable transmission medium, provided that the cabling and installation comply with the requirements of Section 27.7 and the conversion equipment used to interface to the fiber-optic signal complies with all applicable requirements of Chapter 27.

27.4.2.2 Alarm processing equipment at the communications center shall meet the requirements of 27.5.2 and 27.5.4.

27.4.2.3 Alarm processing equipment at a remote communications center shall meet the requirements of 27.4.2.2 and 27.5.3.

27.4.2.4 Alarm boxes shall meet one of the following requirements:

- (1) Publicly accessible boxes shall meet the requirements of 27.6.1 through 27.6.2 and 27.6.5.
- (2) Auxiliary boxes shall meet the requirements of 27.6.1, 27.6.3, and 27.6.5.
- (3) Master boxes shall meet the requirements of 27.6.1 through 27.6.3 and 27.6.5.

27.4.3 **Wireless Network(s).** The terms *wireless network* and *radio system* shall be considered the same and interchangeable throughout this chapter.

27.4.3.1 All wireless networks shall meet the requirements of 27.4.3.2 through 27.4.3.5.

27.4.3.2 In addition to the requirements of this Code, all wireless equipment shall be designed and operated in compliance with all applicable rules and regulations of the Federal Communications Commission (FCC) or, where required, the National Telecommunications and Information Administration (NTIA).

27.4.3.3* Unlicensed radio frequencies shall not be permitted.

27.4.3.4 Fire alarm signals, other emergency alarm signals, and monitoring for integrity signals shall be permitted on the same radio frequency, dedicated for that purpose.

27.4.3.5 The wireless network capacity for the number of alarm boxes permitted on a single radio frequency shall comply with one of the following:

- (1) For networks that use one-way transmission in which the individual alarm box automatically initiates the required message (see 27.5.5.3.3) using circuitry integral to the

alarm box, not more than 500 alarm boxes are permitted on a single radio frequency.

(2) For networks that use a two-way concept in which interrogation signals (see 27.5.5.3.3) are transmitted to the individual alarm boxes from the communications center on the same radio frequency used for receipt of alarms, not more than 250 alarm boxes are permitted on a single radio frequency.

(3) For networks that use a two-way concept where interrogation signals are transmitted on a radio frequency that differs from that used for receipt of alarms, not more than 500 alarm boxes are permitted on a single radio frequency.

27.4.3.6 Alarm processing equipment at the communications center shall meet the requirements of 27.5.2 and 27.5.5.

27.4.3.7 Alarm processing equipment at a remote communications center shall meet the requirements of 27.4.3.6 and 27.5.3.

27.4.3.8 Alarm boxes shall meet one of the following requirements:

- (1) Publicly accessible boxes shall meet the requirements of 27.6.1 through 27.6.2 and 27.6.6.
- (2) Auxiliary boxes shall meet the requirements of 27.6.1, 27.6.3, and 27.6.6.
- (3) Master boxes shall meet the requirements of 27.6.1 through 27.6.3 and 27.6.6.

27.5 Alarm Processing Equipment. The alarm processing equipment required to receive and control the public emergency alarm reporting system shall be installed in the communications center or remote communications center used by emergency response agencies as defined in NFPA 1221.

27.5.1 General. The requirements of 27.5.2 shall apply to all processing equipment, wired or wireless, for a public emergency alarm reporting network.

27.5.2 Alarm Processing Equipment at Communications Center.

27.5.2.1 Type A and Type B Systems.

27.5.2.1.1 Alarm systems shall be Type A or Type B.

27.5.2.1.2 A Type A system shall be provided where the number of all alarms required to be retransmitted exceeds 2500 per year.

27.5.2.1.3 Where a Type A system is required, the automatic electronic retransmission of incoming alarms shall be permitted, provided that both of the following conditions are met:

- (1) Approved facilities are provided for the automatic receipt, storage, retrieval, and retransmission of alarms in the order received.
- (2) The operator(s) of the dispatch facility has the capability to immediately override the automatic retransmission and revert to manual retransmission.

27.5.2.2 Visual Recording Devices.

27.5.2.2.1 Alarms from alarm boxes shall be automatically received and recorded at the communications center.

27.5.2.2.2 A device for producing a permanent graphic recording of all alarm, supervisory, trouble, and test signals received or retransmitted, or both, shall be provided at each communications center for each alarm circuit and tie circuit.

27.5.2.2.3 Reserve recording devices shall be provided in accordance with 27.5.2.2.3.1 and 27.5.2.2.3.2.

27.5.2.2.3.1 Where each circuit is served by a dedicated recording device, the number of reserve recording devices required on-site shall be equal to at least 5 percent of the circuits in service and in no case less than one device.

27.5.2.2.3.2 Where two or more circuits are served by a common recording device, a reserve recording device shall be provided on-site for each circuit connected to a common recorder.

27.5.2.2.4 In a Type B wired system, one such recording device shall be installed in each emergency response facility, and at least one shall be installed in the communications center.

27.5.2.2.5 A permanent visual record and an audible signal shall be required to indicate the receipt of an alarm. The permanent record shall indicate the exact location from which the alarm is being transmitted.

27.5.2.2.6 The audible signal device shall be permitted to be common to two or more box circuits and arranged so that the emergency alarm operator is able to manually silence the signal temporarily by a self-restoring switch.

27.5.2.2.7 Facilities shall be provided that automatically record the date and time of receipt of each alarm.

Exception: Only the time shall be required to be automatically recorded for voice recordings.

27.5.2.3 System Integrity.

27.5.2.3.1 Wired circuits upon which transmission and receipt of alarms depend shall be constantly monitored for integrity to provide prompt warning of conditions adversely affecting reliability.

27.5.2.3.2 The power supplied to all required circuits and devices of the system shall be constantly monitored for integrity.

27.5.2.4 Trouble Signals.

27.5.2.4.1 Trouble signals shall be indicated where there is a trained and competent person on duty at all times.

27.5.2.4.2 Trouble signals shall be distinct from alarm signals and shall be indicated by a visual and audible signal.

27.5.2.4.3 The audible signal shall be permitted to be common to more than one circuit that is monitored for integrity.

27.5.2.4.4 A switch for silencing the audible trouble signal shall be permitted, provided that the visual signal remains operating until the silencing switch is restored to its normal position.

27.5.2.4.5 The audible signal shall be responsive to faults on any other circuits that occur prior to restoration of the silencing switch to its normal position.

27.5.2.5 Power Supply.

27.5.2.5.1 Each box circuit or wireless receiving system shall be powered by one of the following:

- (1)*Form 4A, which is an inverter, powered from a common rectifier, receiving power by a single source of alternating current with a floating storage battery having a 24-hour standby capacity
- (2)*Form 4B, which is an inverter, powered from a common rectifier, receiving power from two sources of alternating

current with a floating storage battery having a 4-hour standby capacity

- (3)*Form 4C, which is a rectifier, converter, or motor generator receiving power from two sources of alternating current with transfer facilities to apply power from the secondary source to the system within 30 seconds

27.5.2.5.2 Form 4A and Form 4B shall be permitted to distribute the system load between two or more common rectifiers and batteries.

27.5.2.5.3 The capacity of batteries, motor generators, rectifiers, or other permitted power supplies shall exceed the calculated load of all connected circuits, so that circuits developing grounds or crosses with other circuits each shall be able to be supplied by an independent source to the extent required by 27.5.2.5.1.

27.5.2.5.4 Provision shall be made to connect any circuit to any battery, generator, or rectifier, or other permitted power supply.

27.5.2.5.5 Individual circuits supplied from common leads shall be protected by the installation of enclosed fuses located at the point where the circuit conductors receive their supply.

27.5.2.5.6 Local circuits at communications centers shall be supplied in accordance with 27.5.2.5.6.1 and 27.5.2.5.6.2.

27.5.2.5.6.1 The source of power for local circuits required to operate the essential features of the system shall be monitored for integrity.

27.5.2.5.6.2 Local circuits at communications centers shall be permitted to be connected to the same power source as box circuits, wireless receiving system circuits, or a separate power source.

27.5.2.5.7 Visual and audible means to indicate a 15 percent or greater reduction of normal power supply (rated voltage) shall be provided.

27.5.2.5.8 Where the electrical service/capacity of the equipment required under Section 4.7 of NFPA 1221 satisfies the needs of equipment in this chapter, such equipment shall not be required to be duplicated.

27.5.2.6 Rectifiers, Converters, Inverters, and Motor Generators.

27.5.2.6.1 Rectifiers shall be supplied from the secondary of an isolating transformer.

27.5.2.6.1.1 The primary of the isolating transformer shall be connected to a circuit not exceeding 250 volts.

27.5.2.6.2 Complete spare units or spare parts shall be in reserve.

27.5.2.6.3 One spare rectifier shall be provided for every 10 operating rectifiers on a system. No system shall have less than one spare.

27.5.2.6.4 Leads from rectifiers or motor generators, with a float-charged battery, shall be protected by fuses rated at a minimum of 1 ampere and a maximum of 200 percent of connected load at nominal circuit voltage. Where not provided with a float-charged battery, the fuses shall be rated at a minimum of 3 amperes.

27.5.2.7 Engine-Driven Generators. The installation of engine-driven generator sets shall conform to the provisions of NFPA 37; NFPA 110; and NFPA 1221.

27.5.2.8 Float-Charged Batteries.

27.5.2.8.1 Float-charged batteries shall be of the storage type. Primary batteries (dry cells) shall not be used. Lead-acid batteries shall be in jars of glass or other identified or approved transparent materials; other types of batteries shall be in containers identified or approved for the purpose.

27.5.2.8.2 Float-charged batteries shall be above building grade level.

27.5.2.8.3 Float-charged batteries shall be located on the same floor of the building as the operating equipment.

27.5.2.8.4 Float-charged batteries shall be accessible for maintenance and inspection.

27.5.2.8.5 Float-charged batteries shall be installed in accordance with Article 480 of *NFPA 70*.

27.5.2.8.6 Batteries shall be mounted to provide effective insulation from the ground or working platform and from other batteries. Mounting equipment shall be listed and identified for the location. It shall be permissible for the authority having jurisdiction to waive this requirement to allow the use of alternative mounting equipment where it is assured that equivalent objectives can be achieved.

27.5.2.8.7 Battery mounting shall be protected against deterioration and shall provide stability, especially in geographic areas subject to seismic disturbance.

27.5.2.9 Equipment Fire Protection. Where applicable, electronic computer/data processing equipment shall be protected in accordance with *NFPA 75*.

27.5.3* Remote Communications Center. Where the communications center is remotely located from the wired or wireless alarm processing equipment, the requirements of 27.5.3.1 through 27.5.3.7, in addition to all of the requirements of Section 27.5, shall apply.

27.5.3.1 All equipment shall be listed for its intended use and shall be installed in accordance with *NFPA 70*.

27.5.3.2 Alarm processing equipment located remote from the communications center shall be capable of providing basic dispatching information independent of the communications center.

27.5.3.3 The alarm processing equipment shall be located where it can be monitored for alarm and trouble conditions and shall be accessible to be manned in case of a pathway or communications failure with the communications center.

27.5.3.4 Wired or wireless alarm repeating systems used to repeat signals between a remote communication center and the alarm processing equipment location shall meet the requirements of 27.5.3.4.1 through 27.5.3.4.7.

27.5.3.4.1 There shall be a minimum of two complete and independent alarm repeater systems, including batteries and power supplies, to provide redundancy.

27.5.3.4.2 If the alarm repeater system is configured with one alarm repeater in standby mode, the system shall be capable of detecting a communications failure and shall automatically switch to the backup system without interruption or loss of any alarm or trouble transmission.

27.5.3.4.3 Alarm repeater systems shall not be used for any purpose other than alarm communications between the communications center and the alarm processing equipment.

27.5.3.4.4 If wireless alarm repeaters are used, they shall operate on a licensed frequency dedicated for this purpose and be licensed to a public entity. Unlicensed frequencies shall not be permitted.

27.5.3.4.5 The communications method used for the alarm repeater, wired or wireless, shall be two-way.

27.5.3.4.6 The public emergency alarm reporting system communications infrastructure shall be used to repeat alarm and trouble signals between the alarm processing equipment and a remote communications center.

27.5.3.4.7 Where it is not possible to use the public emergency alarm reporting system communications infrastructure to provide communications between the alarm processing equipment and the remote communications center, an alternative repeater method shall be permitted and shall meet the requirements of 27.5.3.4.7.1 and 27.5.3.4.7.2.

27.5.3.4.7.1 If an alternative alarm repeater method is used it shall be publically owned, operated, and controlled.

27.5.3.4.7.2 The alternative alarm repeater method shall meet the requirements of 27.5.3, except 27.5.3.4.2 shall not apply.

27.5.3.5 Pathways between the remote communications center and the alarm processing equipment shall be monitored for integrity and shall be dedicated and not used for any other purpose.

27.5.3.6 When communications between the communications center and the alarm processing equipment fails, the requirements of 27.5.3.6.1 through 27.5.3.6.3 shall apply.

27.5.3.6.1 A pathway or communications trouble condition shall be detected and annunciated at both the communication center and the alarm processing equipment location within 200 seconds and shall meet the requirements of 27.5.2.4.

27.5.3.6.2 Visual and audible trouble alarm indications pertaining to a pathway or communications failure between the communications center and the alarm processing equipment location shall be distinct from all other trouble alarms.

27.5.3.6.3 The alarm processing equipment shall be manned by trained personnel until communications can be re-established.

27.5.3.7 Power supplies shall be provided in accordance with 27.5.2.5.

27.5.4 Wired Network Systems.

27.5.4.1 System Arrangement and Operation.

27.5.4.1.1 For a Type B system, the effectiveness of non interference and succession functions between box circuits shall be no less than between boxes in any one circuit.

27.5.4.1.2 A metallic box open circuit condition shall cause a warning signal in all other circuits, and, thereafter, the circuit(s) not in the open circuit condition shall be automatically restored to operative condition.

27.5.4.1.3 Box circuits shall be sufficient in number and laid out so that the areas that would be left without box protection in case of disruption of a circuit do not exceed those covered by 20 properly spaced boxes where all or any part of the circuit is of aerial open-wire, or by 30 properly spaced boxes where the circuit is entirely in underground or messenger-supported cable.

27.5.4.1.4 Where all boxes on any individual circuit and associated equipment are designed and installed to provide for receipt of alarms through the ground in the event of a break in the circuit, the circuit shall be permitted to serve twice the number of aerial open-wire and cable circuits, respectively, as are specified in 27.5.4.1.3.

27.5.4.1.5 The installation of additional boxes in an area served by the number of boxes spaced as indicated in 27.5.4.1.1 through 27.5.4.1.4 shall not constitute geographical overloading of a circuit.

27.5.4.1.6 Sounding devices for signals shall be provided for box circuits.

27.5.4.1.6.1 A common sounding device for more than one circuit shall be permitted to be used in a Type A system and shall be installed at the communications center.

27.5.4.1.6.2 In a Type B system, a sounding device shall be installed in each emergency response facility at the same location as the recording device for that circuit, unless installed at the communications center, where a common sounding device shall be permitted.

27.5.4.2 Constant-Current (100 milliamper) Systems. Constant-current systems shall comply with the requirements of 27.5.4.2.1 through 27.5.4.2.6.

27.5.4.2.1 Means shall be provided for manually regulating the current in box circuits so that the operating current is maintained within 10 percent of normal throughout changes in external circuit resistance from 20 percent above normal to 50 percent below normal.

27.5.4.2.2 The voltage supplied to maintain normal line current on box circuits shall not exceed 150 volts, measured under no-load conditions, and shall be such that the line current cannot be reduced below the approved operating value by the simultaneous operation of four boxes.

27.5.4.2.3 Visual and audible means to indicate a 20 percent or greater reduction in the normal current in any alarm circuit shall be provided.

27.5.4.2.4 All devices connected in series with any alarm circuit shall function when the alarm circuit current is reduced to 70 percent of normal.

27.5.4.2.5 Meters shall be provided to indicate the current in any box circuit and the voltage of any power source. Meters used in common for two or more circuits shall be provided with cut-in devices designed to reduce the probability of cross-connecting circuits.

27.5.4.2.6 Necessary switches, testing, and signal transmitting and receiving devices shall be provided to allow the isolation, control, and test of each circuit up to at least 10 percent of the total number of box and dispatch circuits, but never less than two circuits.

27.5.4.3 Grounded Common-Current Systems. Where common-current source systems are grounded, the requirements of 27.5.4.3.1 and 27.5.4.3.2 shall apply.

27.5.4.3.1 Where common-current source systems are grounded, the resistance of the ground shall not exceed 10 percent of resistance of any connected circuit and shall be located at one side of the battery.

27.5.4.3.2 Visual and audible indicating devices shall be provided for each box and dispatch circuit to give immediate

warning of ground leakage current that will have a detrimental effect on circuit operation.

27.5.4.4 Telephone (Series) Reporting Systems.

27.5.4.4.1 A permanent visual recording device installed in the communications center shall be provided to record all incoming box signals.

27.5.4.4.2 A spare recording device shall be provided for five or more box circuits.

27.5.4.4.3 A second visual means of identifying the calling box shall be provided.

27.5.4.4.4 Audible signals shall indicate all incoming calls from box circuits.

27.5.4.4.5 All voice transmissions from boxes for emergencies shall be recorded with the capability of instant playback.

27.5.4.4.6 A voice-recording facility shall be provided for each operator handling incoming alarms to eliminate the possibility of interference.

27.5.4.4.7 Box circuits shall be sufficient in number and laid out so that the areas that would be left without box protection in case of disruption of a circuit do not exceed those covered by 20 properly spaced boxes where all or any part of the circuit is of aerial open-wire, or 30 properly spaced boxes where the circuit is entirely in underground or messenger-supported cable.

27.5.4.4.8 Where all boxes on any individual circuit and associated equipment are designed and installed to provide for receipt of alarms through the ground in the event of a break in the circuit, the circuit shall be permitted to serve twice the number of aerial open-wire and cable circuits, respectively, as is specified in 27.5.4.4.7.

27.5.4.4.9 The installation of additional boxes in an area served by the number of boxes spaced as indicated in 27.5.4.4.7 shall not constitute geographical overloading of a circuit.

27.5.5 Wireless Network.

27.5.5.1 System Arrangement and Operation.

27.5.5.1.1 Type A systems shall comply with 27.5.5.1.1.1 through 27.5.5.1.1.6.

27.5.5.1.1.1* Two separate receiving networks shall be required for each frequency. Each network shall include the following:

- (1) Antenna
- (2) RF receiver
- (3) Signaling processing equipment
- (4) Time/date alarm printer
- (5) Audible alerting device
- (6) Power supply

27.5.5.1.1.2 Both receiving networks shall be installed at the communications center.

27.5.5.1.1.3 The failure of one receiving network shall not interfere with the other receiving network's ability to receive messages from boxes.

27.5.5.1.1.4 Where the system configuration is such that a polling device is incorporated into the receiving network to allow remote or selective initiation of box tests, a separate de-

vice shall be included in each of the two required receiving networks.

27.5.5.1.1.5 The polling devices shall be configured for automatic cycle initiation in their primary operating mode, shall be capable of continuous self-monitoring, and shall be integrated into the network(s) to provide automatic switchover and operational continuity in the event of failure of either device.

27.5.5.1.1.6 Test signals from boxes shall not be required to include the date as part of their permanent recording, provided that the date is automatically printed on the recording tape at the beginning of each calendar day.

27.5.5.1.2 Type B systems shall comply with 27.5.5.1.2.1 and 27.5.5.1.2.2.

27.5.5.1.2.1 For each frequency used, a single, complete receiving network shall be permitted in each emergency response facility, provided that the communications center conforms to 27.5.5.1.1.1 through 27.5.5.1.1.3. Where the jurisdiction maintains two or more alarm reception points in operation, one receiving network shall be permitted to be at each alarm reception point.

27.5.5.1.2.2 Where alarm signals are transmitted to an emergency response facility from the communications center using the wireless-type receiving equipment in the emergency response facility to receive and record the alarm message, a second receiving network conforming to 27.5.5.1.2.1 shall be provided at each emergency response facility, and that receiving network shall employ a frequency other than that used for the receipt of box messages.

27.5.5.1.3 A device for producing a permanent graphic recording of all alarm, supervisory, trouble, and test signals received or retransmitted, or both, shall be provided at the communications center.

27.5.5.1.4* Where box message signals to the communications center or acknowledgment of message receipt signals from the communications center to the box are repeated, associated repeating facilities shall conform to the requirements of 27.5.5.1.1.1(1), (2), (3), and (6) and include two separate transmitters.

27.5.5.2 Power. Power shall be provided in accordance with 27.5.2.5.

27.5.5.3 Monitoring for Integrity.

27.5.5.3.1 All wireless box systems shall provide constant monitoring of each radio frequency in use. Both an audible and a visual indication of any sustained signal in excess of a 15-second duration shall be provided for each receiving system at the communications center.

27.5.5.3.2 The power supplied to all required circuits and devices of the system shall be monitored for integrity.

27.5.5.3.3* Each wireless box shall automatically transmit a test message at least once in each 24-hour period.

27.5.5.3.4 Receiving equipment associated with wireless-type systems, including any related repeater(s), shall be tested at least hourly. The receipt of test messages that do not exceed 60-minute intervals shall meet this requirement.

27.5.5.3.5 Radio repeaters upon which receipt of alarms depend shall be provided with dual receivers, transmitters, and power supplies. Failure of the primary receiver, transmitter, or

power supply shall cause an automatic switchover to the secondary receiver, transmitter, or power supply.

Exception: Manual switchover shall be permitted, provided that it is completed within 30 seconds.

27.5.5.3.6 Trouble signals shall actuate a sounding device located where there is always a trained, competent person on duty.

27.5.5.3.7 Trouble signals shall be distinct from alarm signals and shall be indicated by a visual and audible signal.

27.5.5.3.7.1 The audible signal shall be permitted to be common to two or more monitored circuits.

27.5.5.3.7.2 A switch for silencing the audible trouble signal shall be permitted where the visual signal remains operating until the silencing switch is restored to its normal position.

27.5.5.3.8 The audible signal shall be responsive to subsequent faults in other monitored functions prior to restoration of the silencing switch.

27.5.5.4 Physical Protection of Transmission Line. The antenna transmission line between the transmitter and the antenna shall be installed in rigid metal, intermediate metal conduit, or electrical metallic tubing in accordance with *NFPA 70*.

27.6 Alarm Boxes.

27.6.1* General. The requirements of 27.6.1.1 through 27.6.1.6 shall apply to all alarm boxes.

27.6.1.1 Concurrent operation of at least four boxes shall not result in the loss of an alarm.

27.6.1.2 Boxes and associated equipment, when in an abnormal condition, shall not disable the public emergency alarm reporting system circuit.

27.6.1.3 Boxes shall be designed so that recycling does not occur when a box-actuating device is held in the actuating position and shall be ready to accept a new signal as soon as the actuating device is released.

27.6.1.4* Boxes, when actuated, shall give a visible or audible indication to the user that the box is operating or that the signal has been transmitted to the communications center.

27.6.1.5 Box cases and parts that are accessible to the public shall be permitted to be of nonconductive material.

27.6.1.6 Box cases and parts that are accessible to the public and that are constructed of conductive materials shall be installed in accordance with the requirements of *NFPA 70*, Articles 250 and 760.

27.6.2* Publicly Accessible Alarm Boxes.

27.6.2.1 Fundamental Requirements. The requirements of 27.6.2.1.1 through 27.6.2.1.11 shall apply to all publicly accessible alarm boxes.

27.6.2.1.1 Means for actuation of alarms by the public shall be located where they are visible, unobstructed, and readily accessible.

27.6.2.1.2 The box housing shall protect the internal components and shall be identified for the location installed.

27.6.2.1.3 Doors on boxes shall remain operable under adverse climatic conditions, including icing and salt spray.

27.6.2.1.4 Boxes shall be recognizable as such and shall have instructions for use plainly marked on their exterior surfaces.

27.6.2.1.5 Boxes shall be securely mounted on poles, pedestals, or structural surfaces as directed by the authority having jurisdiction.

27.6.2.1.6* The location of publicly accessible boxes shall be designated by the authority having jurisdiction.

27.6.2.1.7 Schools, hospitals, nursing homes, and places of public assembly shall have a box located at the main entrance, as directed by the authority having jurisdiction.

27.6.2.1.8 Boxes shall be conspicuously visible and be highlighted with a distinctive color.

27.6.2.1.9 All publicly accessible boxes mounted on support poles shall be identified by a wide band of distinctive colors or signs placed 8 ft (2.44 m) above the ground and visible from all directions wherever possible.

27.6.2.1.10* Location-designating lights of distinctive color, visible for at least 1500 ft (460 m) in all directions, shall be installed over boxes. The street light nearest the box, where equipped with a distinctively colored light, shall meet this requirement.

27.6.2.1.11 Where boxes are installed inside a structure, the installation shall comply with 27.6.2.1.11.1 and 27.6.2.1.11.2.

27.6.2.1.11.1 The box shall be placed as close as is practicable to the point of entrance of the circuit.

27.6.2.1.11.2* Outside plant cables entering buildings or other structures shall be installed in rigid metal conduit, intermediate metal conduit, or electrical metallic tubing. The installation shall comply with the requirements of the applicable raceway article of *NFPA 70*.

Exception: Schedule 80 PVC or RTRC rigid nonmetallic conduit shall be permitted for underground installations, provided that all elbows used are rigid or intermediate metal conduit.

27.6.3 Auxiliary Alarm Box.

27.6.3.1 Fundamental Requirements. The requirements of 27.6.3.1.1 through 27.6.3.1.6 shall apply to all auxiliary alarm boxes.

27.6.3.1.1 The authority having jurisdiction shall designate the location of the auxiliary box.

27.6.3.1.2* Outside plant cables entering buildings or other structures shall be installed in rigid metal conduit, intermediate metal conduit, or electrical metallic tubing. The installation shall comply with the requirements of the applicable raceway article of *NFPA 70*.

Exception: Schedule 80 PVC or RTRC rigid nonmetallic conduit shall be permitted for underground installations, provided that all elbows used are rigid or intermediate metal conduit.

27.6.3.1.3* Wiring between the auxiliary alarm system and the auxiliary alarm box or master alarm box shall be installed in rigid metal conduit, intermediate metal conduit, or electrical metallic tubing and shall meet the requirements of pathway survivability Level 2 (see 12.4.3).

27.6.3.1.4 Where installed outside a structure, the requirements of 27.6.2.1.2 and 27.6.2.1.5 shall apply.

27.6.3.1.5 Where the auxiliary box is a wired box, the requirements of Section 27.7 shall apply.

27.6.3.1.6 Where the auxiliary box is a wireless box, the requirements of 27.6.6 shall apply.

27.6.3.2 Auxiliary Alarm Systems.

27.6.3.2.1 Application. The equipment and circuits necessary to connect a protected premises to a public emergency alarm reporting system shall comply with the requirements of 27.6.3.2.

27.6.3.2.1.1 Where permitted by the authority having jurisdiction, the use of systems described in Chapter 27 shall be permitted to provide defined reporting functions from or within private premises.

27.6.3.2.1.2 The requirements of Section 27.7 shall also apply to wired auxiliary alarm systems.

27.6.3.2.2 Types of Systems.

27.6.3.2.2.1 Auxiliary alarm systems shall be one of the following types:

- (1)*Local energy type
 - (a) Local energy systems shall be permitted to be of the coded or noncoded type.
 - (b) Power supply sources for local energy systems shall conform to Chapter 10.
 - (c) Transmitter trouble signals shall be indicated at the control unit and the building fire command center in accordance with 10.14.7.
- (2)*Shunt type
 - (a) Shunt systems shall be noncoded with respect to any remote electrical tripping or actuating devices.
 - (b) All conductors of the shunt circuit shall be installed in accordance with *NFPA 70*, Article 344, for rigid metal conduit, or Article 358, for electrical metallic tubing.
 - (c) Both sides of the shunt circuit shall be in the same conduit.
 - (d) Where a shunt loop is used, it shall not exceed a length of 750 ft (230 m) and shall be in conduit.
 - (e) Conductors of the shunt circuits shall not be smaller than 14 AWG and shall be insulated as prescribed in *NFPA 70*, Article 310.
 - (f) The power for shunt-type systems shall be provided by the public emergency alarm reporting system.
 - (g)*A local system made to an auxiliary alarm system by the addition of a relay whose coil is energized by a local power supply and whose normally closed contacts trip a shunt-type master box shall not be permitted.

27.6.3.2.2.2 The interface of the two types of auxiliary alarm systems with the three types of public emergency alarm reporting systems shall be in accordance with Table 27.6.3.2.2.2.

Table 27.6.3.2.2.2 Application of Public Emergency Alarm Reporting Systems with Auxiliary Alarm Systems

Reporting Systems	Local Energy Type	Shunt Type
Wired	Yes	Yes
Wireless	Yes	No
Telephone series	Yes	No

27.6.3.2.2.3 The application of the two types of auxiliary alarm systems shall be limited to the initiating devices specified in Table 27.6.3.2.2.3.

Table 27.6.3.2.2.3 Application of Initiating Devices with Auxiliary Alarm Systems

Initiating Devices	Local Energy Type	Shunt Type
Manually actuated alarm-initiating device	Yes	Yes
Waterflow or actuation of the fire extinguishing system(s) or suppression system(s)	Yes	Yes
Automatic detection devices	Yes	No

27.6.3.2.3 System Arrangement and Operation.

27.6.3.2.3.1 Shunt-type auxiliary alarm systems shall be arranged so that one auxiliary transmitter does not serve more than 100,000 ft² (9290 m²) total area.

Exception: Where otherwise permitted by the authority having jurisdiction.

27.6.3.2.3.2 A separate auxiliary transmitter shall be provided for each building, or where permitted by the authority having jurisdiction, for each group of buildings of single ownership or occupancy.

27.6.3.2.3.3 The same box shall be permitted to be used as a public emergency alarm reporting system box and as a transmitting device for an auxiliary alarm system where permitted by the authority having jurisdiction, provided that the box is located at the outside of the entrance to the protected property.

27.6.3.2.3.4 Where 27.6.3.2.3.3 is applied, the authority having jurisdiction shall be permitted to require the box to be equipped with a signal light to differentiate between automatic and manual operation, unless local outside alarms at the protected property serve the same purpose.

27.6.3.2.3.5 The transmitting device shall be located as required by the authority having jurisdiction.

27.6.3.2.3.6 The system shall be designed and arranged so that a single fault on the auxiliary alarm system shall not jeopardize operation of the public emergency alarm reporting system and shall not, in case of a single fault on either the auxiliary or public emergency alarm reporting system, transmit a false alarm on either system.

Exception: Shunt systems complying with 27.6.3.2.2.1(2).

27.6.3.2.3.7 A means that is available only to the agency responsible for maintaining the public emergency alarm reporting system shall be provided for disconnecting the auxiliary loop to the connected property.

27.6.3.2.3.8 Notification shall be given to the designated representative of the property when the auxiliary box is not in service.

27.6.3.2.3.9 An auxiliary alarm system shall be used only in connection with a public emergency alarm reporting system that is approved for the service. A system approved by the authority having jurisdiction shall meet this requirement.

27.6.3.2.3.10 Permission for the connection of an auxiliary alarm system to a public emergency alarm reporting system, and acceptance of the type of auxiliary transmitter and its actuating mechanism, circuits, and components connected thereto, shall be obtained from the authority having jurisdiction.

27.6.3.2.3.11 Paragraph 27.6.3.2 shall not require the use of audible alarm signals other than those necessary to operate the auxiliary alarm system. Where it is desired to provide evacuation signals in the protected property, the notification appliances, circuits, and controls shall comply with the provisions of Chapter 23 in addition to the provisions of 27.6.3.2.

27.6.3.2.3.12 Where an auxiliary alarm system is in an alarm condition that has been acknowledged, deactivated, or bypassed, subsequent actuation of initiating devices on other initiating device circuits or subsequent actuation of addressable initiating devices on signaling line circuits shall cause an alarm signal to be transmitted to the communications center.

27.6.3.2.3.13 Where an auxiliary transmitter is located within a private premises, it shall be installed in accordance with 27.6.2.1.11 and 27.7.2.

27.6.3.2.3.14 Where data communications between a microprocessor-based control unit and an auxiliary alarm system are utilized, they shall comply with all of the requirements in 27.6.3.2.3.14(A) through 27.6.3.2.3.14(C):

(A) The monitoring for integrity shall include communications test messages transmitted between the control unit and the auxiliary alarm system.

(B) The communications test message shall be initiated by either the control unit or the auxiliary alarm system and shall require a response from the corresponding unit, and the following shall apply:

- (1) An invalid response or no response from the control unit or the auxiliary alarm system shall be recognized as a communications failure.
- (2) A communications failure shall initiate a specific communications failure trouble message, which shall be transmitted from the auxiliary alarm system and shall be automatically indicated within 200 seconds at the communications center.
- (3) A trouble condition in 27.6.3.2.3.14(B)(2) shall activate an audible and distinctive visual signal at the auxiliary box indicating a communications failure.
- (4) A trouble condition shall be indicated at the control unit and the building fire command center in accordance with 10.14.7.

(C) Where a separate device is required to interface the control unit to the auxiliary alarm system, all communication paths shall be monitored for integrity and shall comply with 27.6.3.2.3.14.

27.6.4 Master Alarm Boxes. Master alarm boxes shall comply with the requirements of 27.6.2 and 27.6.3.

27.6.5 Wired Network Boxes. The requirements of Section 27.7 shall apply to wired network boxes.

27.6.5.1 Telephone Boxes. The requirements of Section 27.7 shall also apply to telephone boxes.

27.6.5.1.1 Where a handset is used, the caps on the transmitter and receiver shall be secured to reduce the probability of the telephone box being disabled due to vandalism.

27.6.5.1.2 Telephone boxes shall be designed to allow the communications center operator to determine whether or not the telephone box has been restored to normal condition after use.

27.6.6 Wireless Network Boxes.

27.6.6.1 In addition to the requirements of this Code, wireless boxes shall be designed and operated in compliance with all applicable rules and regulations of the Federal Communications Commission (FCC) or, where required by other governing laws, the National Telecommunications and Information Administration (NTIA).

27.6.6.2* Each wireless box shall automatically transmit a test message at least once in each 24-hour period.

27.6.6.3 Wireless network boxes shall be capable of transmitting no less than three specific signals to the communications center, in addition to the box number, with priority as follows:

- (1) Alarm
- (2) Tamper
- (3) Test

27.6.6.4 Wireless boxes shall transmit to the communications center with priority as follows:

- (1) No less than two repetitions for "alarm"
- (2) No less than one repetition for "tamper"
- (3) No less than one repetition for "test"

27.6.6.5 Where wireless network boxes transmit more than one alarm signal, in addition to those in 27.6.6.3, each such signal shall be individually identifiable.

27.6.6.6 Where wireless network boxes transmit more than one alarm signal, they shall be designed to prevent the loss of supplemental or concurrently actuated signals.

27.6.6.7* Where wireless network boxes transmit more than one alarm signal, the priority of each alarm shall be as assigned by the authority having jurisdiction.

27.6.6.8 An actuating device held or locked in the activating position shall not prevent the activation and transmission of other signals.

27.6.6.9 The primary power source for wireless boxes shall be permitted to be from one or more of the following, as approved by the authority having jurisdiction:

- (1) Utility distribution system
- (2) Solar photovoltaic power system
- (3) User power
- (4) Self-powered, using either an integral battery or other stored energy source

27.6.6.10 Boxes powered by a utility distribution system shall comply with 27.6.6.10.1 through 27.6.6.10.6.

27.6.6.10.1 Boxes shall have an integral standby, sealed, rechargeable battery that is capable of powering box functions for at least 60 hours in the event of primary power failure. Transfer to standby battery power shall be automatic and without interruption to box operation.

27.6.6.10.2 A local trouble indication shall activate upon primary power failure.

27.6.6.10.3 Boxes operating from primary power shall be capable of operation with a dead or disconnected battery.

27.6.6.10.4 A battery charger shall be provided in compliance with 10.6.10.3, except as modified in 27.6.6.10.

27.6.6.10.5 When the primary power has failed, boxes shall transmit a power failure message to the communications center as part of subsequent test messages until primary power is restored.

27.6.6.10.6 A low-battery message shall be transmitted to the communications center where the remaining battery standby time is less than 54 hours.

27.6.6.11 Boxes powered by a solar photovoltaic system shall comply with 27.6.6.11.1 through 27.6.6.11.5.

27.6.6.11.1 Solar photovoltaic power systems shall provide box operation for not less than 6 months.

27.6.6.11.2 Solar photovoltaic power systems shall be monitored for integrity.

27.6.6.11.3 The battery shall have power to sustain operation for a minimum period of 15 days without recharging.

27.6.6.11.4 The box shall transmit a trouble message to the communications center when the charger has failed for more than 24 hours. This message shall be part of all subsequent transmissions.

27.6.6.11.5 Where the remaining battery standby duration is less than 10 days, a low-battery message shall be transmitted to the communications center.

27.6.6.12 User-powered boxes shall have an automatic self-test feature.

27.6.6.13 Self-powered boxes shall comply with 27.6.6.13.1 through 27.6.6.13.3.

27.6.6.13.1 Self-powered boxes shall operate for a period of not less than 6 months.

27.6.6.13.2 Self-powered boxes shall transmit a low-power warning message to the communications center for at least 15 days prior to the time the power source will fail to operate the box. This message shall be part of all subsequent transmissions.

27.6.6.13.3 Use of a charger to extend the life of a self-powered box shall be permitted where the charger does not interfere with box operation. The box shall be capable of operation for not less than 6 months with the charger disconnected.

27.7 Public Cable Plant. Metallic and fiber-optic cabling systems and interconnections between alarm transmission equipment and alarm-receiving equipment shall comply with the requirements of Section 27.7.

27.7.1 Requirements for Metallic and Fiber-Optic Systems — Metallic and Fiber-Optic Interconnections.

27.7.1.1 Circuit Conductors and Fiber-Optic Strands.

27.7.1.1.1 Exterior metallic, fiber-optic cable and wire shall conform to International Municipal Signal Association (IMSA) specifications or an approved equivalent.

Exception: Where circuit conductors or fiber-optic strands are provided by a public utility on a lease basis, IMSA specifications shall not apply.

27.7.1.1.2 Where a public box is installed inside a building, the circuit from the point of entrance to the public box shall be installed in rigid metal conduit, intermediate metal conduit, or electrical metallic tubing in accordance with *NFPA 70*.

Exception: This requirement shall not apply to wireless box systems.

27.7.1.1.3 Wires and fiber-optic strands shall be terminated so as to prevent breaking from vibration or stress.

27.7.1.1.4 Circuit conductors and fiber-optic cables on terminal racks shall be identified and isolated from conductors of other systems wherever possible and shall be protected from mechanical injury.

27.7.1.2 Cables. The requirements of 27.7.1.2 shall apply to 27.7.1.3 through 27.7.1.6.

27.7.1.2.1 Exterior metallic and fiber-optic cable and wire shall conform to IMSA specifications or an approved equivalent.

27.7.1.2.2 Overhead, underground, or direct burial cables shall be specifically approved for the purpose.

27.7.1.2.3 Metallic and fiber-optic cables used in interior installations shall comply with *NFPA 70* and shall be installed in accordance with the manufacturer's installation instructions and practices.

27.7.1.2.4 Conductors and/or fiber-optic strands used to transmit signals of other systems that are under the control of a governmental agency shall be permitted to be contained within the same multi-conductor cable as conductors and/or fiber-optic strands used to transmit signals of public emergency alarm reporting systems.

27.7.1.2.5 By special permission as defined in *NFPA 70*, cables not under the control of a governmental agency shall be permitted to contain conductors and/or fiber-optic strands used to transmit signals of a public emergency alarm reporting system.

27.7.1.2.6 Signaling wire and fiber-optic cables containing metallic protection or strength members shall comply with 27.7.1.2.6.1 and 27.7.1.2.6.2.

27.7.1.2.6.1 Signaling wires supplied by a power source having a voltage and/or current rating sufficient to introduce a hazard shall be installed in accordance with *NFPA 70*, Article 760, Part II.

27.7.1.2.6.2 Fiber-optic cables containing metallic protection or strength members shall be grounded and protected in accordance with *NFPA 70*.

27.7.1.2.7 All metallic cables, with all taps and splices made, shall be tested for insulation resistance when installed but before connection to terminals. Such tests shall indicate an insulation resistance of at least 200 megohms per mile between any one conductor and all other conductors, the sheath, and the ground.

27.7.1.3 Underground Cables.

27.7.1.3.1 Underground metallic and fiber-optic cables in duct or direct burial shall be permitted to be brought above-ground only at locations approved by the authority having jurisdiction.

27.7.1.3.1.1 Protection from physical damage or heat incidental to fires in adjacent buildings shall be provided.

27.7.1.3.2 Only fiber-optic and power-limited cables and conductors shall be permitted to be located in duct systems and manholes that contain power-limited public emergency alarm reporting system conductors.

27.7.1.3.3 Where located in duct systems or manholes that contain power circuit conductors over 250 volts to ground, metallic and fiber-optic emergency alarm cables shall be located as far as possible from such power cables and shall be separated from them by a noncombustible barrier or other

means approved by the authority having jurisdiction to protect the emergency alarm cables from physical damage.

27.7.1.3.4 All cables installed in manholes shall be racked and marked for identification.

27.7.1.3.5 Raceways or ducts entering buildings from underground duct systems shall be effectively sealed with an identified sealing compound or other means acceptable to the authority having jurisdiction to prevent the entrance of moisture or gases from the underground duct system.

27.7.1.3.6 All cable joints shall be located in manholes, emergency response facilities, or other accessible locations acceptable to the authority having jurisdiction where equivalent protection is provided to minimize physical damage to the cable.

27.7.1.3.6.1 Cable joints shall be made to provide and maintain conductivity, optical continuity for fiber-optic cable, insulation, and protection at least equal to that afforded by the cables that are joined.

27.7.1.3.6.2 Open cable ends shall be sealed against moisture.

27.7.1.3.7 Direct-burial cable, without enclosure in ducts, shall be laid in grass plots, under sidewalks, or in other places where the ground is not likely to be opened for other underground construction.

27.7.1.3.7.1 Where splices are made, such splices shall be accessible for inspection and tests.

27.7.1.3.7.2 Such cables shall be buried at least 18 in. (500 mm) deep and, where crossing streets or other areas likely to be opened for other underground construction, shall be in duct or conduit.

27.7.1.4 Aerial Construction.

27.7.1.4.1 Cables containing conductors and/or fiber-optic strands used to transmit signals of public emergency alarm reporting systems shall be located below all other cables and conductors, except those used for communications purposes.

27.7.1.4.1.1 Precautions shall be provided where passing through trees, under bridges, over railroads, and at other places where subject to physical damage.

27.7.1.4.1.2 Conductors and cables for public emergency alarm reporting system use shall not be attached to a crossarm that carries electric light and power conductors.

Exception: Power conductors for public emergency alarm reporting system use, operating at 250 volts or less, shall be permitted to share the crossarm with the conductors and cables and shall be tagged.

27.7.1.4.2 Aerial cable shall be supported by messenger wire of approved tensile strength or shall conform to one of the following:

- (1) IMSA specifications as a self-supporting cable assembly or an approved equivalent
- (2) Fiber-optic cable with integral supporting means or all-dielectric self-supporting (ADSS) type

27.7.1.4.3 Single wire shall meet IMSA specifications and shall not be smaller than No. 10 Roebing gauge if of galvanized iron or steel; 10 AWG if of hard-drawn copper; 12 AWG if of improved copper-covered steel; or 6 AWG if of aluminum. Splice lengths shall not exceed the manufacturer's recommendations.

27.7.1.4.4 Wires to buildings shall contact only intended supports and shall enter through an approved weatherhead or

sleeves slanting upward and inward. Drip loops shall be formed on wires outside of buildings.

27.7.1.5 Leads Down Poles.

27.7.1.5.1 Leads down poles shall be protected from physical damage. Any metallic covering shall form a continuous conducting path to ground. Installation, in all cases, shall prevent water from entering the conduit or box.

27.7.1.5.2 Leads to boxes shall have 600-volt insulation listed or approved for wet locations, as defined in *NFPA 70*.

27.7.1.6 Wiring Inside Buildings.

27.7.1.6.1 At the communications center, all conductors, cables, and fiber-optic cables shall extend as directly as possible to the operations center in conduits, ducts, shafts, raceways, or overhead racks and troughs listed or identified as suitable to provide protection against physical damage.

27.7.1.6.2* Where installed in buildings, conductors and fiber-optic cables shall be installed in any of the following wiring methods:

- (1) Electrical metallic tubing
- (2) Intermediate metal conduit
- (3) Rigid metal conduit

Exception: Rigid nonmetallic conduit shall be permitted where approved by the authority having jurisdiction.

27.7.1.6.3 Conductors and fiber-optic cables shall have an approved insulation. The insulation or other outer covering shall be flame-retardant and moisture resistant.

27.7.1.6.4 Conductors and fiber-optic cables shall be installed as far as possible without splices or joints. Splices or joints shall be permitted only in listed junction or terminal boxes.

27.7.1.6.4.1 Enclosures containing public emergency alarm reporting system circuits shall be provided with red covers or doors. The words "public emergency alarm reporting system circuit" shall be clearly marked on all terminal and junction locations to prevent unintentional interference.

27.7.1.6.4.2 Wire and fiber-optic terminals, terminal boxes, splices, and joints shall conform to *NFPA 70*.

27.7.1.6.5 Metallic and fiber-optic cables and wiring exposed to a hazard shall be protected in an approved manner.

27.7.1.6.6 Metallic and fiber-optic cable terminals and cross-connecting facilities shall be located in or adjacent to the operations room.

27.7.1.6.7 Where signal conductors, non-dielectric fiber-optic cables, and electric light and power wires are run in the same shaft, they shall be separated by at least 2 in. (51 mm), or either system shall be encased in a noncombustible enclosure.

27.7.2 Signal Transmission and Receiving Circuits. Signal transmission and receiving circuits shall comply with the requirements of 27.7.2.1 and 27.7.2.2.

27.7.2.1 General.

27.7.2.1.1 ANSI/IEEE C2, *National Electrical Safety Code*, shall be used as a guide for the installation of outdoor circuitry.

27.7.2.1.2 Installation shall provide for the following:

- (1) Continuity of service
- (2) Protection from mechanical damage
- (3) Disablement from heat that is incidental to fire
- (4) Damage by floods, corrosive vapors, or other causes

27.7.2.1.3 Open local circuits within single buildings shall be permitted in accordance with Chapter 23.

27.7.2.1.4 All circuits shall be routed so as to allow tracing of circuits for trouble.

27.7.2.1.5 Circuits shall not pass over, under, through, or be attached to buildings or property not owned by or under the control of the authority having jurisdiction or the agency responsible for maintaining the system.

Exception: Where the circuit is terminated at a public emergency alarm reporting system initiating device on the premises and where a means, approved by the authority having jurisdiction, is provided to disconnect the circuit from the building or property.

27.7.2.2 Interior Box Circuits.

27.7.2.2.1 A means accessible only to the authority having jurisdiction or the agency responsible for maintaining the public emergency alarm reporting systems shall be provided to disconnect all circuit conductors inside a building or other structure.

27.7.2.2.2 Definite notification shall be given to the designated building representative when the interior box(es) is out of service.

27.7.3* Circuit Protection.

27.7.3.1 The protective devices shall be located close to or be combined with the cable terminals.

27.7.3.2 Surge arresters designed and approved for the purpose shall be installed at a location accessible to qualified persons and shall be marked with the name of the manufacturer and model designation.

27.7.3.3 All surge arresters shall be connected to a ground in accordance with *NFPA 70*.

27.7.3.4 All fuses, fuseholders, and adapters shall be plainly marked with their ampere rating. All fuses rated over 2 amperes shall be of the enclosed type.

27.7.3.5 Circuit protection required at the communications center shall be provided in every building that houses communications center equipment.

27.7.3.6 Each metallic conductor entering an emergency response facility from partially or entirely aerial lines shall be protected by a lightning arrester.

27.7.3.7 All metallic conductors entering the communications center shall be protected by the following devices, in the order named, starting from the exterior circuit:

- (1) Fuse rated at 3 amperes minimum to 7 amperes maximum and not less than 2000 volts
- (2) Surge arrester(s)
- (3) Fuse or circuit breaker rated at ½ ampere

27.7.3.8 In regard to 27.7.3.7, the ½-ampere protection on the tie circuits shall be omitted at subsidiary communications centers.

27.7.3.9 At junction points of open aerial metallic conductors and metallic cable, each conductor shall be protected by a surge arrester(s) of the weatherproof type. A connection shall also be between the surge arrester ground, any metallic sheath, and the messenger wire.

27.7.3.10 Aerial open-wire and nonmessenger-supported, two-conductor cable circuits shall be protected by a surge arrester(s) at intervals not to exceed 2000 ft (610 m).

27.7.3.11 Where used for aerial construction, surge arresters, other than of the air-gap or self-restoring type, shall not be installed in public emergency alarm reporting circuits.

27.7.3.12 All protective devices used for aerial construction shall be accessible for maintenance and inspection.

27.8 Emergency Communications Systems (ECS).

27.8.1* Public emergency alarm reporting systems that are capable of two-way wired or wireless communications with command and control capabilities and/or voice communications capabilities shall be permitted to be used as part of the communications infrastructure of an emergency communications system (ECS), provided that it does not interfere with the public emergency alarm reporting system.

27.8.2 The method of interfacing and monitoring for integrity between the public emergency alarm reporting system and the ECS shall be in accordance with 27.6.3.2.3 and treated as an auxiliary alarm system connected to a protected premises.

27.8.3 Wired or wireless alarm boxes shall be permitted for shared use with an emergency communications system and shall meet all the requirements of Chapter 27.

27.8.4 Trouble and alarm indications in the emergency communications system shall be visually and audibly annunciated at the communications center, except under fault conditions that prevent such a notification process.

27.8.5 When a fault condition prevents communications between the ECS and the communications center, an audible and visual trouble indication shall be activated at the fire command center in the protected premises.

27.8.6 Communications between the public emergency alarm reporting system and the emergency communications system shall be monitored for integrity, and faults shall be annunciated at the communications center, as well as at the fire command center or the emergency command center or both, in the protected premises.

Chapter 28 Reserved

Chapter 29 Single- and Multiple-Station Alarms and Household Fire Alarm Systems

29.1 Application.

29.1.1* The performance, selection, installation, operation, and use of single- and multiple-station alarms and household fire alarm systems shall comply with the requirements of this chapter.

29.1.2* Smoke and heat alarms shall be installed in all occupancies where required by other governing laws, codes, or standards.

29.1.3 The requirements of Chapters 10, 12, 14, 17, 18, 21, 23, 24, 26, and 27 shall not apply unless otherwise noted.

29.1.4* The requirements of this chapter shall not apply to installations in manufactured homes.

29.1.5 This chapter shall apply to the life safety of occupants and not to the protection of property.

29.2* Purpose. Fire-warning equipment for residential occupancies shall provide a reliable means to notify the occupants

of the presence of a threatening fire and the need to escape to a place of safety before such escape might be impeded by untenable conditions in the normal path of egress.

29.3 Basic Requirements.

29.3.1 All devices, combinations of devices, and equipment to be installed in conformity with this chapter shall be approved or listed for the purposes for which they are intended.

29.3.2 Fire-warning equipment shall be installed in accordance with the listing and manufacturer's published instructions.

29.3.3* The installation of smoke alarms or fire alarm systems, or combinations of these, shall comply with the requirements of this chapter and shall satisfy the minimum requirements for number and location of smoke alarms or smoke detectors by one of the following arrangements:

- (1) The required minimum number and location of smoke detection devices shall be satisfied (independently) through the installation of smoke alarms. The installation of additional smoke alarms shall be permitted. The installation of additional system-based smoke detectors, including partial or complete duplication of the smoke alarms satisfying the required minimum, shall be permitted.
- (2) The required minimum number and location of smoke detection devices shall be satisfied (independently) through the installation of system smoke detectors. The installation of additional smoke detectors shall be permitted. The installation of additional smoke alarms, including partial or complete duplication of the smoke detectors satisfying the required minimum, shall be permitted.

29.3.4 Supplementary functions, including the extension of an alarm beyond the residential occupancy, shall be permitted and shall not interfere with the performance requirements of this chapter.

29.3.5* Fire-warning equipment to be installed in residential occupancies shall produce the audible emergency evacuation signal described in ANSI S3.41, *American National Standard Emergency Evacuation Signal*, whenever the intended response is to evacuate the building.

Exception: Where mechanically powered single-station heat alarms are used as supplementary devices, unless required by applicable laws, codes, or standards, such devices shall not be required to produce the emergency evacuation signal described in ANSI S3.41.

29.3.5.1 The audible emergency evacuation signal shall be permitted to be used for other devices as long as the desired response is immediate evacuation.

29.3.5.2* Fire-warning equipment producing the audible emergency evacuation signal shall be permitted to incorporate voice notification under either or both of the following conditions:

- (1) Where the voice message is contained completely within the 1.5-second pause period of the audible emergency evacuation signal
- (2) Where the voice message complies with 29.3.5.2(2)(a) and 29.3.5.2(2)(b) as follows:
 - (a) The voice message is first preceded by a minimum of eight cycles of the audible emergency evacuation signal.
 - (b) The voice message periodically interrupts the signal for no longer than 10 seconds, followed by a minimum of two cycles of the audible emergency evacuation signal