E-Flex® II

Perimeter Protection System

Installation, Operation and Maintenance Manual

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Preface

Audience

This E-Flex™ II Installation, Operation and Maintenance Manual explains how to install, operate, and maintain the E-Flex™ II Perimeter Protection System. It describes the planning, installation, and operation of the system. All information required by the site manager and the operator is described in detail.

Accuracy

This manual is based on the latest product information available at the time of printing. Stellar Security Products has reviewed it for accuracy, but cannot be held responsible for any omissions or errors. Stellar Security Products reserves the right to revise this publication and to make changes without obligation to notify anyone of such changes.

Customer Support

If you have comments or questions regarding the operation of any of Stellar Security Products products, please contact us directly at:

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Trademarks

LIMITED HARDWARE WARRANTY

Stellar Security Products, Inc. warrants each of its E-FLEX™ II Products to be free from defects in materials and workmanship for a period of **twelve (12) months** from the date of shipment.

The limit of liability under this Warranty is to repair or replace, **whichever of these alternatives Stellar Security Products, Inc. deems appropriate,** any E-FLEX™ II unit or part thereof within **twelve (12) months after shipment** to the original purchaser.

Conditions of this Warranty require that the unit is **returned, insured and with shipping costs prepaid**, to Stellar Security Products, Inc. at its plant in Santa Clara, California. A further condition is that the unit is not found by Stellar Security Products, Inc. to have become defective from **misuse or abnormal conditions of operation.**

Misuse will render this Warranty null and void. Misuse includes, but is not limited to, any attempts to repair or modify any E-FLEX™ II unit or component thereof by anyone other than Stellar Security Products, Inc. personnel or a Stellar Security Products, Inc. authorized repair facility.

Abnormal conditions of operation include, but are not limited to, damage by earthquake, fire, lightning, or other force majeure.

This Warranty shall be limited to the repair or replacement of E-FLEX™ II units and shall not extend to any incidental or consequential damages resulting from a malfunctioning unit.

Excluded from this Warranty are normally expendable items such as fuses and batteries, except to the extent that such parts are warranted by the original manufacturer and such warranty is marked on the product. Claim under such warranty should be made by the purchaser directly to the manufacturer.

Stellar Security Products, Inc. reserves the right to make changes in design on any of its products without incurring any obligation to make the same changes on units previously purchased.

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Units returned to Stellar System for inspection and repair or replacement must be sent **insured, and with freight prepaid, to:**

Stellar Security Products, Inc.
3511 Leonard Court
Santa Clara, CA 95054 USA
ATTN: Repair Department

A copy of the return papers **must be included** inside the container or unit, as well as the **Return Authorization Number** and a **clear statement of malfunction.** Please contact Stellar Security Products' Customer Service Department for the issuance of a Return Authorization Number prior to shipment.

Stellar Security Products cannot accept responsibility for products returned without proper shipping/order documents and information describing the nature of the malfunction and reason for return.

Stellar Security Products can be reached directly for any questions by calling:

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SECTION 1
INTRODUCTION

Introduction

The E-Flex II is an intrusion detection sensor for outdoor perimeter and interior security. It is a passive detector that is mounted on chain link or weldmesh fences, or on interior surfaces. It is designed as a primary sensor for medium security applications or a secondary sensor for high security applications.

Outdoor perimeter sensors are usually installed in specific lengths called *zones* or *sectors*. Each zone of an installed system provides its own intrusion and supervision alarms. This structuring provides precise information on the location of any intrusion attempt, and allows rapid dispatch of a response force to the specific area in which the intrusion has occurred.

Zone length is determined by the geography of the perimeter, the nature of potential threats, and the degree of security desired. In general, the greater the security requirement, the shorter the zone length should be.

The E-Flex II can operate with up to 1,000 feet (300 meters) of sensor cable for each zone. The maximum zone length for an E-Flex II sensor on a standard 2 meter high fence is 1,000 feet. Shorter zone lengths can be installed, and may be desirable to facilitate closed-circuit television (CCTV) assessment of intrusion activity.

The E-Flex II sensor provides an alarm if an intruder:

- Attempts to climb over the fence
- Attempts to cut through the fence
- Attempts to lift the fence fabric
- Attempts to break through a wall, ceiling or other mounting surface (interior installation).

The E-Flex II sensor provides a supervision alarm if there is a short in the cable or it is cut (open). The alarm is also initiated by the tamper switch if the processor cover is opened.

The signal processor distinguishes between climb-over and cut-through attempts with a single alarm output. Separate calibration is provided for each of these intrusion scenarios. An audio capability option is available for listening to physical disturbances of the fence. This gives the monitoring personnel enhanced ability to assess the exact nature of any intrusion attempt.

An E-Flex II zone consists of:

- *Processor* that uses primary power to drive the entire sensor system. It also contains the circuitry that analyzes the incoming signal from the sensor cable.
- *Sensor cable* that provides the necessary signal data to the processor. The sensor cable is mounted directly to the fence fabric or interior surface. It is connected to the processor by non-sensitive feed cable that is spliced to the sensor cable.
- *Terminator splice kit* that is connected to the end of the sensor cable opposite the processor. This device *supervises* the zone so any attempt to cut through or damage the sensor cable, or to defeat the E-Flex II Sensor will result in a supervision alarm.

- *Junction splice kit* for splicing between the sensor cable and non-sensitive feed cable, or sensor cable to sensor cable splicing.
- *Tie-wraps* for securing cable and junction splices to the fence material. These tie wraps are UV protected for long outdoor life.

There are no physical or electrical interconnections required between zones of an E-Flex II system. Each zone is a self-contained detection system. However, both single zone (E-IIA) and dual zone (E-IIB) processors are available, with the dual zone processor capable of effective surveillance of two adjacent, but separately monitored zones of up to 1000 feet (300 m) each.

E-Flex II Characteristics

- Solid state digital processor
- Lightning, EMI, and RF protection
- Standby battery with charger providing 8 hour minimum standby operation
- Linear coaxial sensor cable for equal sensitivity over entire zone length
- Separate alarm outputs for intrusion, supervision, and tampering.

Principles of Operation

The E-Flex II is used for both outdoor and interior intrusion detection. Figure 2-1 illustrates a single zone E-Flex II sensor used on a chain link or weldmesh fence. Figure 2-2 illustrates a similar installation using a dual zone E-Flex II sensor. Figure 2-3 illustrates an interior installation.

Sensor Cables

The protection of the perimeter security area is accomplished using sensor cables installed the entire length of the protected area. These sensor cables are highly sensitive to physical disturbances. If a potential intruder attempts to climb-over or penetrate a fence, or break through an interior wall on which sensor cables are mounted, stresses in the fence or wall will result in slight movement of the sensor cable.

Due to an electromechanical phenomenon known as the *Triboelectric Effect*, these movements will produce a transfer of charge between conductors in the cable. A frequency profile of a chain link fence structure shows that climbing and cutting activity will produce major frequency modes at approximately 300 Hz. This is detected as a difference in potential at the sensor cable input to the processing circuitry of the processor.

Processor Electronic Monitoring

The E-Flex II processor continually evaluates the electrical signals generated by the sensor cable. The processing circuitry detects attempts to *climb-over* the security perimeter if:

- An electrical signal, greater than a preset minimum amplitude in the 300 ±30 Hz range, is detected in the sensor cable.
- The signal is present for a period of time longer than selected on the climb-over select switch.
- The signal is present for more than 1.0 seconds.

The processor detects attempts to cut through the security perimeter if:

- An electrical signal, greater than a preset minimum amplitude in the 300 ±30 Hz range, is detected in the sensor cable.
- The signal is present for *less than 1.0 seconds*.
- A predetermined (set by the count-select switch) number of pulses in the 300 Hz range is detected, with consecutive pulses falling within the preset minimum time.

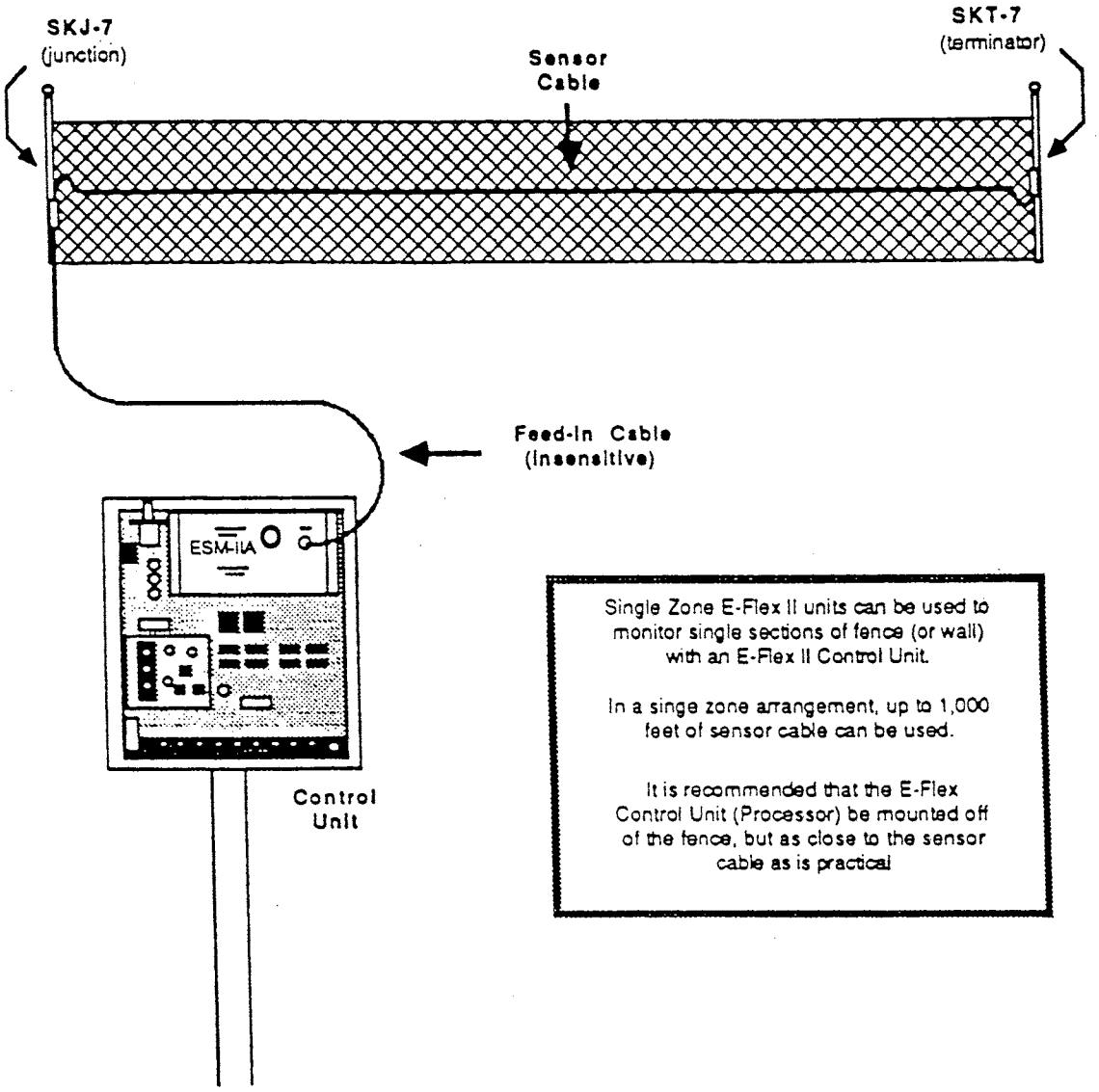


Figure 2-1. Single Zone Arrangement

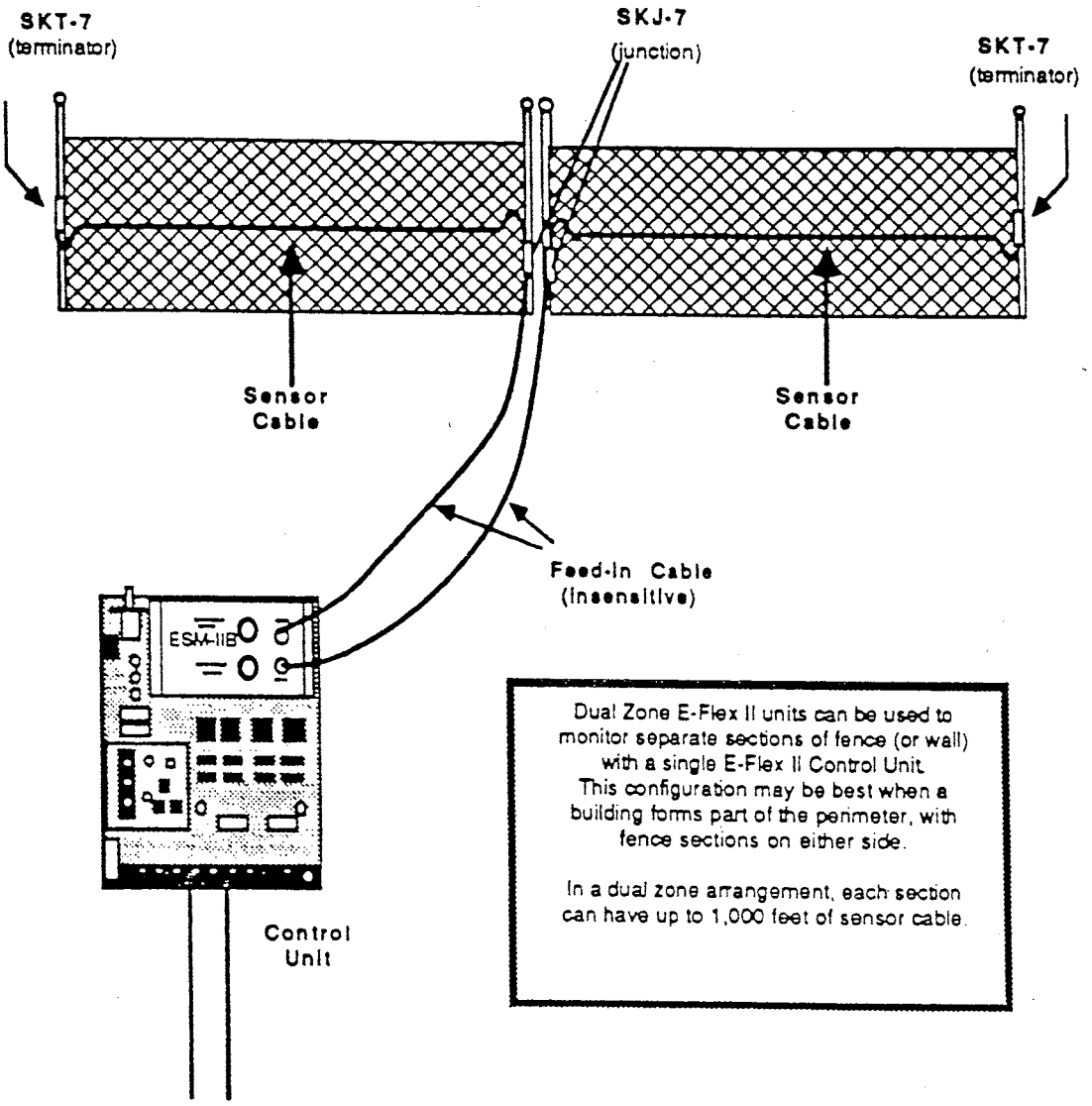


Figure 2-2. Dual Zone Arrangement

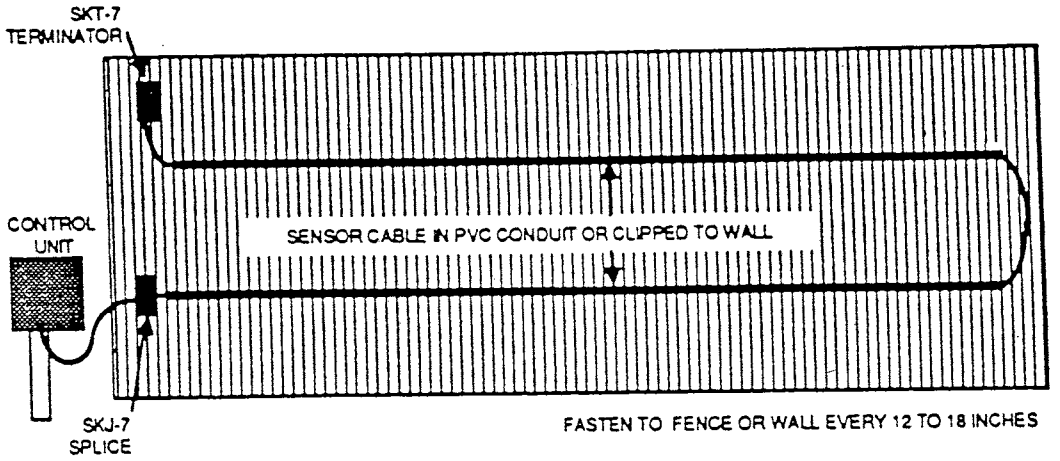


Figure 2-3. E-Flex II Interior Installation

If the E-Flex II circuitry detects a cut-through or climb-over attempt on the security perimeter it will immediately initiate an intrusion alarm. If the required conditions for a cut-through alarm are not met within a set time from the detection of the first pulse, then the circuitry will reset. This time duration can be set at 12.5, 25, 50, or 100 seconds. The duration of the alarm output (Sonalert output) can be adjusted from 0.5 sec. to 5.0 sec.

Terminators

E-Flex II sensors have a DC *supervision* circuit to detect shorting or opening of the sensor cable. At the end of the sensor cable, opposite the processor, there is a terminator device. The standard terminator is an SKT-7. These devices allow a small DC current to flow through the cable and be monitored by the supervision circuit of the processor. A shorted or cut cable causes the cable voltage to change. This is detected by the processor, which will immediately initiate a supervision alarm.

A self-test terminator (model EST-6A) is also available for E-Flex II sensors (requires +12 VDC to generate the test signal). A stream of pulses are generated that create a cut-through or climb-over simulation in the system which will initiate an intrusion alarm. An enable button (at the monitoring point) must be connected in series to the 12 volt potential to activate the device. Depressing the button for several seconds produces a climb-over simulation. Quickly depressing and releasing the button several times will produce a cut-through simulation. This test can be initiated from a remote monitoring station to verify the integrity of the sensor.

Processor Theory of Operation

Figure 2-4 is an overall block diagram of a single zone E-Flex II processor. Figure 2-5 is a block diagram for a dual zone E-Flex II processor, with circuit elements in the single zone illustrations consolidated for simplicity.

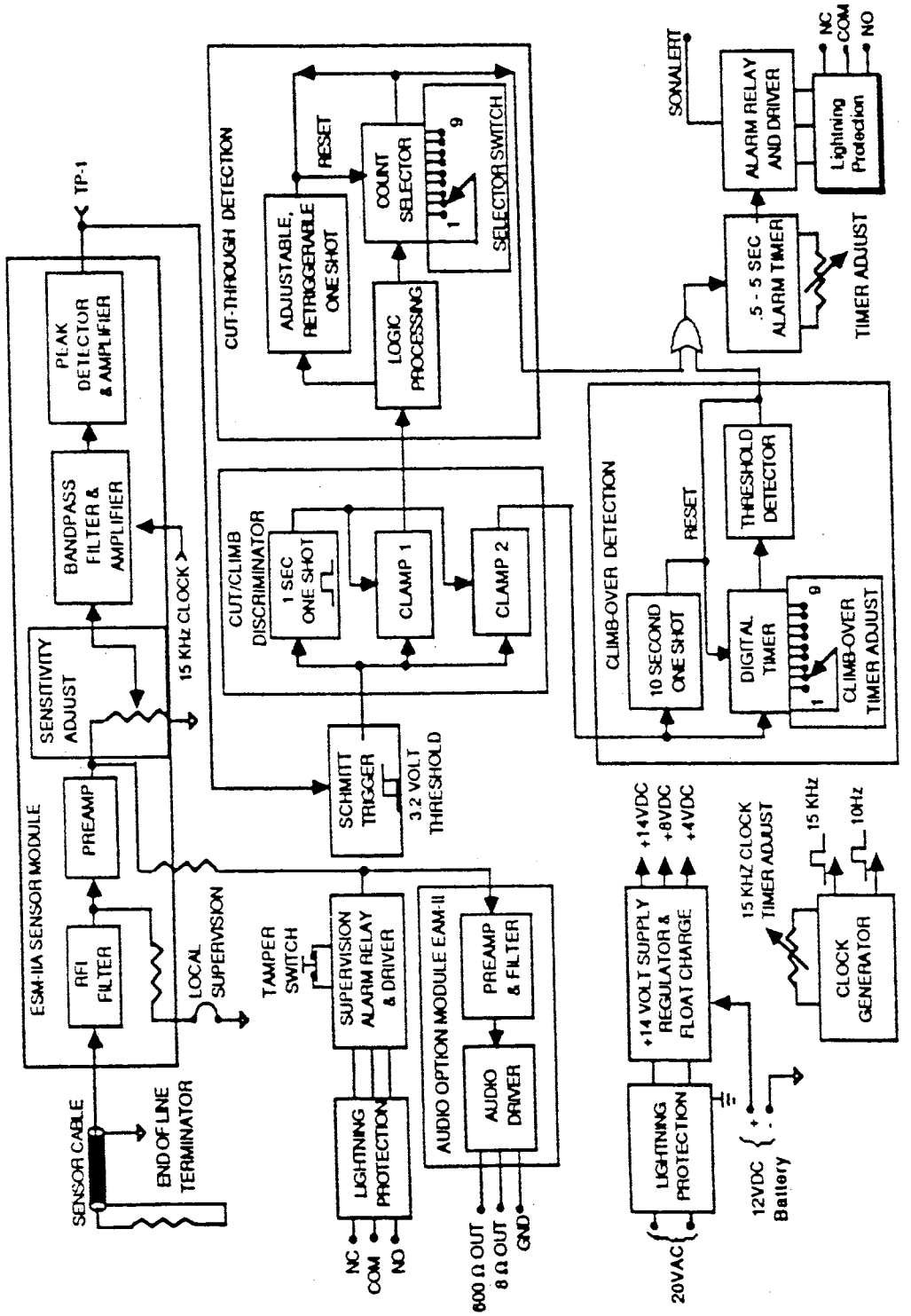


Figure 2-4. E-Flex II Single Zone Block Diagram

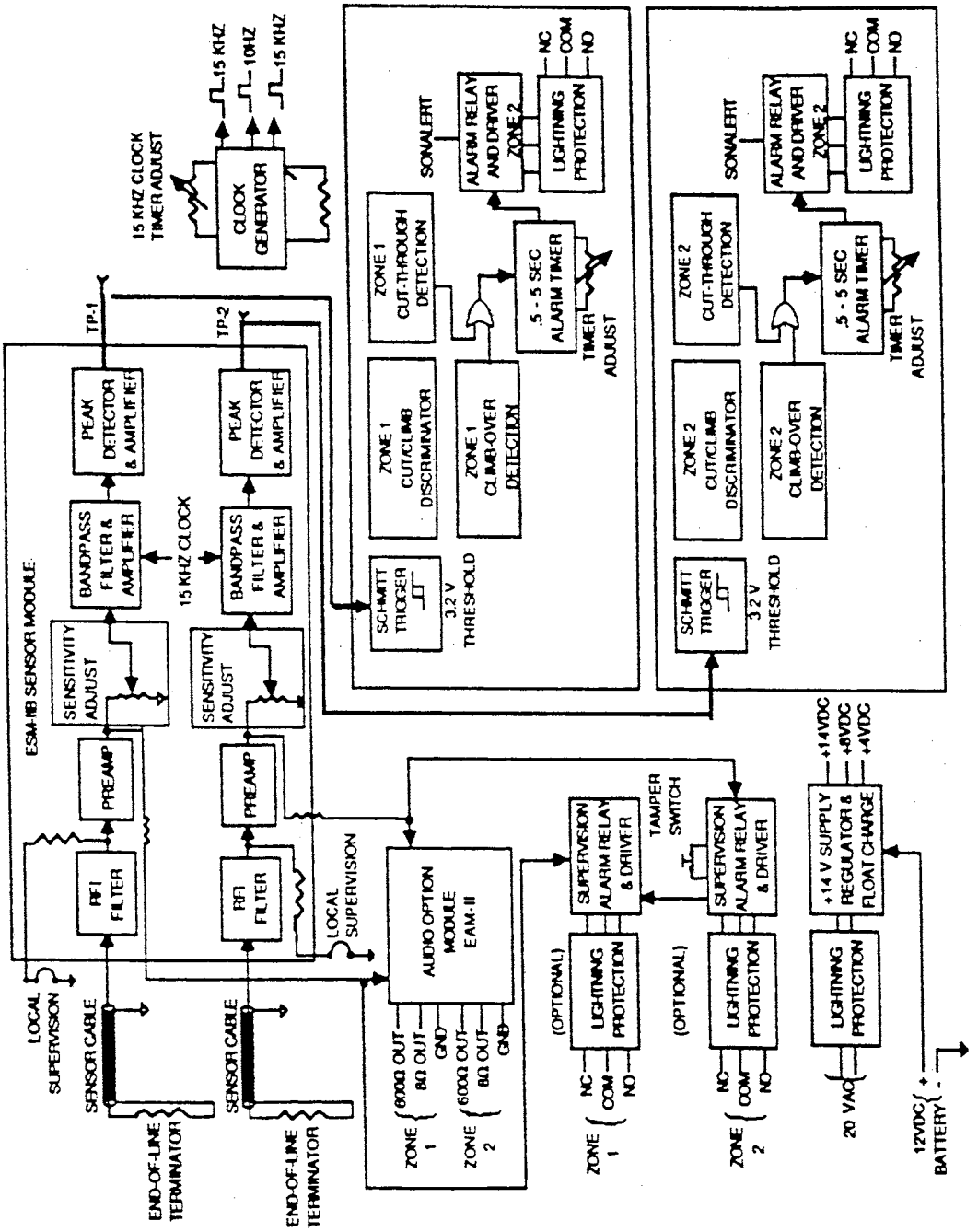


Figure 2-5. E-Flex II Dual Zone Block Diagram

Sensor Modules

Upon receipt of a signal from the sensor cable, the signal is processed according to three different parameters. These parameters form the *signatures* for any intrusion attempt.

Signals received from the sensor cable pass through an RFI filter, a preamplifier, a sensitivity control assembly, and a bandpass filter. Detection outputs from the ESM-IIA or ESM-IIB sensor module are limited to signals that can pass through the bandpass filter, which is centered at 300 Hz and has a -3 dB bandwidth of approximately 60 Hz.

Next the detection signal passes through a peak detector that provides an output at TP-1 for the ESM-IIA and TP1 and TP2 for the ESM-IIB. This output is for basic system tests and calibration using the motion meter (model 2391). The filtered and amplified output from the sensor module is analyzed for the presence of the signatures corresponding to climb over or cut through attempts of the security perimeter.

Intrusion Circuitry

Cut-Through Detection

The peak detector output is sent through an inverting Schmitt Trigger to obtain a definitive high/low signal. This negative pulse signal duration depends on the disturbance. The leading edge of this pulse triggers the oneshot pulse generator. Figure 2-6 illustrates the intrusion logic of the processor.

If the intrusion signal is of short duration (less than 1.0 seconds), as would occur when the wire mesh on the fence is cut, an adjustable timer is activated. The timer generates a reset after 12.5, 25, 50, and 100 seconds. The selected time duration is the limiting interval for the cumulative monitoring activity of the cut-through alarm circuitry. A cut-through signal following this time duration is evaluated cumulatively (based on the count selection setting in the controller) toward the initiation of a cut-through alarm.

If the pulse count selector is set at position 1 an alarm is created by the first signal from the logic processor. If the pulse count selector is set at position 4 the first signal from the logic processor will advance the cut-through counter. (The pulse count selector is factory set at 4 for shipping. The setting is the number at the bottom center of the dial.) If the second cut-through signal is received within the selected time frame, the cut-through counter will advance to position 2. When a fourth cut-through signal passes through the logic processor it will activate the cut-through alarm and simultaneously reset the timer and counter to zero. The cut-through alarm duration is adjustable from 0.5 seconds minimum to 5.0 seconds maximum. The factory adjustment is set at 2.0 seconds.

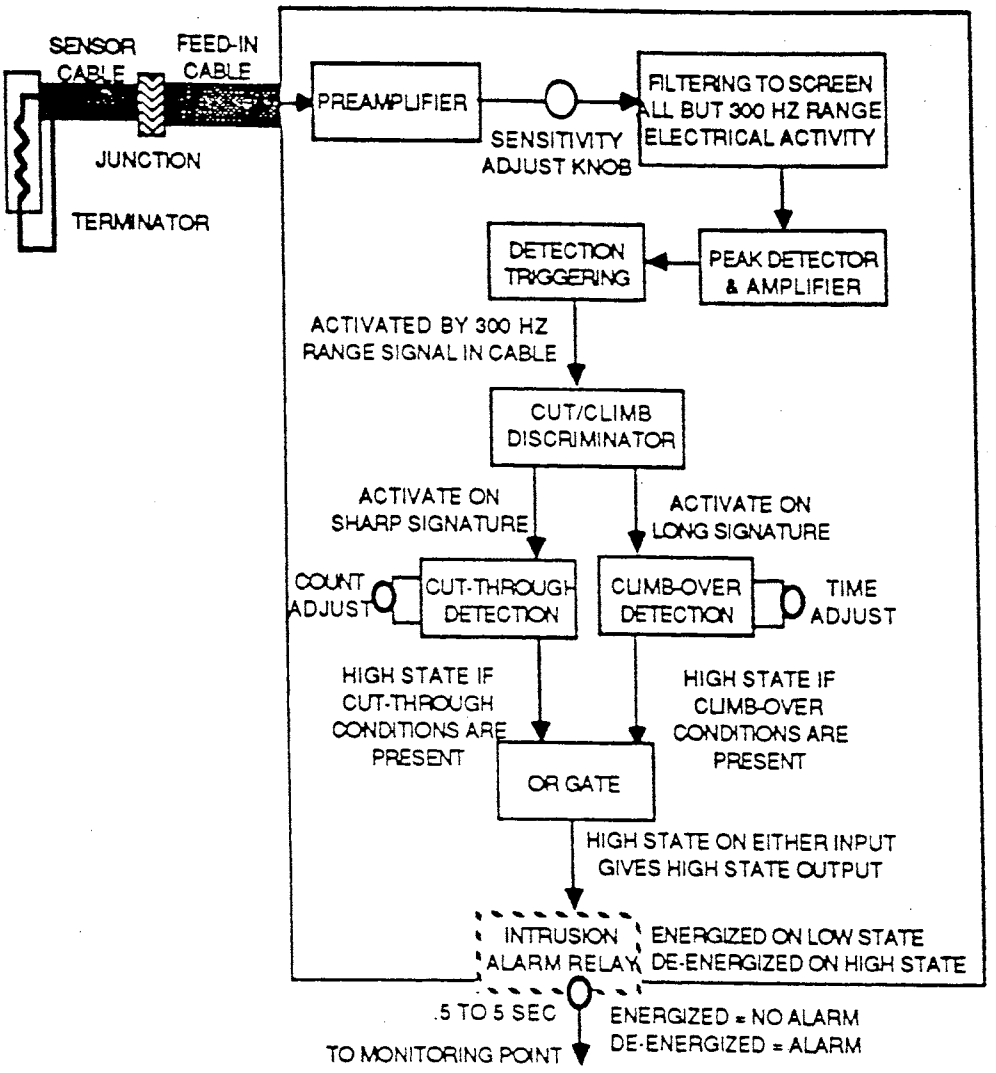


Figure 2-6. E-Flex Intrusion Logic

Climb-Over Alarm Circuits

The signal from the sensor cable must be at least 1.0 second in duration to activate the climb-over alarm. Dual zone processors contain two climb-adjust switches, one for each zone. The minimum time that can be set on these switches is approximately 1.2 seconds. The maximum time is approximately 4.4 seconds. To determine the actual continued disturbance time for an alarm condition, the 1.0 second cut / climb discriminator time must be added to the time duration selected by the climb-adjust switch. If sufficient disturbance occurs during the 10 second climb window determined by the 10 second one-shot, it will create an alarm condition.

Depending on the height of a particular fence, a longer time delay will reduce the number of nuisance alarms and still allow sufficient time for the intrusion alarm circuitry to activate upon an intrusion attempt. Refer to the timing diagram in Section 5.

Sensor Cable Supervision

If the sensor cable is shorted or cut, or the processor is subjected to unauthorized tampering, a supervision alarm will activate. See Figure 2-7 for supervision logic. The sensor cable is terminated by a 1 M Ω resistor forming a voltage divider with a resistor in the sensor module. This causes the output reference voltage of the preamplifier to be ±4.0 VDC.

The DC supervision circuit contains a window comparator that compares the preamplifier output to the reference voltage. As long as the preamplifier output is 4.0 VDC, the supervision alarm relay will be energized. If the sensor cable is cut or shorted the 4.0 V level will change, the supervision alarm relay will deenergize, and a supervision alarm is initiated. In a dual zone processor, each zone is supervised separately.

Tamper Switch

There is a tamper switch mounted in each processor enclosure. The switch is installed in NC or shorted position. When the cover of the processor is lifted it causes the tamper switch to change to NO position. An NO position causes the supervision alarm to activate. The tamper switch can be set to allow the cover to be open for servicing without causing a tamper alarm.

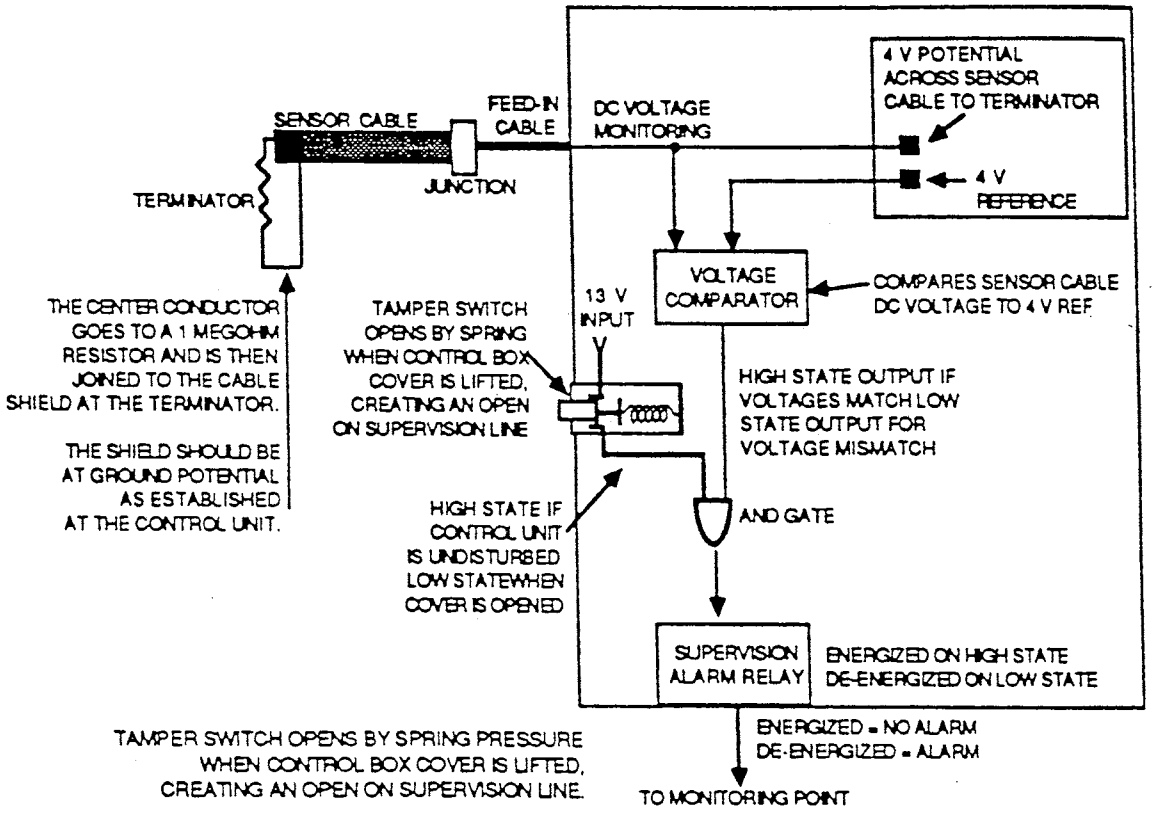


Figure 2-7. E-Flex Supervision Logic

Power Supply

The power supply obtains 20 VAC from a step-down transformer. This is bridge-rectified and regulated to provide operating voltages of +4, +8, and +14 VDC. The power supply also provides a float charge for the backup battery. This is set at 14 volts, with current limited to approximately 240 mA.

If the installed battery terminals are accidentally reversed or shorted, the processor would not be damaged. The processor will continue to operate normally (in a non-alarm mode). Inside the processor enclosure a current-limit lamp lights to indicate there is a shorted or terminal-reversed battery.

All relays operate in a failsafe mode, indicating they are energized when in the non-alarm state. If power is lost the relays will deenergize, and an alarm will be initiated immediately.

Audio Amplifier Option

The optional audio plug-in PC board for the E-Flex II allows direct monitoring of breaches of the E-Flex II protected area. The audio alarm can be wired to sound at the operator's station.

The audio module has two outputs :

1. A speaker output to drive a local speaker with impedance of 4 to 8 Ωs.

2. A differential audio low/audio high output to drive a telephone line. An interface to the telephone monitoring equipment is required.

For more information refer to Section 4.

E-IIA (Single Zone Processor) Specifications

Maximum Zone Length	1000 feet (300 m)
Operating Power / AC	14-24 VAC / 100 mA at 20 VAC (Transformer included with processor) (**NOTE:** if standby battery is used, current requirement becomes 280 mA at 20 VAC to allow for charging current into a discharged battery)
Operating Power / DC	+10.2 V min. to 16 V max. 80 mA at 12 VDC
Environmental	-30° to +70°C ambient temperature Up to 95% relative humidity
Outputs	Supervision and intrusion relays. Both relays are Form C, 3 Watt 0.25 A or 28 VDC maximum non-inductive load
Controls:	
Sensitivity	Adjusts sensor cable detection sensitivity
Cut-Through Count Select	Switch, with nine active positions, to select number of impulses required for cut-through alarm. (Setting is number at center bottom of dial.)
Climb-Over Time Select	Switch, with nine active positions, to select time frame required for climb-over alarm initiation (1.2 to 4.4 seconds). Setting is number at bottom center of dial.
Alarm Output Duration	Adjusts time that alarm relay will deactivate per detected intrusion attempt (0.5 to 5.0 seconds) Factory set at 2 sec.
Cut-Through Interval Time	Selects the time duration before the cut/count is reset (12.5, 25, 50, or 100 seconds)
Enclosure	Weatherproof enclosure - 12.75 " high x 9.25" wide x 4.25" deep (32.5 x 23.5 x 10.8 cm)
Connectors	Type F coaxial cable for input, other connections via barrier strip terminals
Tamper Switch	1-pole, 2-position indicates main enclosure cover open (mounted on circuit board bracket)
Built-in Battery Charger	Designed to float-charge a 12V Gel-Cell standby battery at 14V, current limited at 280 mA

E-IIB (Dual Zone Processor) Specifications

Maximum Zone Length	1000 feet (300 meters) for each of the 2 zones
Operating Power / AC	14-24 VAC / 120 mA at 20 VAC (Transformer included with processor) (**NOTE:** if standby battery is used, current requirement is 280 mA to allow charging current into a discharged battery)
Operating Power / DC	+10.2 V min. to 16 V max. 100 mA at 12 VDC
Environmental	-30° to +70°C ambient temperature up to 95% relative humidity
Outputs	One supervision and one intrusion relay for each zone. All relays are Form C, 3 Watt 0.25 A or 28 VDC maximum non-inductive load
Controls (one for each zone):	
Sensitivity	Adjusts sensor cable detection sensitivity
Cut-Through Count Select	Switch, with nine active positions, to select number of impulses required for cut-through alarm. Setting is number at center bottom of dial.
Climb-Over Time Select	Switch, with nine active positions, to select time frame required for climb-over alarm initiation (1.2 to 4.4 sec). Setting is number at bottom center of dial.
Alarm Output Duration	Adjusts time that alarm relay will deactivate per detected intrusion attempt (0.5 to 5.0 seconds). Factory set 2 sec.
Cut-Through Interval Time	Selects the time duration before the cut/count is reset (12.5, 25, 50, or 100 seconds)
Enclosure	Weatherproof enclosure 12.75" high x 9.25" wide x 4.25" deep (32.5 x 23.5 x 10.8 cm)
Connectors	Type F coaxial cable for sensor, other connections via barrier strip terminals.
Tamper Switch	1-pole, 2-position indicates main enclosure cover open (mounted on circuit board bracket)
Built-in Battery Charger	Designed to float-charge a 12 V Gel-Cell standby battery at 14 V, current limited at 280 mA

Accessories

The following items can be ordered from Stellar Systems.

E-Flex Sensor Cable	Sensor Cable (Model 2386) , interior or outdoor, 1000 ft (300 m) per roll.
E-Flex Feed Cable	Section of non-sensitive feed cable (Model 2388) , 25 ft (7.5 m), with Type F connector .
Tie wraps	Model 2366 to secure cable to fence (1000 pcs. per lot).
Terminators	Model SKT-7 terminator/splice kit for end-of-line terminations
Splice Kit	Model SKJ-7 cable splice kit to interconnect sensor cable and non-sensitive feed cable, or sensor cable and sensor cable.
Motion Meter / Sonalert	Model 2391 (required for calibration)
Transformer (115 VAC)	115 VAC/20 VAC step-down transformer, 50/60 Hz (included with processor)
Transformer (220/230 VAC)	220/230 VAC/20 VAC step-down transformer, 50/60 Hz (included with processor)
24 Hour Standby Battery	Rechargeable Gel-Cell type battery (Model 2495), 13.2 VDC (included with processor)
Test Cable	For testing the processor. A short, dummy cable (Model 2389) allowing easy testing of processor hardware (see Section 5 on testing the processor).
Self-Test Terminator	Model EST-6A tests operation of E-Flex zone from remote location by applying +12 VDC to the self-test terminator. This generates a system test signal and produces an intrusion alarm output.
Clips, Self-Adhesive	For installing sensor cable (Model 2368) on interior surfaces (500 pcs.)
AND Gate	AND gate (Model 2451) combines output of two alarm relays to produce a single alarm.
Dual Alarm Relay	Relay (Model 2349) enables dual output from a single alarm relay.

Options

NEMA-4	Model 2493 heavy duty, weatherproof enclosure for extreme environmental conditions.
Gate Bypass Module	Model 2390 provides security across a sliding gate. See Appendix F.
Audio Module	Model EAM-II plug-in unit, with 600 Ω and low impedance (4-8 Ω) speakers.
Sliding-Gate Disconnect	Model EJ-7 (see Section 4 and Appendix C).
E-ll A , Single Zone	Model E-IIA HR (115/230 V) (PN 09325) - with conformal coated PCB, upgraded lightning arrestor package (includes transzorbs and gas discharge tubes), passed functional tests at -30 degree C, +25 degree C and +70 degree C, transformer and battery. Incased in the NEMA-4 heavy-duty weatherproof enclosure.
E-ll B, Dual Zone	Model E-IIB HR (115/230 V) (PN 09327)- with conformal coated PCB, upgraded lightning arrestor package (includes transzorbs and gas discharge tubes), passed functional tests at -30 degree C, +25 degree C and +70 degree C, transformer and battery. Incased in the NEMA-4 heavy-duty weatherproof enclosure .

SECTION 3
PREPARING FOR INSTALLATION

Unpacking

When you receive your E-Flex II you will find a packing slip attached to the outside of the carton. Please open the packing slip first. As you unpack the carton check each part for shipping damage and take an inventory of carton contents. If anything is damaged or missing contact Stellar Systems.

Installation Planning

Before installing the hardware it is necessary to prepare an installation plan. Primary things to consider when preparing an installation plan are: the perimeter of the installation to be secured, the structure of the perimeter to be secured, a suitable location for mounting the processors, the type and location of the power and monitoring cables, and the position of the sensors to meet the special requirements of the site.

Perimeter Installation

The boundaries of the zones, along which the sensor cables will be installed, must be determined. The sensor cable is designed for mounting on chain link or weldmesh fences or interior walls. The path of the sensor cable should permit wall or fence mounting on the entire length of each zone. The sensor cable must be mounted on the same or similar type of surface of each zone. For example, do not form a zone consisting of a cement wall and sheet rock. The surface should be uniform in height and quality. Different types of fence should be planned as part of separate zones. Fences up to 8 feet (2.4 m) in height may use a single pass of sensor cable. A double pass may be required for fence heights above 8 feet, but not exceeding 14 feet (3.9 m).

Perimeter Structure

A single zone sensor (one processor) can be up to 1000 feet (300 meters) in length. E-IIA single zone processor can monitor one 1000 foot zone. An E-IIB dual zone processor can monitor two adjacent 1000 foot zones. The maximum physical distance allowed between two zones is determined by feed-in cable length limitations (see Section 4).

Mounting Processors

The processors are mounted on poles separate from the fence on which the sensor cables are installed. The processor should be near the sensor cable for ease in testing, calibration, and noise reduction. A fixed post a few feet from the fence lines is best for outdoor applications. For wall mounted applications the processor can be mounted on an adjoining wall.

Monitoring and Power Wiring

Processors require primary power wiring. Alarm monitor wiring must be run between the processors and the monitoring devices. The processors have both intrusion and DC supervision alarm relays for separate monitoring. The processor is shipped with a 20 VAC step-down transformer. A separate enclosure may be needed at the processor locations for power distribution and circuit breaker installation.

Site Survey

A survey should be conducted before installing any system hardware to be sure site conditions are suitable for the optimum functioning of E-Flex II.

The primary concern of a site survey should be the condition of fences, gates, or interior walls along which the sensor cable is attached. The following paragraphs describe a site survey and what is required for various cable mounting structures.

To ensure optimum performance:

- The mounting surface should be as *stable* as possible in compliance with established standards.
- Fences must be cleared of vegetation and *any other objects* that can rattle or disturb the structure.
- A *good ground* should be achieved for the sensor processor.

Adherence to the following guidelines will create an operating environment conducive to efficient operation of a detection device. A regular inspection program should be instituted to ensure that the fencing remains in good condition. Timely repairs to fence damage, the control of vegetation, and regular visual inspections of all detection zones, will provide years of effective operation.

Fence Mounted Sensor

As with all fence detection systems, the *fence condition is critical* to the trouble-free and efficient operation of the E-Flex II sensor. The primary objective of these guidelines is to eliminate - or at least minimize - all noise sources that may be present because of fence conditions.

Fence Framework

All corner posts, end posts, and pull posts should meet the following minimum specifications:

- 2 7/8 inch (7.3 cm) O.D. galvanized, schedule 40 pipe for fences ≤ 12 feet (3.6 m) high.
- 4 inch O.D. galvanized, schedule 40 pipe for fences ≥ 12 feet (3.6 m) high.
- All posts to be plumb within 5° ±1° in 2 planes.
- To test post rigidity apply a 50 lb (23 kg) force, perpendicular to the post and fabric, at 5 feet (1.5 m) above ground level. The post movement, measured at the point where the force is applied, shall be ± 3/4 inch (1.9 cm) from the relaxed position
- Use pull posts at all abrupt changes in grade and at intervals ≤ 500 feet (150 m), space pull posts evenly between corner or end posts
- Diagonally brace corner posts, pull posts, and end posts to adjacent line posts with truss rods that are 3/8 inch (0.95 cm) diameter, and turnbuckles, installed between the top of one post and the bottom of the other.

Fence Posts
All posts in this category should meet the following *minimum* specifications:

- 2 3/8 inch (6 cm) O.D. galvanized, schedule 40 pipe for fences ≤ 12 feet (3.6 m) high
- 2 7/8 inch (7.3 cm) O.D. galvanized, schedule 40 pipe for fences ≥12 feet (3.6 m) high
- Space posts equidistant in the fence-line, with a maximum of 10 feet (3 m) on center
- All posts to be plumb within 5° ±1° in 2 planes
- Test post rigidity by applying a 50 lb (23 kg) force, perpendicular to the post and fabric, at 5 feet (1.5 m) above ground level. The post movement, measured at the point where force is applied, shall be ± 3/4 inch (1.9 cm) from the relaxed position.

Fence Top Rail
Install top rails continuously through post caps or extension arms. Rails should meet the following minimum requirements:

- 1.660 inch (4.2 cm) O.D. galvanized schedule 40 pipe.
- Each joint where the rail meets a post should be secured so no perceivable movement between the two pieces takes place when the fence fabric is flexed. This can be done using press fittings or spot welding.

Fence Bottom and Intermediate Rails
Bottom and intermediate rails are optional and can be installed (in one piece) between posts and flush with the post on the same side as the fence fabric. Rails should meet the following *minimum* requirements:

- 1.660 inch (4.2 cm) O.D. galvanized, schedule 40 pipe
- Each joint, where the rail meets a post, should be secured so no perceivable movement between the two pieces takes place when the fence fabric is flexed. This can be done using wire ties or metal straps.

Tension Wires
Optional tension wires can be installed horizontally to provide a stiffening effect on the fabric. They should be secured at each post so they will not allow any perceivable movement between it and the post when the fabric is flexed. This can be done using wire ties or metal strips.

Fence Fabric

The type of fence fabric recommended is not as critical as how the fabric is installed. Care and attention to this portion of the installation is mandatory. Fence fabric, and its installation, should meet the following minimum specifications:

- 9 GA (≈.378 cm dia) galvanized steel, 2 inch (0.8 cm) mesh chain link (or weldmesh). See Appendix E.
- Selvages: Top sides twisted and barbed; bottom side knuckled.
- Thread stretcher bars through fabric using 1 bar for each gate and end post, and 2 for each corner and pull post. Pull fabric tight so maximum fabric deflection is 2 inches (0.8 cm) when a 30 lb (14 kg) pull is exerted perpendicular to the center of a panel.

  Maintain tension by securing stretcher bars to posts with metal bands spaced 15 inches (38 cm) maximum . Fasten the fabric to the steel framework with 9 gauge steel wire ties spaced 12 inches (30.5) maximum O.C. for all posts, rails, braces, and tension wires.

  Tighten stretcher bar bands, wire ties, and any other fasteners vary securely. None of the fabric should not be free to move.

Climb-over Detection Hardware

All top-of-fence material and hardware should meet the following minimum specifications:

- Any extension arms or outriggers attached to post tops should have a tight press-fit or should be spot welded. No loose or rattling equipment should be allowed.
- When barbed wire is used, each strand should be taut and tightly secured at each support and grounded positively.
- The use of barbed tape is not recommended. It is difficult to fasten the tape to prevent noise generation. If barbed tape must be used, every effort should be made to minimize noise generated from the movement of the tape. This requires tying the barbed tape at specific points where motion can cause the tape to touch the fence.

Gates

Perimeter gate frames should consist of rigid structural material, with necessary horizontal and vertical bracing, to provide adequate support for the rigid attachment of fabric and hardware accessories. All gate hardware accessories should be firmly attached with a minimum of free-play and/or wear. Double gates should have stops that provide a rigid anchor.

Any locking hardware (such as padlocks) should not be free to move in the wind. All sliding gate track hardware, supports, guides, and accessories should not have excessive free-play that could cause rattling if the gate moves with the wind.

Vegetation

All weeds, brush, and overhanging limbs, that may touch the fence fabric when the wind is blowing, must be cleared away from the fence.

Interior E-Flex Applications

E-Flex can be used in a variety of interior security applications. The E-Flex sensing element is a proprietary coaxial cable. Depending on the deployment of the sensor cable, E-Flex can function as a space detector or an interior perimeter detector. E-Flex is immune to those stimuli which tend to cause ultrasonic, microwave and passive infrared sensors to generate nuisance alarms.

The construction of the interior walls, floors and ceiling will dictate the most effective method of installing the E-Flex sensor cable. On solid structures such as concrete or brick walls, closely spaced multiple passes of cable should be attached so an attack on the wall can be detected prior to an actual break through. As with exterior applications, up to 1000 feet (300 meters) of sensor cable can be used for each zone. In less rigid structures the sensor cable can be attached in multiple passes vertically spaced at intervals of 3 feet (1 meter).

The sensor cable should be mounted on surfaces that are similar throughout each zone. This will enable optimum calibration of the sensor for the given threat scenario. For example, do not attach the sensor cable to both a concrete wall and sheet rock wall in the same zone. Installing the sensor cable in conduit is acceptable. It offers a secure and effective means of maintaining maximum physical contact with the protected surface. Framework, studs and girders should be used as conduit attach points. Alternately, the sensor cable can be directly embedded in mortar or cast in a concrete wall, taking care to avoid any damage to the cable.

Surface treatment such as plaster board, insulation board and cladding may reduce the sound and vibration transmitted to the sensor cable, so more passes of sensor cable are required to cover the same area then would be required on an untreated wall. Single-skin structures (e.g., sheetmetal buildings) are usually not suitable as a mounting surface for E-Flex cable since they tend to produce thermal or "oil-can" noise during rapid temperature changes. Heavy machinery or other sources of vibration should not result in a processor TP1 reading (using the motion meter) in excess of 10 units once the sensor cable has been properly installed.

Roofs are often the preferred means of intrusion. Industrial buildings often have steel roof supports covered with asphalt sheeting or other roofing material. E-Flex sensor cables can be placed in conduit attached to the roof sheeting or the support structure. Sensor performance will depend on the span of the roof, its design and construction materials.

Skylights and windows are vulnerable points in any building. To detect intruders attempting to gain entrance through these openings sensor cable can be attached to the window framework. Security cages for high value inventory or to enclose high security areas, are a very good application for the E-Flex. Do not stack boxes or other material against the cage thereby compromising the sensor effectiveness. False ceilings and computer room floors can also be protected by E-Flex. The sensor cable can be deployed in a trap fashion above the ceiling and under the floor to detect penetration attempts.

Grounding Considerations

The E-Flex II sensor must have a single ground reference. This normally originates at the processor. A stable earth ground is required at the processor mounting location, and the entire system is referenced to this ground. In most cases a good ground is established by implanting an 8 foot (2.4 m) copper grounding rod. Interior installations can be connected to this grounding rod providing the connecting cable (12 gauge) is <10 feet (3.0 meters).

Determining a List of Materials

The E-Flex II sensor system is supplied in kits for installation convenience. E-Flex II processors come in both single zone and dual zone kits. However, all E-Flex II hardware components can also be purchased individually. Refer to Section 2 for more information about options and accessories. A motion meter (model 2391) should be ordered for proper system calibration.

A single zone E-IIA processor installation kit includes:

1 each	E-IIA Single Zone Processor
1 each	SKT-7 terminator it
1,000 ft (300 m)	2386 sensor cable
1 each	SKJ-7 cable splice kits
1 each	2388 feed-in coaxial cable (and connector) 25 ft (7.5 m)
1,000 pcs	2366 tie wraps

A dual zone E-IIB processor installation kit includes:

1 each	E-IIB Dual Zone Processor
2 each	SKT-7 terminator kit
2,000 ft. (600 m)	2386 sensor cable
2 each	SKJ-7 cable splice kits
2 each	2388 feed-in coaxial cable (with connector) 25 ft (7.5 m)
2,000 pcs	2366 tie wraps

Options

The following optional items can be included when planning an installation. They would enhance the overall effectiveness of secure facilities.

Audio Option

The audio option (model EAM II) is used for single zone and dual zone sensors, and allows direct assessment of possible breaches to the protected perimeter.

The audio module has outputs for 2 zones intended to drive a local speaker, with impedance of 4 to 8 Ω, and a 600 Ω output to drive a long line (telephone interface). A 600Ω headset can also be connected directly to the 600 Ω terminals.

For local listening, a 4 to 8 Ω good quality speaker can be connected to the speaker output.The volume control should be set at the minimum required for a good signal-to-noise ratio.

Self-Test Terminator Option

An EST-6A terminator device can be used in place of the standard SKT-7 terminator. The EST-6A is a self-testing terminator. It electronically simulates both climb-over and cut-through type intrusion attempts, and will verify the operation of the sensor circuitry.

Enhanced Lightning Protection Option

Lightning protection supplied with the standard E-II processors consists of metal-oxide varistors located at the 20 VAC input terminals and all relay contacts. However, in heavy lightning environments, it is recommended that the enhanced lightning protection option be ordered.

The enhanced lightning protection option is a feature of all high-reliability versions of the E-Flex II. It consists of a transzorb/resistor/spark gap combination. The spark gap absorbs the bulk of the energy, while the transzorb clamps the remaining transient energy to a safe voltage level. The resistor isolates the transzorb/spark gap combination. To order the enhanced protection option, add an "-EP" to the corresponding model number (E-IIA-EP or E-IIB-EP).

General Installation

The primary installation steps for E-Flex II sensor are:

- Mount the processor
- Attach sensor cable to the surface (fence or wall) along the detection line
- Mount terminator device(s) at the end of sensor cable
- Install junction device(s) between the sensor cable and non-sensitive feed cable
- Make all electrical connections to the processor.

Processor Installation

The processor is in a weather-proof housing that permits interior or exterior mounting. Figure 4-1 illustrates an exterior installation.

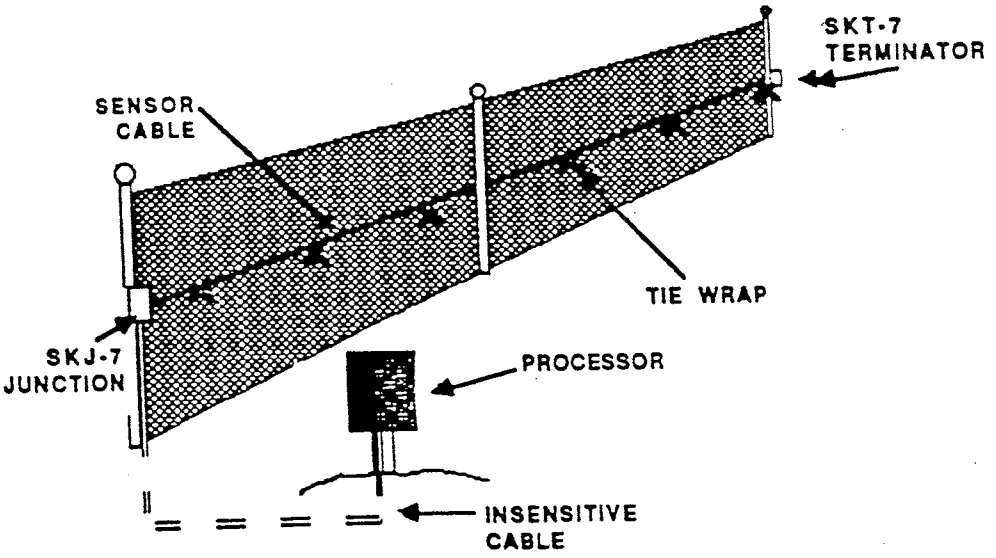


Figure 4-1. Processor Installation

The processor should be mounted with the conduit holes of the housing on the bottom. If PVC conduit is used it should be sealed to prevent accumulation of moisture.

For exterior installations the processor must be mounted on a separate structure a few feet from any fence on which sensor cable is installed. However, it should be close enough to the sensor cable for easy calibration and maintenance, and to reduce the electronic noise level in the circuitry.

If the processor is mounted on a fence post use a unistrut bracket. Use a separate post located close to the fence. A stainless steel hose clamp can also be used to mount the housing to a post.

When mounting the processor any distance from the sensor cable remember that the interconnecting non-sensitive feed cable is limited in length due to the capacitance inherent in each specific type of coaxial cable. The maximum length of interconnecting cable **for a 1000 foot zone** should be in accordance with the following:

Non-sensitive cable type	Maximum length
RG-59/U, 21 pf/ft (69 pf/m)	380 feet (116 m)
RG-62/U, 13 pf/ft, (43 pf/m)	610 feet (186 m)

The non-sensitive feed cable should have a solid center conductor .023 - .025 inch in diameter (0.6 mm) to fit the F-Type connector. Sensor cable must not be connected directly to the processor. The sensor cable must only be attached to the fence or surface where intrusion attempts are to be detected.

The length of non-sensitive feed cable used in any gate section must be *added to* the length of non-sensitive feed cable used to connect the processor to the sensor cable.

Junction Devices

The SKJ-7 is a moisture-proof, splicing-kit/junction device used to connect the sensor cable to the non-sensitive feed coaxial cable, or to connect sensor cable to sensor cable. It is also used when splicing or repairing the sensor cable, and in gate applications. Refer to Appendix B for additional information.

A cut or short in sensor cable does not require replacing the entire cable. The damaged section can usually be removed and a splice made using junction devices if the damage is limited to a short segment of cable.

The SKJ-7 mounts vertically, and attaches directly to fence fabric with tie wrap. See Figure 4-2.

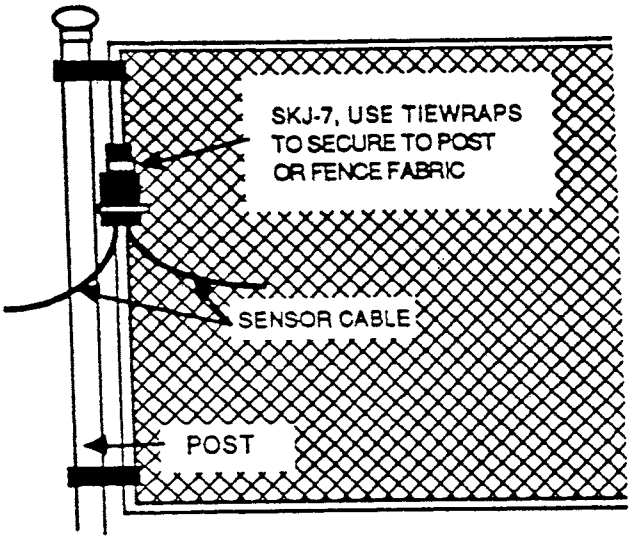


Figure 4-2. SKJ-7 Splice Kit Junction Device Mounting

Termination Devices

The SKT-7 is a moisture-proof termination device that allows supervision of the sensor cable. It mounts vertically and is attached to fence post or fence fabric using tie wrap. Refer to installation instructions that accompany the kit. Use 3 tie wrap to attach the SKT-7. See Figure 4-3. Connect the SKT-7 terminator as shown in Appendix B.

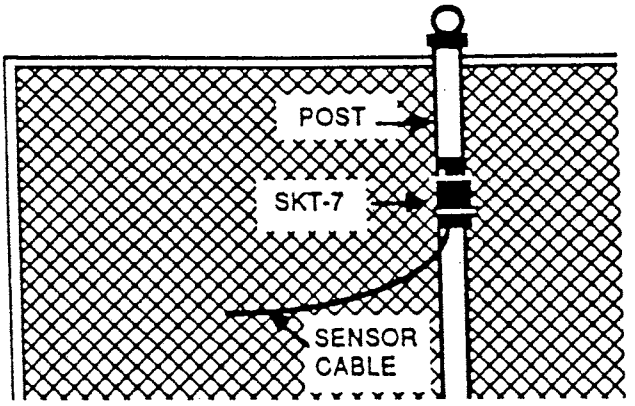


Figure 4-3. SKT-7 Terminator Device Mounting

The EST-6A is a remote test termination device with circuitry contained inside a moisture-proof enclosure. To install, provide a +12 VDC line between terminator and monitoring point with current capacity of 30 mA for the self-test feature. Install a self-test switch in the 12 VDC line at the monitoring point. When the switch is activated 12 volts is applied to the terminator as shown in Figure 4-4.

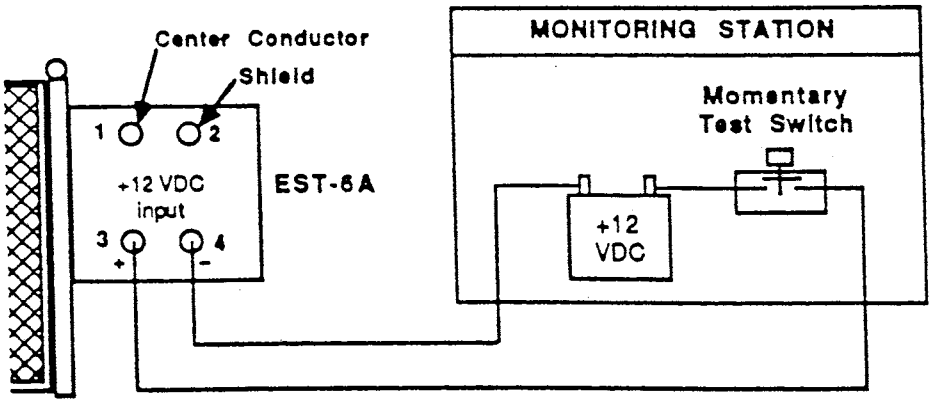


Figure 4-4. EST-6A Connection

The EST-6A can be used to simulate a climb-over attempt by depressing the test button several seconds. The climb-over timer adjust on the processor determines how long the button must be depressed to get an alarm. By depressing and immediately releasing the button several times, a cut-through attempt is simulated. The count select adjustment on the processor determines how many times the button must be depressed to get an alarm.

If there is excess sensor cable at the terminator, do not coil the cable. Such a coil can provide hyper-sensitive detection, with resultant nuisance alarms. Either cut the cable to the proper length, leaving a moisture drip loop outdoors, or loop cable back on the fence or structure (Figure 4-3). Such a loop not only provides additional protection for the area near the terminator, it is a convenient way to save extra cable that might be needed for later rearrangement or repair.

Sensor Cable Installation

E-Flex sensor cables are generally installed directly on the fence or interior surface to be protected. The cable can also be routed through conduit attached to the fence fabric or interior surface. In outdoor applications either PVC or metal conduit can be used, taking care that certain precautions are observed.PVC conduit is easier to install, and can be routed around corners and along the sensor cable path little difficulty. Scheduled 125 PVC is preferred for this type of installation. However, in installations where the sensor cable may be subjected to abnormal physical damage, schedule 40 PVC can be used for added protection. In either case it is important to insure that the PVC conduit is in good contact with the fence throughout the length of each zone.

Metal conduit *must* be installed in such a manner that it is firmly attached to the fence without any movement of the conduit relative to the fence. Otherwise this could be a source of nuisance alarms. Configuring the metal conduit around corners, and to follow the sensor cable path, is more difficult than PVC conduit. Metal conduit is effective in E-Flex installations on vinyl covered chain link and weldmesh fences.

Chain Link Fences

On a regular 7 foot (2.0 m) high fence the sensor cable is attached at the half-way point of the fence with the following in mind:

- Sensitivity is better if the cable is not attached close to horizontal stiffeners. For enhanced cut-through protection and reduced sensitivity setting, the cable may be run back and forth to form two passes along the fence (subject to the 1,000 foot (300 m) maximum cable length limitation).

- On fences > 10 feet (3 m) high, the cable must be double-passed to insure adequate detection (Figure 4-5). Cable lines should be located at approximately one-third and two-thirds of the way up the fence.

- Keep the lowest cable pass ≥3 feet from the ground to avoid damage from grass fires and stray animals. Use exterior tie wrap (Model 2366) to attach cable to the fence fabric. Install tie wrap by hand, tightening them only until snug.

Installation

1. Start sensor cable installation near the junction device (connects to non-sensitive feed cable from the processor). Make the first tie with enough cable to reach the junction device and form a service loop for a moisture drip leg (Figure 4-2).

2. Unreel sensor cable along the fence, making temporary ties near each fence post (keeping cable off the ground to prevent cable damage). Leave enough slack so the cable droops ±2 inches between posts. To facilitate later cable repair, leave a 2 foot (60 cm) service loop at a post (see Figure 4-6) approximately every 50 feet (15 m) along the fence.

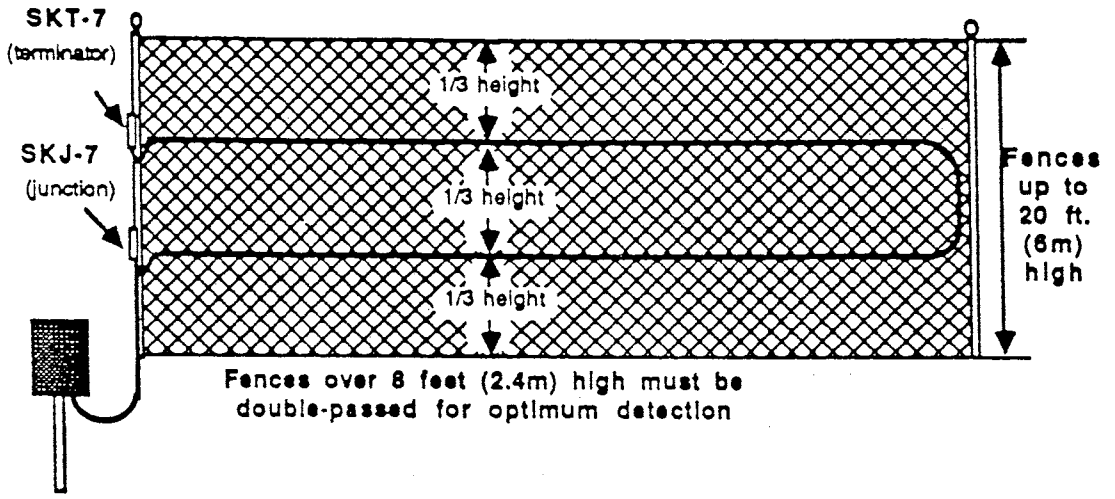


Figure 4-5. Sensor Cable on Fences >7 Feet (2.4 m)

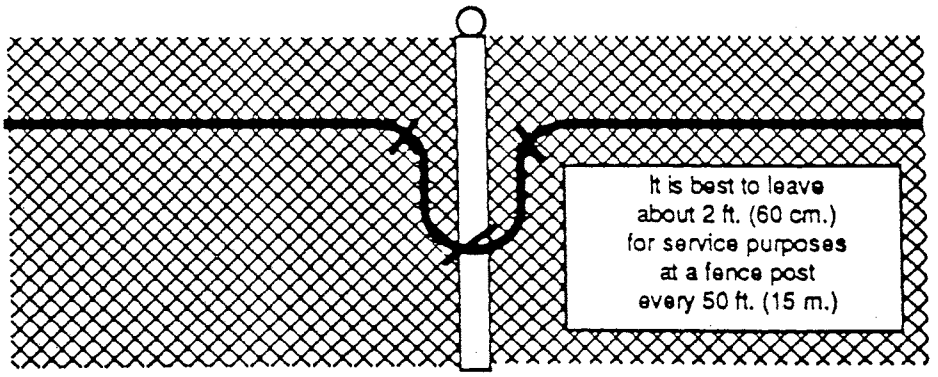


Figure 4-6. Cable Service Loop

NOTE: Sensor cable can be installed by one person. However, the job is easier, and there is less chance of damage to the cable, if one person unreels the cable while a second person attaches the cable to the fence.

Caution

Handle the cable carefully! For best operation and long life, the cable should not be knotted, kinked, nicked, or scraped.

3. Many fence corners include diagonal and/or horizontal stiffeners. This may make the fence fabric near the corner quite rigid. This will reduce the ability of a single run of cable to detect a climb-over attempt in this area. Therefore, it is good practice to loop the sensor cable on each side of the corner post, as shown in Figure 4-7 and 4-8.

   Figure 4-9 shows the recommended arrangement of sensor cable at the intersection of 2 zones (with separate processors) in the middle of a section of fence.

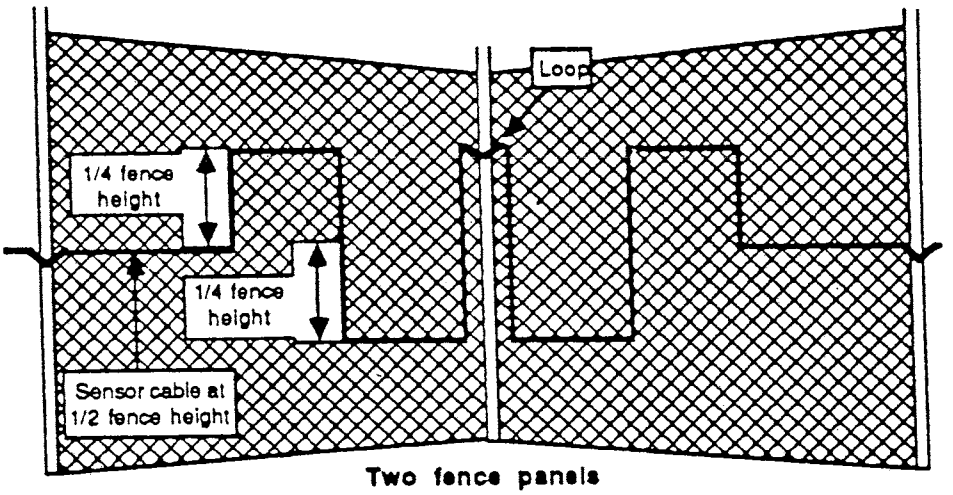


Figure 4-7. Corner Single-Pass Sensor Cable

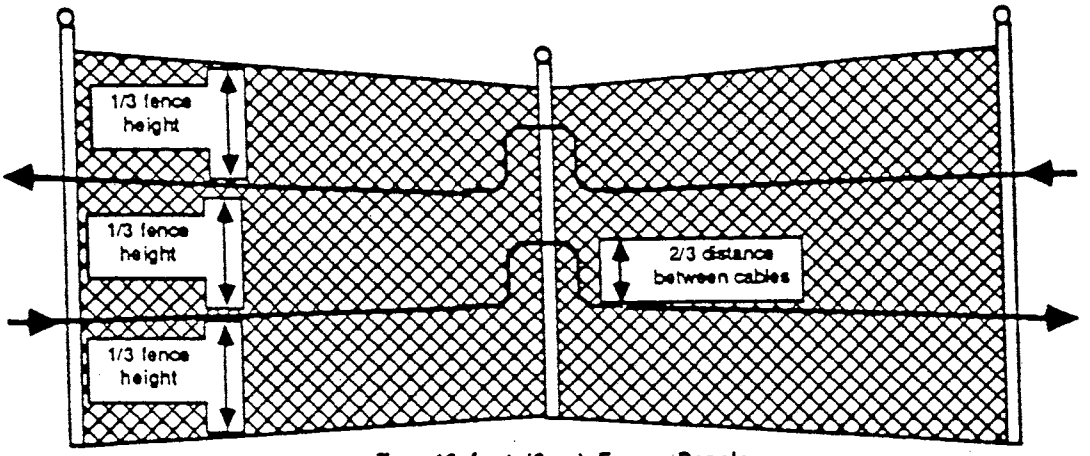


Figure 4-8. Corner Double-Pass Sensor Cable

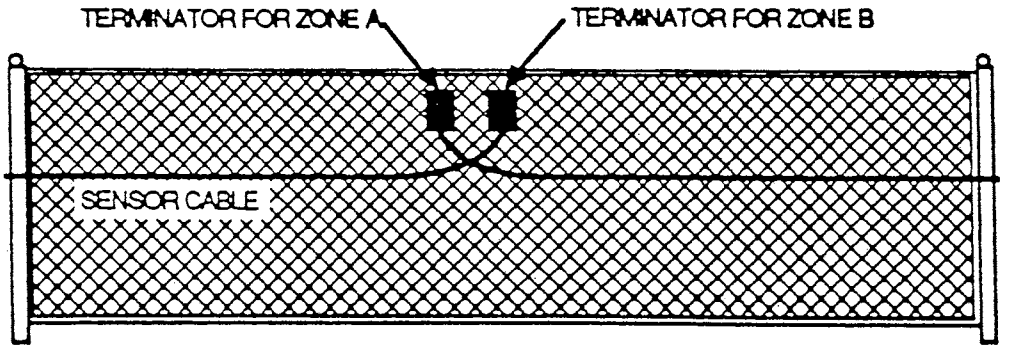


Figure 4-9. Two Zone Sensor Cable Intersection

4. When the entire sensor cable has been loosely attached to the fence, return and attach the cable at points 12 inches (30 cm.) apart all along the fence, using tie wrap. The cable should also be tied on both sides of every post that it passes over. The sensor cable should be tight enough to prevent movement in the wind, but not under constant tension.

NOTE: DO NOT attach tie wrap at interconnecting points of fence fabric. Place them midway between the interconnecting points. Refer to Figure 4-10.

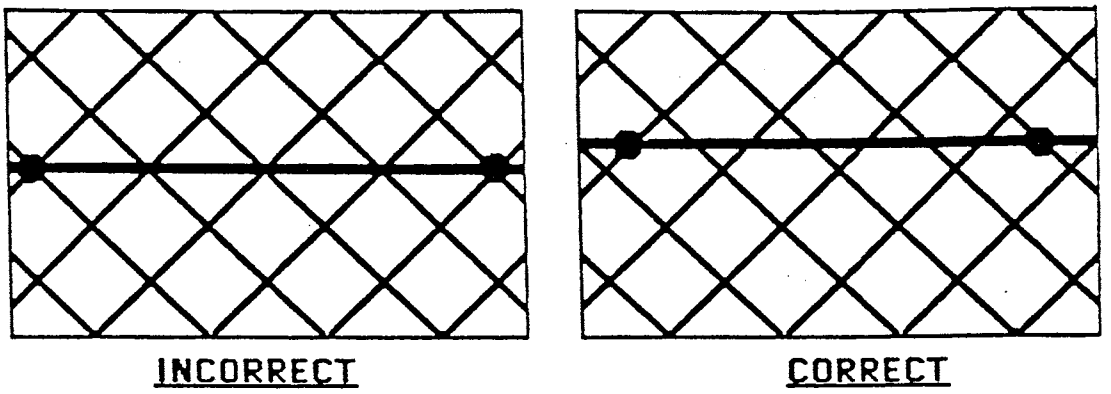


Figure 4-10. Fence Fabric Cable Ties - Incorrect and Correct

Swinging Gates

If a swinging gate is or is not protected by E-Flex, certain items are still required to install E-Flex on a fence containing a single or dual swinging gate.

- Conduit (PVC) must be provided across the gate opening (below ground) for non-sensitive feed cable. It should start at one side of the gate and extend to the other side of the gate. The conduit must be buried at least 18 inches (45 cm.) deep and be watertight.

- The length of non-sensitive coax cable used to bypass the gate sections must be added to the total amount of non-sensitive feed cable used in the zone. This total length must not exceed that given in Table 4-1.

Unprotected Gate Installation

If there is a single or dual sliding or swinging gate in the perimeter, an unprotected gate installation is the same as one that is protected. Install conduit from one side of the gate to the other. Run the non-sensitive coaxial cable through the conduit. Run the sensor cable between each side of the gate, and connect the sensor cable to the non-sensitive coax bypass with a junction device on each side of the gate (Figures 4-11 and 4-12). Seal the conduit with a weather head connector to keep out moisture.

Protected Gate Installation

A gate can be both protected and opened as shown in Figure 4-13. To protect a single swinging gate run sensor cable to the hinged side of the gate. Make a service loop that reaches the gate without binding the cable when gate is opened in any direction. Run the sensor cable around the perimeter of the gate panel, ±12 inches (30 cm) from the edges.

Connect an SKJ-7 junction device to the cable and then to the non-sensitive coaxial bypass cable. This non-sensitive coaxial cable will be run through underground conduit to the other side of the gate and up the gate post on the other side. Connect an SKJ-7 junction device to the cable, then connect the E-Flex sensor cable to the junction device and continue running the sensor cable along the fence.

For a dual swinging gate run sensor cable to one side of the gate (see Figure 4-12). Make a service loop that reaches the gate panel without binding the cable when the gate is opened. Run sensor cable around the perimeter of the first gate panel, ±12 inches (30 cm) from the edges as shown in Figure 4-14.

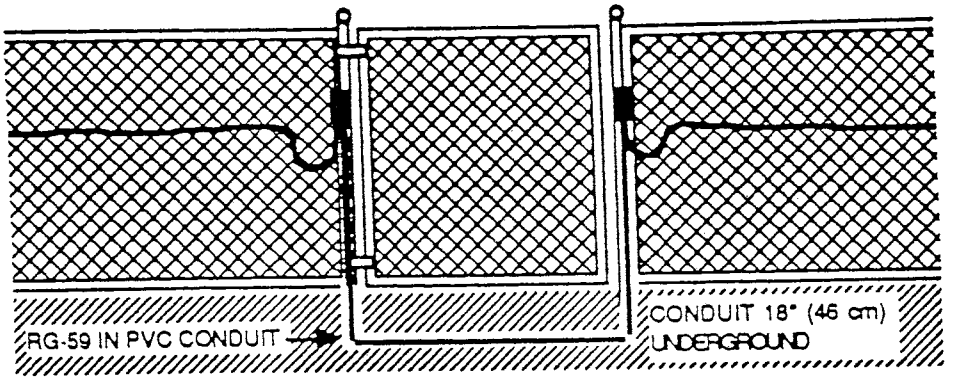


Figure 4-11. Single Swinging Gate (Unprotected)

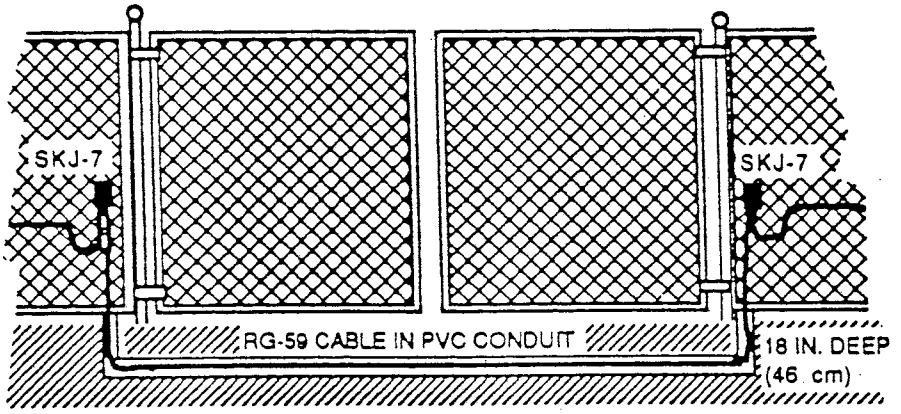


Figure 4-12. Dual Swinging Gate (Unprotected)

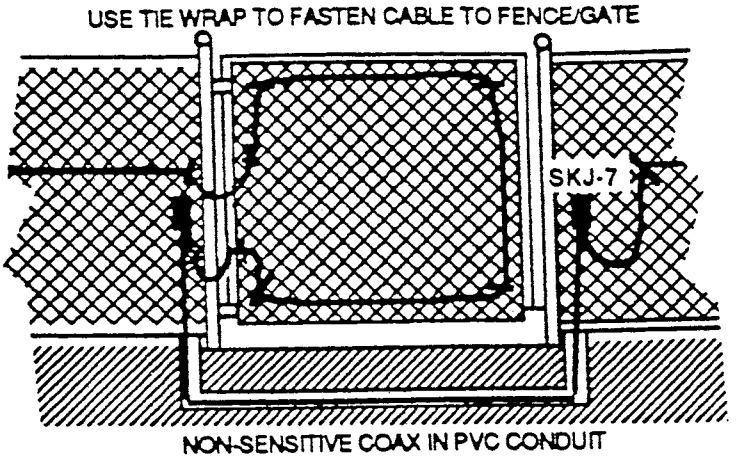


Figure 4-13. Single Swinging Gate (Protected)

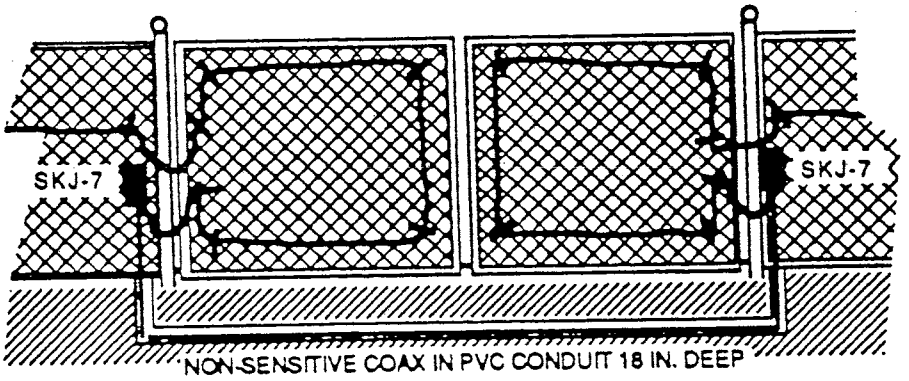


Figure 4-14. Dual Swinging Gate (Protected)

Connect an SKJ-7 junction device to the sensor cable and then to the non-sensitive coaxial bypass cable. This non-sensitive coaxial cable is run through underground conduit to the other side of the gate and up the gate post on the other side. Make a service loop across the fence post on the right side of the gate.

The second junction device is mounted on the gate post supporting the second *swinging panel*, with sensor cable run around the perimeter of that panel, 12 inch (30 cm) from the edge. Make another service loop from the gate panel to the fence large enough so cable will not bind when gate is opened in any direction. Continue running sensor cable along the fence.

EJ-7 Sliding Gate Disconnect Assembly

To provide security across a sliding gate, use the EJ-7 sliding gate disconnect assembly. With this device the gate may be left securely unattended, but the gate can be opened and closed by separating the connection to open the cable line. See Appendix C.

Gate Bypass Module

The gate bypass module option operates in two modes: secure and access. When in the secure mode an alarm will be triggered every time the sliding gate is used; in the access mode no alarm will be triggered when the site is accessed through that gate. See Appendix F.

Interior Applications

To install the E-Flex sensor cable on a solid structure, such as a wall or ceiling, proceed as follows:

1. Plan the cable pattern. Figure 4-15 illustrates a typical arrangement for walls ≤10 feet (3 m) high. For best results on hollow structures, such as plaster board and plywood, the distance between cable passes should be less than 5 feet (1.5 m). Closer spacing provides even better detection. For solid structures, such as concrete or brick, the cable spacing should be ±3 feet maximum. As long as the length of sensor cable is ≤1000 ft (300 m), several passes of cable may be used. The cable can be installed directly on the surface of the wall or run through PVC conduit that is attached to the wall. Testing may be required to establish the most effective cable position and spacing. Remember, a single zone (1 processor) should cover only one height and type of surface.

2. Starting at the end nearest the junction device, use self-adhesive clips (model 2368) to attach the cable to the structure in the preplanned pattern. Place the clips about 12 inches (30 cm.) apart. The cable should be tight, but not under any tension (see Figure 4-16). Instead of mounting the sensor cable directly on the wall, the cable can be run through PVC conduit and the conduit can be attached to the surface. Framework within the wall can be used to attach the conduit.

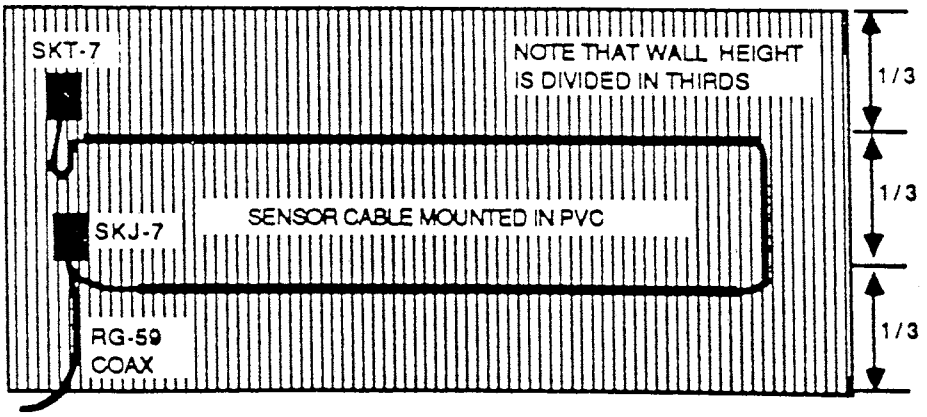


Figure 4-15. Cable Spacing for 10 Foot (3 m) High Wall
(Double cable passes for 20 feet (6 m) high wall)

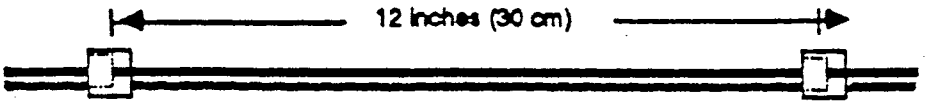


Figure 4-16. Interior Cable Installation

Electrical Connections

Processor

Before power is applied to the E-Flex processor, all electrical connections should be checked for proper installation. Refer to Figures 4-17 and 4-18.

Grounding

When considering earth ground sources it is critical that the earth ground source be stable and noise free. An improper or unstable earth ground source can induce noise into the E-Flex processor. This noise may cause the processor to initiate *false alarms*. Do not use the fence structure as a ground reference.

A proper earth ground source is usually obtained by driving an 8 foot (2.4 m) copper grounding rod in the ground near the processor. Use a 12 gauge (2.05 mm dia.) wire to connect the grounding rod to terminal 1 of TB-2 of the processor .

The entire E-Flex II sensor uses the processor as its ground source. A system ground is established through the shield (braid) of the non-sensitive coaxial cable and the sensor cable shield. When splicing the shields or braid of these cables be sure there are no weak connections or opens in the ground path. If an open or break in the ground path occurs, the supervision alarm relay will deenergized to an alarm state.

A large difference in potential may exist between the fence ground and the processor ground. This difference is generally induced by a local power source (50 or 60 cycle). Multiple grounds will produce ground currents in the sensor cable shield and introduce noise in the system. For this reason only one ground path should be established for the sensor cable shield and the non-sensitive feed coaxial cable.

To test for noise from inadequate grounding, use the motion meter at TP-1 on the processor (TP-1 and TP-2 for a dual zone processot). The sensitivity adjustment should be in its normal operational setting (+2). If the motion meter reads >10 divisions when the sensor is undisturbed there is probably inadequate grounding.

If excessive noise is present or becomes evident at some time after installation, check the integrity of the cable installation first. In particular, insure that there is no inadvertent ground connection to the coaxial cable shield at either the junction device(s) or terminator(s). The processor is always grounded at its mounting location using a grounding rod.

AC Power

Primary power to an AC powered E-Flex processor is 115/230 VAC. Operating power is 16/20 VAC (model E-IIB/E-IIA), supplied by a step-down transformer. AC power connection to the processor is made on terminals 9 and 10.

Caution

Direct connection of the 115/230 VAC line to the E-Flex processor will result in *MAJOR SYSTEM DAMAGE.*

DC Power

A 12V, 8 hour standby battery (PN 63001) is provided with each processor. To connect the battery to the processor, first connect the red (positive) lead to terminal 7. Connect the black (negative) lead to terminal 8. Be careful not to cross these two leads.

Instead of AC power a main power supply of +12VDC can be applied directly to terminals 7 and 8. In this case, the 12VDC battery is not connected. If DC power is used be sure the polarity is correct. The processor provides a trickle current to keep the battery charged to full potential. The processor is protected against shorts or reversals of the battery terminals.

In remote locations where the AC power supply may not be stable or reliable, an uninterrupted power supply (UPS) with back up batteries should be considered for primary power.

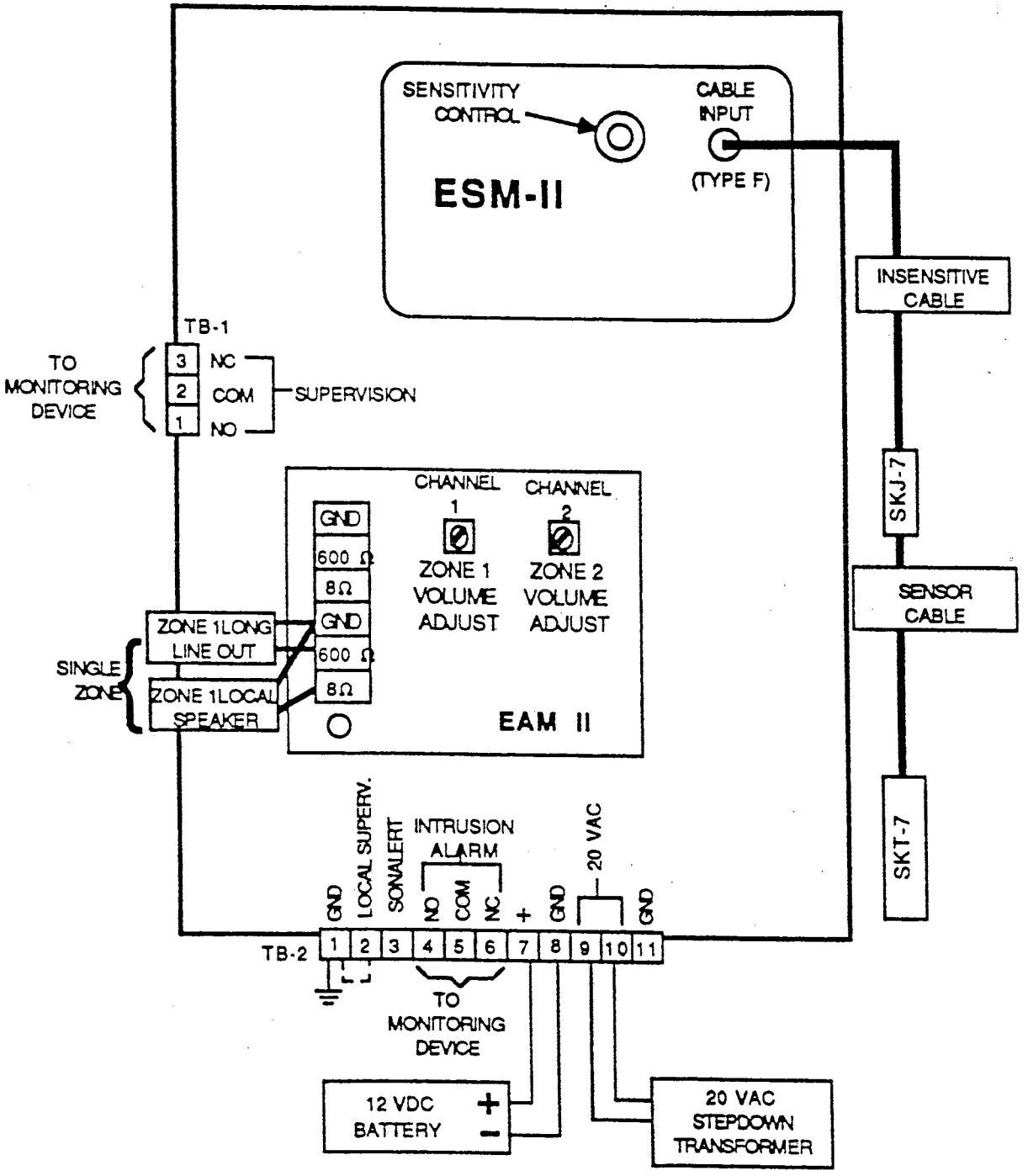


Figure 4-17. E-IIA Processor Electrical Connections With Plug-In Audio Module

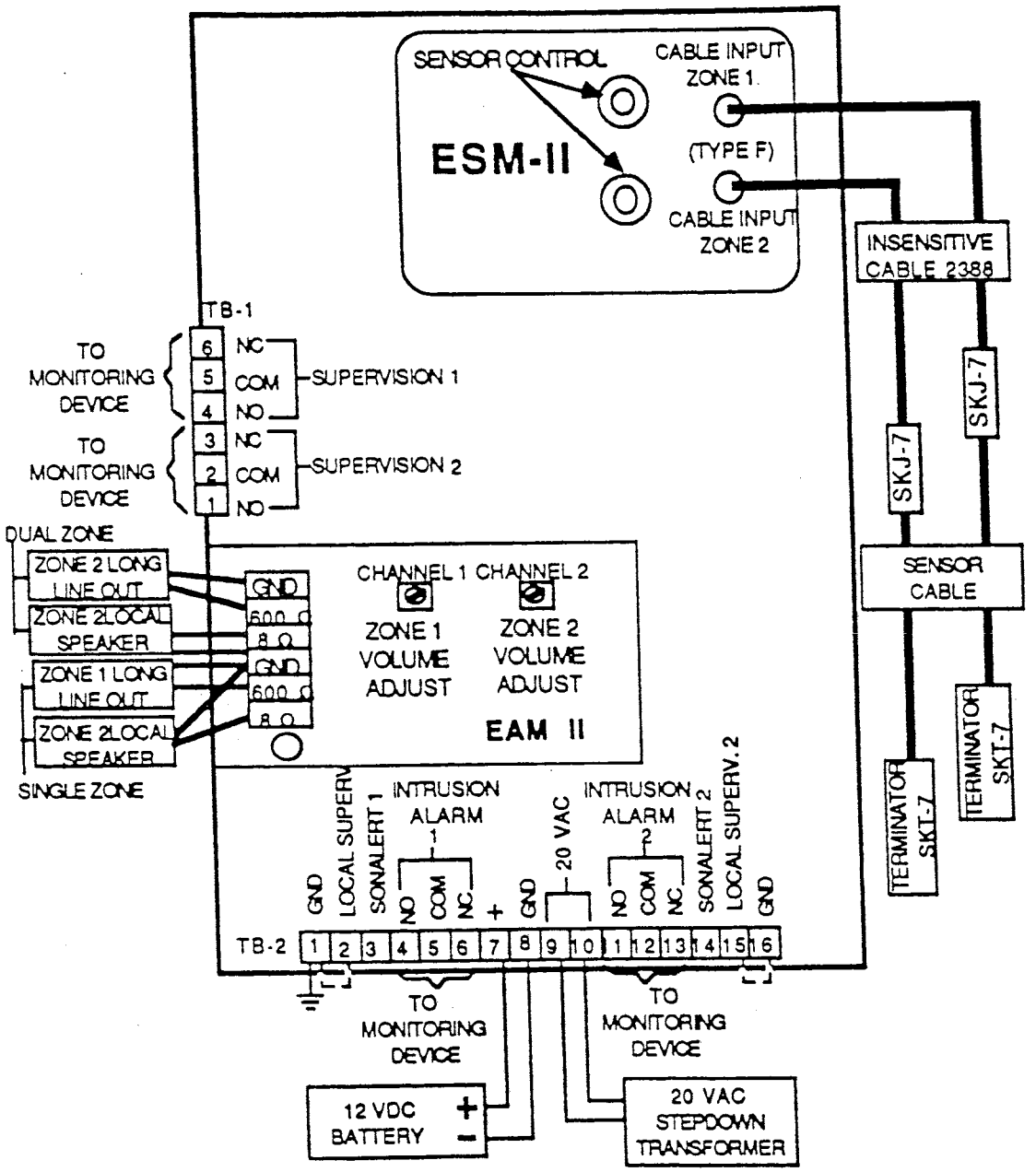


Figure 4-18. E-IIB Processor Electrical Connections With Plug-In Audio Module

Alarm Relays
The E-IIA single zone processor has 2 output relays, and the E-IIB dual zone processor has 4 output relays. The relays are used to indicate alarm conditions detected in the processor.

- The relays depend on power being present in the processor.
- The relays are energized by output from the supervision and detection circuit.
- The supervision circuit will deactivate the supervision relay if a fault is sensed by the sensor cable, or by the power or tamper switch.
- The detection circuit deactivates the intrusion relay if intrusion activity is detected.
- If a relay is not energized an alarm condition is present, or power is absent.

If AC power and DC backup power to the processor is interrupted or lost, the relays will de-energize, causing an alarm. Should a cut-through, climb-over, or supervision alarm condition occur, the appropriate output alarm relay will de-energize, causing an alarm. The processor relays are single pole, double-throw form C. They have normally open (NO) and normally closed (NC) contacts. The appropriate contacts are wired to the alarm monitoring system.

There is an open circuit, between the common and normally open contact at the screw terminal of the relay, when no alarm condition is present. When an alarm condition is detected, the relay de-energizes to form a short between the common and normally open contact. Changing from an open state to a closed state indicates that an alarm condition has been detected.

The reverse is true when using a normally closed contact. The change from closed state to open state indicates that an alarm condition has been detected. All relay contacts silkscreened on the circuit board are in an energized, non-alarm state. Refer to Figure 4-17, 4-18.

Tamper Switch

All E-Flex sensors have a tamper switch mounted in the processor. The tamper switch internally connects to the supervision circuitry and initiates a supervision alarm if any processor tampering occurs. Both zones 1 and 2 supervision circuitry activate simultaneously when a dual zone processor is tampered with.

The tamper switch has three positions, as shown in Figure 4-19. When the processor cover is closed the switch is in **position C**. In position C it acts as a short on the supervision alarm output line. If the processor cover is opened the switch moves to **position B**. When the tamper switch is in position B it acts as an open on the supervision alarm output line and de-energizes the relay.

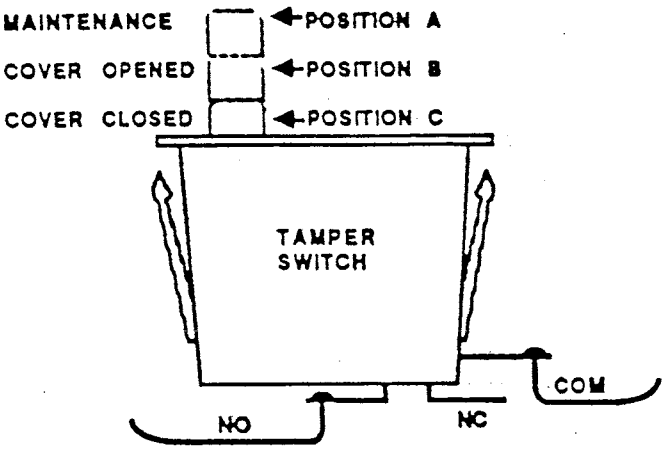


Figure 4-19. Processor Tamper Switch

If it is necessary to leave the processor open for inspection or maintenance purposes the tamper switch control button can be pulled out to position A.

Cable Input

Type F coaxial connectors are used to attach the non-sensitive feed cable to the processors. Non-sensitive coaxial feed cable must be used to wire the processor to the sensor cable. The sensor cable is only attached to a surface where detection is desired. Each E-Flex kit contains a section of non-sensitive cable (model 2388) with a Type F connector attached at one end. The cable is 25 ft (7.5 m) long. The cable can be cut, but must be spliced to the sensor cable that is mounted on the surface to be protected.

Time Adjustable Alarm Relay

All processors have a variable alarm duration. The length of the signal is adjusted with a trimpot adjustable from 0.5 seconds CCW to 5.0 seconds CW. The processor alarm is factory adjusted to 2 seconds. The trimpot location is shown in Figures 5-2 and 5-3.

Audio Alarm Option (EAM II)

The Audio Alarm option drives a speaker and/or a telephone line. The operation is identical for both single-zone and dual-zone processors. To install the Audio option module refer to Figure 4-20 for cable requirements, and have the following tools available:

1 Phillips screw driver
1 wire stripper
1 loudspeaker
1 matching transformer (if using 600 ohm line)

Caution

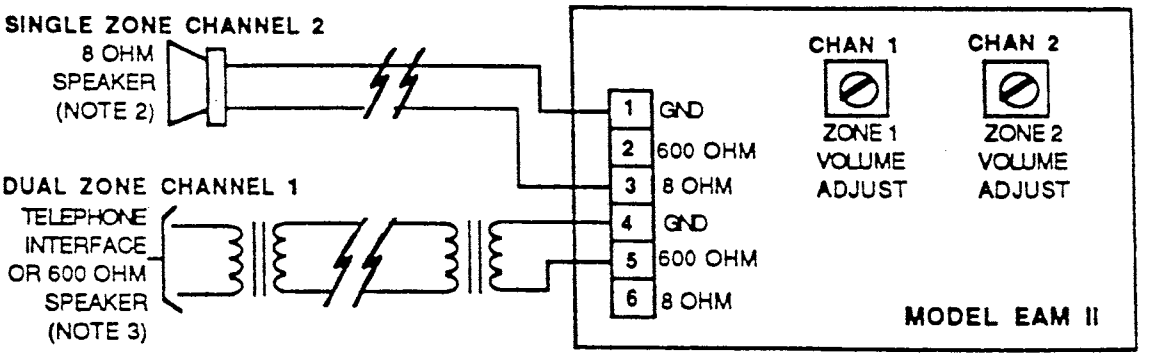
Turn off power before installing module or damage will occur to the processor's main PCB.

Installation

To mount the Audio option module on the processor's main PCB refer to Figure 4-17 and 4-18 for correct positioning and:

1. Plug the Audio option module in J1 on the main PCB in processor.
2. Snap in the two (2) bottom teflon standoffs.

Refer to Section 5 for calibration.



NOTES:

1. Each zone has one (1) 8 ohm output and one (1) 600 ohm output. Both 8 ohm and 600 ohm outputs can be driven for each zone individually or together.
2. Maximum distance (8 ohm output): 18 GA. wire (solid or stranded) = 3000 feet (900 m); 22 GA. wire (solid or stranded) = 1000 feet (300 m)
3. Maximum distance (600 ohm output): 18 GA. wire (solid or stranded) = 20,000 feet (6 km); 22 GA. wire (solid or stranded) = 10,000 feet (3 km)

Figure 4-20. Audio Alarm Option

Installation Verification

Once the sensor has been connected, it is important to verify that the installation is correct. To verify the installation, perform the following checks:

1. For AC powered processors, check terminals 9 and 10. Verify voltage is between 14 VAC and 24 VAC.

2. For DC powered processors, check terminals 7 and 8. Verify voltage is between 10.2 VDC and 16VDC.

3. Check resistance between the center conductor and shield of the non-sensitive feed cable. This should show 1 MΩ ±0.1 MΩ (900-1,100 kΩ). If an open or short exists it is probably due to an open or short in a splice or terminator.

High Risk Installations

The E-Flex II requires careful installation. There is a range in quality between installations. One installation could be carelessly performed, with inadequate grounding, unstable mounting surfaces, or other related factors. Such an installation can still be sufficiently effective to provide acceptable detection without an unacceptable nuisance alarm rate. But such an installation is clearly inferior to one in which meticulous care has been taken to follow Stellar Systems recommendations. This procedure should only be attempted *after* all grounding and other installation considerations detailed in this manual have been followed carefully.

Detection Profile Evaluation

The detection profile of a zone can be affected by a variety of minor deficiencies in the mounting structure. The E-Flex sensor cable is exceptionally uniform in electrical characteristics. This fact can be used to obtain a detection profile (in the form of a chart) that shows the magnitude of recorded disturbances at locations along the length of the fence.

Using a strip-chart recorder, monitor the signal strength at TP-1 (use both TP-1 and TP-2 for dual-zone processors) while a series of equal disturbances are introduced along the entire length of the fence. Figure 4-21 illustrates typical strip-chart output.

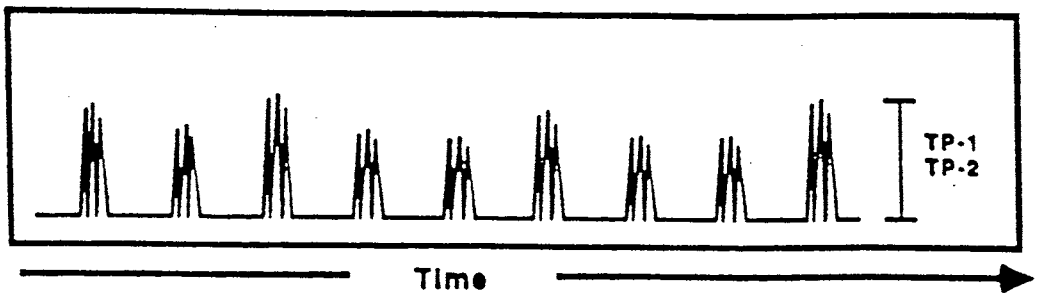


Figure 4-21. Strip-Chart Printout

To use the strip-chart recorder for a test:

1. Set recorder sensitivity to 2.5 VDC.

2. Connect recorder to test point (TP1 or TP2) of zone to be tested.

3. Using a metal object (screw driver) walk along the length of the zone. Tap the zone surface with equal force at regular intervals. Make sure tap intervals are spaced at least 1 second apart. The number of taps should equal the number of points to be sampled.

4. Mark the tap locations on the fence (tape or other marker).

5. Examine the strip-chart output. A detection profile is established by the pulse sets on the printout.

   The pulse sets correspond to the tap points along the fence. An ideal detection profile would have each set of pulses equal in height to indicate a uniform response to disturbances at different points along the zone. With a high-uniformity profile, uniform detection is achieved without producing any extra nuisance alarms (hot spots) along the zone. If the plotter output indicates some points on the zone are more sensitive (high pulses) or less sensitive (low pulses), adjustments can be made to the fence, wall, or the cable layout.

6. Check that structure is rigid, firm along its surface, and has nothing hitting or rattling against it.

7. If some points on the zone show noticeably low sensitivity, try to secure those areas more firmly. If sensitivity remains low add extra passes or extra loops of cable in the low sensitivity areas.

8. If there is any problem obtaining detection profile uniformity contact Stellar Systems.

Calibration

Four adjustments are required to calibrate the E-Flex II sensor:

Sensitivity	This adjustment affects the sensitivity of climb-over and cut-through detection, i.e. the sensor's overall performance.
Cut-through count select	Sets the number of cut-through characteristic pulses required to initiate an intrusion alarm.
Climb-over timer	Sets minimum climb-over activity time required to initiate an intrusion alarm.
Cut-through time duration	Sets cut-through time duration.

Motion meter (model 2391), and test cable (model 2389) are used to test or calibrate an E-Flex II installation. Refer to Figure 5-1. Calibration test points for single zone processors are shown in Figure 5-2 and for dual zone processors in Figure 5-3.

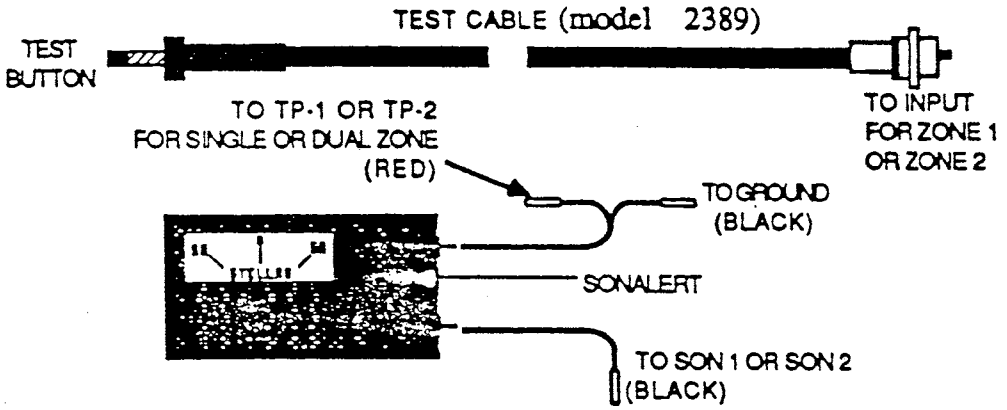


Figure 5-1. Motion Meter/Sonalert and Test Cable

Processor Calibration (E-IIA Single Zone, E-IIB Dual Zone)

1. Apply power to processor.
2. Connect the motion meter leads to points indicated in Figure 5-2 (5-3 if dual zone).
3. Turn the sensitivity control dial fully CCW to obtain minimum sensitivity. Motion meter should indicate a deflection of less than 4 on the scale.
4. Set cut-through count select switch to position 1:

   SW1 - single zone processor
   SW1 - zone 1, dual zone processor
   SW2 - zone 2, dual zone processor

   and the climb adjust switch to position 3:

   SW2 - single zone processor
   SW3 - zone 1, dual zone processor
   SW4 - zone 2, dual zone processor

5. Set the cut through time duration jumper to 25 seconds:

   JU1 - single zone processors
   JU1 - zone 1, dual zone processor
   JU2 - zone 2, dual zone processor

6. Sharply tap the fence fabric with a metal tool (screwdriver) to simulate a cut in the fence fabric.
7. Check motion meter response which, at minimum sensitivity, should be negligible.
8. Gradually turn the sensitivity control dial clockwise until a tap on the fence fabric produces a motion meter deflection above 36 divisions on the scale, and the Sonalert sounds.
9. Attempt to climb the fence to verify the sensitivity setting. The motion meter should deflect above 36 divisions. If not, increase sensitivity. The Sonalert should produce an audible alarm within 2 seconds. Tapping or climbing any point along the length of the zone should produce approximately the same deflection on the motion meter.
10. Adjust sensitivity control to the minimum setting that adequately detects intruder penetration. This reduces nuisance alarms caused by environmental disturbances.

NOTE: With no fence disturbance the motion meter should indicate a reading of less than 10 on the scale. If there is no movement on the motion meter, or if sensitivity has to be set higher than 7, refer to troubleshooting in this section.

11. Set count select switch to number of cuts desired.
12. Set the climb adjust switch as determined by height of fence.

13. Set time duration jumper (12.5, 25, 50, or 100 seconds).

NOTE: When shipped, the count select and climb adjust switches are factory set at 4. Lower settings may contribute to a higher number of nuisance alarms.

14. Using a metal tool, tap fence the same number of times as set on the count selector switch. Separate the taps by at least 1 second. Verify that Sonalert produces an audible tone to indicate an alarm *at the correct count* . Perform this test at several points on the fence where sensor cable is installed.

15. Attempt to climb the fence. Verify that Sonalert produces an audible tone to indicate an alarm *at the correct time*. If the selected climb-over time has NOT generated an alarm within 10 seconds after activity starts the detection circuit will reset.

16. Attempt cut and climb intrusions at regular intervals along the entire length of the zone. Verify that system consistently detects both types of intrusion. Depending on fence conditions, sensitivity variations may occur along the zone.

17. With no fence disturbances occuring, use an ohmmeter to verify that all relays are in their normal position (non-alarm state). NC to COM terminals should be an electrical short. NO to COM terminals should be an electrical open.

18. For future reference record all adjustment settings after calibrating each zone. Monitor new installations for at least a full week. Keep a record of any nuisance alarms that occur. Minor adjustments may be required based on monitored system behavior.

19. The alarm timer is factory set at 2 seconds. It is adjustable from 0.5 to 5 seconds if necessary. Refer to Figure 5-2 (5-3 if dual zone).

20. If the audio option is installed, use the adjustable resistors (R16 for zone 1, and R15 for zone 2) on the EAM-II audio amplifier board to adjust speaker volume. Tap the fence with a metal object and adjust the potentiometer for desired volume. The best signal-to-noise ratio is achieved by setting the volume control to the minimum level that provides a clear, audible indication.

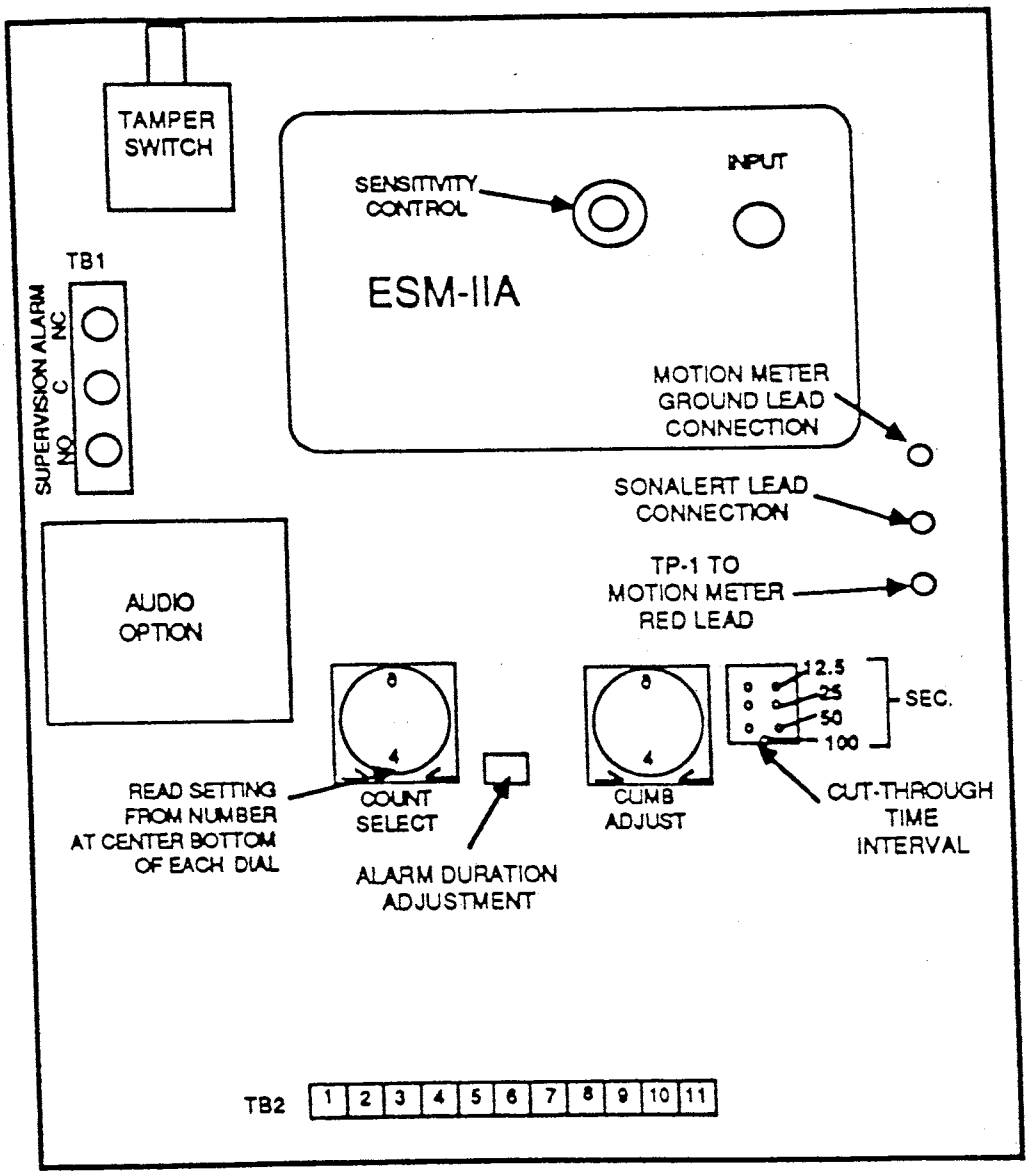


Figure 5-2. Single Zone E-Flex IIA Calibration Points

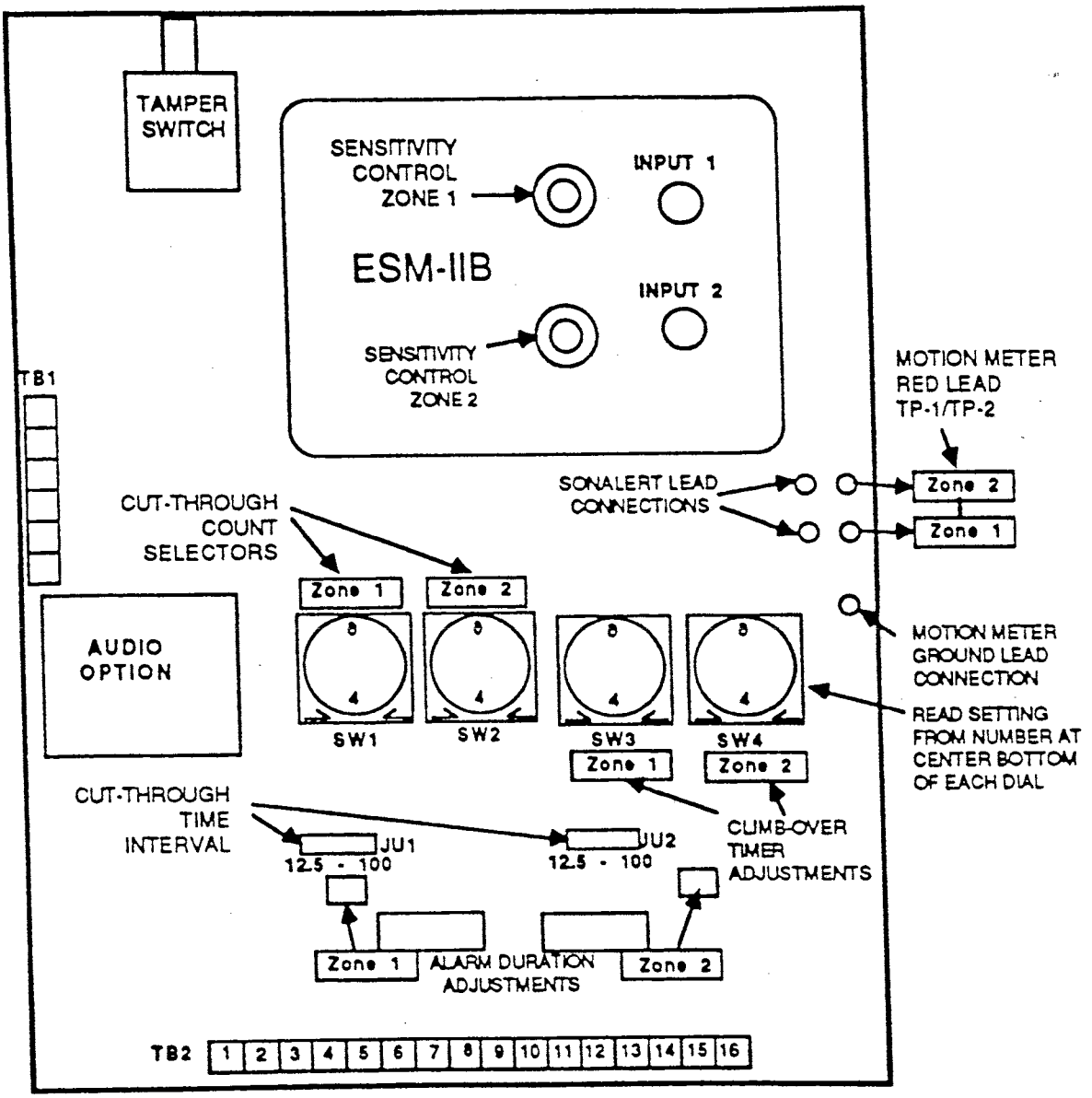


Figure 5-3. Dual Zone E-Flex IIB Calibration Points

Audio Amplifier Calibration

Use adjustable resistor, on the optional EAM II audio amplifier PCB, to adjust speaker volume. See Figure 5-4.

NOTE: Do not disturb any adjustment point settings sealed with red Glyptol. These are factory set and should not be touched without the approval of Stellar Systems technical personnel.

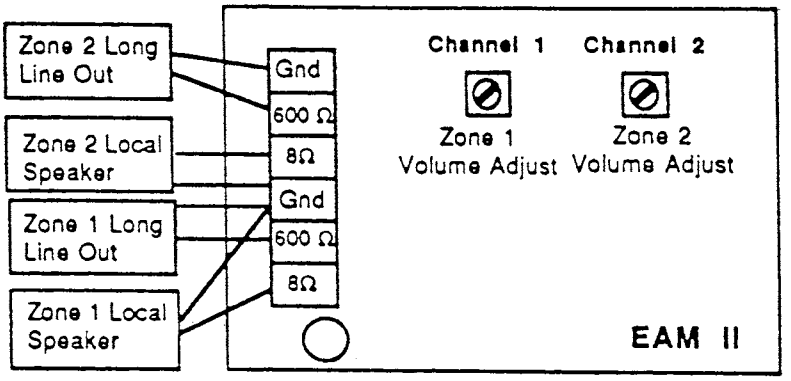


Figure 5-4. Audio Amplifier Option

1. Tap the fence (do this for each zone in dual zone processors) with a metal object.

2. Adjust the potentiometers to obtain speaker volume desired when a disturbance is detected.

3. Speaker volume and ESM sensitivity are separate. To familiarize yourself with sounds produced by different types of disturbances, attempt to simulate gates closing, animals against the fence, or large vehicles driving near the fence. It will take several event simulations before it is possible to distinguish between an actual intrusion attempt and normal background noise.

Interior Processor Calibration

The procedures for calibrating exterior E-Flex II sensors can be used to calibrate both single zone and dual zone interior processors. The term "cut-through" can be equated to a blow on a wall. The term "climb-over" can be equated to a sustained attack on a wall. The climb-over and cut-through simu-lations should be handled accordingly.

Aside from the testing activities for exterior calibration, simulate an attack on an *inner surface* and compare the E-Flex response to a similar attack initiated on the *external surface* of a wall.

E-Flex II Maintenance

While the E-Flex II is durable, and can operate effectively for long periods of time in a range of environments, it is highly advisable to engage in periodic inspections of each installation. It is recommended that the following inspection be made every 3 months.

1. Make sure the fence does not have any vegetation, or other material, around it that can disturb the fence.

2. Check sensor cable mounting to be sure it is not loose or disconnected.

3. Do climb-over and cut-through simulations in each zone as described in E-Flex II Calibration. Verify that motion meter responses are in accordance with set standards.

4. Check all the tie wrap and splices.

Tie wrap and cabling can deteriorate with age, especially in harsh climates. Every 6 months perform a careful visual inspections of cable over 5 years old. If a shield-to-center conductor test shows a deviation from 1 MΩ, ±100 kΩ, the cabling may have deteriorated to the point where the entire cable should be replaced.

Troubleshooting

The basic field-repairable/replaceable elements of the E-Flex II sensor are:

- The processor board assembly
- Sensor cable
- Insensitive cable
- Junction and termination devices
- Electrical interconnections

It is recommended that a minimum of 1 operating processor be kept as a spare. In large systems a ratio of 1 spare for each 10 installed processors is recommended. Spare terminators, junctions, and lengths of both sensor and non-sensitive feed cable should be maintained in appropriate quantities for repair purposes.

When a processor malfunctions replace the processor with a spare. Send the faulty processor back to Stellar Systems for repair. Cables, junctions, and terminators can be repaired at the site as required.

If the E-Flex II develops a specific problem refer to the troubleshooting charts. The charts should quickly help localize most problems. The following pages present troubleshooting flowcharts used to localize faults. The procedures on the charts are broken down by alarm symptoms.

Chart 1	Constant supervision alarm
Chart 2	Intermittent supervision alarm
Chart 3	False intrusion alarm (no supervision alarm)
Chart 4	No intrusion alarm upon intrusion.

Troubleshooting Notes

- When alarms occur be sure they are valid alarms before suspecting E-Flex problems.
- If the 20 VAC power supply is producing <14 VAC, check primary power to the processor first. If primary power is normal, remove one AC wire to screw terminal. If 20 VAC remains low replace the 115/20VAC step-down transformer. If the problem persists the processor can be identified as the source.
- If primary power is lost, and the processor fails to function, the light on the bottom right corner of the processor PCB may be burned out, thus preventing backup battery recharging. If this happens replace the bulb.

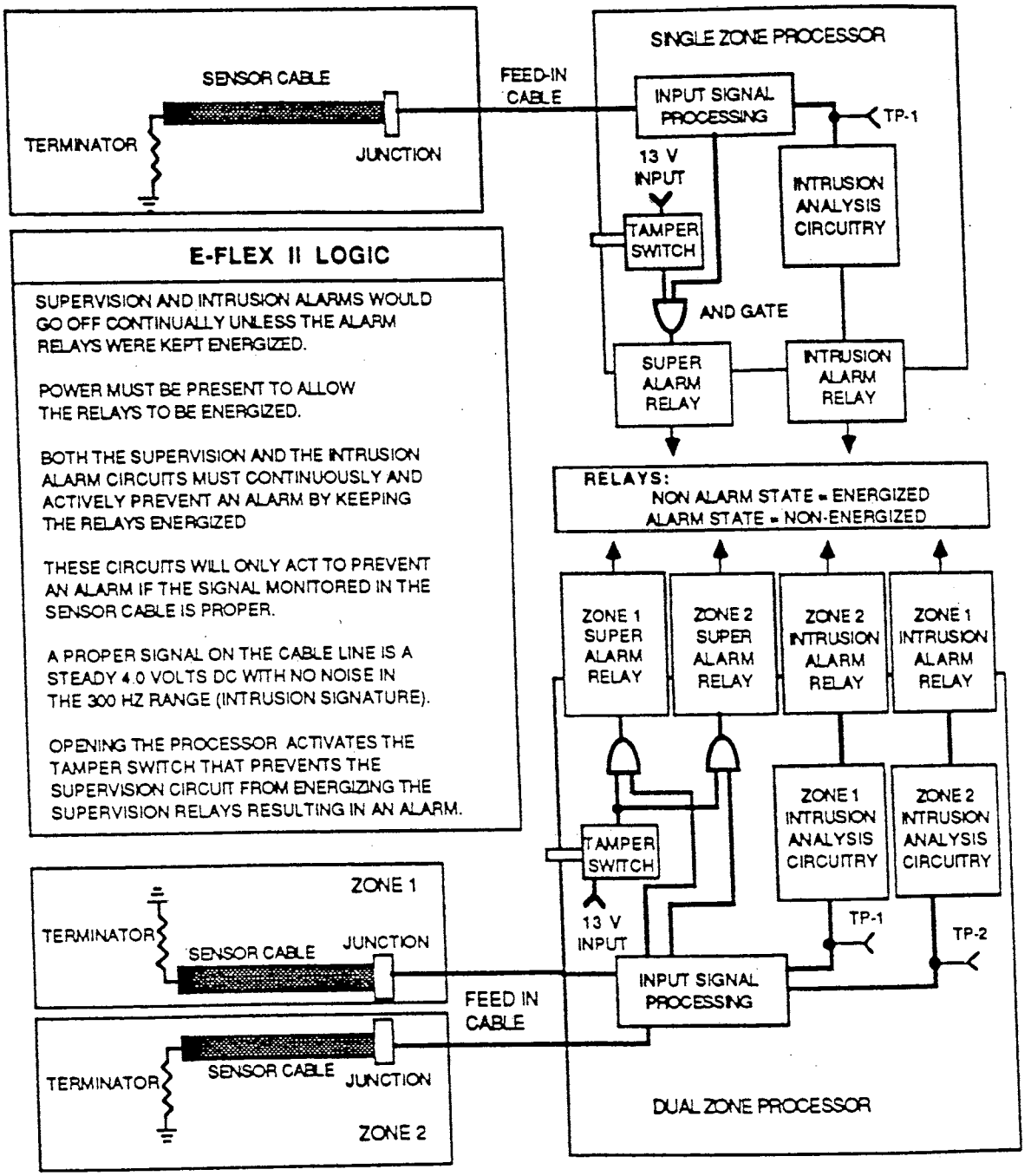


Figure 5-5. Basic Logic of E-Flex II

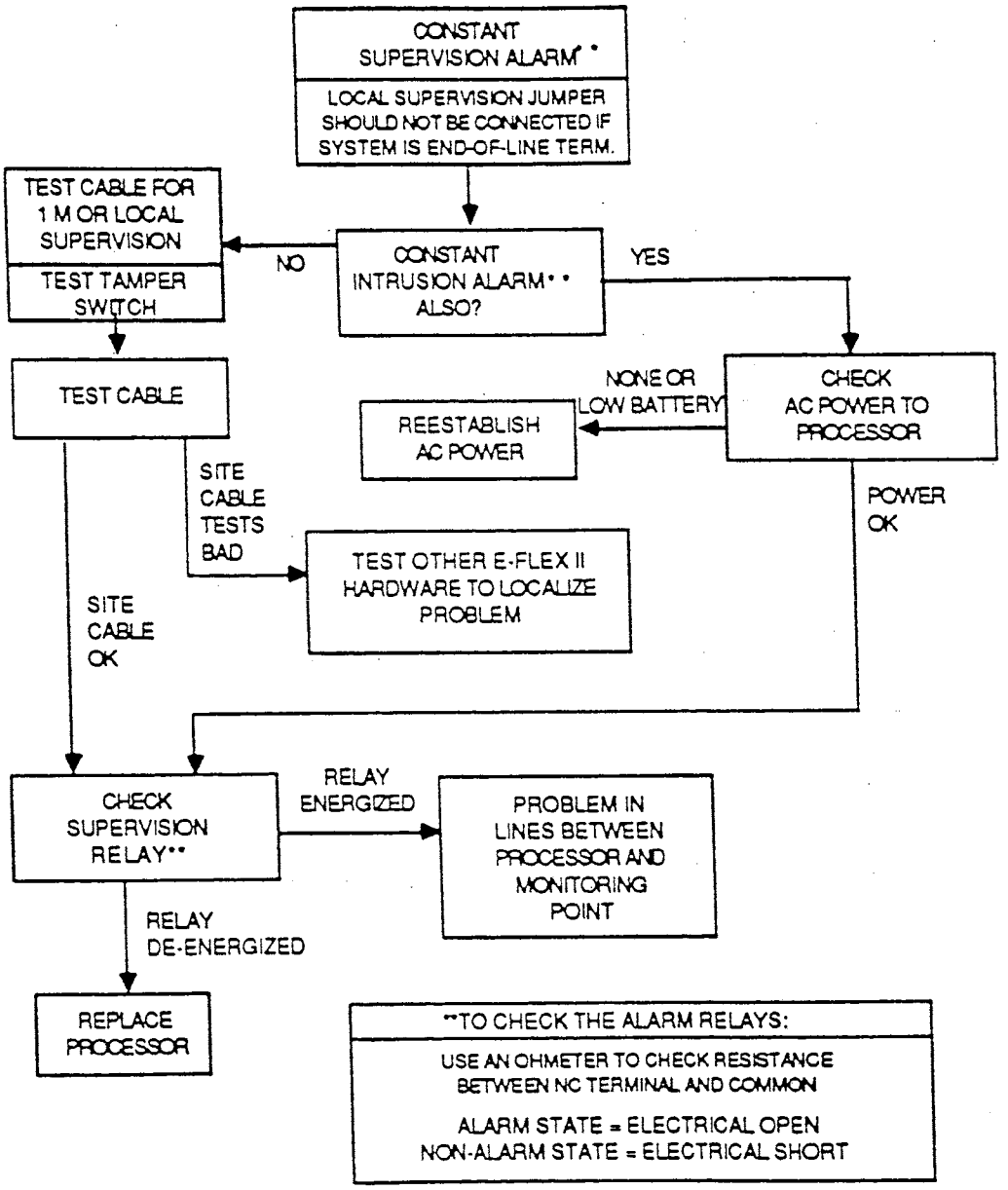


Figure 5-6. Troubleshooting Chart 1

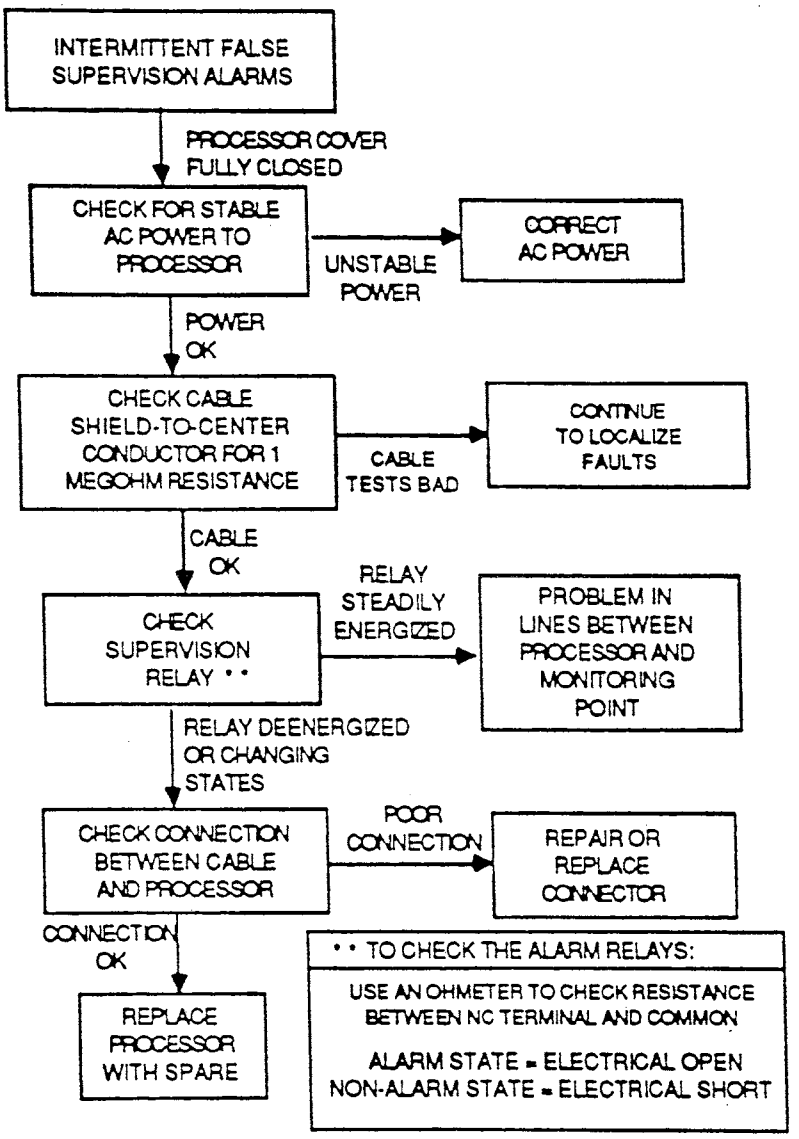


Figure 5-7. Troubleshooting Chart 2

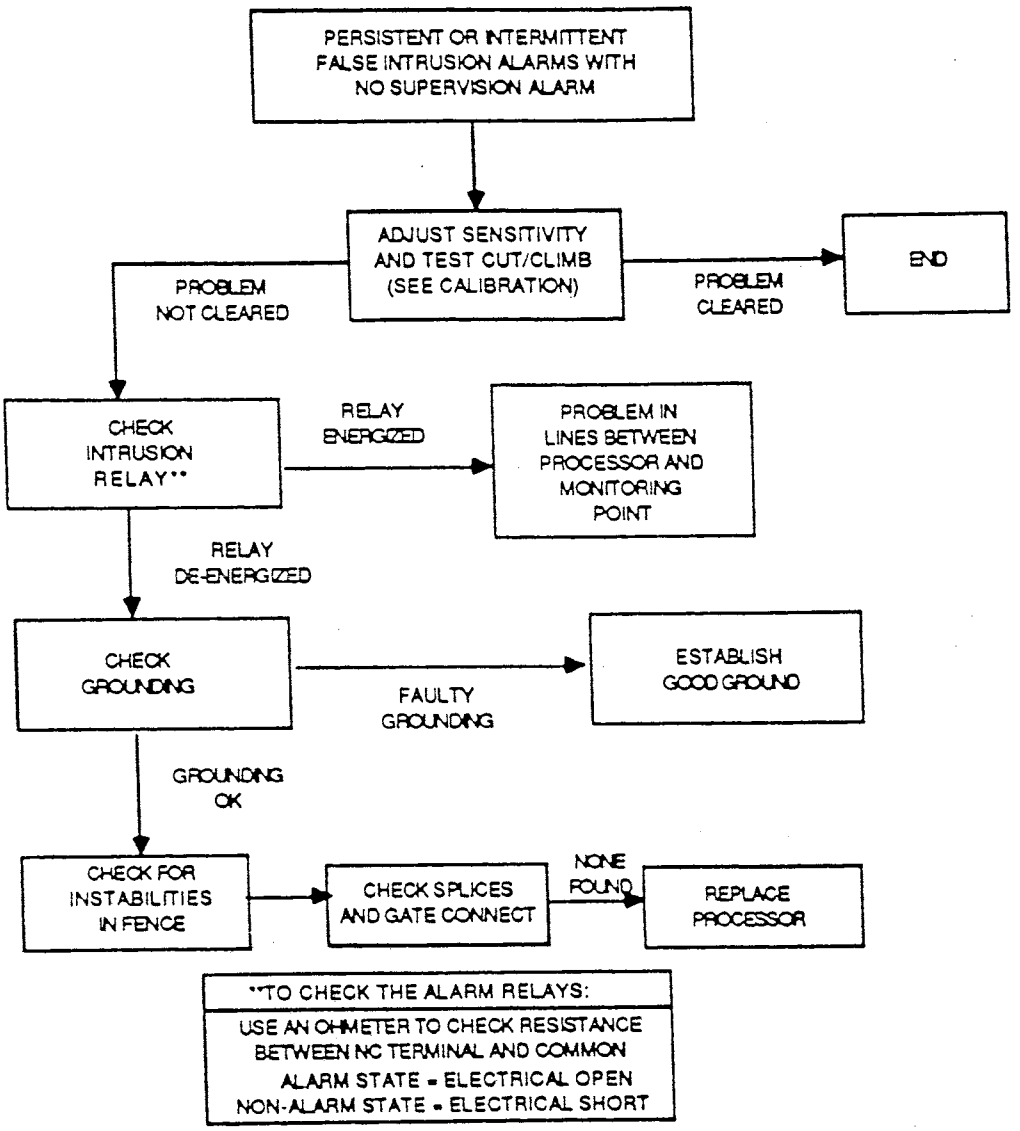


Figure 5-8. Troubleshooting Chart 3

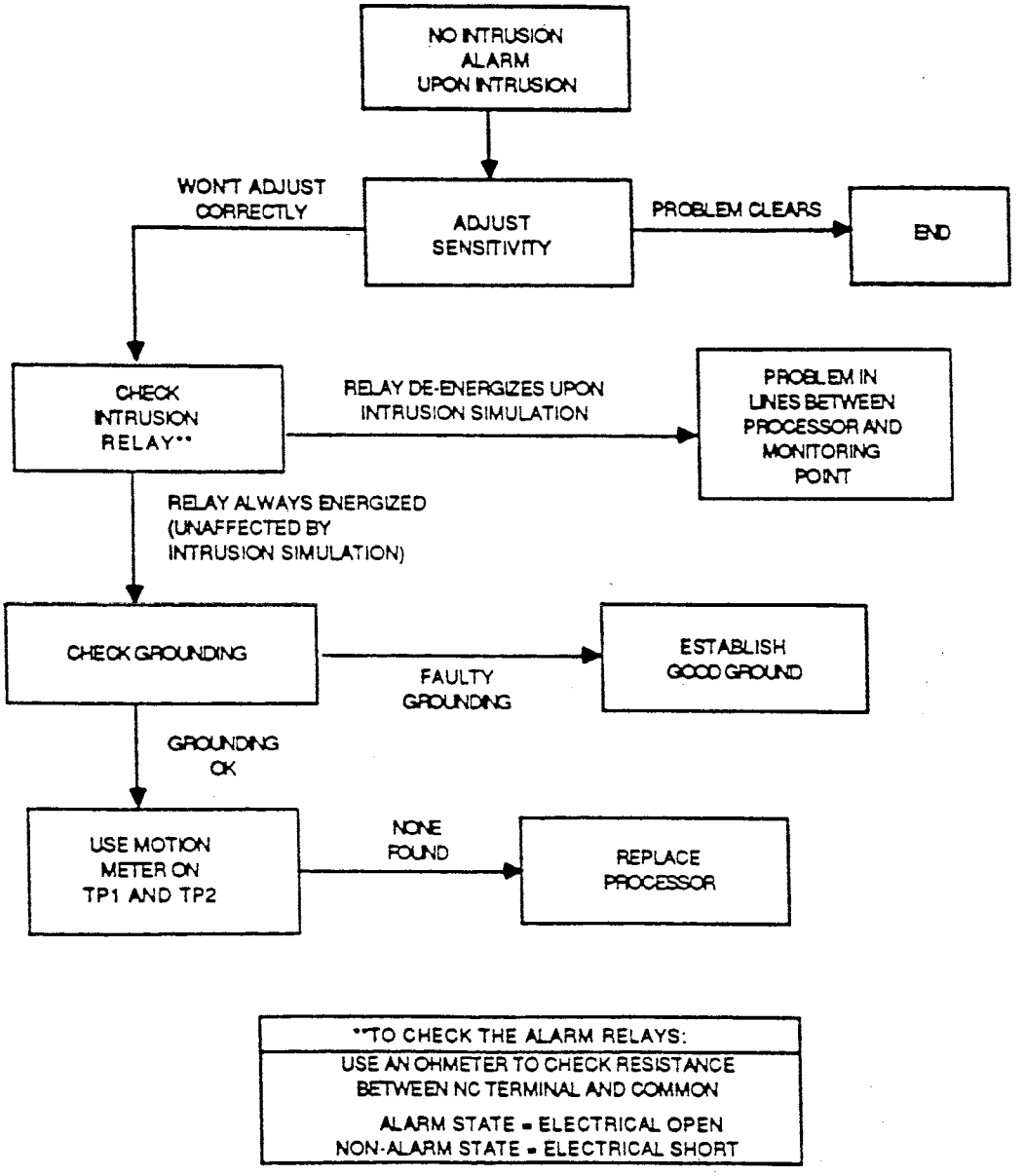


Figure 5-9. Troubleshooting Chart 4

Testing

The E-Flex II sensor can be divided in two parts for testing :

1. The E-Flex II processor
2. The remainder of the E-Flex II sensor hardware, which includes:
    - Sensor cable
    - Non-sensitive feed cable
    - Junction device(s) SKJ-7
    - Termination device SKT-7
    - Electrical interconnections

A motion meter/Sonalert (model 2391) is required to test the E-Flex II processor. A volt ohm-meter (VOM) is needed to test the rest of the system.

Processor Testing

NOTE: This procedure should be performed only after a problem has been localized in the processor.

Before testing the processor, it must be isolated from the rest of the sensor. Simply detach the input lead of the feed-in cable(s) from the processor's coaxial inputs.

Zone 1 Processor Testing

With the 20 VAC or 12 VDC power on:

1. Connect a jumper between terminals 1 and 2 for zone 1 local supervision testing.
2. Connect the motion meter red lead to TP-1.
3. Connect the black lead to ground. (The Sonalert function of the motion meter need not be connected at this time.)
4. Turn the zone 1 sensitivity control CW for 100% sensitivity.

The motion meter should read 0 to 15. If the meter reads ≥15, the processor is faulty. However, if the meter reads zero (0), the processor could still be faulty. Make a note of the reading and proceed with the test.

5. Turn zone 1 sensitivity control knob to position 4.
6. Connect Sonalert lead to terminal 3.
7. Turn zone 1 count selector to position 4.

8. Turn zone 1 climb adjust knob to position 3.

9. Connect VOM to terminal 5 (common) and 6 (NC).

10. Connect E-Flex test cable (model 2389) to zone 1 input.

11. Tap end button of the test cable 4 times, at intervals of 2 to 3 seconds. After the fourth tap, the Sonalert should sound and the VOM should show the relay changing states. The motion meter should read between 40 and 50 divisions with each button depressed.

    If the Sonalert sounds but the VOM does not show the relay changing states, the relay or the relay transistor driver is faulty and the processor should be repaired.

12. Make a loop in the sensor cable, insert a screwdriver into the loop, move the screwdriver back and forth, continuously tapping the cable for 2 or 3 seconds. The Sonalert should sound and the VOM should show the relay changing states. The motion meter should read between 50 and 60 divisions.

    If the Sonalert sounds but the VOM does not show the relay changing states, the relay or the relay transistor driver is faulty, and the processor should be repaired.

Second Processor Test For Zone 1

1. Connect VOM leads to supervision relay. One lead to terminal 2 (common) and the other lead to terminal 3 (NC). Be sure the tamper switch is pulled out completely.

2. Remove jumper between terminals 1 and 2. The VOM should indicate the relay has changed states.

3. Reinstall the jumper.

The relay should now change back to a non-alarm state. If the relay does not change states, the relay or the relay transistor is faulty, and the processor should be repaired.

If the processor is powered by 20 VAC, check the backup battery. In charging mode the backup battery should measure between 13.7 and 14.8 VDC using a VOM.

If all these tests are positive, the circuitry associated with zone 1 in the processor is operating properly. Be sure to disconnect the local supervision jumper (terminals 1 and 2) before reconnecting the sensor cable for normal operation.

Zone 2 Processor Testing

With the 20 VAC or 12 VDC power on:

1. Connect jumper between terminals 15 and 16.

2. Connect motion meter red lead to TP-2.

3. Connect black lead to ground. (The Sonalert function of the motion meter need not be connected at this time.)

4. Turn the zone 2 sensitivity control CW for 100% sensitivity.

The motion meter should read 0 to 15. If the meter reads ≥15 the processor is faulty. However, if the meter reads zero (0), the processor could still be faulty. Make a note of the reading and proceed with the test.

5. Turn zone 2 sensitivity control knob to position 4.

6. Connect Sonalert lead to terminal 14.

7. Turn zone 2 count selector to position 4.

8. Turn zone 2 climb adjust selector to position 3.

9. Connect VOM to terminal 12 (common) and 13 (NC).

10. Connect test cable (model 2389) to the zone 2 input.

11. Tap end button of the test cable 4 times, at intervals of 2 to 3 seconds. After the fourth tap, the Sonalert should sound and the VOM should show the relay changing states. The motion meter should read between 40 and 50 divisions with each button depressed.

    If the Sonalert sounds but the VOM does not show the relay changing states, the relay or the relay transistor driver is faulty, and the processor should be repaired.

12. Make a loop in the sensor cable, insert a screwdriver in the loop, move the screwdriver back and forth, continuously tapping the cable for 2 or 3 seconds. The Sonalert should sound and the VOM should show the relay changing states. The motion meter should read between 40 and 50 divisions.

    If the Sonalert sounds but the VOM does not show the relay changing states, the relay or the relay transistor driver is faulty and the processor should be repaired.

Second Processor Test for Zone 2

1. Connect VOM leads to the supervision relay. One lead to terminal 5 (common) and other lead to terminal 6 (NC). Be sure the tamper switch is pulled out completely.

2. Remove jumper between terminals 15 and 16. The VOM should indicate that relay has changed states.

3. Reinstall jumper.

The relay should change to non-alarm state. If relay does not change states the relay or the relay driver is faulty, and the processor should be repaired.

If all the above tests are positive, the processor is operating properly. To return to normal operation disconnect local supervision jumper (terminals 15 and 16) before reconnecting the sensor cables.

Removing and Replacing Processor PCB

The processor board is designed for easy replacement. To remove the board:

1. Remove primary power. For AC powered models, disconnect at terminals 9 and 10. For DC powered models, disconnect at terminals 7 and 8. If present, remove battery backup at terminals 7 and 8.

2. Remove all other connectors from processor board. The connectors should be labelled so they can be easily reconnected.

3. Remove screws holding the board in the enclosure. Be careful to support the board when it is removed. Do not touch the board components. Some components can be damaged by static discharges upon contact.

4. Extract the board.

To install a different board reverse this procedure.

Testing Other E-Flex II Hardware

1. Disconnect the coaxial cable between the processor and the problem zone. For zones with cables over 400 feet (120 m) use only an analog VOM.

2. Using the VOM, measure cable resistance between center conductor and shield. If zone is several hundred feet long (over 100 meters), it may be necessary to use an analog VOM with a larger test current. One of the following conditions will be found:

   - Cable shorted
   - Cable open
   - Resistance outside of the 1 MΩ ±100 kΩ range.
   - 1 MΩ (±100 k Ω) resistance

If the first three conditions are found, the problem is in the cables or in one of the terminator, splice devices, or gate disconnect.

Because a short or cut (open) is in the line between processor and terminator, visually inspect the terminator and each splice junction. If no faults are visible, replace the terminator and test again. If necessary, replace the splice devices until you get a good VOM reading between center conductor and shield of the cable at the processor.

If there is a terminator or junctions in the line, remove one of the junctions, from the center, and test for a good VOM reading between that point and the terminator. This procedure will help isolate the particular device that has failed.

APPENDIX A
OTHER FENCE FABRIC INSTALLATIONS

Weldmesh Fencing

Weldmesh fencing is frequently used at international sites. At sites where weldmesh fences are used, the E-Flex II installation is generally performed in the same manner as for chain link fencing.

Unlike the loosely-coupled, intertwined, vertical spirals that make up chain link fencing, weldmesh fence fabric runs horizontal and vertical, and is welded at every intersection. Weldmesh also uses a smaller diameter wire than chain link. Weldmesh fencing sections are attached to fence posts, top and bottom rails. The E-Flex II sensor cable is attached to the weldmesh fabric every 12 inches using UV protected tie wraps.

E-Flex II can be used effectively on a weldmesh fence. Proper installation results in a sensitivity setting of 2.2 for alarming on tap (cut-through). The center of a section is about twice as sensitive as it is near a support pole. The top section of fencing is as sensitive as the center. However, the bottom of the section may be less sensitive than the top. An additional pass of the sensor cable along the bottom of the fence is recommended.

Climb-over is physically more difficult on weldmesh because the fabric is flat, and the intrusion (exterior) side has vertical welded wires which would cause the foot of an intruder to slip.

Palisade Fencing

There are many different types of palisade fencing. The effectiveness of E-Flex II installed on palisade fencing will depend entirely on the characteristics of each individual fence. For an evaluation of your specific site please contact Stellar Systems main office for the sales representative in your area.

In general, palisade fencing must be rigidly installed, and without anything attached that the wind could move. The sensor cable should be run along the upper horizontal rail. The cable must be firmly attached by clips which are screwed or riveted to the rail, or attached by tie wrap.

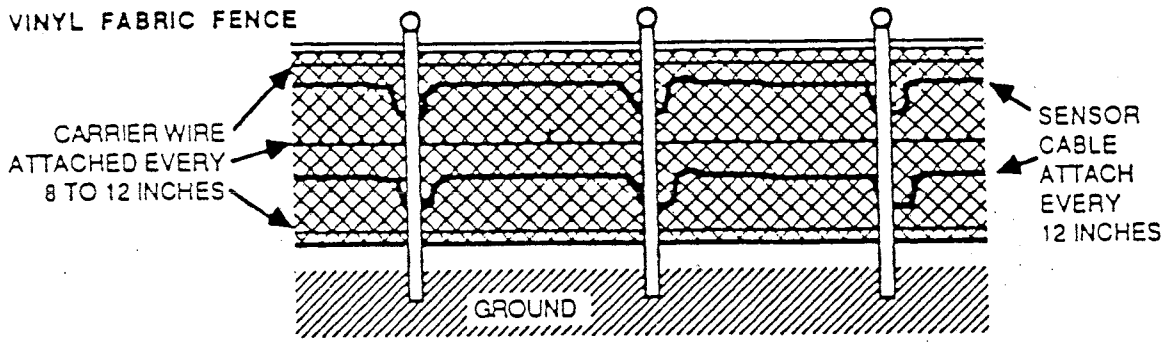
Some types of palisade fencing have a connecting tubular rail through which the sensor cable can run undetected. This protects the cable from the elements, tampering or other damage.

Vinyl Covered Chain Link

The vinyl that covers the chain link or weldmesh fence fabric is a soft material. Therefore, the coupling between the fence fabrics and the sensor cable may be significantly reduced. On standard zone lengths of 300 to 500 feet (100 to 150 m) this can be compensated on a good tight fence by proper calibration at a slight increase in processor sensitivity adjustment.

On fences greater than 7 feet (2 m) in height, or with zone lengths greater than 500 feet (150 m) the overall system sensitivity can be increased by installing a dual pair of sensor cable for each zone, without the need to increase the processor sensitivity adjustment. Refer to the following illustration.

To install E-Flex II on vinyl covered fencing the fence fabric must be stretched tightly, or steel carrier wires should be installed at the top, bottom, and center of the fabric.



Wrought Iron and Other Fencing

For wrought iron, or any other type of fencing that might be included in the security perimeter of your site, please contact Stellar Systems.

APPENDIX B
SK-8 JUNCTION AND TERMINATOR SPLICE ASSEMBLIES

Terminating Cable;

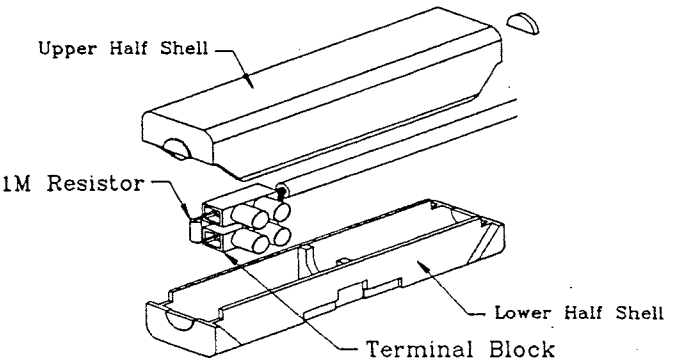
- With wire strippers, strip back the outer insulation of the sensor cable 1.00 inch (26 cm), exposing the braided shield.
- Separate shield from center conductor and insulation. twist shield into a smaller single wire for insertion in to the terminal block.
- Strip back center conductor insulation 0.5 inch (13cm).
- Connect the sensor cable center conductor to one post of the two position terminal block.
- Connect the shield to the adjacent post.
- Connect the Resistor (1Meg) across the opposite terminals.
- Remove the end caps from the cable end of the top half shell.
- Place the terminal block and resistor into the gel cavity of the lower half shell.
- Snap the two half shells together.
- Attach the assembly to the fence, or other secure structure, with a tie wrap.

Materials: (qty: 1 each)

Upper and lower 'gel' shells

Terminal Block

1 meg Resistor



Splicing Cables;

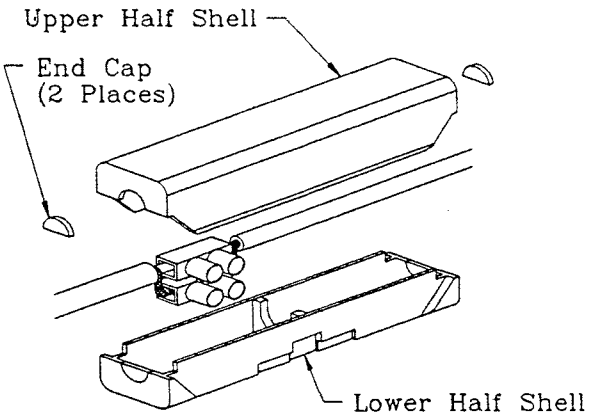
- With wire strippers, strip back the outer insulation of the sensor cable 1.00 inch (26 cm), exposing the braided shield.
- Separate shield from center conductor and insulation. twist shield into a smaller single wire for insertion in to the terminal block.
- Strip back center conductor insulation 0.5 inch (13cm).
- Connect the sensor cable center conductor to one post of the two position terminal block.
- Connect the shield to the adjacent post.
- Connect the other sensor cable, or non-sensitive cable, center conductor to the opposite post.
- Connect the shield to the adjacent post.
- Remove the end caps from both ends of the top half shell.
- Place the terminal block into the gel cavity of the lower half shell.
- Snap the two half shells together.
- Attach the assembly to the fence, or other secure structure, with a tie wrap.

Materials: (qty: 1 each)

Upper and lower 'gel' shells

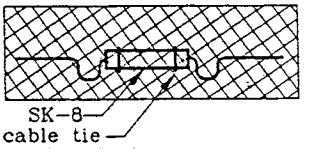
Terminal Block

1 meg Resistor (discard for this application)



Mounting:

Note: The housing must remain dry during the installation process. For severe weather applications a horizontal orientation is sugessted to protect the cable entry points from rain and run off.

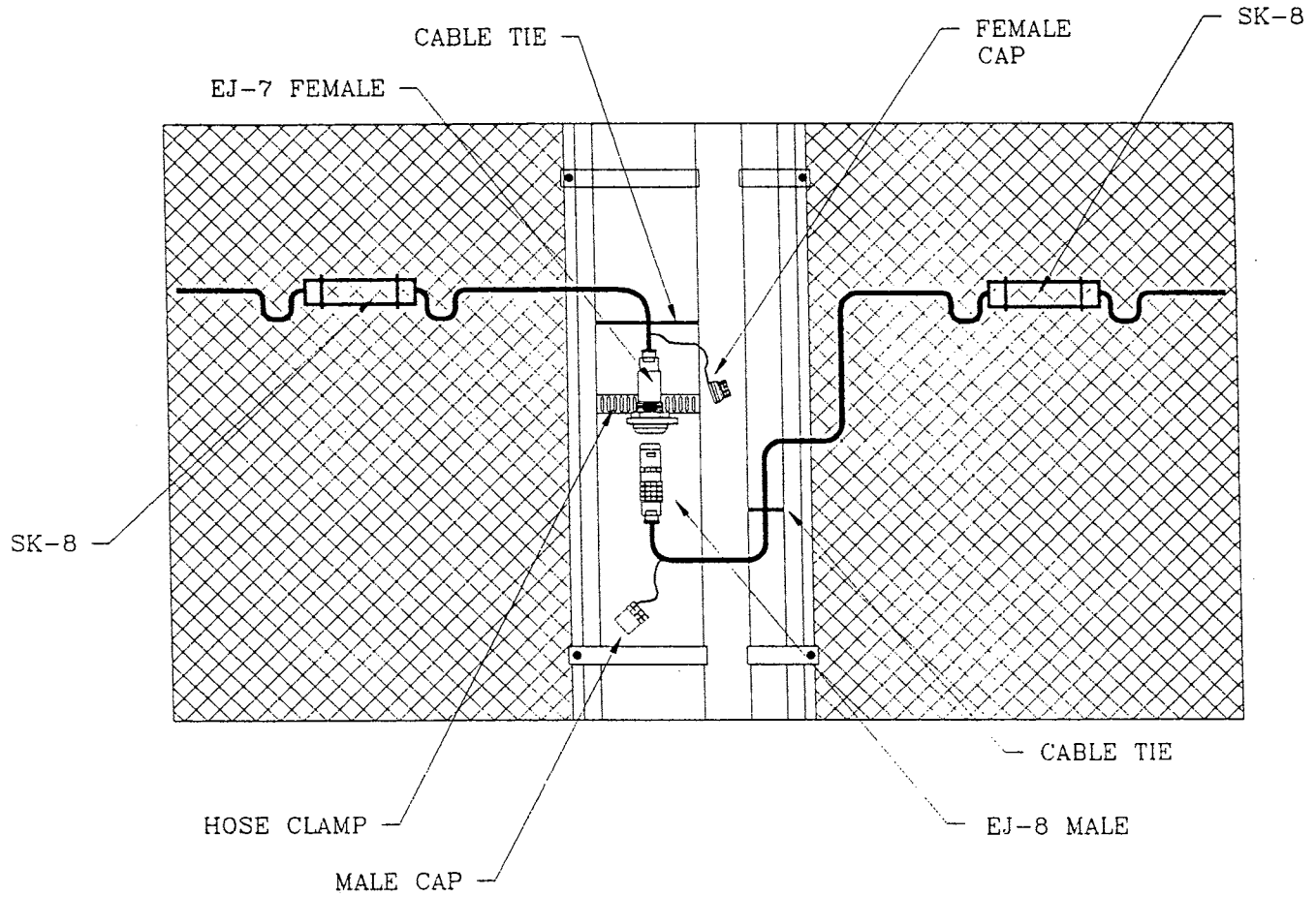


APPENDIX C

EJ-8 GATE CONNECTOR INSTALLATION

LIST OF MATERIALS:

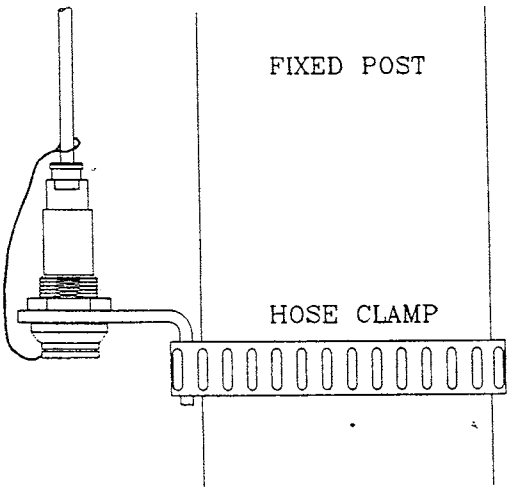
- 1 EACH EJ-8 MALE CONNECTOR WITH NON SENSITIVE FEED CABLE SEGMENT
- 1 EACH EJ-8 FEMALE CONNECTOR WITH NON SENSITIVE FEED CABLE SEGMENT
- 2 EACH SK-8 SPLICE KIT
- 1 EACH MALE CONNECTOR CAP
- 1 EACH FEMALE CONNECTOR CAP



NOTE: When caps are not in use, they fit into one another for storage, and to protect from excess movement. The connectors should be capped when the gate is to remain open for extended periods.

INSTALLATION INSTRUCTIONS:

- Place the male cap stay wire over the open end of the non-sensitive cable on the male connector, put the cap in place, (on the connector) during installation to ensure proper placement.
  Follow the same procedure for the female connector.
- Wrap a hose clamp (customer supplied) around the fixed post on on the opening side of the fence on which the EJ-8 will be mounted.
  Before tightening the clamp, postion the L-shaped bracket under the clamp against the post (see figure at right). Tighten the hose clamp until the entire assembly is firmly attached to the post.
- Dress the non-sensitive cables to the SK-8 Splice kits with cable ties as shown above.



NEMA-4 Installation

Refer to Figure D-1 when performing the following procedure:

1. Mount the processor board to the fab baseplate (PN 12579) using the following hardware:

7	Screws, PHP 4-40 x 5/16"	PN 47001-0405
7	Screws, PHP 4-40 x 1/2"	PN 47001-0408
4	Washers, Lock Ext Tooth 4	PN 47006-04
7	Washers, Lock Split Ring 4	PN47011-04
7	Spacers, Hex 4-40 x 1/2"	PN47016-0408

2. Before installing the subassembly in the enclosure, remove existing tamper switch from the PCB assembly and discard.

3. Install baseplate assembly in NEMA-4 enclosure with the four mounting screws provided with the enclosure.

4. Fit the 19" tamper switch cable (PN 00603) in mounting bracket located on the side of enclosure.

5. Plug tamper switch in processor board at same spot where the first tamper switch was removed (black to point A, blue to point B).

6. Test supervision relay with VOM while pushing the tamper switch.

7. Close the unit.

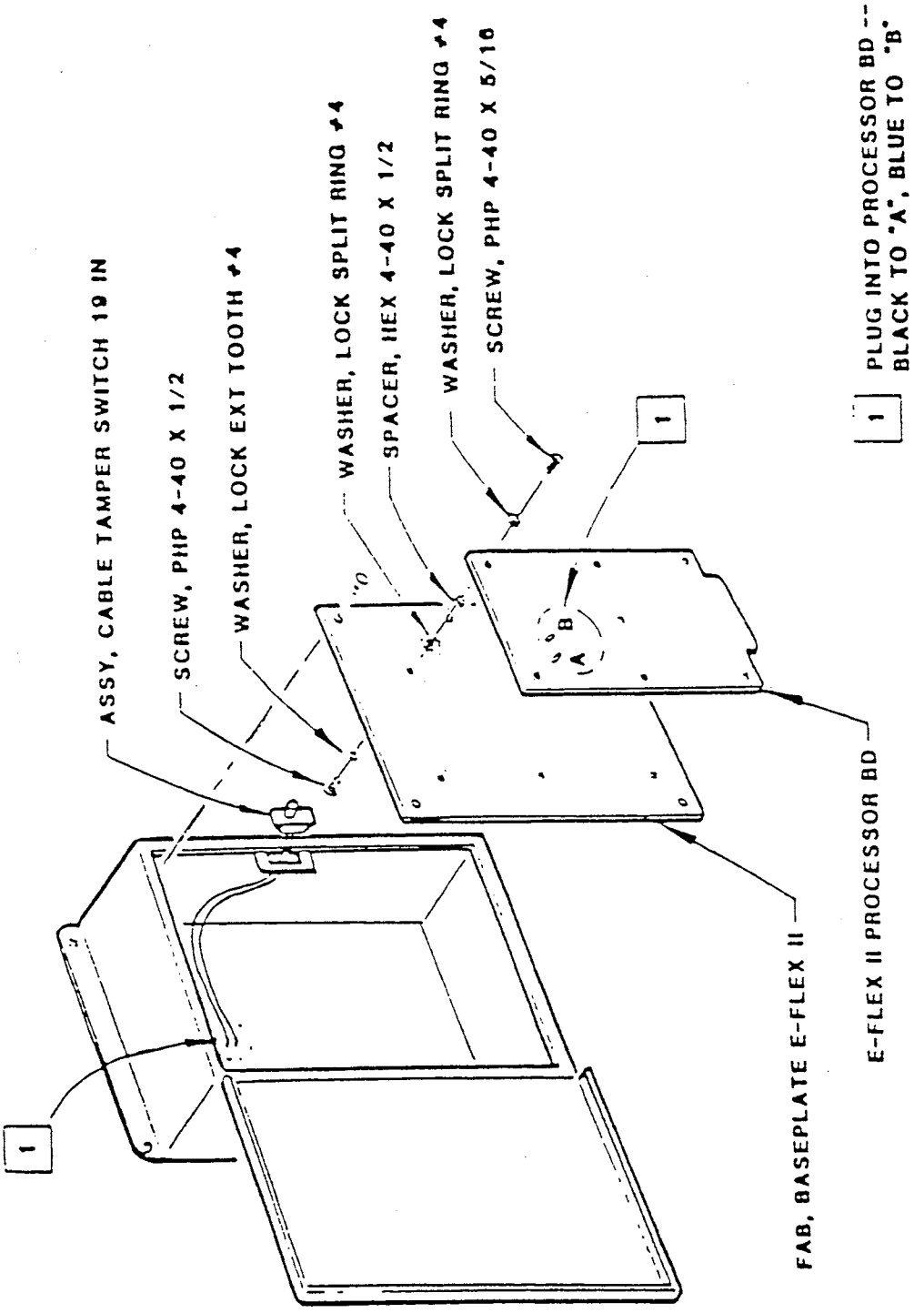


Figure D-1. NEMA-4 Enclosure

EST-6A Installation

To install the EST-7 Assembly:

1. Mount the 2 hose clamps loosely on the fence post.
2. Insert mounting base of terminator under the hose clamps.
3. Tighten hose clamps to secure the mounting base.
4. Mount remainder of assembly on base with screws provided.
5. Connect sensor cable center conductor to terminal 1 and connect sensor shield to terminal 2.
6. Connect ground lead to terminal 3 and connect +12 VDC lead to terminal 4.
7. Attach the front cover.

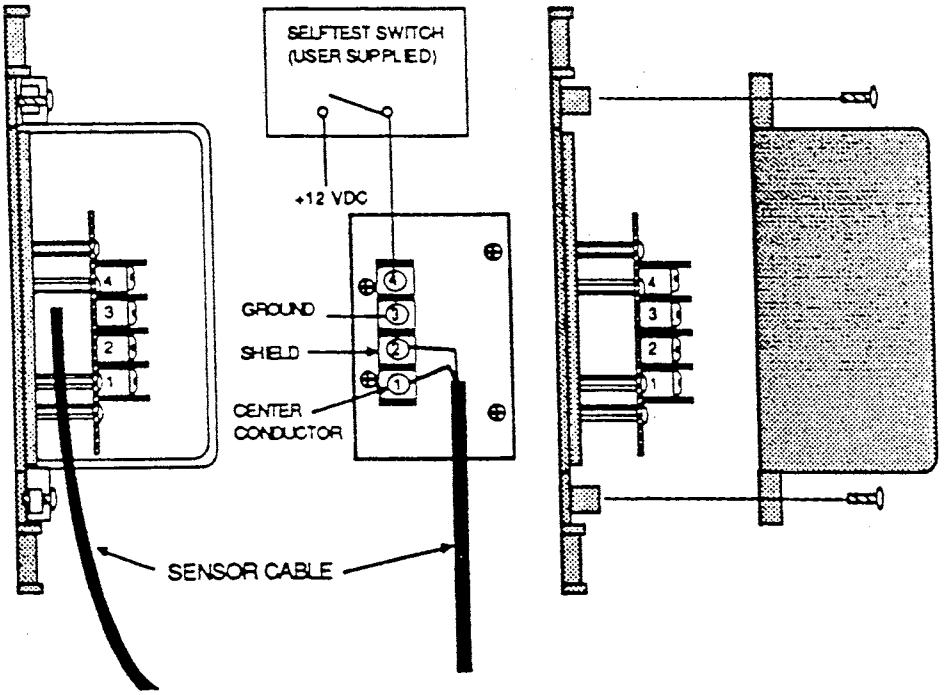


Figure E-1. EST-6A Self-Test Terminator

APPENDIX F
E-FLEX II GATE BYPASS MODULE

Description

The E-Flex II Gate Bypass module (model 2390) is used to bypass a protected gate without triggering an intrusion alarm when the gate is accessed. It can be ordered for manual or remote operation. The unit operates in secure and access mode. With unit in secure mode an alarm triggers each time the gate is used. In access mode no alarm is triggered when the gate is used.

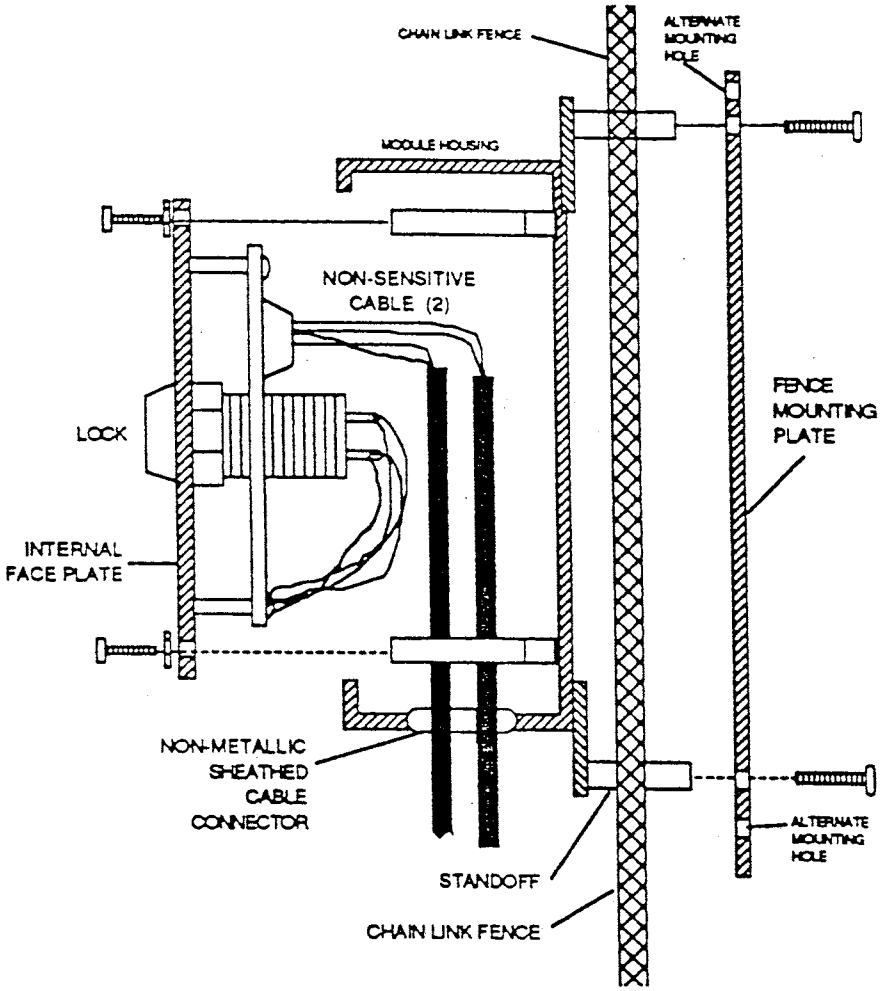


Figure F-1. Local Gate Bypass Module

Specifications

Operational	No alarm generated when switching to access or secure modes.
Electrical	
Switch	MEDECO high security; DPDT; 28 VDC, 7 amps.
Terminal board	Two (2) to four (4) terminals each.
Terminating resistor	Internal 1 megohm. Can be used to terminate the sensor cable.
Tamper switch	Double pole, single throw (DPST) microswitch.
Mechanical	
Housing	Aluminum bell housing with threaded inlet; stainless steel faceplate
Lock cover	Hinged
Lock	MEDECO U.L. listed, high security.
Environmental	
Cover plates	ASTM salt spray test - 300 hours.
Temperature	-40 to +66 degrees C.

Materials

The gate bypass installation requires essentially the same materials as the standard E-Flex II.

1. Conduit (PVC) must be provided across the gate opening (below ground) for the non-sensitive feed cable. It should start at one side of the gate and extend to the other side of the gate. The conduit must be buried at least 12 inches (30 cm) deep and be water-tight. Both ends of the conduit must extend above the ground and be capped with weather-tight heads.

2. One (1) bypass unit and one (1) junction box is required for each gate.

3. The length of the non-sensitive feed cable used to bypass the gate sections must be added to the total length of cable used in the zone.

Installation Instructions

1. Mount module housing. Refer to Figure F-1.
2. Route cable through bottom of housing, leave an extra ± 8 to 10 inches (20-25 m) of cable at front of housing.
3. Dress back center conductor and shields of the cable in the same manner as the terminator/splice kits. Refer to Appendix B.
4. Attach cable to terminals TB-1 and TB-2 in accordance with wiring instructions for the respective applications.
5. Install internal face plate with 2 screws provided. Refer to Figure F-1.
6. Install the waterproof flip-top cover with 2 screws provided. Refer to Figure F-1.
7. Insert key and test system for access and secure operation by turning the key to the desired position.

Types of Installation

Use non-sensitive feed cable for all the underground bypass installations. The cables are run through PVC conduit and the conduit needs to be buried 18 inches deep. The ends of the conduit must extend above the ground and be capped with weather-tight fittings.

Sliding Gate

When the gate bypass module is used with a sliding gate it must also be mounted 5 to 10 feet from the gate to prevent alarms being generated by the activity of the gate. The underground PVC conduit, through which the sensor cable runs, should be 12 inches deep.

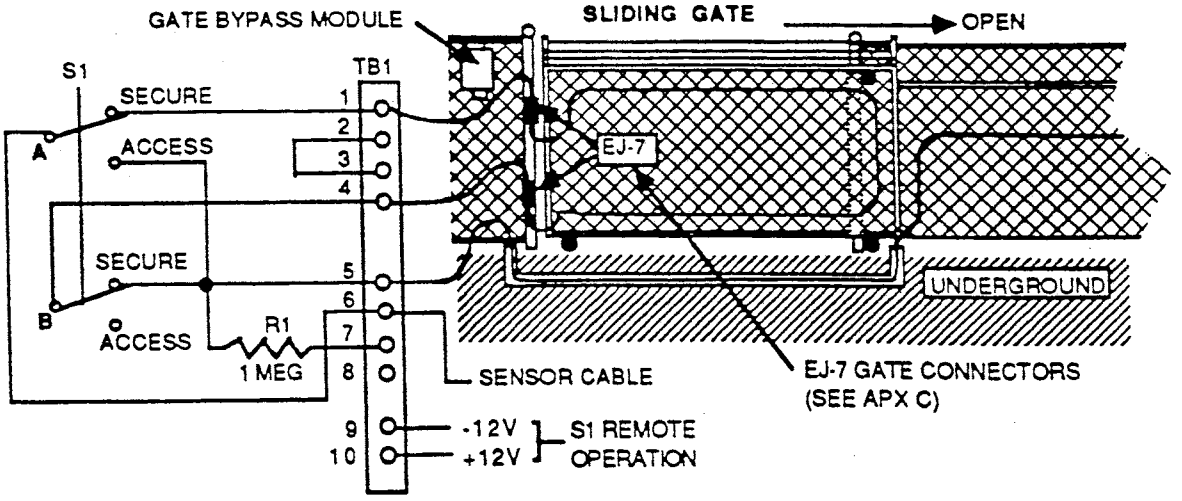


Figure F-2. Sliding Gate

Double Swinging Gate

When used to shunt a double swinging gate, the gate bypass module should be mounted 5 to 10 feet from the gates to prevent gate activity from generating alarms.

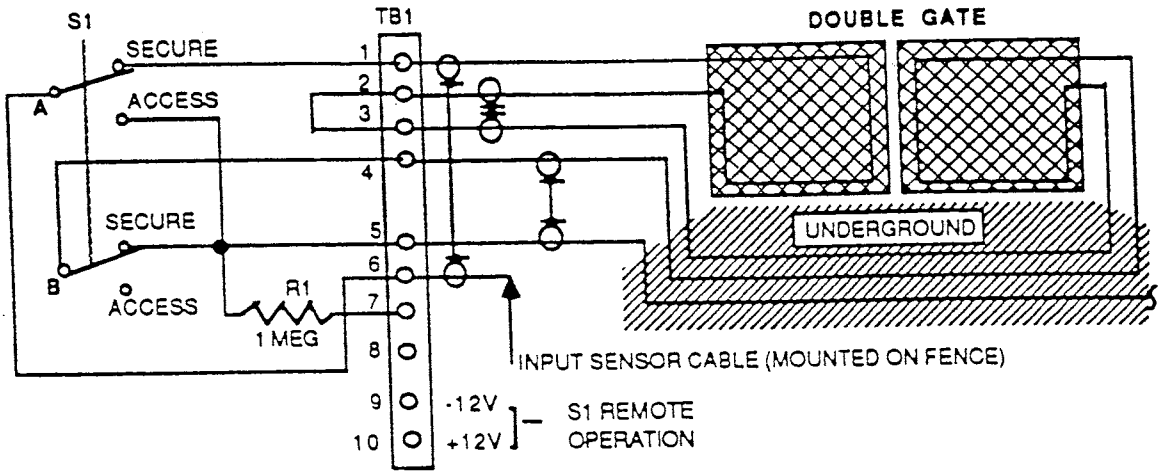


Figure F-3. Double Swinging Gate

Sensor Cable Shunt Out

The gate bypass module can be installed anywhere along a sensor cable. Alarms will not be received that originate past the bypass installation point.

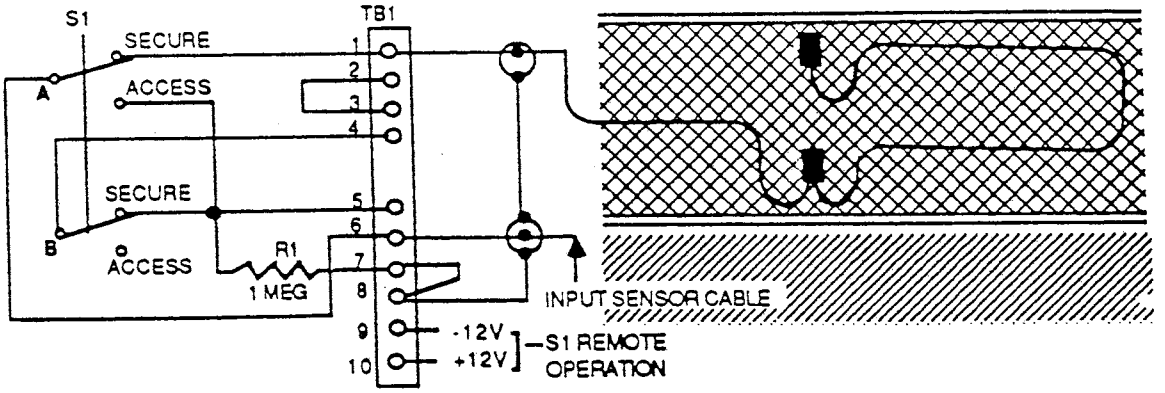


Figure F-4. Sensor Cable Shunt

Single Swinging Gate

Used to allow access through a single swinging gate. The gate bypass module should be mounted 5 to 10 feet from the gate to prevent the action of the gate generating alarms.

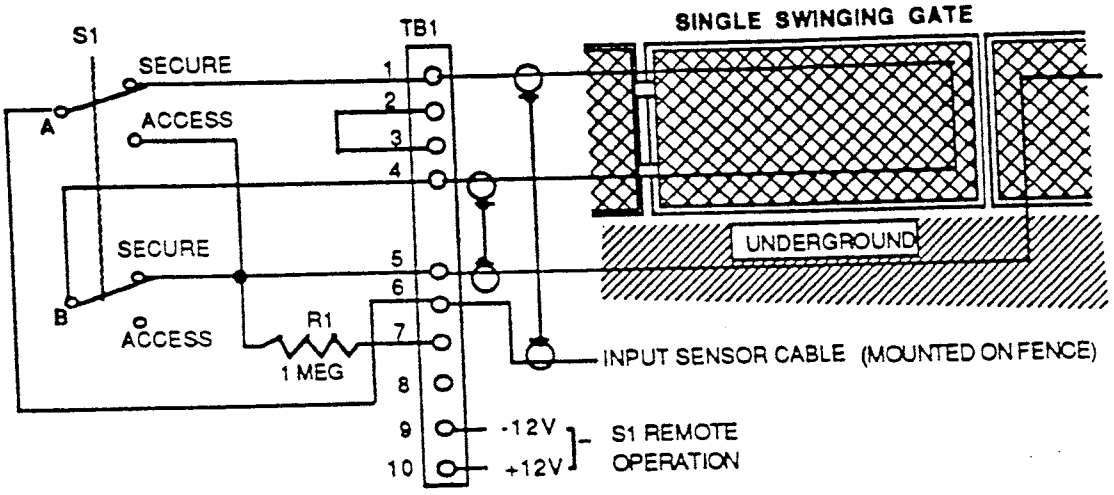


Figure F-5. Single Swinging Gate

Addendum

E-Flex Local Gate ByPass

Model 2490-1

Table of Contents

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Operation 1
Interface 2
  Swinging Gate - Single Panel 3
  Swinging Gate - Double Panel 4
  Sliding Gate 5
  Termination of Zone 6

Introduction

The Stellar Security Products E-Flex Gate ByPass unit has been upgraded to support the operation of the complete system with multiplexed annunciator equipment such as the MCM-1000.

The following features are incorporated;

1. Status terminals to indicate to the annunciation system the state of the bypass unit, (ByPassed, Secure).
2. Tamper terminals to protect the housing.

Operation

When the key is in the access position;

1. The sensor cable is shunted around the gate or terminated at the gate, depending on the particular configuration.
2. The status contacts close giving a signal to an annunciation device.

If the faceplate assembly is removed from the ByPass Housing, a tamper switch will open, supporting an indication, when wired appropriately, to an annunciation device.

Interface

The terminal block is a 11 position, stripped bare wire, screw clamp, style device which does not require crimp lugs or special hardware connections.

The connections to the annunciation device are consistent regardless of ByPass configuration on the gate or fence. These connections are;

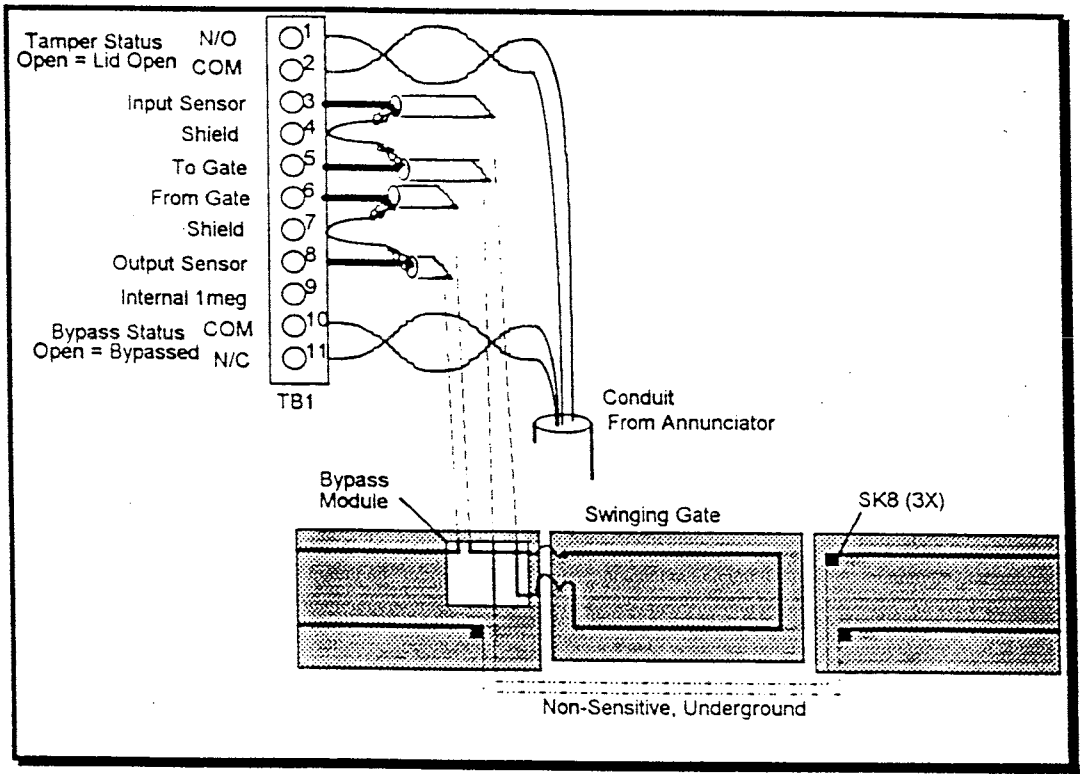
Pin 1	Tamper Status - N/O (Closed when Faceplate assembly is in Place)
Pin 2	Tamper Status - Common
Pin 10	ByPass Status - Common
Pin 11	ByPass Status - N/C

These connections are typically fed through conduit, off the fence, underground, to the transponder housing for interface to the annunciator, or to the local key box mounted for convenient access from vehicles, or the walkway.

Swinging Gate - Single Panel

For operation in conjunction with a Swinging gate, install the ByPass Module to the gate coax cables as follows;

Pin 6	Center conductor of Return from Gate or ByPassed section.
Pin 8	Center conductor to continuing section of sensor.
Pin 7	Tie point for coax shield.
Pin 5	Center conductor of Cable to the Gate or ByPassed section.
Pin 3	Center conductor from prior section of the zone.
Pin 4	Tie point for coax shield.

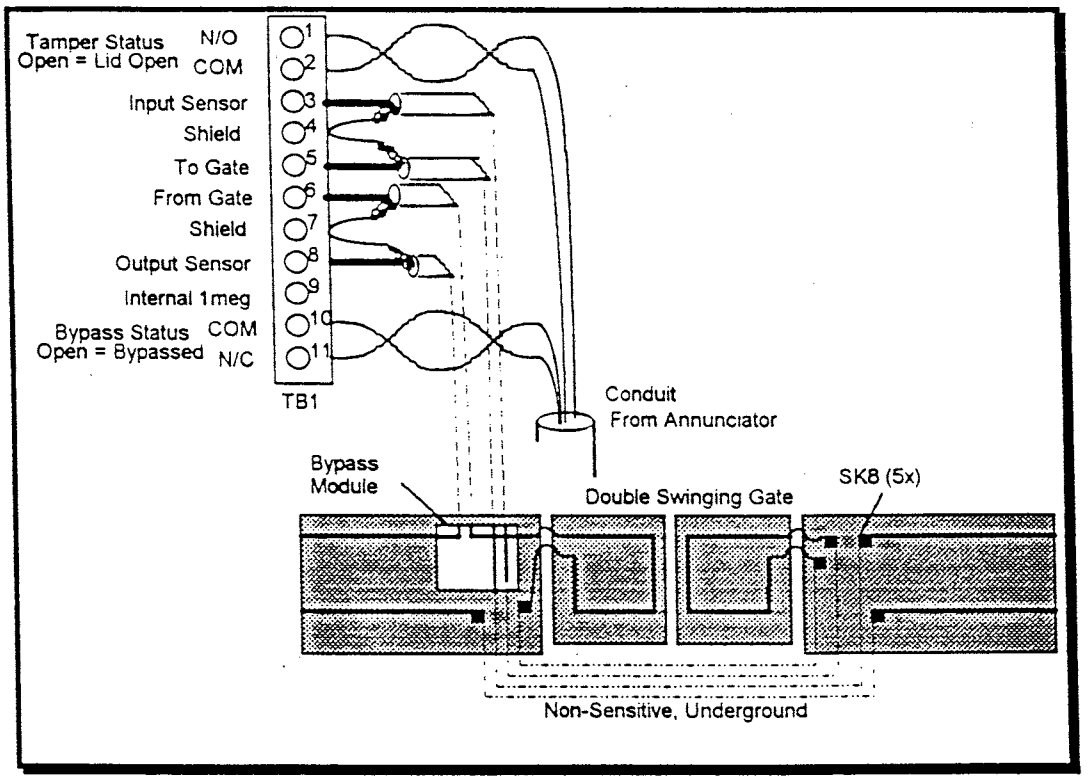


Swinging Gate - Double Panel

For operation in conjunction with a Double Swinging gate, install the ByPass Module to the gate coax cables as follows;

Pin 6	Center conductor of Return from Second Gate Section.
Pin 8	Center conductor to continuing section of sensor beyond the gate.
Pin 7	Tie point for coax shield.
Pin 5	Center conductor of Cable to the First Gate Section.
Pin 4	Center conductor from prior section of the zone.
Pin 3	Tie point for coax shield.

The return from the First Gate Section must be spliced with an SKJ-7 to non-sensitive cable which is fed underground to another SKJ-7 splicing it to the sensitive cable on the Second Gate Section. The return from the Second Gate Section is spliced with an SKJ-7 to non-sensitive cable which is fed underground, back to the ByPass module for connection to pin 6.



Sliding Gate

For operation with a Sliding gate, the connections are the same as with a single swinging gate. The EJ-7 gate connectors are additional components, however, which support opening the sliding gate. See appendix C of the E-Flex manual.