SECTION 16900

CONTROLS AND DETECTION FOR ELECTRIFIED FENCE SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Programmable Logic Controller Equipment:
      a. Central processing unit.
      b. Software.
      c. Input and output models.
      d. Communications.
      e. Communications data cable.
   2. Central Control Monitoring Equipment:
      a. Computer system.
      b. Support software.
      c. Process monitoring and control software.
      d. Graphic display panel at central control station.
      e. Graphic display panels at sally port tower stations.
      f. Graphic display for patrol vehicles.

B. Related Sections:
   1. Section 01430 - Electrified Fence Mock-Ups.
   2. Section 01431 - Electrified Fence Extra and Operational Materials.
   3. Section 02836 - Electrified Fence.
   4. Section 05051 - Tamper-Proof Metal Fasteners.
   5. Section 16123 - Conductors -(600V and Below).
   6. Section 16161 - Cabinets and Enclosures for Electrified Fence System.
   7. Section 16902 - Electronic Controls and Relays.
   8. Section 16942 - Electrified Fence Field Testing.

1.2 REFERENCES

A. ANSI C37.90a - American National Standards - Surge withstand Capability (SWC) Test.

B. CEC - 2007 California Electrical Code.

C. FCC - Federal Communications Commission.

1.3 SYSTEM DESCRIPTION

A. General: The system shall perform the following general functions:
   1. Controls: Allow the fence system to be energized when the proper preconditions have been met.
   2. Detection: Measure system performance. Report system status, including alarms, through a communication system. Maintain and report system history.
   3. System status: Display on graphic panel system status and alarms.

4. Annunciate alarms: By means of a radio system, verbally annunciate system alarms.

B. Major Components: In order to meet the general performance requirements, the system shall consist of the following major components:
   1. Programmable logic controllers: Located in equipment room in Central Services Building and control cabinets.
   2. PLC I/O Modules: Located in tower graphic panels.
   3. Data acquisition system: Wire line based.
   4. Computer system: Located in equipment room in Central Services Building. Includes CPU, memory, terminals, printers and other components including software.
   5. Graphic displays: Located in Central Services Building, each tower, and in each patrol vehicle.
   6. Radio annunciation system: Digital-to-voice converter, transmitter and antenna located at Central Services Building and portable receivers.

C. Specific Performance Requirements
   1. Utilize PLC's for the fault detection circuit remote setpoint controls.
   2. General Central Control Monitoring System Requirements:
      a. Data acquisition between cabinet, panels and Central Control per drawings.
      b. Historical reports.
      c. Display of alarms and status on graphic display panel.
      d. Voice annunciation at portable receivers.
   3. Provide a microprocessor-based date acquisition system which has the capability of multiplexing the data from cabinet to cabinet as shown on the PLC interconnection diagram in the drawings.
      a. Data acquisition shall be via PLCs at Central Control and at individual cabinets connected with a data network. The selected system must meet the following requirements:
         1) Maximum time from change of input status to change of output status at other cabinets: 1 second.
         2) Maximum time from change of input status to change of alarm/status at graphic display panel: Three seconds.
   4. Hardware requirements for interface of graphic display panel and voice annunciation system to data acquisition system may be hard wired, via RS 232 communication ports or via the PLC data highway using remote I/O modules. Type of interface will affect hardware requirements of graphic panel and voice annunciation system. Provide hardware to make systems compatible and comply with the requirements herein.
   5. Fault detection circuit alarms from the control cabinets and high temperature alarms in all cabinets must be manually reset at the individual cabinets. All other alarms and status are automatically reset at the individual cabinets. All alarms seal in and require manual reset at each graphic display and guard tower annunciator panels.
   6. A zone or communication failure alarm shall not be generated upon loss of power to control cabinets for one second (adjustable zero

to five seconds) or less to prevent spurious alarms during electrified fence or site engine-generator exercising.

1.4 SUBMITTALS

A. Submit under provision of Division 1.

B. Provide a multi-phase submittal as follows:
   1. Phase 1:
      a. Submit catalog sheets on all components. The sheets shall clearly indicate the model and specifications that will be used in this installation.
      b. This submittal should include any design changes that the Contractor and/or manufacturers feel are necessary to meet the performance criteria stated in this Specification. CDCR reserves the right to accept or reject such recommendations, and the Contractor will be held to the performance requirements in either case.
      c. Submit an engineered block diagram schematic which shows the interface of all components and subsystems. The diagram shall indicate the quantity of each component required (not including spares). The block diagram may illustrate certain components such as control cabinets by one figure labeled "typical".
      d. The purpose of this submittal is to ensure that the Contractor, Manufacturers and CDCR have a common understanding of the components, subsystems, and appropriate interfaces.
   2. Phase 2: Submit an engineering manual and a set of drawings consisting of the following information:
      a. Schematics of the total system including all cabling and wiring. Block diagrams will suffice for items that are readily available to the public, such as the PC computer, monitor, etc.
      b. Furnish detailed construction drawings, including mounting and connection techniques for the various components. Copies of construction details from the contract documents may be used and duplicated as appropriate.
      c. Information by the individual equipment specification sections.
      d. A chapter of the manual shall be devoted to the monitoring and control software. Software programs to be used shall be described, and the specific capabilities for data manipulation and retrieval shall be fully delineated.
      e. Details and shop drawings on graphic display panels, including dimensions, materials, colors, enclosures, and support features.
      f. Develop comparable detail for other subsystems in document.
      g. Complete ladder logic programming for each PLC. Documentation shall be provided cross-referencing each coil and contact locations within the program. The function of each coil shall be identified.
      h. Shop and fabrication drawings of the graphic panel.
      i. Printout of sample reports.

C. Operation and Maintenance Data:
   1. Submit operation data under provisions of Division 1.
   2. Include installation, operating, and maintenance instructions for each PLC component.
   3. Submit maintenance data under provisions of Division 1.
   4. Include recommended preventative maintenance procedures and materials.

D. Test Reports: Provide in accordance with Section 16161.

E. Training Material:
   1. Submit CDCR Personnel training manuals and overhead slides, video or slides proposed for training sessions 14 days prior to first session.

F. Software Programs and Licenses:
   1. Submit printed copy of PLC programming, including cross-references and annotation notes.
   2. Submit all PLC and personal computer software program discs, including third-party software, licensed to the CDCR.

1.5 QUALITY ASSURANCE

A. Manufacturers: Companies specializing in manufacturing the products (or similar products) in this section and related sections with minimum three years documented experience.

B. Access: CDCR Representative may elect to visit manufacturers'/ suppliers' facilities prior to or at anytime during fabrication of equipment. Manufacturers/suppliers shall grant access to their facility for the CDCR Representative visits.

C. Manufacturer of the cabinets and panels shall be the same company that develops the shop drawings, PLC programming and monitoring and control software computer program.

1.6 MOCK-UP

A. Equipment:
   1. PLC: Furnish 1.
   2. Programming Terminal: Furnish 1. For making programming changes and observing alarm conditions.
   3. Other equipment and material as required to perform the tests described in Section 16161.

B. Support:
   1. Provide support required for the testing in Section 16161. This shall include having the author of the PLC software program present. On-site programming changes shall be made as required to test, experiment, and optimize the fault detection system.

1.7 OPERATIONAL MATERIALS

A. Deliver operational materials as specified in Section 01431.

1.8 EXTRA MATERIALS

A. Submit extra materials as specified in Section 01431.

PART 2 PRODUCTS

2.1 PLC SYSTEM

A. Manufacturers:
   1. Allen Bradley SLC 500 series to be compatible with existing CDCR electrified fence installations.

B. Central Processing Unit:
   1. System Memory:
      a. CMOS technology with battery backup.
      b. Long-life lithium batteries to maintain memory configuration for one year in case of power outage.
      c. Executive memory in non-volatile, read-only memory (EPROM).
      d. User logic, configuration data and system status data in Random Access Memory (RAM) with battery backup.
      e. 12K words program memory and 4k words additional data storage.
      f. 4K of logic memory.
   2. Capacity of 960 input or output points, any combination of analog or digital.
   3. Scan time 1 MS/K user memory or less.
   4. Keyswitch to prevent unauthorized alteration of the user program.
   5. Ambient temperature of 0°C to 60°C and a humidity of 5% to 95% noncondensing.

C. Software:
   1. Software shall be provided to program the PLC using a simple intuitive graphic approach, such as ladder logic.
   2. Instruction Set:
      a. Normal and latching relay coils. Up and down counters.
      b. Normally open and normally closed contacts.
      c. 1.0-, 0.1-, and 0.01-second timers.
      d. Add, subtract, multiply and divide 4 digit, double precision and floating point numbers. Perform square root, log, natural log and exponential functions on floating point numbers.
      e. Sine and cosine trigonometric functions.
      f. Floating point to integer, integer to floating point and change sign math conversion.
      g. Greater than, less than, equal and not equal comparisons of floating point numbers.
      h. Move integer or floating point number from one memory location to another.
      i. Bit modify, Bit sense and Bit rotate functions.

D. Remote I/O Modules:

1. Addressing: Remote I/O modules supports all addressing modes.
2. Remote I/O Scanner Module: Mount the remote I/O scanner module in the PLC processor rack. Communications between the scanner and remote I/O processor modules shall be independent of the PLC processor scan.
3. Remote I/O Interface Module: The interface module communicates with the remote I/O scanner mounted in the PLC processor rack. Transmitted information includes digital and analog input and output storage registers, loss of communications and I/O failure. Mount the interface module in a rack assembly with the input/output modules at the local control panel.

E. Input/Output (I/O) Modules:
   1. Removable field wiring terminal blocks.
   2. Surge protection per ANSI C37.90a. Provide protection at PLC or at field terminals.
   3. Status LEDs for discrete input and output points.
   4. Discrete output modules:
      a. 24-volt d-c or isolated 120-volt a-c.
      b. 2 amp maximum output current.
         1) 10 ms maximum response time.
         2) 3 mA leakage current, maximum.
   5. Discrete input modules:
      a. 24-volt d-c or isolated 120-volt a-c.
      b. 50 ms maximum response time.
   6. Analog input modules:
      a. 4 to 20 mA from 2- or 4-wire transmitters.
      b. 12 bit resolution.
      c. ±0.1% accuracy of full scale.
      d. ±0.02% linearity of full scale.
   7. Analog output modules:
      a. 4 to 20 mA from 2- or 4-wire transmitters.
      b. 11 bit resolution.
      c. ±0.6% accuracy of full scale.
   8. All spare inputs and outputs shall be identified and terminated at the field terminal strip.

F. Communications:
   1. Provide communications capabilities between PLCs and remote I/O modules for data acquisition between cabinets.
   2. Network Capabilities:
      a. 31,250 band, minimum.
      b. Transmission distance: 10,000 feet minimum.
      c. Connection of up to 16 physical devices.
      d. CRC error checking.

G. Communications Data Cable: Refer to Section 16123.

H. Surge Protection: Provide surge protection devices compatible with the PLC network and UL-497B listed protection for data communication circuits. Leviton Cat. No. 3803-DHP or equal. Provide one device for each data cable termination at each PLC and remote I/O.

2.2 COMPUTER SYSTEM

A. General:

1. The central computer shall receive digital and analog information from the central control PLC, generate alarm and status information on the monitor and printer, generate historical reports, and interface with the voice annunciation system and graphic panel.
2. The central computer shall automatically start up and the software shall automatically load and run when the power to the computer is turned on, both initially and after power outages. A false alarm shall not be generated after a power outage at central control.
3. A zone or communication failure alarm shall not be generated upon loss of power to control cabinets for one second or less to prevent spurious alarms during electrified fence or site engine-generator exercising.

B. Hardware:

1. Computer:
   a. IBM compatible 19-inch rack mounted 2.66-GHz or higher processor.
   b. 80-GB or larger hard drive unit with an average access time of 9.5 ms.
   c. 16X DVD drive.
   d. 2-GB DDR2 RAM.
   e. Detachable tactile keyboard.
   f. Mouse.
   g. Internal battery backup calendar clock.
   h. Two serial ports.
   i. One parallel printer port.
   j. Two universal serial bus (USB) ports.
   k. Minimum 2-GB USB port flash drive with software.
   l. Provide 19-inch rack mount supports for computer and keyboard. Industrial Computer Source 6200-UMR and 6531-KBD, APW Enclosure Products, or equal.
   m. Integrated video card.
   n. Five expansion card slots.
   o. Three-year manufacturer's warranty.
2. Color Monitor:
   a. 17- or 19-inch minimum size rack-mounted color flat monitor.
   b. Variable vertical angle positioning.
   c. 1280 x 1040 screen pixel resolution.
3. Printer:
   a. Laser type printer with 32 MB of memory.
   b. Printer shall be provided with a printer driver which is compatible with all of the software provided.
   c. Print speed shall be a minimum of 30 pages per minute.
   d. Resolution shall be 1200 by 1200 dpi minimum.
   e. Printer shall have a paper tray with a capacity of 350 sheets of standard letter size paper.
   f. The printer shall be provided with a parallel and serial port for communications with the computer.

g. Provide a pull-out rack for the printer in the central control cabinet.
h. Provide HP LaserJet 2420 series, Xerox, Okidata, or equal.

C. Monitoring and Control Software:
1. Support Software:
a. Operating System: Microsoft Windows, Version 2000 workstation or newer.
b. Report Generation Package: Microsoft Access, Visual Basic, or equal.
c. Troubleshooting flow chart screens, which are to include fence wires that are in alarm and logic flow diagrams on troubleshooting common problems. Refer to sample screens following this section.
2. Communications:
a. Direct read and write of all accessible PLC registers and bits.
b. Full support of PLC protocol with the ability to perform as the master on a network of PLCs.
c. Alarm logging of PLC communications failures.
3. Historical Logging:
a. Change of state for discrete values.
b. Ambient averaged current for each fault detection circuit.
4. Alarm Logging:
a. Change of state for discrete values.
b. Alarm, acknowledged, unacknowledged and return to normal messages. Date, time, point name, value and state recorded on CRT and hard disk.
c. When a system off signal is received from the interlock panel, alarm logging for zone alarms shall be disabled. When the fence is returned to service the alarm logging shall automatically be enabled. Tamper and temperature alarms shall not be disabled.
5. Security Entry:
a. Minimum two-level security entry using a minimum six-digit alphanumerical code.
b. Level 1: Allows operator to view all graphic screens but does not allow any changes to set points.
c. Level 2: Allows the operator to modify set points and send values to remote PLCs.
6. Reports:
a. Generate the following reports:
1) Alarm history with type, zone, and time. Listed chronologically or by specific zone.
2) Access history with date and time.
b. Provide report format consistent with existing CDCR prisons. CDCR will provide latest format (SCC-Level III facility) upon written request from Contractor.
c. Provide PC screens the same as shown on the sheets following this section. Site adapt screens to meet this facility's configuration (i.e., number of zones, number of interlock panels, remote PLCs, etc.).
7. CRT Display:

a. All alarms and status information shall be displayed on the CRT.

8. Manufacturers:
   a. WINtelligent VIEW.
   b. Intellution FIXX DMACS.
   c. Intouch Wonderware.

2.3 CENTRAL CONTROL GRAPHIC DISPLAY PANEL

A. Graphic Display:
   1. Manufacturers:
      a. Empact WM Series.
      b. WSA Annunciators FAA Series
      c. Or equal.
   2. Composed of a Lexan clear film to which the graphic image is applied and a 1/8-inch aluminum sub-panel to which the graphic film is permanently bonded. Produce the graphic image by using a multi-step reverse silkscreen process applied to the back of the Lexan film. Legends shall be photographically produced using approved font.
   3. Mount graphic display assembly into an anodized aluminum trim frame creating a finished door.
   4. Mount the graphic display door to a back box that is hinged on the right and locked on the left. Provide mounting brackets to support back box from steel columns between windows.
   5. Lexan shall be textured and non-glare, non-yellowing, durable and scratch-resistant.
   6. Provide a black non-glare background. Site outline and text shall be white.

B. LEDs:
   1. Manufacturer:
      a. Hewlett Packard HLMP.
   2. Super bright, wide viewing angle LEDs.
   3. Position behind the graphic Lexan film and mount on printed circuit board socket. Provide bevel on graphic display for wide viewing angle of LED. Bevel cut shall be the same color as the background.
   4. The illumination from indicators must be clearly visible from an angle up to 45 degrees in front of the panel with 100 foot-candles of general room illumination.
   5. Provide terminals for field wiring within back box.

C. Interconnection:
   1. Wiring to the front panel LEDs shall be provided with quick disconnect cables.
   2. Provide terminals for field wiring within back box.

D. Lamp test circuit controlled by a remote push button.

E. Lamp trouble circuit to detect an LED failure. Light the "Lamp Trouble" LED if any LED on panel has failed.

F. Legend LEDs shall flash or be on steady when any of the associated alarms flash or are on steady, respectively. They shall be off otherwise.

G. Provide two alarm horns, each with field selectable sounds; one for the zone alarms and one for all other alarms. Each horn shall emit a unique sound. The electrified fence zone alarms shall sound distinctively different than the alarm sounds generated by other systems in the control room. Selection of horn tones to be determined by CDCR Representative.

H. Circuitry to respond from remote alarm acknowledge and alarm reset push buttons. Provide the alarm reset and silence features through circuitry in the graphic panel or through PLC programming. When the alarm silence push button is pressed, the audible alarm horns shall be silenced until an additional alarm is received. The alarm reset push button shall turn off the alarm lights on the graphic panel if the alarm condition has cleared. The alarm reset and silence push button actions shall be input into the PLC and recorded at the central computer for historical retrieval.

I. The graphic display panel shall indicate failure of communications from the graphic display panel to the central computer or any PLC communications link by flashing the "Communication Failure" LED. Pressing alarm acknowledge push button shall cause the LED to remain on steady. The communications failure LED shall turn off automatically without pressing the reset push button as soon as the communication failure has been cleared.

J. Input Power: D-C voltage from power supply in central control cabinet.

K. Hardwire or provide remote I/O to activate LEDs or horn and to monitor push button controls within the graphic panel.

L. The "PLC fault" LED shall flash and an alarm horn shall be activated if the PLC fails. After pressing "alarm acknowledge" push button, the horn shall silence and the LED shall remain on steady. After failure has been corrected, pressing "alarm reset" push button shall restore the panel to normal. Note that separate relays and timers are required in the graphic panel to accomplish this function.

2.4 SALLY PORT TOWER GRAPHIC PANELS

A. Graphic Display:
   1. Provide aluminum frame with metal or plexiglass face with etched lines and lettering. Alternatively, provide panel construction per central control graphic display panel.
   2. Displays shall be edgelit or backlit.
   3. Provide black matte finish for background and white text and lines.

B. Relays, Push Buttons, and Indicators: Refer to Section 16902.

2.5 PATROL VEHICLE GRAPHIC DISPLAY

A. Provide aluminum plate with etched lines and lettering.

B. Provide black matte finish for background and white text and lines.

C. Provide clips and mount for visor of CDCR patrol vehicle.

D. Provide quantity per Section 01431.

2.6 VOICE ANNUNCIATION SYSTEM

A. Radio Network Interface:
1. Interface directly with PLC through RS-232 port or individual hard wired inputs.
2. Interface directly with radio systems.
3. Monitor eight discrete points, quantity as required.
4. Digitized voice messages for all monitored points.
5. Provide inversion voice scrambling circuitry compatible with other CDCR institutions.
6. Empact RANS-Audio rack-mounted style encoder unit with voice scrambling feature, Model RA-595RSC or equal.

B. Radio Transmitter:
1. 5 watts, minimum.
2. Power output adjustment.
3. Coded tone signalling.
4. Frequency: 450- to 470-MHz range.
5. 16F2/3 modulation.
6. 2.5-ppm frequency stability.
7. Empact RA660H transmitter with RA683 antenna, Ritron DT-450 with ROA-45 omni-directional antenna, Motorola M100 series, or equal.
8. Provide coverage inside central control and up to one mile beyond perimeter fence. Prepare and submit a radio propagation study for the site. Alternately, perform reception test at the site with proposed equipment.
9. Comply with FCC narrow band width requirements.

C. Antenna Cable:
1. RG-8U low loss cable.
2. Tinned copper braid, 100% shield coverage.
3. PVC jacket.
4. Belden 9913, West Penn, Atlas, or equal.

D. Mobile Radio Receiver:
1. Coded tone signalling.
2. UHF frequency range.
3. Audio output: 90 db SPL at 12 inches.
4. Frequency stability: ±0.0015% from -10°C to 50°C.
5. Provide automatic low battery alert.
6. Receiver shall operate for seven hours, minimum, with a 10% receive duty cycle.
7. Receiver shall meet Military Standard 810D, Procedure II for rain.

8. Receivers shall be modified so that the units cannot be turned below a minimum volume of 50 db at 3 feet during operation.
9. Provide Motorola Monitor IV with scramble technology, Empact RA-559USC with scrambled voice circuitry, or equal. Scrambled voice circuitry must be compatible with radio network interface.
10. Provide two vehicle charger amplifiers, Empact RA582 or equal. Provide power cord, mounting hardware, and antenna cable adapter. Mount in CDCR patrol vehicles. Provide locking kit and cigarette lighter adaptor power cord for future use by CDCR personnel.
11. Provide one charging base and power supply for each portable alarm receiver.
12. Provide single unit charger with antenna, call light, and reset button. Empact RA583 or equal. Install in watch commander's office.
13. Refer to Section 01431 for quantity of receivers.
14. Comply with FCC narrow band width requirements.

E. Provide the following voice alarms:
1. Electrified fence zone 1 alarm.
2. Electrified fence zone 2 alarm.
3. Electrified fence control cabinet 1 tamper alarm.
4. Electrified fence control cabinet 2 tamper alarm.
5. Electrified fence control cabinet 1 high temperature alarm.
6. Electrified fence control cabinet 2 high temperature alarm.
7. Electrified fence power service cabinet tamper alarm.
8. Electrified fence power service cabinet high temperature alarm.
9. Interlock Panel 1 tamper alarm.
10. Interlock Panel 2 tamper alarm.
11. Electrified fence Zone 1 de-energized (repeat message every 10 minutes if any "system off" condition occurs).
12. Electrified fence Zone 2 de-energized (repeat message every 10 minutes if any "system off" condition occurs).
13. Electrified fence Zone 1 operational (followed by applicable FCC call sign) (repeat message every 60 minutes if all of the "system on" inputs are true.
14. Electrified fence Zone 2 operational (followed by applicable FCC call sign) (repeat message every 60 minutes if all of the "system on" inputs are true.

F. All voice alarms shall be preceded by the official facility name or approved acronym to be confirmed by CDCR Representative. Official facility name will be provided by CDCR Representative.

G. The system shall repeat the "electrified fence de-energized" and "electrified fence operational" messages three times with a short time delay between voice transmissions (i.e., do not repeat the three transmissions a second time one minute later). For all other messages, the system shall repeat the voice alarm messages three times with a short time delay between voice transmissions, followed by a one-minute delay and repeat the same voice alarm message three times. Programming for this feature shall be in the PLC. If an alarm occurs during the one-minute delay between a previous alarm's voice transmission, the new voice alarm message shall be transmitted immediately in lieu of

waiting until after the first alarm's second set of transmissions has been completed.

H. Radio transmitters and receivers shall meet the requirements of FCC rules, part 22, 74 and 90.

I. Do not reset alarm transmissions with the graphic panel reset feature.

2.7 UPS SYSTEM

A. Provide an on line UPS at the central control cabinet to protect equipment from line disturbance, subcycle power losses, and power outages. In normal operation, the a-c power shall be rectified to d-c power. The d-c power from the charger shall maintain the batteries at full charge. When line power fails, the inverter shall change the battery d-c power back to a-c while it regulates and provides a sine wave power to the load. The load shall automatically transfer to the inverter a-c line in less than 10 milliseconds. The UPS shall be complete with power indication, inverter circuit breaker protection, power fail, and low battery alarm relay contacts. Batteries shall be sealed leakproof and maintenance free mounted in a separate battery rack. UPS unit shall come complete with internal battery charger and battery connect cables.

B. The UPS system shall have the following requirements:
1. Input/Output Voltage: 120-volt a-c, single phase, 60 Hz.
2. Connected Equipment: All equipment in central control cabinet except printer. In addition, connect central control graphic display panel and PLC.
3. Minimum Output Rating: As required to power specified equipment.
4. Output Harmonic Distortion: 5% maximum at full load.
5. Frequency Stability: ±0.5%.
6. Overload Capacity: 125% for 10 minutes.
7. Maximum Charge Rate With Load: 20 amperes.
8. Minimum Run Time: 35 minutes at half load.
9. Minimum Recharge Time: 16 hours.

2.8 SHOP TESTING

A. Refer to Section 16161 for shop test requirements.

PART 3 EXECUTION

3.1 FREQUENCY COORDINATION

A. Perform a frequency coordination search to select a frequency in the specified range. Submit and obtain approval for frequency from FCC.

B. The Contractor shall prepare an FCC application for the State to obtain a frequency in the 450- to 470-MHz range for local government or State police radio service. The application shall be submitted to the CDCR Office of Telecommunications via the CDCR Representative. The

Contractor shall coordinate the signaling or coding such that the other users of the frequency will not interfere with the voice annunciation system.

3.2 INSTALLATION AND START UP

A. Install devices and equipment in accordance with manufacturer's instructions.

B. Furnish and install all wire and date cable as shown on the drawings. Make electrical wiring interconnections as shown on drawings.

C. Test the complete system after installation to assure that all components are operating with the specified range and all interlocks are functioning properly.

D. Calibrate systems after installation in conformance with the component manufacturer's instructions. This shall provide that those components having adjustable features are set carefully for the specific conditions and applications of this installation.

E. Defective components which cannot achieve proper calibration or accuracy either individually or within a system shall be replaced.

F. Provide central control graphic panel, push-button station, central control cabinet, and PLC panel to BP 4 contractor for installation.

G. Provide sally port tower graphic panels and associated transformer and disconnects to BP 3 contractor for installation.

3.3 SYSTEM PROGRAMMING

A. All necessary programming for complete system operation shall be performed by the Contractor. Within six months after acceptance of the installation, the Contractor shall perform one program update at a date acceptable to the State.

3.4 FIELD TESTING

A. Conduct field testing in accordance with Section 16942.

3.5 OPERATIONAL TESTING

A. Conduct operational testing in accordance with Section 16942.

3.6 TRAINING

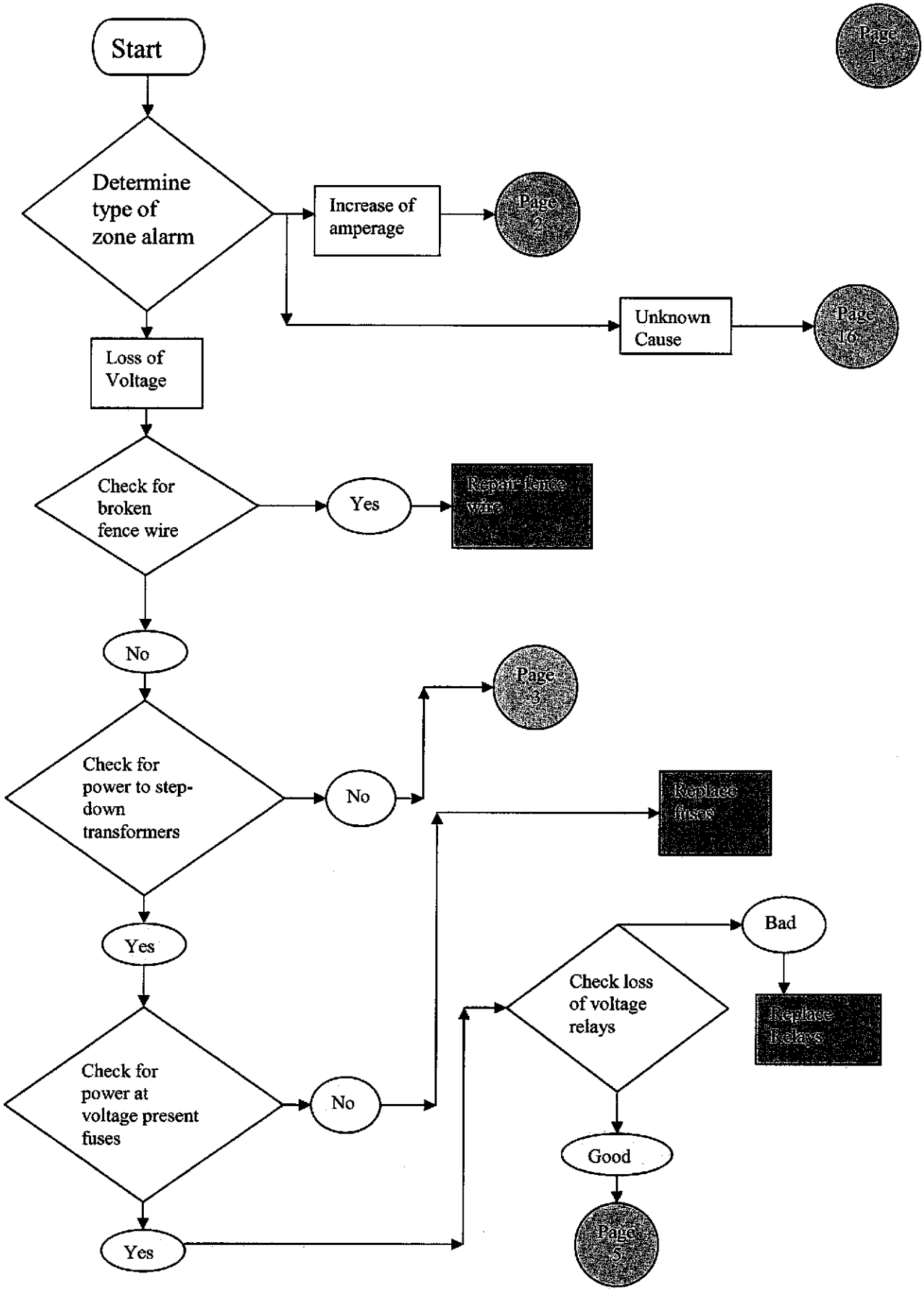
A. See the requirements in Section 16161.

END OF SECTION

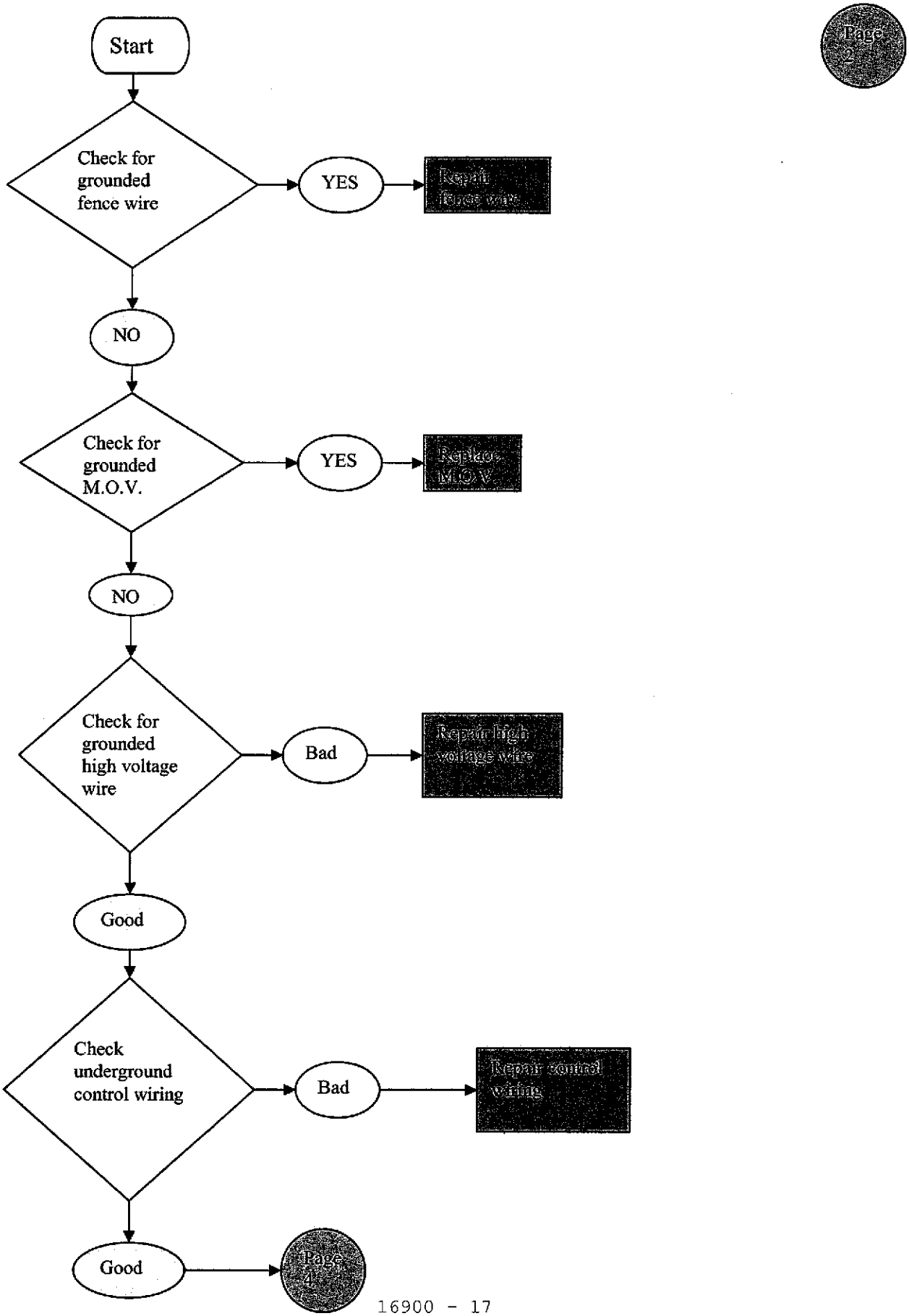
ATTACHMENT A

TROUBLESHOOTING CHARTS

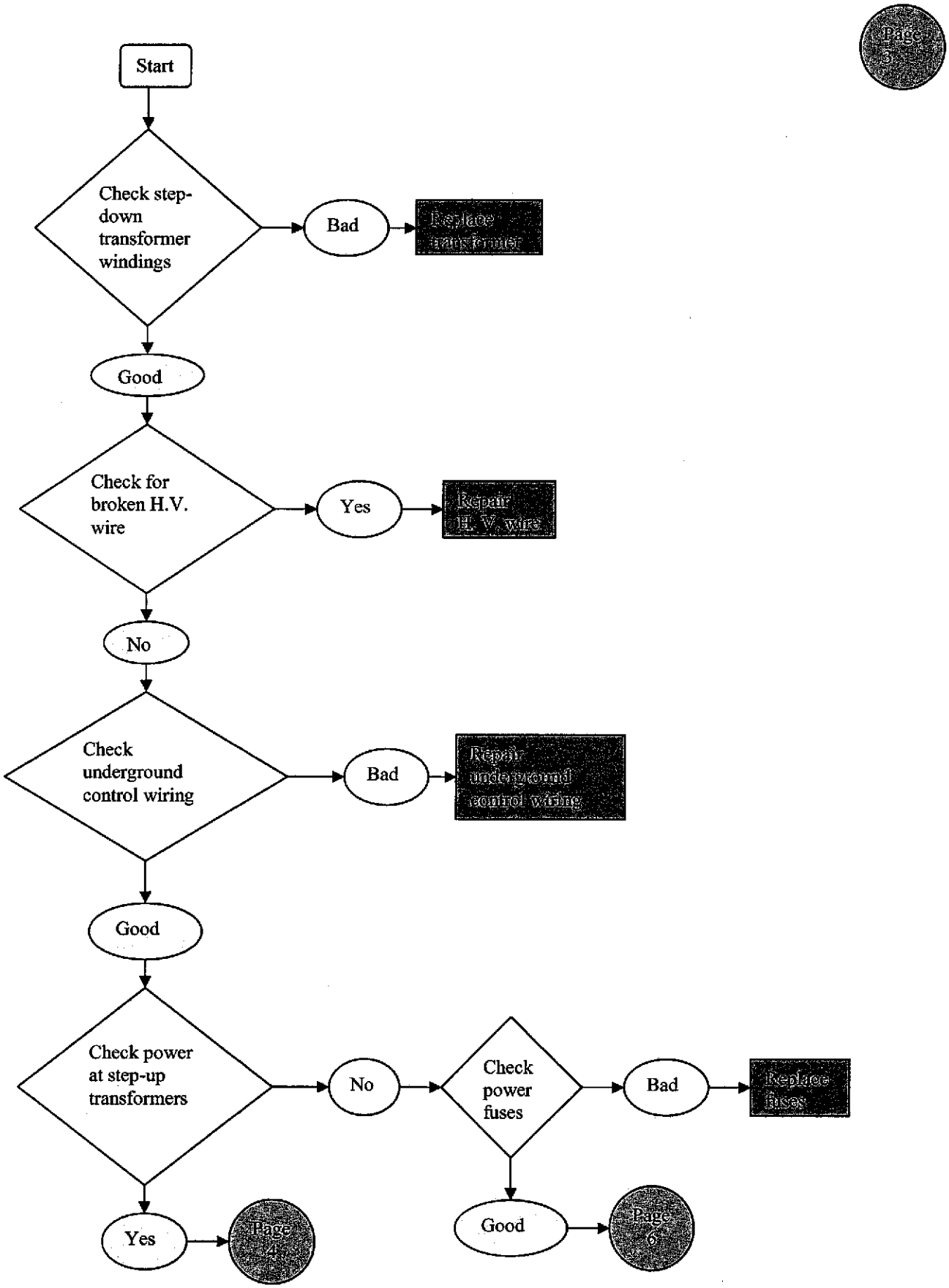
ZONE ALARM TROUBLESHOOTING CHART



HIGH AMPERAGE ZONE ALARM TROUBLESHOOTING CHART



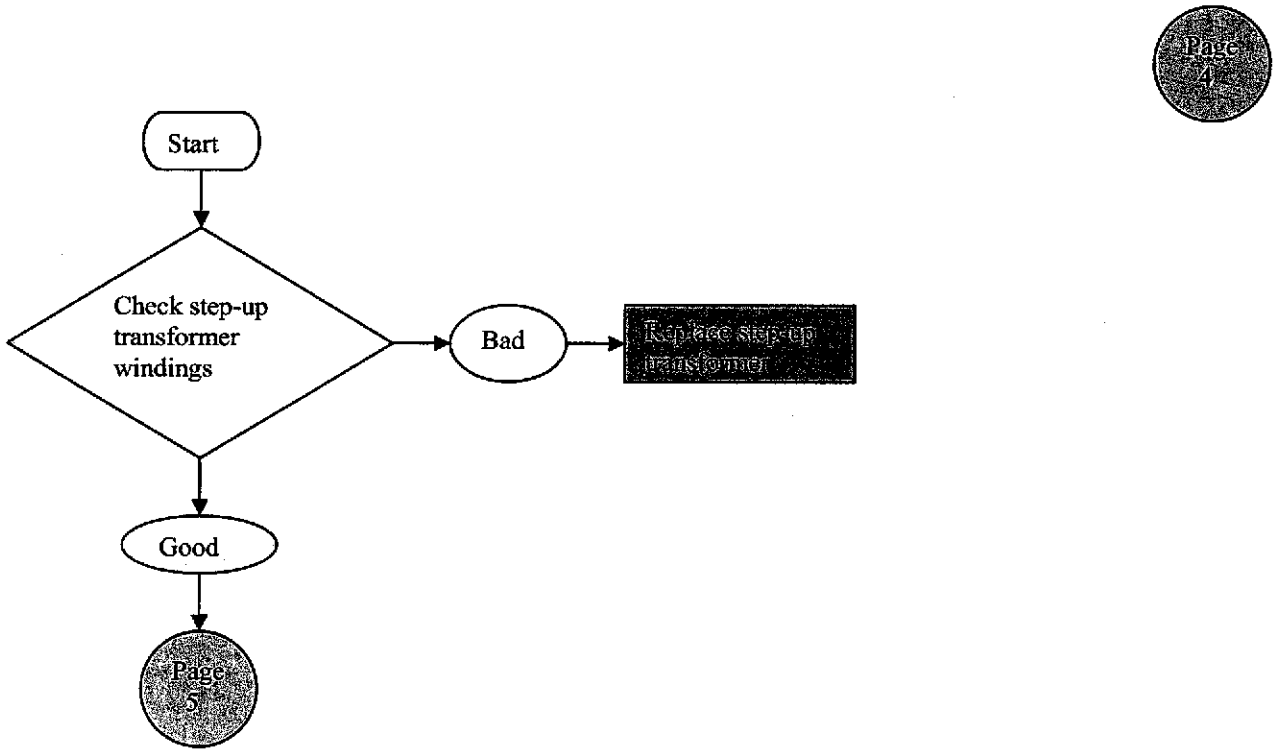
LOSS OF VOLTAGE ZONE ALARM TROUBLESHOOTING CHART



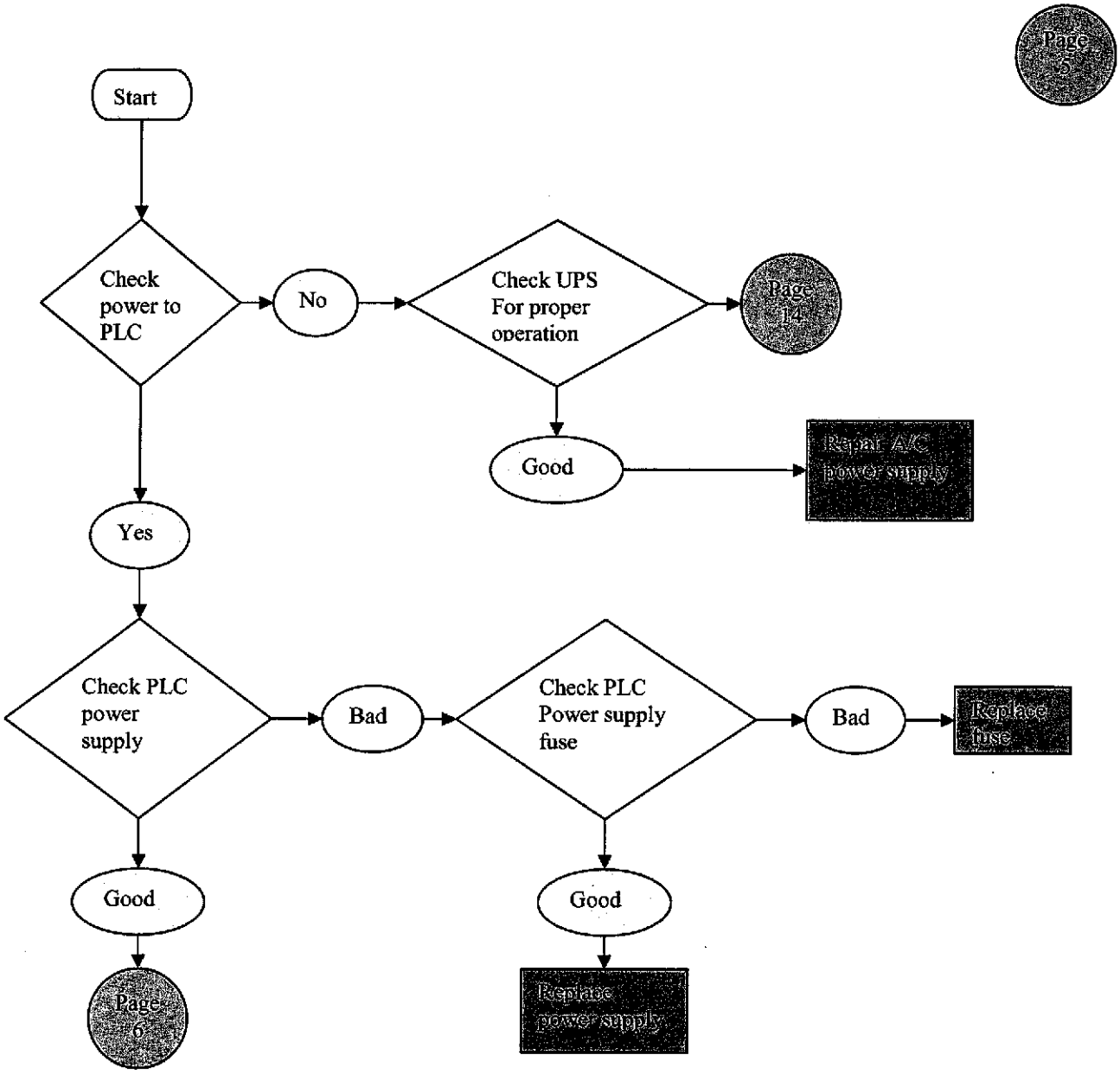
Appendix A:
Point of Connection Table

Bldg No.	Building Name POC ID	Fin. Floor Elevation (feet)	Fire Flow* (gpm)	Pipe Size (inches)	Top of Pipe (feet BFF)	Feet Below F.F. (Invert)	Invert Elevation	Coordinate Northing	 Easting
	HH-C 611							9627.08	16979.38
N/A	PIA Modular buildings	N/A							
	DW-1			2	3.00			10468.43	17812.09
	SS-1			6		4	IE 18.83	10468.43	17826.76
	NG-1			1	3			10469.97	17838.07
	HH-E N/A							10477.49	17814.57
	HH-C N/A							10477.49	17809.32

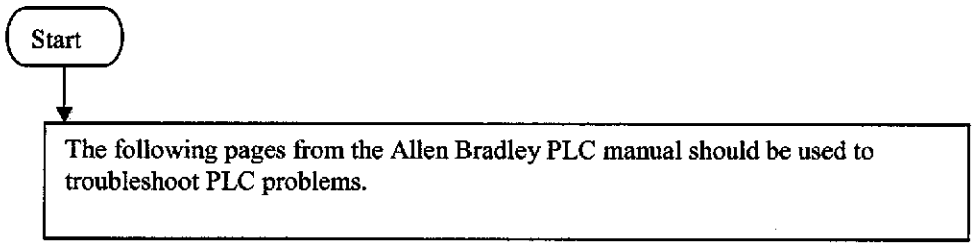
ZONE ALARM TROUBLESHOOTING CHART (CONTINUED)



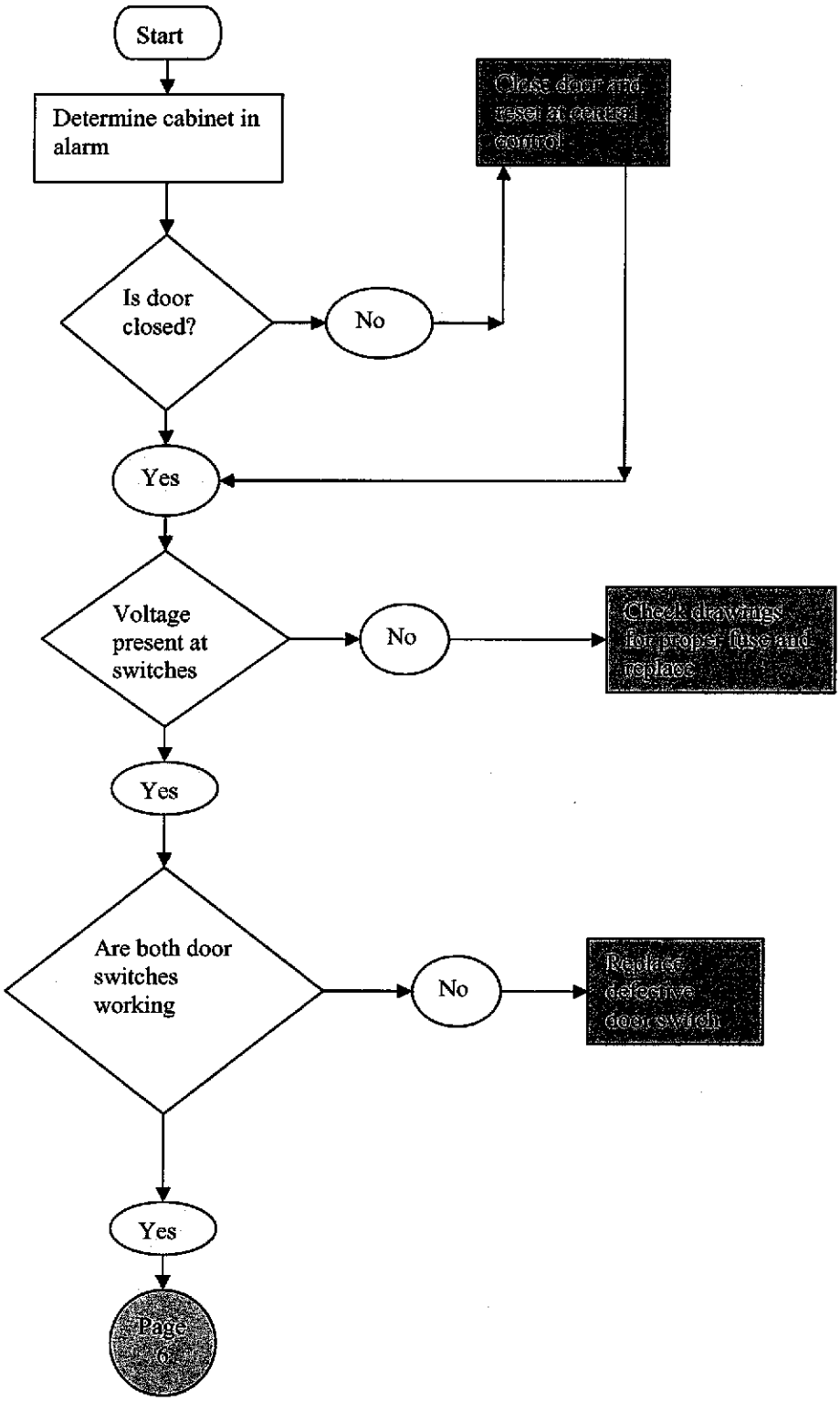
PLC TROUBLESHOOTING CHART



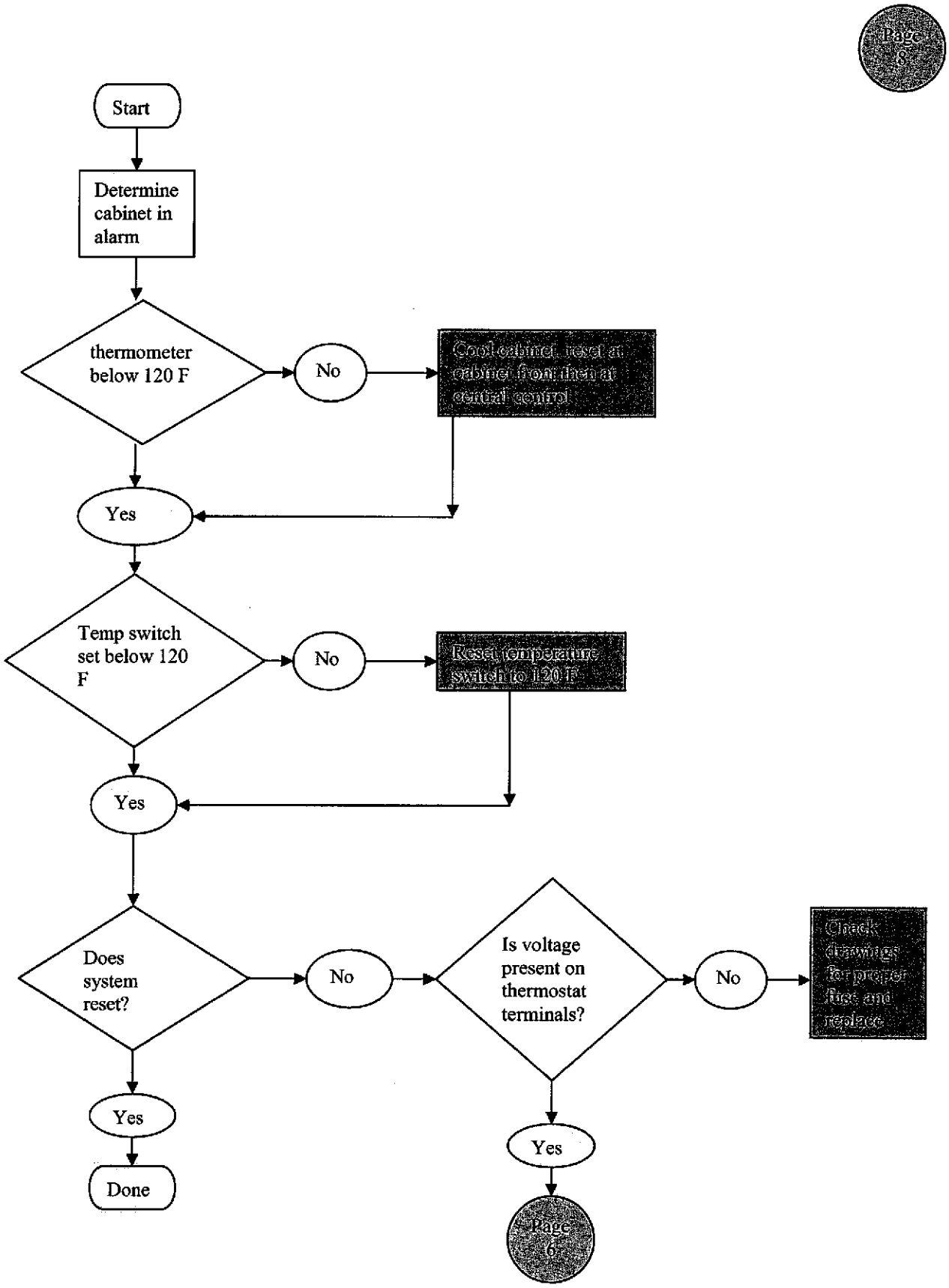
PLC TROULBESHOOTING CHART



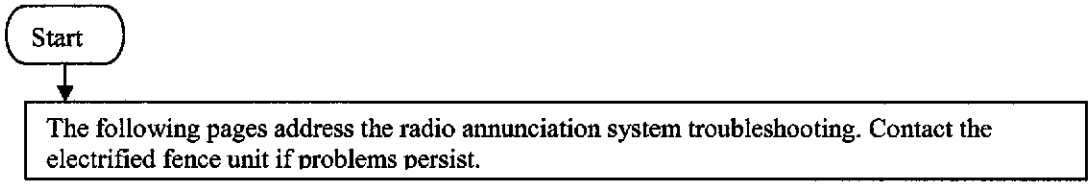
CABINET TAMPER ALARM TROUBLESHOOTING CHART



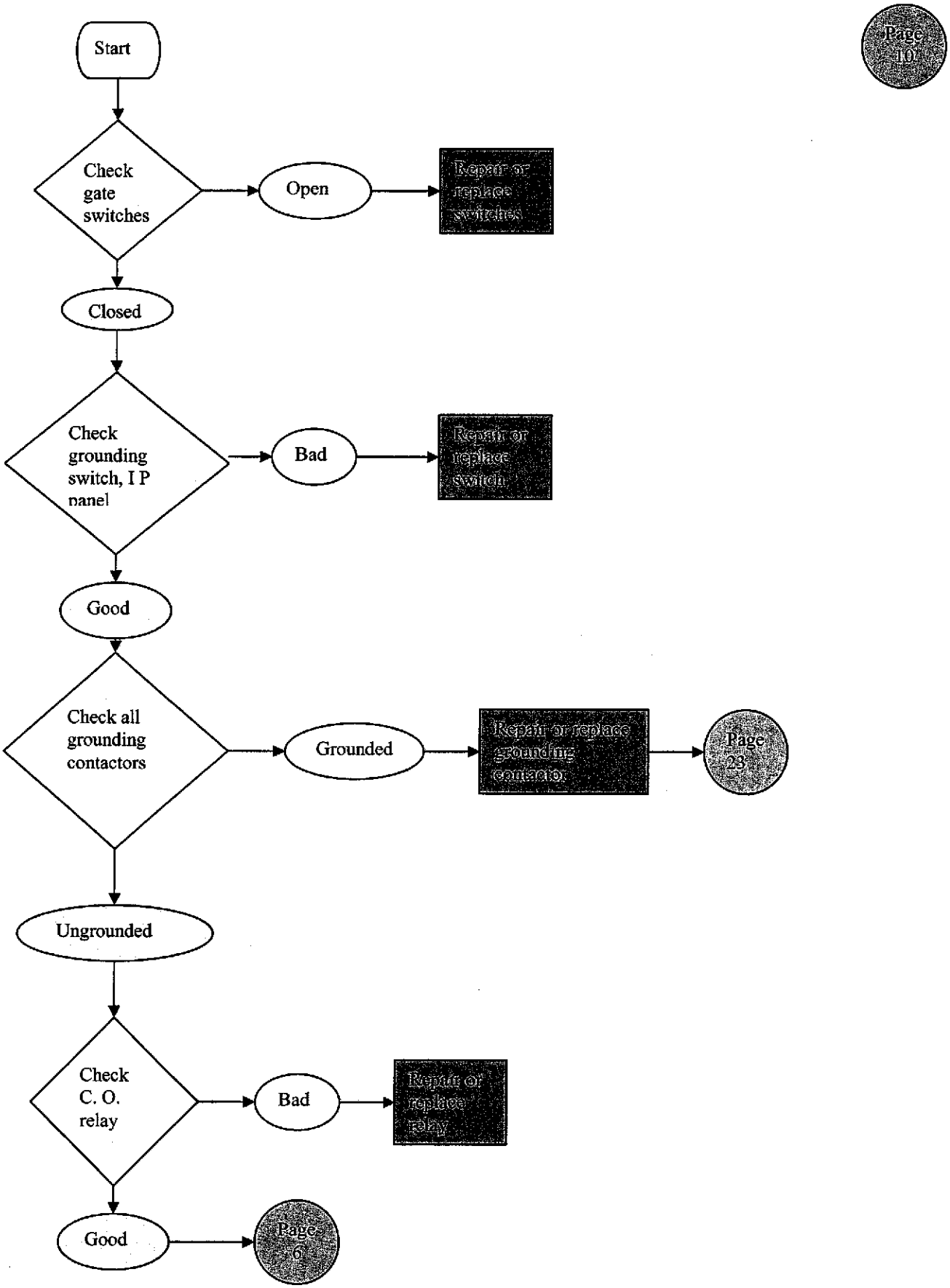
HIGH TEMPERATURE ALARM TROUBLESHOOTING CHART



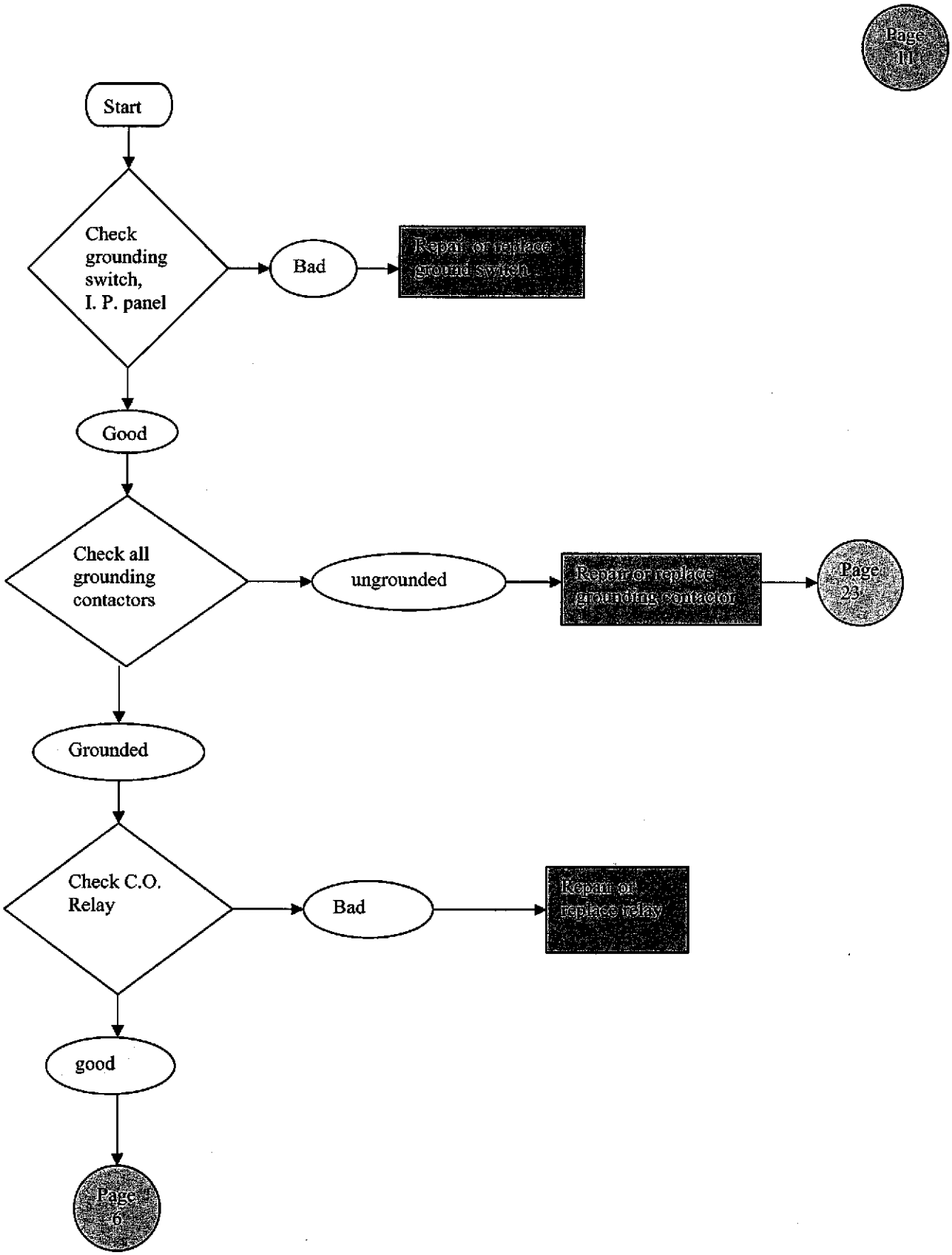
RADIO ANNUNCIATION TROUBLESHOOTING CHART



SYSTEM RE-ENERGIZING TROUBLESHOOTING CHART

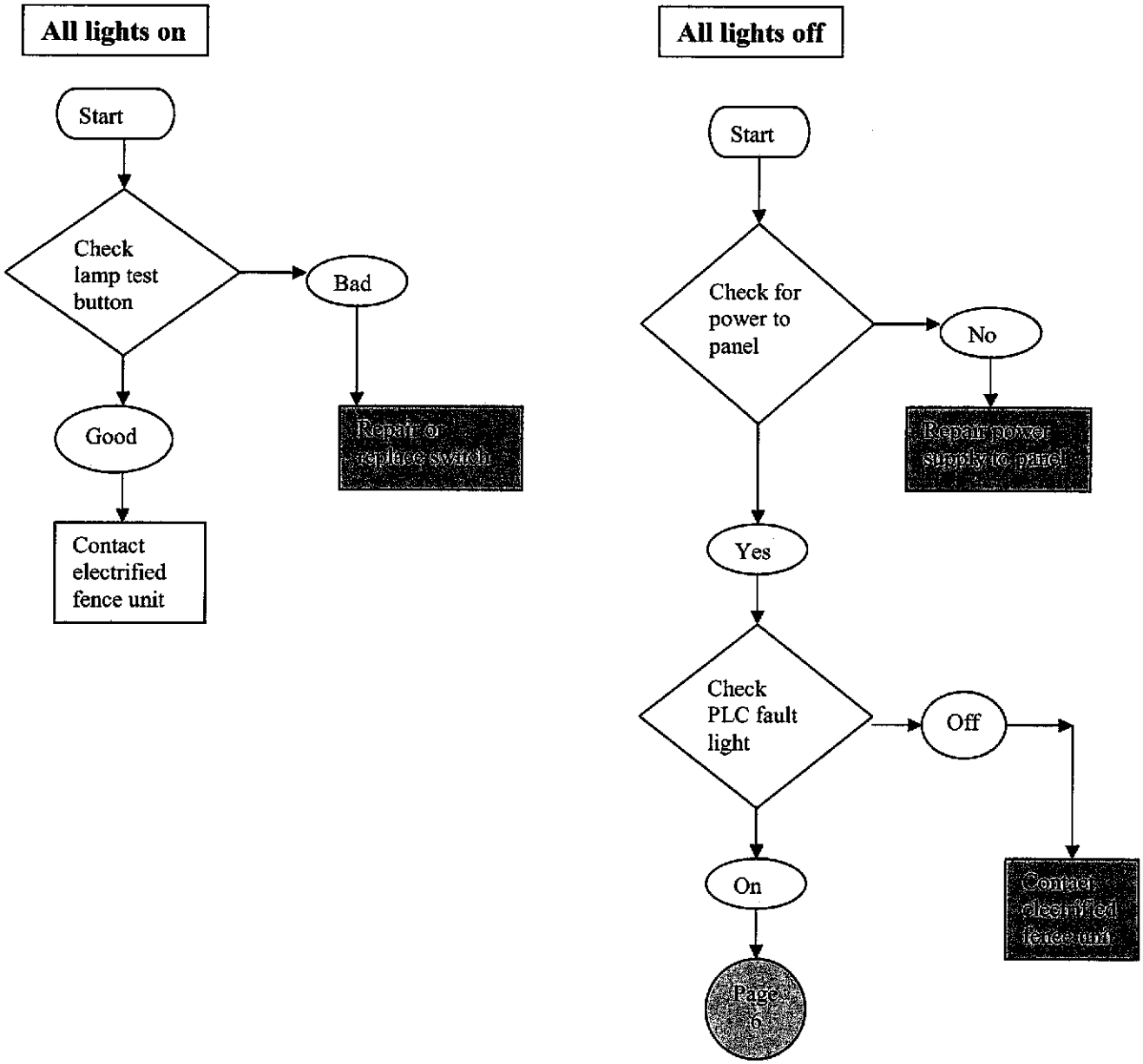


SYSTEM DE-ENERGIZING TROUBLESHOOTING CHART



GRAPHIC PANEL TROUBLESHOOTING CHART

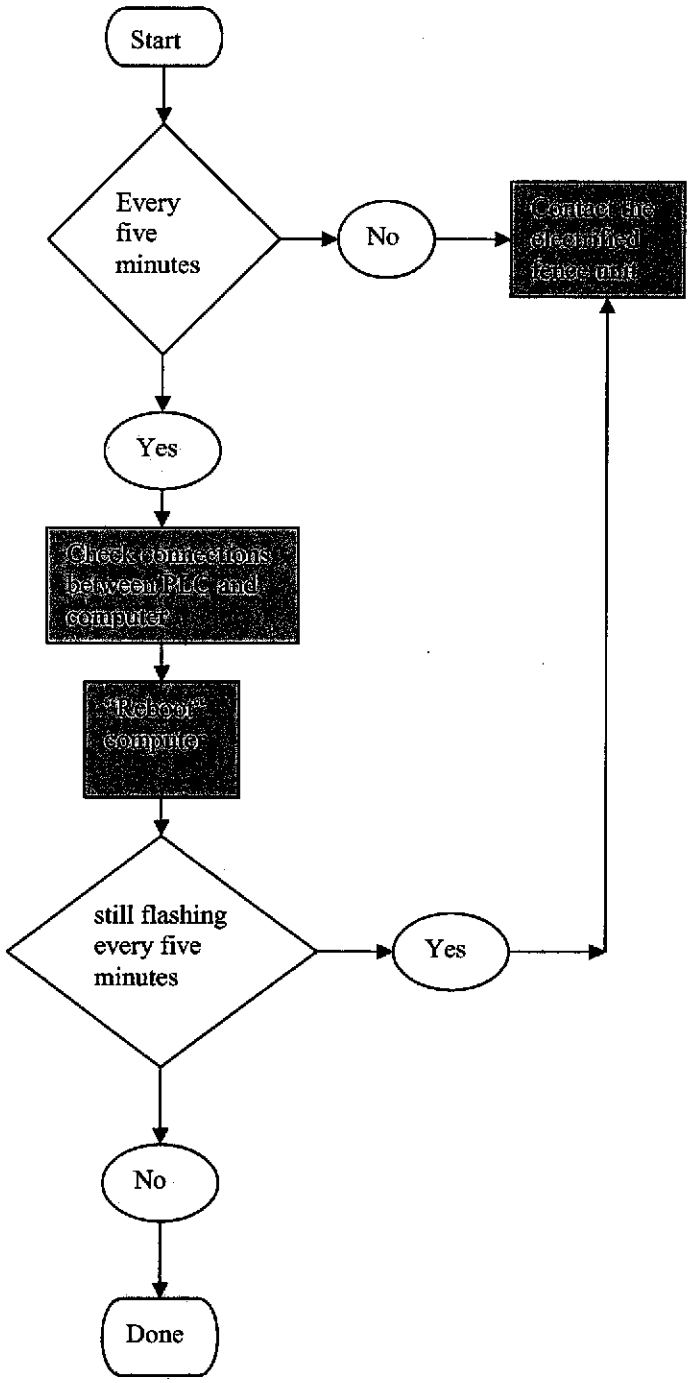
Page 12



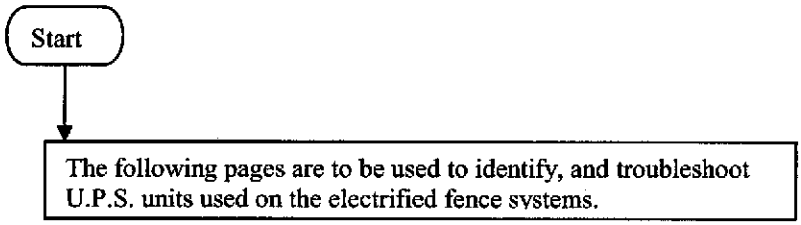
GRAPHIC PANEL TROUBLESHOOTING CHART (CONTINUED)

Page 13

All lights flashing



U.P.S. TROUBLESHOOTING CHART



ZONE ALARM UNKNOWN CAUSE

Start

Page 16

The following narrative provides assistance in identifying and resolving Unknown Zone alarm problems. These steps may be lengthy, but each step should be completed before moving to the next. Each step will be explained first, then all steps will then be flowcharted on following pages to establish logical operational steps for troubleshooting ease. If the Problem is rectified in any step the process can stop at that point. Completing further steps will only prove to be a preventive meassure toward future problems of this type.

A few zone alarms happen so quickly (less than 250 miliseconds) that the PLC does not capture the amperage spike. This occurrence is not cause for undue concern, as long as these types of alarms are not considered normal daily operational parameters.

These troubleshooting sheets are for persistant zone alarms that are not attributable to bird kills, shorting detection rings/wires, and wildlife netting problems. Be aware that each zone's alarm must be cleared and reset before another zone alarm can be annunciated and recorded in that same zone.

1) When a suspected zone alarm of unknown causes occurs, go to the electrified fence computer and print out an amperage report for the time period that would capture the amperage recording during the time of the zone alarm. You may want to look at time frames before and after the alarm occurance to help identify problems which may be associated with the zone alarm (emergency gererator running, etc.).

2) If the amperage report does not indicate an increase in amperage for the zone alarm, then try to reset the zone alarm at the central control graphics annunciation panel. This reset procedure **must** be performed before the affected zone's controller cabinet has been reset. If the zone alarm resets at the central control graphics annunciation panel with no further action then the zone alarm is a loss of voltage alarm, and troubleshooting should start on page # 1 of this trouble shooting guide.

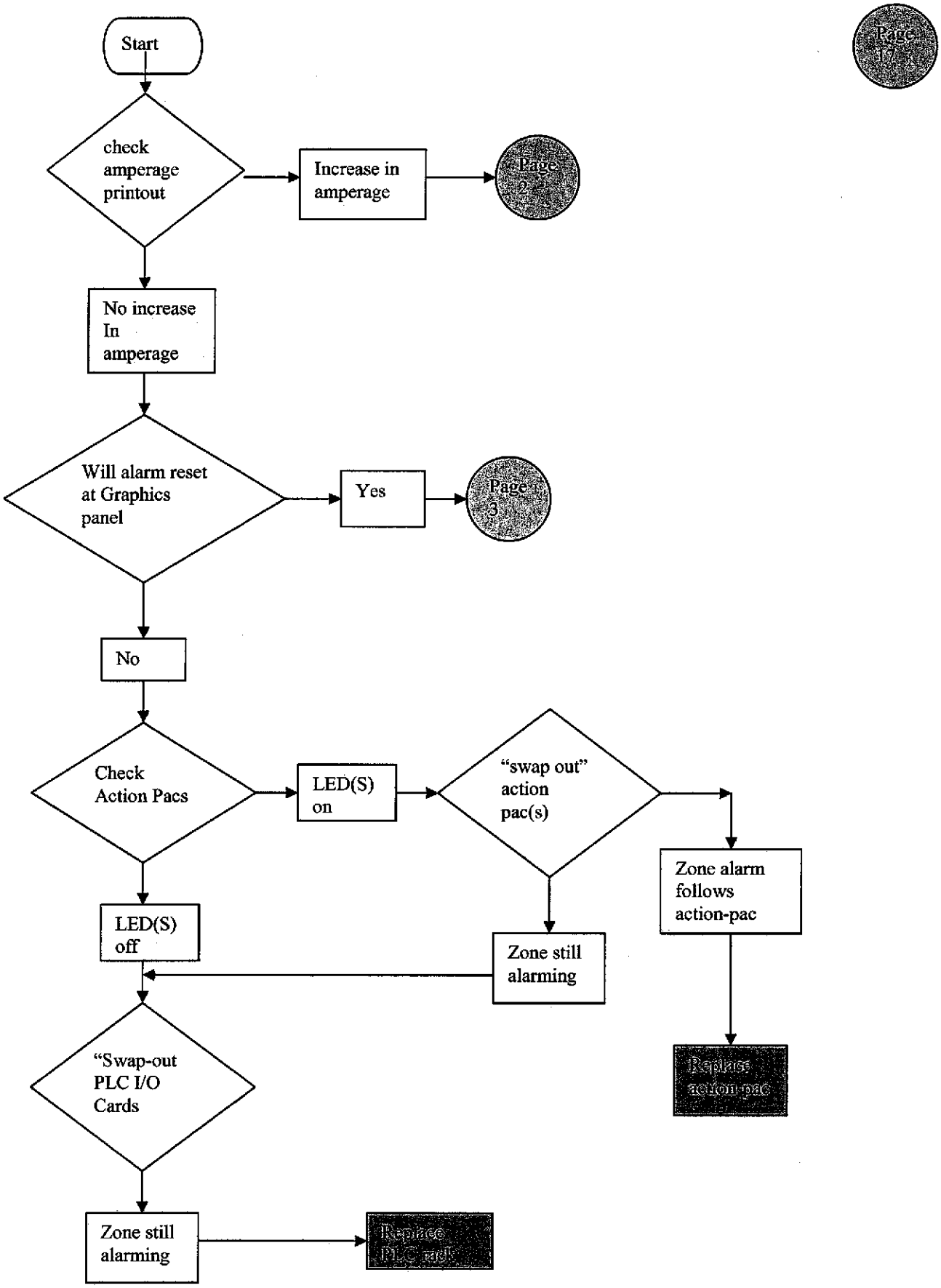
3) If the amperage report does not indicate an increase in amperage, and a loss of voltage is not indicated by step # 2 above, then the affected phase of the zone will have to be determined by observing the indicator light on the *action pac* of the affected zone **before** alarm reset is initiated. The process to identify the problem at this point is to "swap out" the suspect *action pac* with another *action pac* from another zone, or one of known quality. If the suspect *action pac* is placed in another zone, and the alarms follow the *action pac*, the *action pac* needs replaced. If the zone alarm persists on the zone and phase as origianally identified, then the parimeters in the main PLC are problably out of specification, and the Electrified Fence unit will have to be contacted for further technical assistance.

4) If multiple phases of the zone, or multiple phases in one controller cabinet(separate zones) are coming into alarm as indicated by the LED on the *action pacs*, the remote PLC input and output cards should be "swapped out" with cards from another zone, or new cards installed. If the cards are "swapped out" with cards from another zone, and the zone alarm(s) follows the suspected cards, replace the cards. These cards have DIP switches, and must be recorded for the cabinet that they are taken out of, so when a different card is installed in the cabinet it will be "addressed" correctly, and recognized by the PLC. All PLC cards should be inspected upon removal to identify and record the DIP switch settings. **This should be done first**, before any other troubleshooting operations take place.

ZONE ALARM UNKNOWN CAUSE (CONTINUED)

5) If the zone alarm persists on the origianal zone location as first discovered after the I/O cards have been replaced, the next area of attention shall be toward the PLC rack assembly. The rack assembly will have to be removed and replaced with one of known quality. All cards removed from the rack must be reinstalled in the same location in the new rack. Check all connections to the cards after the reinstallation to assure proper fit up. If problems persist after this change out, contact the electrified fence unit for further technical advise.

ZONE ALARM UNKNOWN CAUSE (CONTINUED)



COMMUNICATION FAILURE (COM FAULT)

Start

1) The following narrative provides assistance in identifying and resolving communication failures. These steps maybe lengthy, but each step should be completed before moving to the next. Each step will be explained first, then all steps will then be flowcharted on following pages to establish logical operational steps for troubleshooting ease. If the Fault is rectified in any step the process can stop at that point. Completing further steps will only prove to be a preventive meassure toward future problems of this type. Communication failures may come from many different areas due to the network that the PLC operates under to manage information sharing

2) Loss of power to the Electrified Fence system may generate a COM FAULT. If the site wide or Electrified Fence generator assumes utility power operations, be aware that a COM FAULT may be generated upon transfer of power, in this case it should automatically reset itself.

3) If the COM FAULT does not clear, reset the main PLC near Central Control with the key switch. Turn the key switch from run to program and then back to run.

4) Check the main PLC's communications link to the Computer. If the communications link between the PLC and computer is lost no information that the computer is reporting is valid/updated. To clear this communications error, shut down the computer by right clicking the mouse button and follow normal windows based shut down procedures, and restart the computer to re-establish the communications link. View the amperage screen to verify slight changes in amperage readings indicating proper communuications with the PLC.

5) Review for proper functionality all the tower annunciation panels. If power is lost to these panels, a COM FAULT will be generated. Check the communications wire and plug at the panel, as well as the power supply to the panel.

6) Proceed to the controller and sensor cabinets to check the power supplies at the remote PLC's. After assuring that specified power is available, these power supplies should be removed from the rack assembly (after the power is shut off), and visually inspected for hot spots and obvious component failure. Also check the card edge connectors for corrosion and hot spots. These power supplies are interchangable between cabinets. If the power supply units are changed between cabinets, and the problem follows the power supply from the cabinet that was first having problems, then replace the power supply with one of known quaility.

7) Next inspect the "Blue Tube" communication cable and plug end. Unplug and inspect the the plug end for corrosion and the plug recepticle for bent or missing pins. The Blue Tube wiring should be checked for continuity and shorts to ground, but this should be considered less likely than other listed problems. If there are splices in the communications wire the splices should be examinated to insure corrosion has not degraded the splice, and that the splice is still intact.

8) Reconnect the cable to the communications ASB card, turn the power back on, and observe the light on the card for proper operation. After assuring that specified power is available, these ASB cards should be removed from the rack assembly (after the power is shut off), and visually inspected for hot spots and obvious component failure. Also check the card edge connectors for corrosion and hot spots. These cards are interchangable between cabinets, but not the central control PLC. Be aware

that these cards have DIP switches, and the settings should be recorded for future reference, **when** removed.

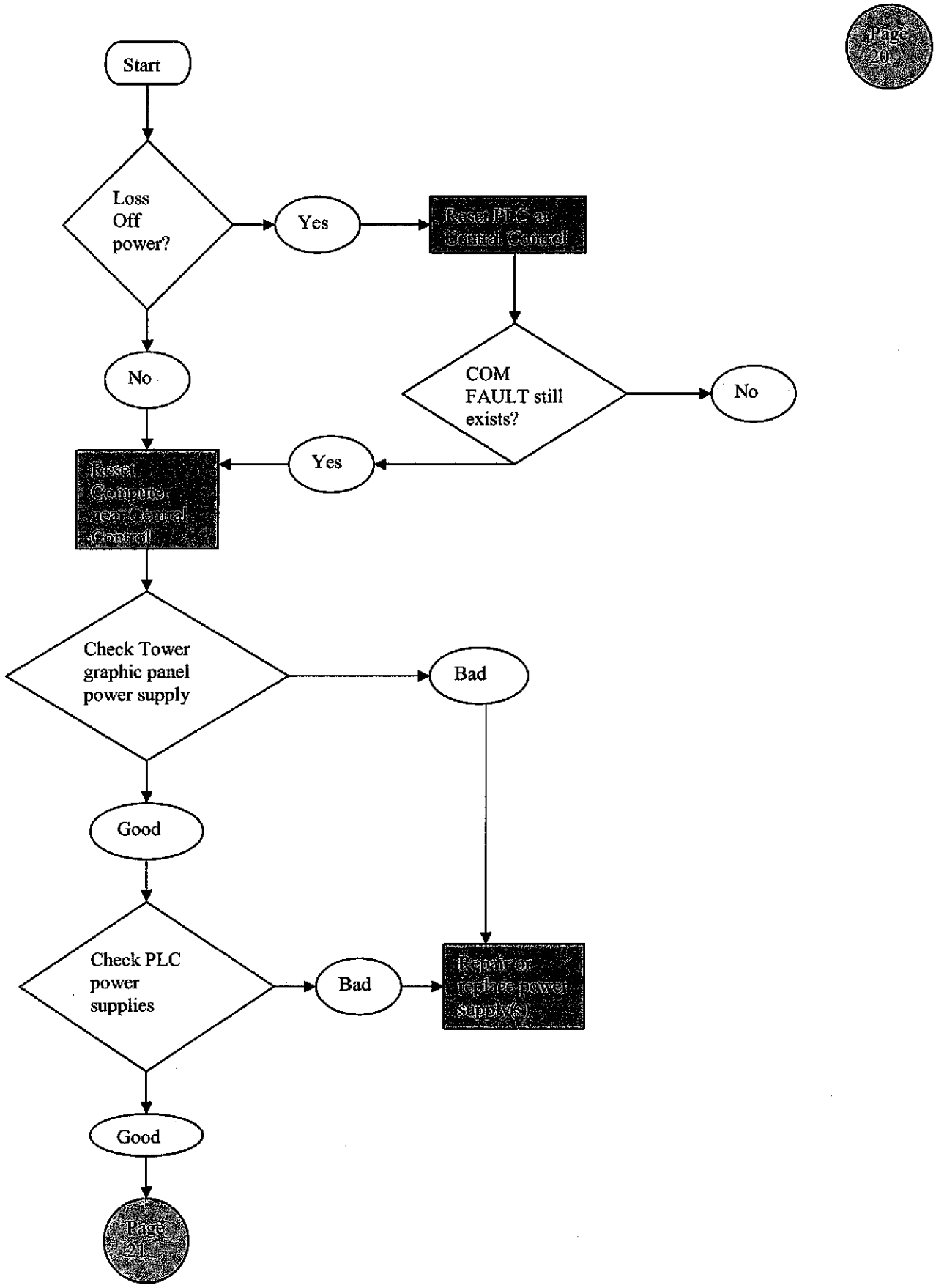
COMMUNICATION FAILURE (COM FAULT) (CONTINUED)

9) The ASB card should have a flashing light to indicate communications are normal. If the COM FAULT follows the ASB card to another panel, then replace the ASB Card.

10) The same procedure # 6 and # 8 should be used to inspect and troubleshoot the power supply and Scanner Cards at the main PLC near Central Control.

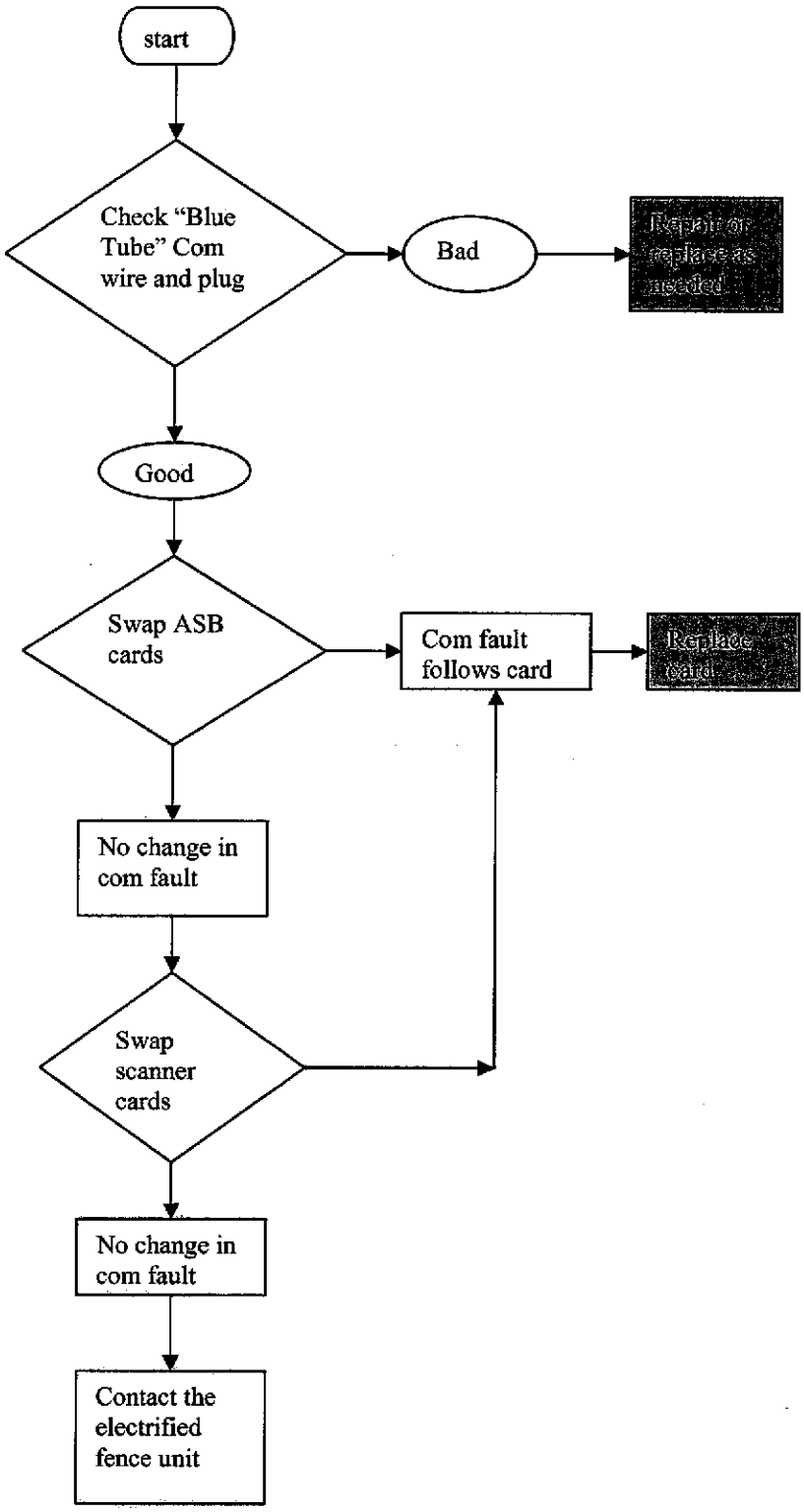
11) If all of the above steps have not solved the COM FAULT, contact the electrified Fence unit for further technical assistance.

COMMUNICATION FAILURE (COM FAULT) (CONTINUED)

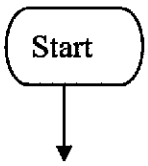


COMMUNICATION FAILURE (COM FAULT) (CONTINUED)

Page 21



GROUNDING CONTACTOR TROUBLESHOOTING

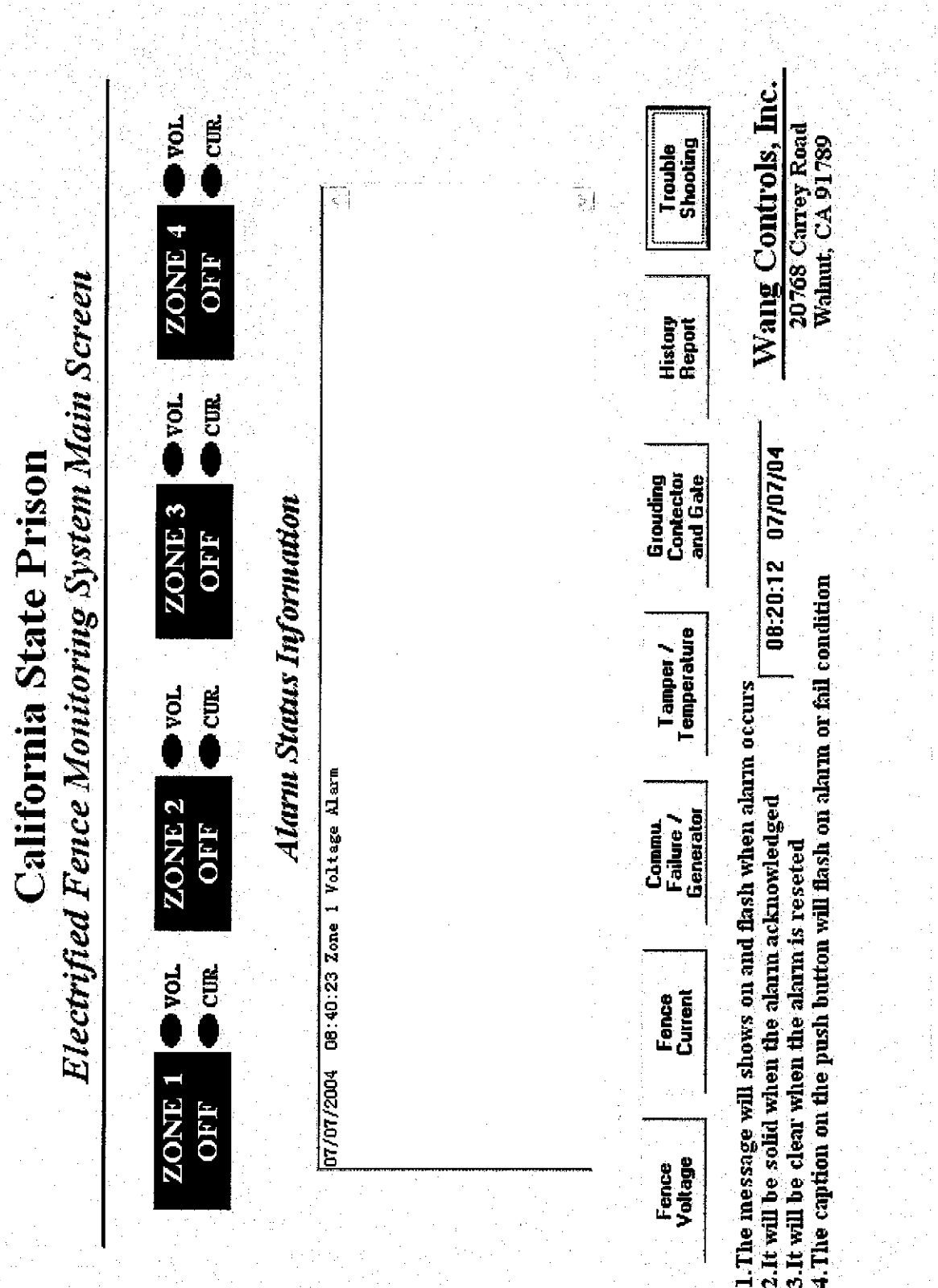


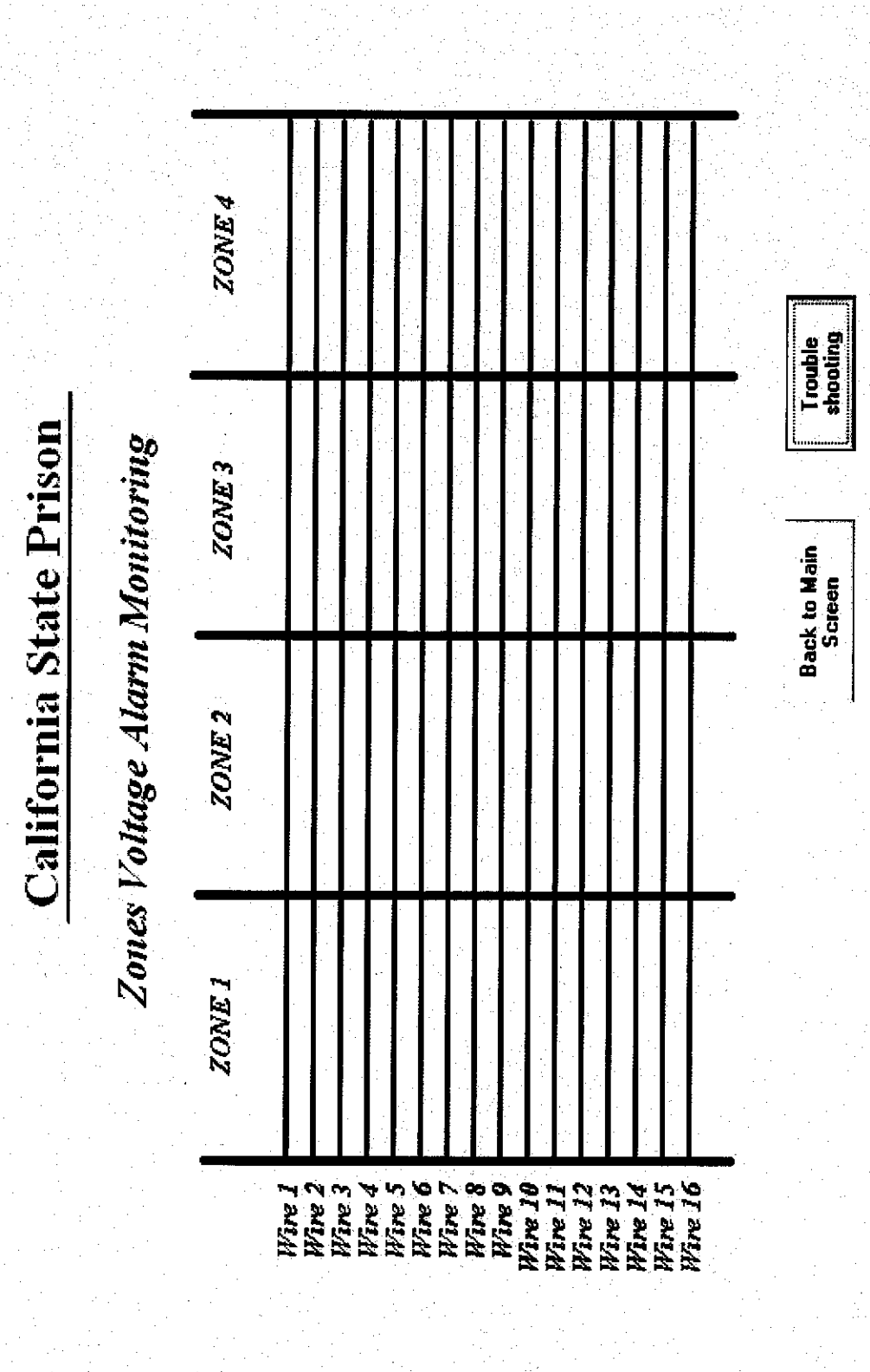
The following pages from the Joslyn Clark service manual are to be used to troubleshoot problems with grounding contactors, and to make adjustments to them.

ATTACHMENT B

SCREEN SNAPSHOTS

SECTION 16900 ATTACHMENT B
SCREEN SHOTS




California State Prison
Zones Voltage Alarm Monitoring
ZONE 1
ZONE 2
ZONE 3
ZONE 4
Wire 1
Wire 2
Wire 3
Wire 4
Wire 5
Wire 6
Wire 7
Wire 8
Wire 9
Wire 10
Wire 11
Wire 12
Wire 13
Wire 14
Wire 15
Wire 16
Back to Main Screen
Trouble shooting
The wires and wire number will change color upon alarm condition

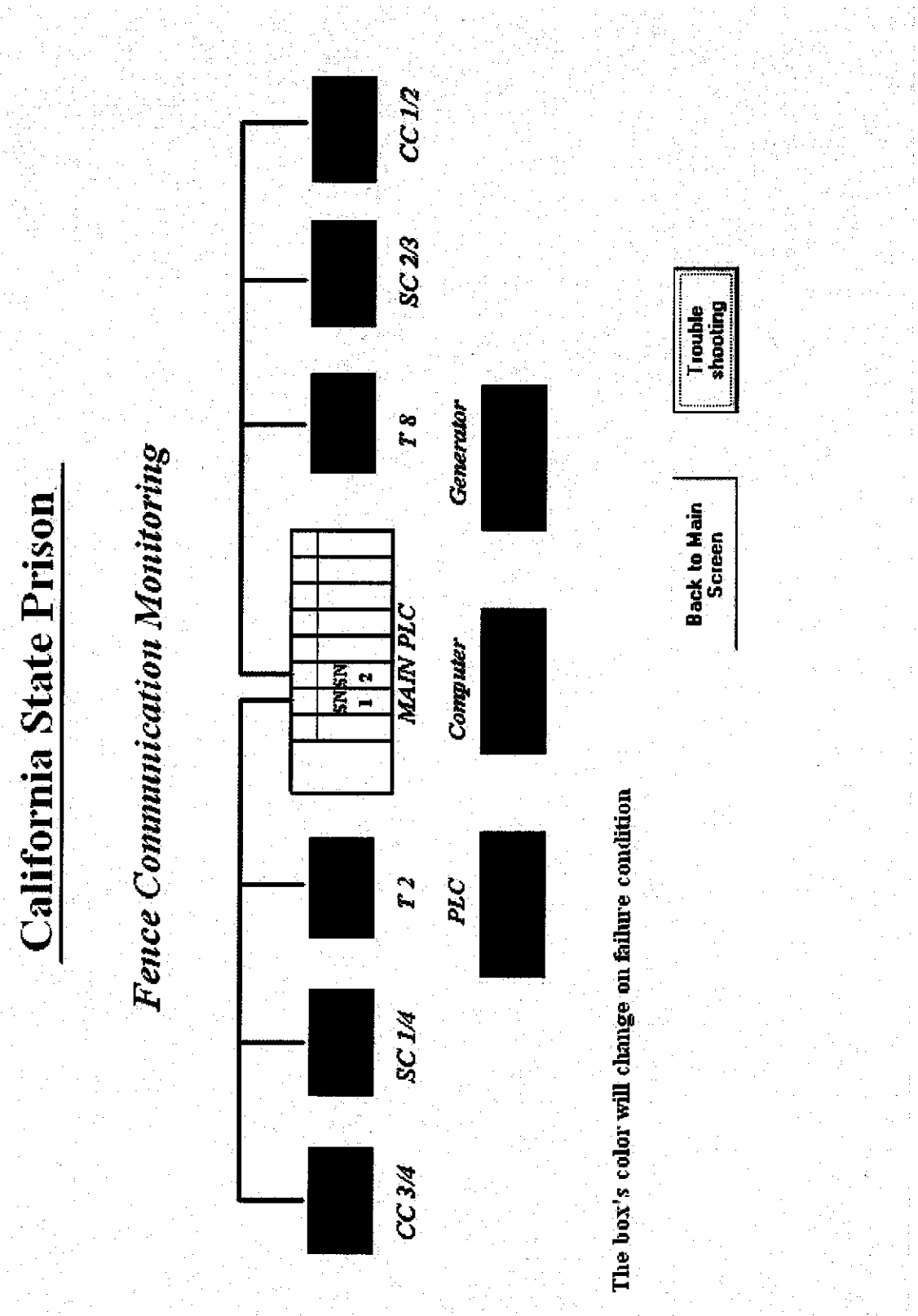
California State Prison

Zones Current Monitoring

	ZONE 1	ZONE 2	ZONE 3	ZONE 4
Phase AB	10.00 amp	10.00 amp	10.00 amp	10.00 amp
Phase AC	10.00 amp	10.00 amp	10.00 amp	10.00 amp
Phase BC	10.00 amp	10.00 amp	10.00 amp	10.00 amp

The box's color will change on alarm condition

Back to Main Screen | Currents Report | Trouble shooting


California State Prison
Fence Communication Monitoring
CC 3/4
SC 1/4
T 2
PLC
SN
SN
1
2
MAIN PLC
Computer
Generator
T 8
SC 2/3
CC 1/2
Back to Main Screen
Trouble shooting
The box's color will change on failure condition

California State Prison
Tamper and Temperature Monitoring
CC1
CC2
CC3
CC4
PSC
IP1
IP2
1.The box's color and caption will change in a state of Door Open/Close condition
2.The same changes in Temperature OK/High condition
Back to Main Screen
Trouble shooting

California State Prison
Grounding Contact / Gate Monitoring
Zone 1
Zone 2
Zone 3
Zone 4
IP-Gate
1.The box's color and caption will change in a state of grounding contactor Open/Close condition
2.The same changes in IP-Gate OK/Fail condition
Back to Main Screen
Trouble shooting

California State Prison
System Alarm, Zone Current History Report
System Alarm Report
Report Date
From:
5/21/2004
To:
5/30/2004
Get Report
Zone Current Report
Report Date and Zones
5/24/2004
All Zones
Zone 1
Zone 3
Zone 2
Zone 4
Get Report
08:15:25 07/07/04
Back to Main Screen

California State Prison

Discrite I/O Map

		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
CCC	IN	0	0	1	0	0	1	0	0	1	1	0	0	1	0	0	1	SLOT 3
	OUT	1	0	0	1	0	0	1	1	0	0	1	0	0	1	1	1	SLOT 4
	OUT	0	0	1	0	0	1	0	0	1	1	0	0	1	0	0	1	SLOT 5
	OUT	1	0	0	1	0	0	1	1	0	0	1	0	0	1	1	1	SLOT 6
CC1/2	IN	0	0	1	0	0	1	0	0	1	1	0	0	1	0	0	1	SLOT 2
	OUT	1	0	0	1	0	0	1	1	0	0	1	0	0	1	1	1	SLOT 3
CC3/4	IN	0	0	1	0	0	1	0	0	1	1	0	0	1	0	0	1	SLOT 2
	OUT	1	0	0	1	0	0	1	1	0	0	1	0	0	1	1	1	SLOT 3
SC1/4	IN	0	0	1	0	0	1	0	0	1	1	0	0	1	0	0	1	SLOT 2
	OUT	1	0	0	1	0	0	1	1	0	0	1	0	0	1	1	1	SLOT 3
SC2/3	IN	0	0	1	0	0	1	0	0	1	1	0	0	1	0	0	1	SLOT 2
	OUT	1	0	0	1	0	0	1	1	0	0	1	0	0	1	1	1	SLOT 3

Back to Main Screen