Central Office Power Evaluation (COPE)

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1.. General

1.1 Purpose

This practice provides information required to perform a comprehensive evaluation of DC power systems, ground systems, and noise performance found in:

- Central Offices (COs).
- Remote Switching Units (RSUs).
- Digital Loop Carrier (DLC) sites.

Use this practice and the Central Office Power Evaluation Inspection Sheet form to:

- Evaluate problem areas.
- Establish a record of past performance related to the electrical characteristics of a CO.

1.2 Filing Instructions and Supersedures

Discard all previous issues and associated addenda of this practice and file this issue numerically in your GTE Network Services practices set.

This practice supersedes and cancels:

- All policies, procedures, general instructions, letters, and memoranda which address this subject.
- Any document which provides information contrary to the information contained in this practice.

1.3 Reason for Reissuing

This practice has been reissued to incorporate multiple changes in the content. Read this entire practice to ensure your familiarity with the new information.

1.4 Responsibility

This practice was published by the GTE Network Services Enterprise Services Department. For more information about this practice, contact the GTE Network Services Headquarters Network Reliability Support Department.

1.5 Disclaimer

This practice was prepared solely for the use of GTE Network Services. It must be used only by its employees, customers, and end users when installing, operating, maintaining, and repairing GTE Network Services' equipment, facilities, and services. Any other use of this practice is forbidden. The information contained in this practice may not be applicable in all circumstances and is subject to change without notice. By using this practice the user agrees that GTE Network Services will have no liability (to the extent permitted by applicable law) for any consequential, incidental, special, or punitive damages that may result.

2. Overview

2.1 Responsibilities

The Network Operations Center (NOC):

- Provides first level technical support for CO power equipment.
- Assists in trouble resolution.
- Assists in the procurement of spare maintenance equipment.
- Assists in the resolution of COPE discrepancies, as required.

Network Reliability COPE Teams within each Region are responsible for performing:

- Comprehensive power evaluation of power systems used in:
  - COS.
  - Remotes.
  - Pair gain systems.
- Investigate evaluations, if power problems indicate analysis and corrective action is required.

The power evaluation should be performed:

- Annually for each:
  - CO.
  - Remote.
  - Pair gain site.

  OR
- More frequently if power problems indicate that evaluation, analysis, and correction are in order.
- Review GTE's "When In Doubt Check It Out " program.
- Issue a High Risk Activity Notification for COPE activity.
- Perform COPE activities during the maintenance window.

2.2 Test Equipment

The following test equipment is required to perform a COPE inspection:

- Dacron TS21 hand-held test telephone or equivalent.
- Fluke 8060A Digital Multimeter (DMM) or equivalent.
- HP-4934A wideband test set or equivalent.
- Wilcom T304/305 AC Current Meter.
- Fluke 80T-150 temperature probe or equivalent.
- Biddle heavy-duty megger with Earth Tester Kit (MC 575777) or equivalent.
- Model UM7700 FW Bell current gun or equivalent.
- Two 8- to 12-foot cords with:
  - 310 plug on one end.
  - Clips on the tip.
  - Ring leads on one end.
- Lorain LS 2000 load box or equivalent.
- Model B7106 ECOS AC tester or equivalent with a 7562 Isolation Probe or equivalent.
- Alber Cellcorder or equivalent.
- Midtronics Celltron Plus or equivalent.
- Laptop with communications software.
- Canoga Perkins PR80A Tunable Amplifier or equivalent.
- Infared Hear Scanner Sensor Exergen Corporation Microscanner E or equivalent.
- Fluke 80 TIR or equivalent.

2.3 Tools

The following tools are needed to perform a COPE:

- Four-inch blade screwdriver.
- Four-inch Phillips screwdriver.
- Flashlight.
- Socket set that meets office requirements.
- 3/32-inch by 2-inch screwdriver.
- Open-end or box wrench that meets office requirements.
- Insulated mat.
- Electrical tape.
- Eight-foot wooden step ladder.
- Proto 6008 torque wrench or equivalent.

2.4 Documentation

A COPE inspection requires the following documentation:

- Central Office Power Evaluation Inspection Sheet form (Form 00-205-0006, see Exhibit 1).
- Power equipment manufacturer's manuals.
- GTE Network Services practices.
- Site power distribution prints.

NOTE: Complete the COPE Inspection Sheets after completing each step.

2.5 Safety

Power safety is the most important responsibility of the COPE Evaluation Team.

The COPE Evaluation Team is responsible for ensuring that personnel:

- Working on or around power equipment, do not wear:
  - Rings.
  - Watches.
  - Chains.
  - Loose clothing.
  - Dangling objects.
- Wear safety goggles or glasses and rubber gloves when working on batteries or power equipment.
- Do not work on batteries that have been equalized or check-charged until all gas has dissipated (normally 12 - 24 hours).
- Never accept another employee's word that the power is turned off. Check it personally.
- Use tools with insulated handles when working on power equipment.
- Cover all power equipment with an insulated mat when working above the equipment.
- Always have another employee present when working on any power equipment.
- Respect power, work safely, and use common sense.

2.6 Definitions

The following chart provides definitions for the acronyms and terms used in this practice.

Acronym or Term	Definition
A	Ampere - Unit of current.
AC	Alternating Current
ALU	Analog Line Unit
AMP	Ampere
APC	Administrative Processor Complex
ATU	Analog Trunk Unit
BHL	Busy Hour Load
BOD	Battery on Discharge
CDF	Coin Dial-Tone First
CO	Central Off ice
COPE	Central Off ice Power Evaluation
CVGB	Cable Vault Ground Bar

(continued)

2.6 Definitions, continued

Acronym or Term	Definition
CXR	Carrier
dB	Decibel
dBrnC	Reference Noise Measured at C-message
DC	Direct Current
DCO	Digital Central Office
DLC	Digital Loop Carrier
DMM	Digital Multimeter
DMS	Digital Multiplex System
DSX	Digital Cross-Connect
EAX	Electronic Automated Exchange
ECOS	ECOS Electric Corporation
ECPGB	Entrance Cable Protector Ground Bar
ECS	Exchange Carrier Standards
EL	Electronic Logic
EQ	Equipment
FA	Fuse Alarm
FGB	Floor Ground Bar
FGE	Framework Ground Equalizer
FTUF	Frame Trunk Unit Frame
GRD	Ground
GWB	Ground Window Bar
HF	High Frequency
ICB	integrated Collector Bus
IGZ	Isolated Ground Zone
INAS	integrated Network Alarm System
kHz	Kilohertz (1,000 Hertz)
LC	Low Current

(continued)

2.6 Definitions, continued

Acronym or Term	Definition
LED	Light Emitting Diode
LRB	Logic Return Bus
LRE	Logic Return Equalizer
LVB	Low Voltage Return Bar
LVG	Low Voltage Ground
MC	Mailcode
MDF	Main Distributing Frame
MGB	Master Ground Bar
MIS	Miscellaneous
MISC	Miscellaneous
MISF	Miscellaneous Frame
mV	Millivolt
mVdc	Millivolts DC
NMS	Noise Measuring Set
NOC	Network Operating Center
Ohm	Unit of electrical resistance.
OLS	On-line Support
OSP	Outside Plant
PAD	Packet Assembler/Disassembler
PDU	Power Distribution Unit
PDUF	Power Distribution Unit Frame
PWR	Power
RFA	Rectifier Fail
RPM	Remote Packet Module
RSU	Remote Switching Unit
SPC	Stored Program Controlled
SPG	Single Point Ground

(continued)

2.6 Definitions, continued

Acronym or Term	Definition
SPS	Smart Power System
SXS	Step-by-Step
TL-1	Transaction Language One
T/R	Tip and Ring
TSA	Terminal Strip A
V	Volt
Vac	Volts AC
Vdc	Volts DC
VOM	Volt Ohmmeter
VRLA	Valve Regulated Lead Acid
Xmtr	Transmitter

2.7 References

The following chart provides sources of supplementary information relating to this practice. The documents could be required for performing certain tasks.

See...	For Information About...
200401400	Safety Precautions - Central Office
205-000-500	Power Connections, Central Office Inspection and Tightening Procedures
205-002-501	Isolated Ground Faults Detection - Direction and Troubleshooting - Switching and Transmission Systems
205-005-200	Batteries - Central Office Remote - installation and Maintenance
205-253-l05*	Generator Lorain Ringing - Model T-50, 50R - Description, Installation, and Maintenance
205-254-l 00*	Generator Lorain Ringing - Model T-100
205-601 -701	Electronic High-Low Voltage Alarm Circuit Adjustment
205-605-501	Alarms, Audible and Visual - (Excluding SATT Alarms) - Testing Procedures

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2.7 References, continued

See...	For Information About...
205-605-502	Audible and Visual - Power Equipment - Alarms Test Procedures
205-705-201	Power Plant Bus Bar Installation
206-311-100"	Tone Supply Precise Tone Plan Description
224-100-100"	GTD-5 EAX - Power and Alarm Equipment AG Communications
237-224-214*	Installation of Ground Isolation
256-050-204	Cabling Methods - Running and - Securing Switchboard Cable
331-310-510	Message Noise Measurement - Battery Supply Circuit - in Central Offices
605-l 00-202	Cable Bonding and Grounding - Underground Cable in Manholes
795-001-070	Switching Systems - Power Cabling and Fusing - Engineering Applications
795-805-071	Central Office Grounding Systems - Engineering Applications
795-805-072	AC Service Grounding - Engineering Applications
795-805-073	Central Office Grounding - Transmission Equipment
795-805-074	Inspecting Central Office - Grounding and Electrical Protection
795-805-075	Remote Electronic Serving Area - Grounding Systems - Engineering Considerations
795-805-076	NORTEL Digital Multiple System (DMS) - Switching Systems Grounding - Engineering Application
795-805-077	Guidelines for Grounding Stromberg-Carlson - DCO Switching System Grounding - Engineering Applications
795-805-078	Engineering Guidelines for Grounding - Lucent Switching Technologies - Equipped in GTE Facilities
833-216-070	EAX No. 1 Transmission Design and Objectives

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2.7 References, continued

See...	For Information About...
833-221-070	EAX C-I Transmission Design and Objectives
833-222-070	EAX No. 2 Transmission Design and Objectives
833-224-070"	GTD-5 EAX Transmission Performance Specifications
887-030-085	Radio Station Protection - Engineering Considerations
887-600-071	Fundamentals of Ground Measurements
887-600-072	Methods for Measuring Electrode Ground Systems
887-795-070	Lightning Protection Guidelines
903-I 01-070	Protection Cable Bonding and Grounding
Mini-COPE #1 Section D**	NOC Bulletin Board
Mini-COPE #3**	NOC Bulletin Board
Mini-COPE #8**	NOC Bulletin Board

* Published by AG Communication Systems.

** Available by using remote dial-up access into the National NOC Bulletin Board, at I-800-628-0515. (Access is password protected and must be coordinated with the NOC-OLS.)

2.8 Forms

The following forms are referenced in this practice:

- Continuity Test form, Form 00-205-0002.
- Central Office Power Evaluation COPE Discrepancy List form, Form 00-205-0003.
- Central Office Power Evaluation COPE Discrepancy Referral form, Form 00-205-0004.
- Smart Monitor/Control System form, Form 00-205-0005.
- Central Office Power Evaluation Inspection Sheet form, Form 00-205-0006.

To obtain these forms, prepare a Form Request (Form 900001814) and send it to Forms Administration at:
GTE Network Services
Forms Administration
700 Hidden Ridge
PO. Box 152092
Irving, TX 75015-2092
Fax: 972/718-2659

3. Noise

3.1 Transmission Battery Test Equipment Set-Up

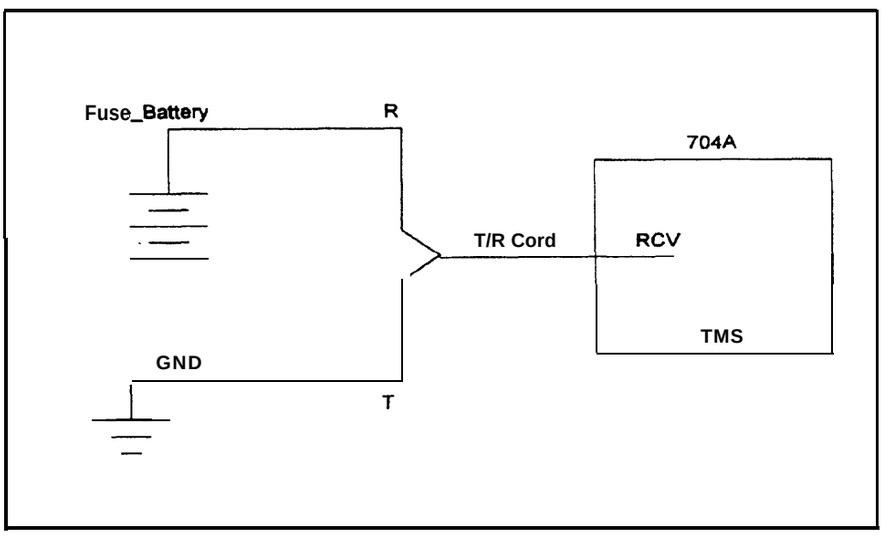
Set the test set to the following positions for transmission battery noise testing:

- Quiet:
  - 600 ohms.
  - Bridged.
- Weighted or C-Message:
  - Noise.
  - Receive.

Use the same equipment to test:

- Batteries.
- PDUs.
- Fuses.
- Filter circuits.

The following illustration describes how only the test points change.



3.2 Battery Noise Testing

Use the instructions in the following chart to test battery noise.

Step	Testing Battery Noise
1	Measure the transmission battery noise at the batteries (refer to GTE Telephone Operations Practice 331-31 0-51 0).
2	Connect the cord tip lead to Cell 1 (positive).
3	Connect the ring lead of the cord to Cell 23 (negative). Use Cell 24 if the system has no end-cells.
4	Record results on the Central Office Power Evaluation Inspection Sheet form, (Form 00-205-0006, see Exhibit 1) in the space marked “Batteries.” Note any noise level greater than 32 dBrnC.

3.3 Determining the Battery Noise Source

Perform the procedure in the following chart if the battery noise objective is not met.

Step	Determining Noise Source Action
1	▪ Turn off each rectifier one at a time and note any reduction in the noise level across the batteries. • Restore the rectifier to service and continue with the next rectifier. • Lower noise levels indicate a bad rectifier. • Refer to manufacturer's manuals for corrective procedures. • Correct as required. • Proceed to Step 2 if the battery noise is greater than the battery noise objective.
2	• Set all rectifiers to the Equalize Mode. **NOTE: Note any noise level reduction. Reduced noise indicates a need to fully charge the battery plant.** • Charge batteries if required. • Proceed to Step 3 if the battery noise is greater than objective.
3	• Verify that the battery plant has four times the BHL ampere-hour capacity (refer to GTE Telephone Operations Practice 795-000-073). • Refer to the Region Power Engineer as required.

NOTE: The noise source is originating from the office equipment if the noise level continues to be greater than objective.

3.4 PDU and Power Board Testing

Use the procedure in the following chart to test and record PDU and power board noise.

Step	Testing PDU and Power Board Noise
1	Read between the positive and negative bus above the PDU and power boards.
2	Record results on the Central Office Power Evaluation Inspection Sheet form, (Form OO-205-0006, see Exhibit 1) in spaces marked "Power Boards."

3.5 Equipment Bay Noise

This section provides procedures for determining and correcting equipment bay noise problems.

3.5.1 Equioment Without Bay Filters

The following chart describes the procedure for measuring noise in equipment without bay filters.

Step	Measuring Noise
1	Measure the transmission battery noise at the equipment bay fuse panel.
2	Record the results for each equipment bay on the Central Office Power Evaluation Inspection Sheet form, (Form OO-205-0006, see Exhibit 1) in spaces marked "Non-Filtered Bays."

Start at the site PDU when identifying the source of high input noise to equipment frames. Use the NMS and the procedure in the following chart to identify noise.

Step	Correcting Noise Problems
1	Determine the panel: • Test each fuse panel after connecting one test lead to the PDU's positive bus. • Use the panel with highest noise level for Step 2.
2	Determine the fuse: • Read the noise level of each fuse position in the panel. • Use the fuse with the highest noise level for Step 3. NOTE: **The reading might be only slightly higher than the other fuses.**
3	Determine the equipment frames: • Consult office wiring prints to determine equipment frames associated with the noisy fuse. • Use the frame with the highest noise level for Step 4.
4	Determine the equipment shelf – Read the noise levels of each shelf in the identified equipment frame.
5	Determine the noise source: • Measure the input to each piece of equipment located on the shelf to determine the noise source. • Replace equipment with the highest measured noise level.
6	Repeat Steps 1 through 5 until all bays meet noise level objectives.

3.5 Equipment Bay Noise, continued

3.5.2 Equipment With Bay Filters

Use the procedure in the following chart to measure noise in SXS switches.

Step	Measuring Noise - SXS Switches
1	Measure at the battery input terminals of the filter.
2	Measure at the output terminals of the filter.
3	Record results on the Central Office Power Evaluation Inspection Sheet form, (Form 00-205-0006, see Exhibit 1) in spaces marked "Filtered Bays."

NOTES: The equipment side (the filtered battery side) should measure at least 10 dB less than the battery side.

if the output terminal of the filter battery measures more than 30 dBrnC, correct the problem by replacing the filter.

Use the following chart to measure SPC switch noise.

Step	Measuring Noise - SPC Switches
1	Take noise readings at the GTD-5 switches TSA block. Measure between terminals: • 1 and 4 (Input). • 2 and 4 (Inductor). • 3 and 4 (Capacitor). **NOTE: if the site is a DMS or ESS switch, consult CO equipment prints for filter circuit test points.**

1-2 BATTERY 1-l	**2-2 INDUCTOR 2-1**	**3-2 CAPACITOR 3-1**	**4-2 GROUND 4-1**

2	Record the results for each equipment bay in Central Office Power Evaluation Inspection Sheet form, (Form OO-205-0006, see Exhibit 1) in the spaces marked "Filtered Bays."
3	List bad filter locations on the Central Office Power Evaluation Inspection Sheet form.

3.6 Determining Noise Problems

The battery filter circuit reduces battery noise transmissions that enter the line or trunk circuits approximately 10 dBrnC higher than normal. GTD-5 ALU and ATU frames can have trouble in these circuits with no indication.

Possible sources of battery noise transmissions include:

- Equipment with a switching power supply (a unit that converts voltage).
- Equipment cooling fans.
- Unbalanced power loops.
- OSP cable shield problems.
- Bad filter capacitor circuits.
- AC circuit induction due to lack of separation from DC circuits.
- Loose power connections.
- Improperly sized battery plants.

NOTE: Use appropriate manufacture documentation for all switching technologies and Pair Gain units to correct transmission battery noise problems.

The site PDU is the starting point for identifying the source of high input noise to equipment frames. Test for noise using the following procedure.

Step	Testing Power Supply
1	Determine the panel: • Connect one test lead to the positive bus of the PDU and test each fuse panel. • Use the panel with highest noise level for Step 2.
2	Determine the fuse: • Read the noise level of each fuse position in the panel. • Use the fuse with the highest noise level for Step 3.
3	Determine the power supply: • Check the 50 Vdc input to each power supply. • Use the power supply with the highest noise reading for Step 4.
4	Change out the power supply with the highest reading. Repeat these steps until the noise levels meet the noise objectives. **NOTE: Do not change out a power supply until all power supply battery Inputs are measured in all noisy frames.**

3.7 Correcting Noise Problems

GTD-5 ALU and ATU frames can have trouble in the circuits with no indications.

Nominal readings are listed in the following chart.

The Nominal Reading for the...	IS...
Input	30 dBrnC or less.
Inductor	20 dBrnC or less.
Capacitor	20 dBrnC or less.

The following chart lists examples of filter noise readings.

Frame	Unit	Input	Inductor	Capacitor	Trouble Found
ALUF	000	29	17	15	Normal readings
ALUF	001	30	28	19	Blown cap fuse
ALUF	002	18	30	16	Wiring problem
ALUF	003	40	22	20	Noisy power supply
ALUF	010	29	21	20	Noisy facilities

NOTES: If battery filter circuit outputs are above 20 dBrnC, the cause might be in the outside facilities instead of in the filter circuit. Refer the trouble to the appropriate work group.

Inductor and capacitor noise readings should be 10dB lower than the input reading, even the noise objective is met.

Investigate the following problems (see Section 3.7).

3.7.1 Blown Fuse

The 1A indicator fuse (FA4) will open when the 15A (FF4) fuse blows. However, the 1 A (FF4) fuse can be replaced even when the 15A (FF4) fuse is blown, due to a resistor in parallel with the 15A (FF4) fuse. Anytime a 1A (FF4) blows, remove and check the 15A (FF4) fuse with an ohm meter. Remove the FF4 fuse during the maintenance window. An open 15A (FF4) fuse causes the filtered battery output, measured at TSA 2 - 2, to be approximately 10 dBrnC higher than normal.

Remove and check the capacitor fuse (FF4), if the output of the circuit is not 20 dBrnC or lower.

3.7 Correcting Noise Problems, continued

3.7.2 Wiring Problem

The terminal strip (TSA) is wired wrong. If the battery and indicator leads are reversed (TSA l-l and 2-l), the 4 MH Ll inductor is bypassed. In this configuration, approximately 30 dBrnC is measured at the filtered battery output (TSA 2-2).

NOTES: Use the equipment bay EL as a reference when checking the TSA block wiring.

Loose lugs on the terminal strip TSA can affect the circuit operation. Hold the lead end tightly under the lug.

3.8 Cross-Off ice Noise Testing

Perform five line-to-line test calls to determine the cross-office noise performance. Use the instructions in the following chart to test for cross-office noise.

Complete each line of the NOISE section on the Central Office Power Evaluation Inspection Sheet form, (Form OO-205-0006, see Exhibit I), as required.

NOTE: The objective noise level is less than 18 dBrnC.

Step	Testing for Cross-Office Noise
1	Connect the 310 plug to the line 1 jack.
2	Connect the other end of the line 1 cord to the T/R on a block with access to the originating equipment.
3	Connect the hand test set to the dial jack or terminals on the NMS.
4	Connect the NMS line 2 jack to the block with access to the terminating equipment.
5	Set up the NMS in this configuration: • Receive. • 900 ohm. • Terminated. • Weighted or C-MESSAGE. • Quiet. • Noise.
6	Perform five line-to-line test calls.
7	Record results on the Central Office Power Evaluation Inspection Sheet form, (Form 00-205-0006, see Exhibit 1).
8	If test call results exceed 18 dBrnC, use the Cross-Office Noise Trouble Locating Flowcharts (see Exhibits 2 and 3) to perform 20 more test calls.

NOTE: In some cases, measurements taken with a Halcyon 704A might be erroneous when powered by AC. if measurements fail to meet objectives, verify the reading by holding a test call and switching the 704A to the battery Power Mode.

4. Grounding Systems

4.1 Inside Ground Inspection

Use GTE Telephone Operations Practices 795-805-071, 795-805-072, and 795-805-074 as guidelines for inspection and evaluation of grounding systems.

A well designed grounding system:

- Provides an equalized ground reference for equipment operation.
- Controls potential differences to minimize electric shock to personnel.
- Reduces noise by providing low-impedance paths between:
  - Frames.
  - Systems.
  - Earth.
- Provides a degree of reliability for the service life of the equipment at the site.
- Protects equipment from damage or fire hazard by ditching excessive fault and lightning currents to earth.

Improper grounding results in:

- Erratic equipment operation.
- Noisy circuits.
- Premature component failures.
- Catastrophic equipment failures.
- Potential safety hazards.

Complete each line of the GROUNDING SYSTEMS section of the Central Office Power Evaluation Inspection Sheet form, (Form 00-205-0006, see Exhibit 1), as required.

The grounding and bonding inspection consists of visually inspecting and testing:

- Site building ground system.
- Site lightning protection system.
- Personal safety ground system.
- Exchange OSP cable-entrance ground and bonds.
- Frame grounds.
- All ground and splice bars.
- All grounds connected to the:
  - Building ground system.
  - Lightning protection ground system.
  - Safety Ground System.
  - MGB.
  - FGB.
  - All ground bars in the IGZ.

4.2 Outside Ground Inspection

Visually and physically inspect the outside ground connections around the building including:

- Lightning rod connections to ground cables.
- Down lead connections to ground rods.
- Ground ring connections to ground rods.
- Building steel connections to ground system.
- Ground cable connections to the well.
- Ground cable connections to water pipes.

  NOTE: Verify that Lead 9 bonding between the exterior and interior water pipes (typically across the water meter) is in place. Check local ordinances if Lead 9 is not in place since some municipalities prohibit its placement.

- Fence bonding cable connections to the ground system.

  NOTE: Verify that metallic fences within 6 feet (1.8m) of the grounding electrode are bonded to it.

4.3 Lightning Protection Outside (if equipped)

4.3.1 General Considerations

Outside lightning protection requires meeting the following lightning protection standards:

- Roof and down-conductors need at least two paths to the ground.
- Make ground connections to water pipes where available.
- Outside metal bodies (e.g., vents, pipes, ladders, etc.) extending through the structure:
  - Must be bonded to the nearest lightning conductor.
  - Might require additional separate grounding.
- Conductor size (two or equivalent) is based on mechanical strength considerations.

4.3.2 Lightning Rods

The air terminal (lightning rod) is a major means of protection. Verify that air terminals (lightning rods), when in place are located:

- On the highest point of elevation.
- A minimum of 10 inches above the structure to eliminate the danger of fire from the arc.
- Every 20 feet maximum for rods that are less than 24 inches.
- Every 25 feet maximum for rods that are 24 inches.

4.3.3 Down Leads

Down conductors should have:

- A horizontal or downward course.
- No bends less than:
  - 90 degrees.
  - Eight inches in radius.
- A minimum of two conductors with no more than 100 feet between conductors.

4.3 Lightning Protection Outside (if equipped), continued

4.3.4 Inspection and Evaluation

Use the following instructions to inspect and evaluate outside surge arrestors.

Step	Inspecting and Evaluating Outside Lightning Protection
	Perform a visual and physical inspection of all system connections.
2	Record results on the Central Office Power Evaluation Inspection Sheet form, (Form OO-205-0006, see Exhibit 1) in the spaces marked "Lightning Protection – Outside."

4.4 Lightning Protection Inside

Use the following instructions to inspect and evaluate indoor lightning protection.

Step	Inspecting and Evaluating Indoor Lightning Protection
1	Ensure that all large metal bodies within six feet of a lightning conductor are bonded to the lightning conductor.
2	Verify that a lightning protection device is installed at the AC main power panel and all indicator lights are properly illuminated. **NOTE: Reference Mini COPE #I Section D and GTE Telephone Operations Practice 887-000-301.**
3	Record results on the Central Office Power Evaluation Inspection Sheet form in the spaces marked "Lightning Protection – Inside."

4.5 Sites Without Lightning Protection Systems

Refer to the GTE Telephone Operations Practice 887-795-070, Lightning Protection guidelines, to determine protection needs.

NOTE: Contact Support Assets - Real Estate and Building Services for assistance in evaluating risk assessment.

4.6 Grounding Towers

Verify that external towers adjacent to the CO building are located 1.8 m (6 feet) from the building structure to minimize the affect on the foundation. Practical considerations (i.e., proximity to other buildings, structures, etc.), however, must be taken into account. Ensure that the down conductors used to ground the tower ring are bonded to the building's number 1 lead (refer to GTE Telephone Operations Practice 795-805-071).

Verify that roof mounted towers are grounded using down conductors, preferably external to the building.

CAUTION: Vertical (roof-to-ground) down conductors must not be routed through the switching area and must be separated from all power and switchboard cables by a minimum of 24 inches because this could increase the electromagnetic fields inside the building and induce surges into cabling equipment .

When electrical or digital systems are installed in structures with existing roof-mounted towers that have grounded conductors through the building, verify that the structure includes additional grounding conductors.

4.6 Grounding Towers, continued

4.6.1 Towers on Buildings

Verify that building towers include the following requirements:

- Connect the tower base ground ring to:

  All tower base fit sections.

  Waveguide or coaxial outer conductor.

  Lighting AC branch circuit conduit and green wire.

  Lighting arrester ground (refer to GTE Telephone Operations Practice 795-805-072).

  OR

- Verify that Lead 22 is:
  - Run from the tower ring to the lighting down conductor at each corner and the middle of each side of the building.
  - Connected to the corner structural steel building columns and extended from the lower lends of the corner columns to the external lightning ground system.

NOTE: Refer to GTE Telephone Operations Practice 887-030-085 for additional tower grounding information and GTE Telephone Operations Practice 887-795-070 for lightning protection.

4.7 Cable Bonding and Grounding

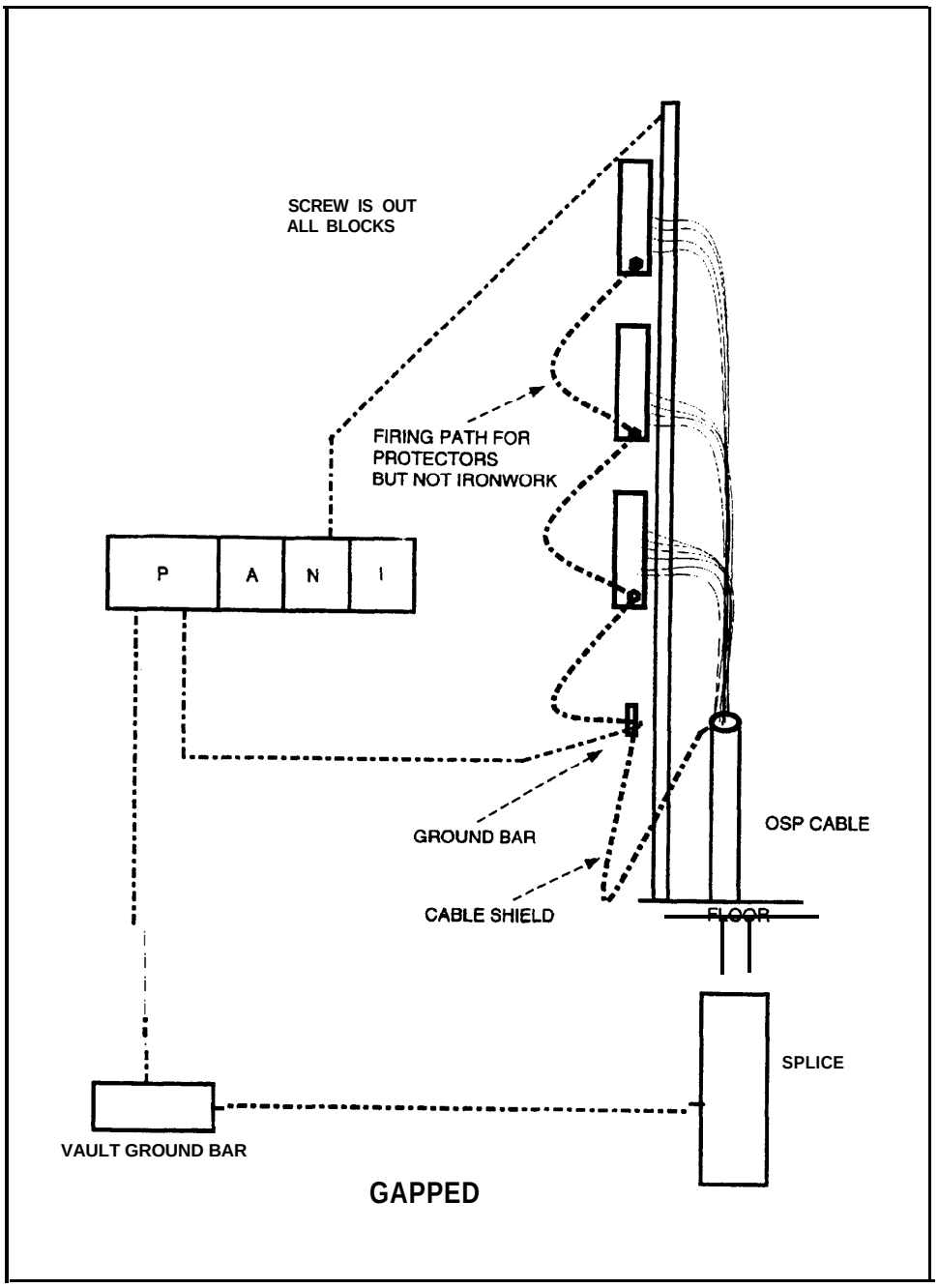
The following chart describes a procedure for visually and physically inspecting the OSP cables. Refer to GTE Telephone Operations Practices 605-100-201 and 795-805-071 and Mini-COPE #3.

Step	Inspecting and Evaluating OSP Cables
1	Use the Wilcom T304/305 or equivalent test set to verify that Lead 17 has some AC current on each entrance cable shield and: • Is #6 wire or cable ribbon. • Has tight connections to the tip splice. • Takes the most direct path to the ground bar. • Has no splicesor sharp bends (six-inch minimum radius). • Bonds all cables on the field side of the tip splice as close as practical to the cable entrance. **NOTES: Bonding needs to be as close as practical to the cable entrance where no tip splice exists.** **A lack of any AC current could indicate bonding problems.**
2	Ensure that Lead 16 (or 16A): • Is I/O insulated cable. • Is attached to the ground bar using two-hole compression lugs. • Is bonded to all cable support racks. • Has no splices or sharp bends. • Has tight connections.
3	Ensure that OSP cables: • Are not encircled by metallic supports. • Are wrapped in fire-proof tape (if not located in cable vault, conduit, or subduct). • Have continuous cable shields across the splice (refer to GTE Telephone Operations Practice 605-100-201). **NOTE: DO NOT intentionally close gapped cables in existing locations.** • Have all cable entrance holes sealed. • Verify that all cables are either gapped or continuous. **NOTE: There should be no mixed, i.e., gapped and continuous systems.**

(continued)

4.7 Cable Bonding and Grounding, continued

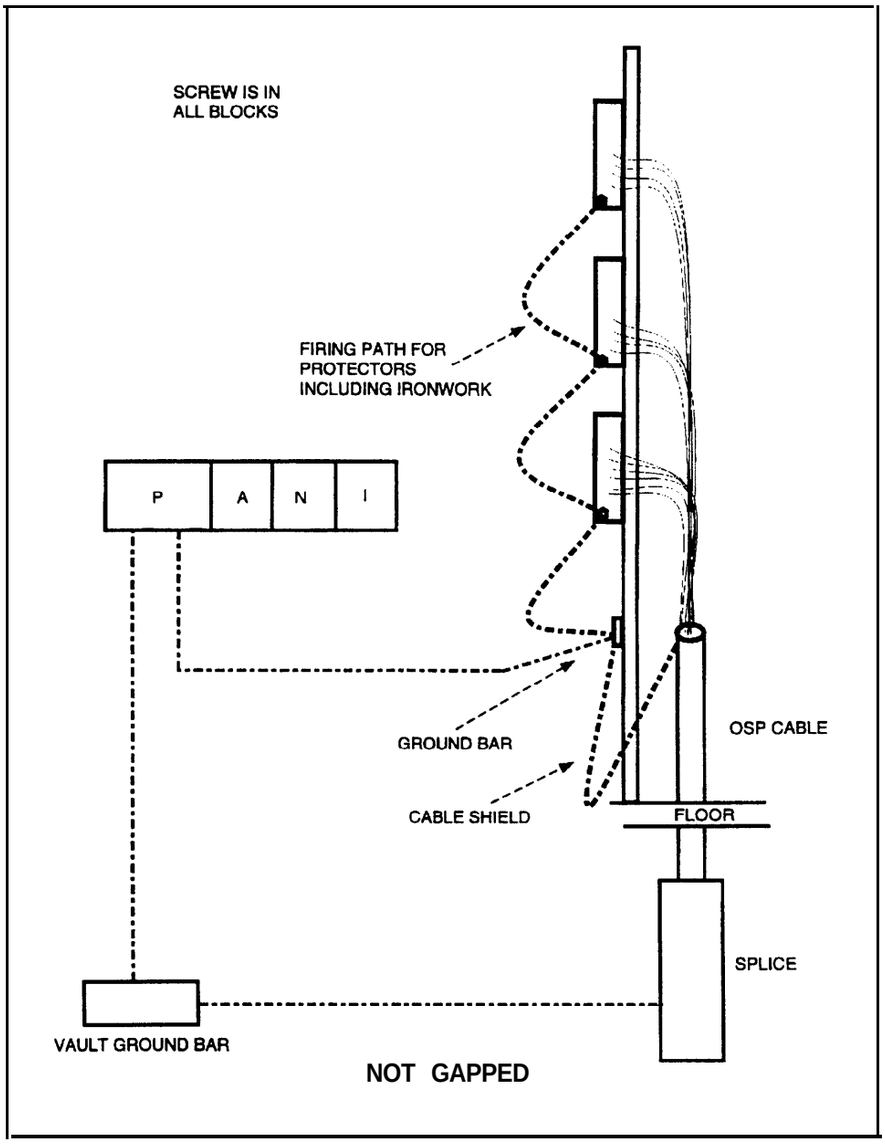
Step	Inspecting and Evaluating OSP Cables
3	Continued,



(continued)

4.7 Cable Bonding and Grounding, continued

Step	Inspecting and Evaluating OSP Cables
3	Continued,



4	Record results on the Central Office Power Evaluation Inspection Sheet form, (Form 00-205-0006, see Exhibit 1) in the spaces marked "Cable Bonding."

4.8 High-Frequency Cable

Use the following instructions and Mini-COPE #3 to inspect and evaluate high-frequency cable.

Step	Inspecting and Evaluating High-Frequency Cable
1	Examine the high-frequency cable protectors: • To verify the discharge path for protectors and shields (refer to GTE Telephone Operations Practice 795-805-073). • Record discrepancies on the Central Office Power Evaluation Inspection Sheet (Form 00-205-0006, see Exhibit 1), in the spaces marked "Protection Block" and "Cable Shield".
2	Locate all office DSX (Digital Cross-Connect) panels, then: • Inspect them for high-frequency cable shield grounds. **NOTE: Do not ground shields at the DSX equipment.** • Record discrepancies on the Central Office Power Evaluation Inspection Sheet (Form 00-205-0006, see Exhibit 1), in the spaces marked "DSX Bay."

4.9 Ground Bars

Use the following chart when visually and physically inspecting ground bars.

Step	Inspecting and Evaluating Ground Bars
1	Visually inspect all cables terminated on the: . MGB. • FGB (if equipped). • CVGB (if equipped). • All ground bars in the equipment ground zone (if equipped).
2	Ensure that: • Ground bar connectors are two-hole compression type. • No ground connections exist on the LVG (if equipped). • All cables connected to the ground bar are in good condition and properly labeled. Record results on the Central Office Power Evaluation Inspection Sheet form in the spaces marked "Ground Bar Cables Labeled."
3	Measure resistance drop across all ground bar connections by: A. Setting the DMM scale to the lowest resistance setting. B. Measuring the resistance across cable connection to the ground bar. **NOTE: 0.000 ohms is a good connection. Any reading above 0.01 ohms indicates a bad connection.**

(continued)

4.9 Ground Bars, continued

Step	Inspecting and Evaluating Ground Bars
4	Make all corrections as required. **NOTE: Tighten ground connections only during the maintenance window.**
5	Record the location of all bad connections on the Central Office Power Evaluation Inspection Sheet form in the spaces marked "Loose or Bad Connections."
6	Use the following procedure to measure AC and DC current on ground bar cables: A. Calibrate the current gun to DC 0.0 milliamps. B. Set current gun to DC current. C. Lock the probe's jaws around each cable listed on the form. D. Record any DC current readings on Central Office Power Evaluation Inspection Sheet form in the spaces marked "Ground Return Amperage." E. Set the current gun to AC and repeat Steps C and D to measure AC current on the leads listed on the form. **NOTES: A grounding problem is indicated and must be investigated further, if excessive* DC current is measured on the following:** • **Ground ring (Lead 5).** • **Well (Lead 7).** • **Water pipe ground (Lead 8).** • **Cable ground (Lead 16, 16A, or** 17). **Leads 16, 16A, and 17 might show some AC current (see Section 4.6, Step 1). This indicates good cable sheath continuity. Isolated equipment frame ground (Lead 41) displays no current.** ***The value of excessive cannot be well designed in this case because of various variables (e.g., on site ground resistance and other site specific variables). A good rule of thumb is that anything greater than 5 Amps requires further investigation.**
7	Complete sketches of both master and floor ground bars per instructions on the Central Office Power Evaluation Inspection Sheet form in the GROUNDING SYSTEMS section.
8	Annually check and verify ground resistance readings (refer to GTE Telephone Operations Practices 887-600-071 and 887-600-072 on MGB, well ground, and ground ring or field). Record readings on the Central Office Power Evaluation Inspection Sheet form.

4.10 Distributing Frame Grounding

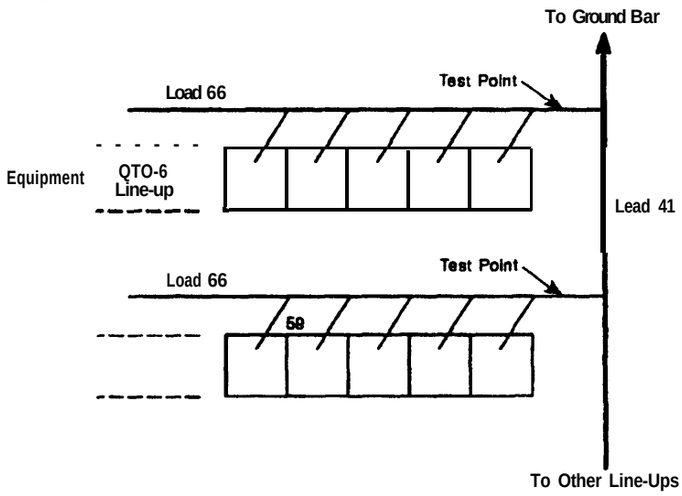
Use GTE Telephone Operations Practice 795-805-071 and the instructions in the following chart as references when visually and physically inspecting the ECPGB

Step	Inspecting and Evaluating MDF Grounding
1	Ensure that Lead 23: • Is attached to the ECPGB using compression lugs. • Has no splices or sharp bends. • Has tight connections. • Is connected to the frame ground bar at least every 17 feet (5.18 m). • Is separated from the switchboard cables by at least 12 inches (30.48 cm) outside of the MGB and MDF.
2	Ensure that Leads 24 and 24A: • Have no splices or sharp bends. • Have tight connections. • Are directly connected to the protection block.
3	Record results of inspection on lines 4 and 5. **NOTE: Ensure that all frame grounding is the same, mixing of former CONTEL and GTE frame grounding systems is NOT allowed.**

4.11 Inspecting the Ground Isolation for SPG Switches

Complete each line of the Inside Ground Inspection section of the Central Office Power Evaluation Inspection Sheet form, as required when completing this section.

Use the procedure in the following chart for evaluating ground isolation detail of the office and AC power (refer to the appropriate switching technology GTE Telephone Operations Practices in Section 2.7 and manufacturers system practices).

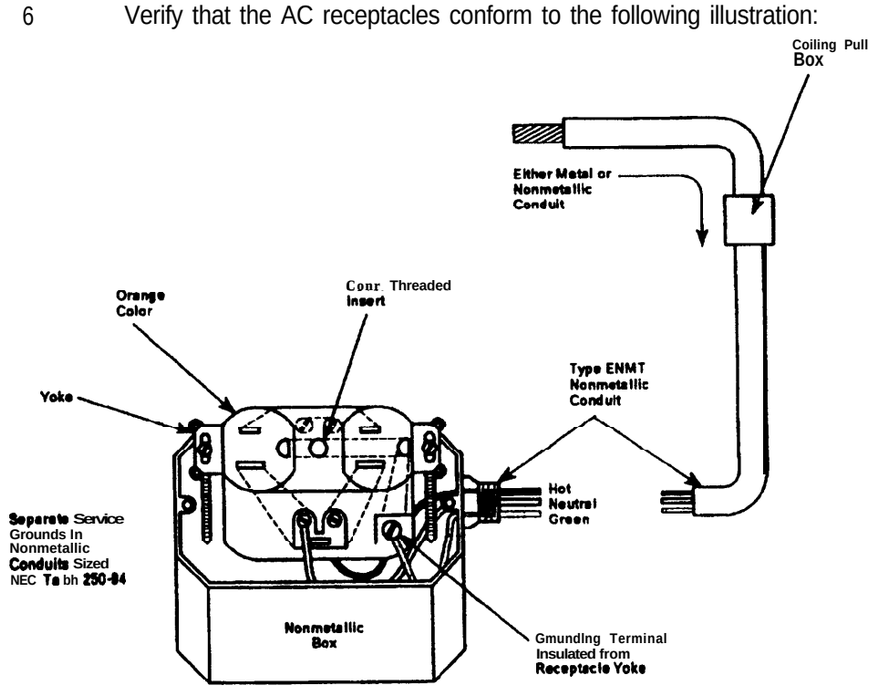
Step	Testing Isolation
1	Measure the current at the end aisle (test point) indicated in the following illustration: 
2	Clamp the ammeter to Lead 58 to ensure no AC or DC current is present. Record the results on the Central Office Power Evaluation Inspection Sheet form. If any DC or AC current is present, correct the problem before preceding. After verifying that there is no AC current present, lift lead 41 and verify the 25 M ohm isolation. **Note: In DMS sites, measure the LRE and FGE cables at the MGB/FGB for any AC or DC currents. None should be present. Use this procedure to measure any current that might be present.**
3	Ensure that all equipment frames are isolated from the site's floor and superstructure through visual inspection. Record the results on the Central Office Power Evaluation Inspection Sheet form.
4	Visually inspect all power equipment installed in the isolated frames (MISF, MISC, FTUF, etc) to ensure that a positive battery terminal is not connected to the chassis of the unit being inspected. Ensure that commercial power is not connected to the inverter within the isolated frame area. Record the results on the Central Office Power Evaluation Inspection Sheet form.
5	Refer to GTE Telephone Operations Practice 205-002-501 for procedures to correct any isolation current problems.

4.12 AC Receptacle Ground Isolation

WARNING: This section must be performed by a licensed technician.

Use the following instructions when evaluating isolated AC receptacles.

Step	Evaluating AC Receptacles
1	Insert the 7562 isolation probe into the farthest isolated receptacle from the AC distribution panel. Connect the probe wire to the metal receptacle cover or the cover screw. **CAUTION: Plug the probe into the receptacle before inserting the 87106 test set.**
2	Insert the 87106 AC tester into the 7562 test probe. Perform isolation tests using the test equipment and the manufacturer's procedures.
3	Check the test results for ground-to-neutral shorts or polarity problems.
4	Check the 4RSEE results on the Central Office Power Evaluation Inspection Sheet form.
5	Repeat Steps 1 - 4 for all isolated AC receptacles in the office.
6	Verify that the AC receptacles conform to the following illustration:



7	Check for any unauthorized equipment plugged into isolated receptacles (refer to GTE Telephone Operations Practice 795-805-072). Record any discrepancies on the Central Office Power Evaluation Inspection Sheet form.

(continued)

4.12 AC Receptacle Ground Isolation, continued

Step	Evaluating AC Receptacles
8	Verify that the AC green wire ground is bonded to the MGB in DMS switching sites. This splice box must be located within three feet of the MGB. Verify and record discrepancies on the Central Office Power Evaluation Inspection Sheet form.

5. Power Cable and Bus System

5.1 Inspection

Perform the following requirements when inspecting the power cable and bus systems:

- Visual inspection of the bus system.
- Visual inspection of power cables.
- Test of the power cable connections from the rectifiers to the bus system.
- Measurement of the voltage drop from the batteries to the PDU.

NOTE: Complete each line of the POWER CABLE AND BUS SYSTEM section of the Central Office Power Evaluation Inspection Sheet form (refer to GTE Telephone Operations Practices 205-705-201 and 256-050-204).

5.2 Bus System

Use the procedure in the following chart when inspecting the bus system.

Step	Inspecting and Evaluating the Bus System
1	Visually inspect the bus system and record the type and size of the system on the Central Office Power Evaluation Inspection Sheet form in the spaces marked “Bus System.”
2	Use a torque wrench to sample ten bolted clamps and record torque pressure on the Central Office Power Evaluation Inspection Sheet form in the space marked “Torque Pressure.”
3	Correct bolt torque values using retorque values (refer to GTE Telephone Operations Practice 205-705-201). **NOTE: The retorque values are for clean, dry (non-lubricated) nuts and bolts. For lubricated bolts, use ⅓ of the retorque value.**
4	Measure all splice connections on the bus system using the millivolt drop test. Voltage greater than 9 mV indicates a bad connection that needs correction. Record the results on the Central Office Power Evaluation Inspection Sheet form in the spaces marked “Bus to Bus System.”

5.3 Power Cabling

Use the procedure in the following chart when inspecting power cabling.

Step	Inspecting and Evaluating Power Cabling
1	• Inspect all power cables to ensure that the required: – Bend radius is maintained. – Cables separation is present. • Voltage greater than 9 mV reflects a bad connection and must be corrected. • Record results on the Central Office Power Evaluation Inspection Sheet form in the spaces marked “Connections to LVB, FRE, FGE Bars and Bus”.
2	Check all cable bus connections for loose connections.
3	• Inspect all power cables to ensure that the required: – Bend ratios are maintained. – Cable separation is present. • Power cables must have three inches of separation from switchboard cables. • Record results on the Central Office Power Evaluation Inspection Sheet form in the spaces marked “Ground and Power Cables.” **NOTE: Refer to the GTE Telephone Operations Practice 256-050-204 for further requirements.**

5.4 Power System Voltage Drop

Use the instructions in the following chart to check for excessive voltage drop from the power plant to office equipment.

Step	Inspecting and Evaluating the Bus System
1	• Set the DMM to the 200 Vdc scale to read the voltage at the batteries between Cells 1 and 23 or 24. • Record results on the Central Office Power Evaluation Inspection Sheet form in the spaces marked "Office Voltage Across 1 & 24 or 1 & 23."
2	• Take the voltage reading at the main PDU. Subtract the main PDU from the reading in Step 1. • Record voltage drop results on the Central Office Power Evaluation Inspection Sheet form in the spaces marked "Voltage Drop - Batteries to PDU." **NOTE: A voltage drop of more than 0.25 is excessive.**
3	• Read the voltage at the equipment bay furthest from the batteries. Subtract the bay voltage reading from the office voltage obtained in Step 1. • Record the results of the voltage drop on the Central Office Power Evaluation Inspection Sheet form in the spaces marked "Voltage Drop - Batteries to Bay." **NOTE: A voltage drop of more than 1.50 Vdc is excessive.**

Excessive voltage drop could be caused by:

- Loose bus connections.
- Loose or high-resistance cable connections.
- Undersized bus or cable.

5.5 Guttertap Power Connections

The following chart provides instructions for testing guttertap connections.

NOTE: **This should be done only if the results of the voltage drop tests or noise tests indicate a problem. Use an infrared scanner to identify any problems discovered In Section** 5.4. **Use the procedure in the following chart to detect problems.**

Step	Testing Guttertap Connections
1	Set the voltmeter on the 200 mV scale.
2	Remove the connector cover to expose the connector and cables.
3	Insert the voltmeter probes across the connection (one probe on the feeder cable and one probe on the cable tap).
4	Measure the voltage drop while the connector is carrying the load. The reading should be 9 mV or less.

6. Batteries

6.1 Battery Rundown

Perform a Battery Rundown Test on all switching sites. This test is performed on an annual basis during the maintenance window. Record all results on the Continuity Test form (Form 00-205-0002, see Exhibit 4).

CAUTION: Do not perform this test if battery chargers are off line for any reason during the 48 hours period before the battery test.

NOTE: This is the last power routine performed after all other routines have been completed and pass associated specifications.

The following chart describes the battery test procedure.

Step	Battery Test
1	Review the battery plant records for indications of a bad battery cell.
2	Inspect the batteries for loose cell strap connections or cable connections.
3	Visually inspect cells for leakage or damage.
4	Place a DMM across the battery set closest to the PDU or battery distribution board. Place a lead on positive post of cell #1 and negative post of Cell #24 (23 in a 23 cell system). Verify the correct float voltage.
5	Test the batteries before the Rundown Test if the battery test equipment is Alber Cellcorder® or Midtronics Celltron Plus@. If using a DMM measure the voltage: • Across each cell and record the results. • Drop across each battery post connected by cell straps and record the results.
6	Turn off all battery plant rectifier (chargers) and monitor the battery voltage as it drops. **NOTE: Do not allow voltage to drop below 46 Vdc. Turn on rectifiers at 46 Vdc.**

Battery Types	Cells	Float Voltage	Equalize Voltage
Lead-antimony	23	49.91	54.00
Lead-antimony	24	52.08	54.00
Lead-calcium	23	50.60	*
Lead-calcium	24	52.80	*
Valve Regulated	23	51.75	*
Valve Regulated	24	54.00	*

***NOTE: Do not equalize lead calcium or valve regulated cells without consulting the NOC-OLS Power Group.**

(continued)

6.1 Battery Rundown, continued

Step	Battery Test
7	The voltage drops from the float voltage to approximately 48 volts and then increases to approximately 49 volts and holds there (stabilized reference point), record this voltage activity on the Continuity Test form (Form 00-205-0002, see Exhibit 4). **NOTE: The time to reach the voltage stabilized reference point can take anywhere from a few seconds to several minutes depending on office load and battery size.**
8	• Monitor the voltage for the recommended time periods on the Continuity Test Form and observe the voltage for 20 minutes beyond the stabilized reference point. • Subtract this amount from the initial stabilized reference voltage. The difference must not be greater than -.IV. The discharge period will not last the calculated reserve time if the difference is greater than -.I V. • Verify that all multiple interior cables are carrying equal current with a clamp on the ampere meter and record the reading on the Continuity Test form (Form 00-205-0002, see Exhibit 4).
9	Turn on rectifiers and switch to the Equalize Mode for 24 hours for the battery plant (lead-antimony only) to receive a full charge.
10	Contact Engineering for an evaluation of the battery plant reserve capacity.

NOTES: Sizing calculations (refer to GTE Telephone Operations Practice 795-000-073 for reserve time standards):

- **Automatic start standby generated on premise = 3 hours battery reserve.**
- **Standby generator not on premise = 5 hours battery reserve.**
- **Remote/inaccessible sites without standby generator = 8 hours or more battery reserve.**

Use the sizing calculation to determine the battery reserve time of healthy batteries at the device load.

Given:

End ceil voltage is 1.75 Vdc per ceil at 77°F.

Assume:

1680 AH battery.

Actual load current drain is 210 amps.

.80 represents 80% of battery capacity according to manufacture specifications.

Calculation example:

(1680 X .80) / 210 = 6.4 hours expected reserve.

Battery life in pair gain sites is from 3 - 5 years due to the weather conditions.

6.2 Emergency Generator Batteries

The following chart provides instructions for inspecting the emergency generator power plant.

Step	Inspecting the Emergency Generator Batteries
1	Visually inspect: • Batteries for corrosion and cleanliness. • Battery and starter cable connections.
2	Turn the battery charger off.
3	**The** following chart describes system voltage reading.

If The System Is...	Then Read the Voltage Across...
Twelve-cell	Cells 1 and 12 with a VOM, and record the results on the Central Office Power Evaluation Inspection Sheet form in the spaces marked "Battery Readings With Charger Off." The voltage should be above 22 Vdc.
Six-cell	Cells 1 and 6 with a VOM and record the result on the Central Office Power Evaluation Inspection Sheet form in the spaces marked "Battery Readings With Charger Off." The voltage should be above 11 Vdc.

Step	
4	Turn the charger on.
5	The following chart describes system voltage reading.

If The System Is...	Then Read the Voltage Across...
Twelve-cell	Cells 1 and 12 with a VOM, and record the results on the Central Off ice Power Evaluation Inspection Sheet form in the spaces marked "FL' The voltage should be above 26.4 Vdc.
Six-cell	Cells 1 and 6 with a VOM and record the results on the Central Office Power Evaluation Inspection Sheet form in the spaces marked 'Charger Voltages" The voltage should be above 13.2 Vdc.

(continued)

6.2 Emergency Generator Batteries, continued

Step	Battery Test
6	If the charger has an Equalize Mode, switch to high, and record the result on Central Office Power Evaluation Inspection Sheet form in the space entitled "EQ." The equalize voltage should be less than 28.1 Vdc.
7	Use the manufacturer's guidelines or consult the the generator maintenance personnel when making charger adjustments.

7. Power Equipment

7.1 Adjustments

Adjustments to power equipment, (i.e., rectifiers, converters, ringing generators, or inverters) are performed using the manufacturer's equipment manuals.

7.2 Power Boards

Use the following procedures when inspecting and evaluating power boards.

7.2.1 Inspection and Evaluation of Power Boards

Complete each line of the Power Boards section of the Central Office Power Evaluation Inspection Sheet form as describe in the following chart.

NOTE: Refer to GTE Telephone Operations Practices 205-000-500, 205601-701,795-805-073, and 205-605-501 when evaluating power boards.

Step	Inspecting and Evaluating Power Boards
1	Record power board bay locations and types on the Central Officer Power Evaluation Inspection Sheet (Form 00-205-0006, see Exhibit 1).
2	Perform visual and physical inspection of power board, fusing, labeling, and connections.

7.2 Power Boards, continued

7.2.2 Fusing

Use the instructions in the following chart when checking fuses.

Step	Inspecting Fuses
1	Select the power board being checked and record the following information on the Central Office Power Evaluation Inspection Sheet (Form 00-205-0006, see Exhibit I), Power Boards Section under visual and physical inspection: • Missing alarm fuses. • Unlabeled fuses. • Mislabeled fuses. • Missing spare fuses. • Loose fuse holders. • Incorrect fuse size. • Excessively warm fuse holders.
2	Remove any protective shields from the rear of the power board to allow access to fuse connections.
3	Perform the following on each fuse position: A. Check each connection for movement. Check the fuse side and bus side of each cable. Record any movement on the Central Office Power Evaluation Inspection Sheet form. B. Set the DMM to 200 mV DC or lower scale and check the mV drop across each fuse connection from the bus to the fuse cable connection. Record any connections that exceed 80 mV on the Central Office Power Evaluation Inspection Sheet form and perform the following:

If...	Then...
Greater than 80 mV	Measure the fuse load. Reading: 1. Greater than or equal to 50% and less than 80% of the fuse rating = no problem. 2. Less than 50% of the fuse rating = a bad connection. 3. Equal to or greater than 80% of the fuse rating = to the overload fuse. 4. Correct problem before proceeding.

(continued)

7.2 Power Boards, continued

7.2.2 Fusing. continued

Step	Inspecting Fuses
4	Make any necessary corrections and replace all shields.
5	Repeat Steps 1 - 4 for all office power boards.

7.2.3 Meters

Use the instructions in the chart below when checking meters.

Step	Inspecting Meters
1	Select the power board being checked and verify that the ammeter range and millivolt specifications on front of the power board match the shunt specifications on the back of the power board. Record specifications on the Central Office Power Evaluation Inspection Sheet form.
2	Calibrate power board voltage meters using the following procedures for 48 V Plant only: A. Use a DMM to set the meter voltage to the range of the meter being checked. B. Place the DMM test leads across battery terminals at the back of the meter (across Cell 1 and Cell 23/24 of the battery string farthest from the power board meter being calibrated). C. Verify that the DMM reading matches the meter reading. D. Correct the meter reading by adjusting the meter needle calibration screw as required. **NOTE: The power board voltage meter should read the same as voltage at the battery terminals.** E. Complete the calibration sticker and place the sticker over the adjustment screw.

(continued)

7.2 Power Boards, continued

7.2.3 Meters. continued

Step	Inspecting Meters
3	Calibrate power board ammeters with shunts using these procedures: A. Set the test set to the lowest millivolt range using a DMM capable of reading millivolts. B. Place the DMM test leads across the shunt where the meter leads are connected to the shunt. Record the millivolt reading for use in Step 3D. c. Divide the meter millivolt specification value into the meter voltage specification full scale range. Example: 5000 amps /15 mv = 100 (i.e., the amount of amps per mv drop across the shunt is 100). D. Multiply the millivolt reading obtained in Step B by the millivolt drop value in Step C. Example: 15 mv (Step B reading) x 100 (Step C answer) = 1500 (this is what the ammeter should read). E. Verify that the meter matches the Step D value. F. Adjust the ammeter calibration screw as needed and place the calibration sticker over the needle screw.
	WARNING: Hazardous voltage could cause injury to personnel. Exercise extreme caution.
4	Use the following procedures to calibrate the power board ammeters without shunts: A. Set the test set to the lowest millivolt range using a DMM capable of reading millivolts. B. Place the DMM test leads across the meter terminals at the back of the meter. **NOTE: Use the millivolt reading in Step 4D.** C. Divide the meter millivolt specification value (line 5 of form) into the meter voltage specification (line 4 of form) full scale range. Example: 5000 amps/50 mv = 100 amps (i.e., the amount of amps per mv drop across the shunt). D. Multiply the millivolt reading from Step B by the Step C value. The meter should read this result. E. Adjust the ammeter calibration screw as needed and place the calibration sticker over the needle screw.
5	Complete the calibration sticker with the current date and technician's initials.
6	Repeat Steps 1 through 5 for each power board in the office.
7	Read the total office discharge ammeter and record the time of reading on the Central Office Power Evaluation Inspection Sheet form.

7.2 Power Boards, continued

7.2.4 Alarms

Use the instructions in the following chart when testing alarms.

Step	Inspecting Alarms
1	Verify the proper operation of power board fuse alarms and power room fail alarms. Record results on the Central Office Power Evaluation Inspection Sheet form.
2	Record the office high voltage and battery discharge alarms voltage levels on the Central Office Power Evaluation Inspection Sheet form (refer to GTE Telephone Operations Practice 205-005-200).
3	Adjust the high voltage and BOD alarms (refer to GTE Telephone Operations Practice 205-601-701).
4	Ensure that the equipment is restored to service in the SPC offices after clearing the alarm condition.
5	Repeat Steps 1- 4 for each office power board.

7.2.5 Evaluation of Power Boards with a Smart Power System

Perform the evaluation using the Smart Monitor/Control System form (Form 00-205-0005, see Exhibit 5).

7.3 Rectifiers

Complete each line of the Central Office Power Evaluation Inspection Sheet form POWER EQUIPMENT section as required.

Use the instructions in the following chart when checking main rectifier voltage.

Step	Inspecting Main Rectifier Voltage
1	Record the model numbers and specification numbers of the different unit types on the Central Office Power Evaluation Inspection Sheet form in the spaces marked “Rectifier Model Number.”
2	Visually inspect the rectifier ammeters. All meters must show a load. Record the readings on a separate sheet of paper and compare with the readings with the power board “charge” meter. Verify that the load is identical.
3	If readings differ, follow the meter calibration procedures explained in the manufacturer’s rectifier manual.
4	Determine the total load in the office by reading the total discharge amperage meter on the power board.
5	Compare the reading with the rated output current of the rectifier being tested.

(continued)

7.3 Rectifiers, continued

Step	Inspecting Main Rectifier Voltage
6	The following chart describes amp meter discharge readings.

If the Reading Is...	Then...
Lower than the rectifier capacity	Turn off all other rectifiers not being tested.
Higher than rectifier capacity	Determine the number of rectifiers needed to carry the office load. Turn off all unnecessary units.

7	Connect the DMM between Cell 1 and Cell 23 or 24: • In the battery string. OR • At the PDU Power meter.
8	Record the float voltages of the rectifiers under test on the Central Office Power Evaluation Inspection Sheet form in the spaces marked "Float."
9	Switch the rectifier to the Equalize Mode and record the voltage readings of the DMM on the Central Office Power Evaluation Inspection Sheet form in the spaces marked
10	Repeat steps 4 - 9 for each office rectifier.

7.3.1 Main Rectifier Current

Use the instructions in the following chart when inspecting the main rectifier current.

Step	Inspecting the Main Rectifier Current
1	• Check the DC ammeter on each rectifier. • Record each rectifier's load on the Central Office Power Evaluation Inspection Sheet form in the spaces marked "Load Sharing." • The reading should be within 5% of the expected rectifier load. • Use the manufacturer's instruction manual to make load sharing or paralleling adjustments if a reading is not within 5%.

(continued)

7.3 Rectifiers, continued

7.3.1 Main Rectifier Current. continued

Step	Inspecting the Main Rectifier Current
2	Check the current limit of each rectifier using the following steps: A. Place the rectifier being checked on Equalize Mode and record the ammeter reading on the Central Office Power Evaluation Inspection Sheet form in the spaces marked "Current Limit." B. Place the completed rectifier on the float. C. Repeat Steps 1 and 2 until all rectifiers are checked. D. The current limiting objective is to limit the rectifier to 100 -110% (manufacturer's specifications) of its rated capacity. If the rectifier does not perform within these specifications: • Consult the manufacturer's instruction manual for current limit adjustment procedures. OR • Contact the NOC OLS Power Group for an alternative procedure.

7.3.2 Rectifier Checks - Internal

Use the instructions in the following chart to internally check the rectifier.

Step	Inspecting Rectifiers
1	Remove or open the rectifier cover. **WARNING: Avoid contact with any AC components located in the rectifier.**
2	Perform a visual and physical inspection on the rectifier for: • Poor wiring. • Leaking or unfused capacitors. • Capacitors with a bulging case or popped up button. • Hot or discolored components. • Excessive heat. • Loose cables.
3	Record visual inspection results on the Central Office Power Evaluation Inspection Sheet form in the spaces marked "Internal Wiring."

(continued)

7.3 Rectifiers, continued

7.3.2 Rectifier Checks - Internal. continued

Step	Inspecting Rectifiers
4	Read the AC voltage at the circuit breaker. Use the following procedure: A. Set the DMM to the 750 Vac scale. B. Read the voltage between each conductor and the neutral or ground (green wire). C. Record the voltages on the Central Office Power Evaluation Inspection Sheet form in the spaces marked "AC Voltage - Phase to Neutral. " D. Read the voltages on any two wires in the main breaker and record the voltage on the Central Office Power Evaluation Inspection Sheet form in the spaces marked "Phase to Phase."
5	Use the AC voltage recorded on line 8 to verify that the transformer is tapped correctly. Use: • 208 taps, if line 8 is below 225 Vat. • 240 taps, if line 8 is above 225 Vac Record the results on the Central Office Power Evaluation Inspection Sheet form in the spaces marked "Voltage Taps."
6	Verify the size and condition of the main rectifier fuse. The fuse size should be marked on the fuse and on the fuse holder. The fuse should be 20 - 30% higher than the rectifier rating. Consult the manufacturer's instruction manual for the correct size, if the fuse is not marked.
7	Use the DMM on the millivolt scale to check the fuse for a good connection. Voltage must be lower than 80 mV. Enter the results on the Central Office Power Evaluation Inspection Sheet form in the spaces marked "Fusing - Clean and Correct Size."
8	Close the rectifier.

7.3 Rectifiers, continued

7.3.3 Checking Rectifier Alarms

Use the instructions in the following chart when checking rectifier alarms.

Step	Checking Rectifier Alarms
1	Test the following using the manufacturer's instructions: • RFA (Rectifier Fail Alarm). • LC (Low Current). • FA (Fuse Alarm).
2	Verify that the remote alarms are relayed back to the Power Boards or SPS and record the results on the Central Office Power Evaluation Inspection Sheet form in the spaces marked "Alarms."
3	Check the remote sense leads for: • One fused pair from each rectifier to the Power Board. • One fused pair from the Power Board to within 3 feet of Cell 1 and Cell 23 or 24. • Tight connections.
4	Record the results on the Central Office Power Evaluation Inspection Sheet form in the spaces marked "Remote Sense Leads."

7.3 Rectifiers, continued

7.3.4 End-Cell Equipment

Use the instructions in the following chart when checking end-cell equipment. Record results in the End-Cell Equipment Checks section of the Central Office Power Evaluation Inspection Sheet form.

Step	Checking End-Cell Equipment
1	Set the DMM to the 20 volt scale.
2	Place the DMM across Cells 23 and 26 or 27. Record the float voltage on the Central Office Power Evaluation Inspection Sheet form.
3	Switch the rectifier to the Equalize Mode and record the voltage readings on the Central Office Power Evaluation Inspection Sheet form. These voltages should be: • 6.6 and 7.0 volts for calcium-batteries. • 6.5 and 7.0 volts for antimony-batteries.
4	Connect the DMM across Cells 1 and 23 to get the end-cell switch cut-in and cut-out values. **CAUTION: Do not let office voltage fall below 46 Vdc.**
5	Turn off rectifiers until the CO voltage drops to 47 volts. The end-cell should cut in at 47 ± 0.5 Vdc. Record the reading on the Central Office Power Evaluation Inspection Sheet form.
6	Turn the rectifiers back on. The end-cell switch cuts out at 48 Vdc volts ± 0.5 Vdc. Record the readings on the Central Office Power Evaluation Inspection Sheet form. **NOTE: Perform Steps 4 - 6 from the power board, if equipped with the H-850073 circuit. If the values do not meet specifications (refer to GTE Telephone Operations Practice 205-601-701).**
7	Visually inspect the following for discrepancies: • End-cell rectifier. • Switch wiring and operation.
8	Record Step 7 results on the Central Office Power Evaluation Inspection Sheet form.

7.4 Inverters

Use the instructions in the following chart when evaluating office inverter power. Complete each line of the Central Office Power Evaluation Inspection Sheet form Inverters section.

WARNING: Hazardous voltage could cause injury to personnel. Exercise extreme caution.

Step	Inspecting Inverters
1	Record the type of equipment and bay location on the Central Office Power Evaluation Inspection Sheet form in the spaces marked "Inverter Model" and "Spec" (Form 00-205-0006, see Exhibit 1).
2	Determine the proper input and output voltages for the equipment. The information is found on the equipment or in the manufacturer's equipment manual. Record design voltages and locations on the Central Office Power Evaluation Inspection Sheet form in the spaces marked "Type."
3	Set the DMM to the 750 VAC scale. Measure the inverter output voltage. Record the results on the Central Office Power Evaluation Inspection Sheet form in the spaces marked "Voltage AC - Out." Verify the 60 cycle output frequency by using the manufacturer's test equipment guidelines to check the frequency.
4	Locate the DC input fuse and measure and record the Vdc voltage on the Central Office Power Evaluation Inspection Sheet form in the spaces marked "DC - In."
5	Verify that no AC power is used as a primary and/or backup when the inverter is located and/or serves equipment in the IGZ.
6	Perform a grounding evaluation per Mini-COPE #8 and GTE Telephone Operations Practice 795-805-792.
7	Use the manufacturer's equipment manual to check the output alarms. Record on the Central Office Power Evaluation Inspection Sheet form.

7.5 Converters and Miscellaneous Carrier Power Boards

Use the instructions in the following chart to evaluate office converter power. Record results in the Central Office Power Evaluation Inspection Sheet form Conveners section.

Step	Inspecting Converters
1	Enter converter type and specification information on the Central Office Power Evaluation Inspection Sheet form.
2	Record the bay location on the Central Office Power Evaluation Inspection Sheet form.
3	Measure the voltages at the output of each convener and record the reading on the Central Office Power Evaluation Inspection Sheet form.
4	Check the alarm by removing the converter output fuse. Verify that an alarm is indicated at the equipment and the switch. Record the results on the Central Office Power Evaluation Inspection Sheet form.
5	Verify that the equipment is in service after replacing the fuse. SPC offices might require software commands to fully restore service.
6	Use NMS and measure the equipment output noise. Record the noise reading on the Central Office Power Evaluation Inspection Sheet form.
7	Use the manufacturer's documents to correct any discrepancies.

7.6 Ringing Plant

Use the following information to inspect and evaluate ringing plant.

7.6.1 Evaluating Current, Voltage, and Frequency

Use the following chart to evaluate the ringing plant. Complete each line of the Central Office Power Evaluation Inspection Sheet form Ringing section, as required.

Step	Evaluating Ringing Plant - Current, Voltage, and Frequency Measurements
1	Record the type, location, and frequencies used on the ringing equipment.
2	Select one ringing generator, and using the Wilcom® T304/305 current meter (or equivalent), measure the AC load current by: A. Locating the ringing output generator leads and clamping the probe around either lead. B. Observing the milliamp reading for one minute. Record the highest observed measurement on the Central Office Power Evaluation Inspection Sheet form.

(continued)

7.6 Ringing Plant, continued

7.6.1 Evaluating Current. Voltage. and Frequency. continued

Step	Evaluating Ringing Plant - Current, Voltage, and Frequency Measurements
3	Repeat Step 2 for all office ringing generators.
4	Use the DMM to the 200 Vac scale.
5	Select one ringing generator, and measure output voltage. All voltages should be within 2 Vac below the assigned voltage and 5 Vac above the assigned ringing voltages. Record the results on the Central Office Power Evaluation Inspection Sheet form.
6	Switch the DMM to the Frequency Mode, and observe the meter. Record the generator frequency on Central Office Power Evaluation Inspection Sheet form.
7	Repeat Steps 5 and 6 for each office ringing generator.
8	Use the noise measurement test set to measure the noise across the 48 Vdc INPUT terminals of each ringing generator unit. Record the results on the Central Office Power Evaluation Inspection Sheet form. **CAUTION: Do not measure AC ringing OUTPUT or the meter will be damaged.**
9	Use the manufacturer's equipment manual to test the transfer of the primary ringing generators to the programmable generators. Record the results on the Central Office Power Evaluation Inspection Sheet form.
10	Repeat Steps 3 through 9 for all secondary ringing generators and programmable generators. Record results on the Central Office Power Evaluation Inspection Sheet form.
11	Verify that the ringing failure alarms are working according to the manufacturer's equipment manuals. Record on the Central Office Power Evaluation Inspection Sheet form.
12	Ensure that a programmable generator remains on the site's most used frequency.

7.6 Ringing Plant, continued

7.6.2 Load Testina a Rinaina Generator

Test the ringing generator current limiting values. Use the Lorain LS 2000 load test set to perform the test and make any required adjustments.

Use the following procedure to load test a ringing generator.

Step	Load Testing a Ringing Generator
1	Ensure that the generator being tested is: • Off-line. • Not supplying office ringing.
2	Determine the load current for the output voltage present. Calculate the current using Ohms Law: I = P / E. Example: If the power rating is 25 watts, and the output voltage is 100, then: I (Current) = 25W / 100 Vac = 0.25 A or 250 mA **The following steps use this example for switch settings. Values will change depending on the generator under test.**
3	Verify that the fine load adjustment knob is turned fully counter-clockwise.
4	Set the ammeter switch to the O0.5A scale.
5	Turn on the 4W to 17W switch and the 12.5W switch.
6	Adjust the fine load adjustment knob until the current indicated on the ammeter is 0.25 A or 250 mA.
7	Calculate the full load current again if the output voltage has dropped to determine the new full load current value. (See Step 2.) **NOTE: Start with the adjustable load knob turned fully counter-clockwise. As progressing load switches are turned on, the load current doubles the value provided from the preceding switch.**
a	Turn on the 4-I 7W switch and the 12W switch.
9	Turn the adjustable load knob clockwise until the desired load current is reached.
10	Add additional load switches if the previous knob is fully clockwise and the desired value has not been reached.

(continued)

7.6 Ringing Plant, continued

7.6.2 Load Testina a Rinaina Generator. continued

Step	Load Testing a Ringing Generator
11	Turn the knob fully counter-clockwise.
12	Turn off the 125W switch.
13	Turn on the 25W switch.
14	Use the following switch combinations to get a linear progression in load current: [125w], [25w], [12.W + 25W-J, [50W-j, [50W + 12.5w], [75wl, [75W + 12.5W], [75W + 25W], [75W + 12.5W + 25W], [75W + 50W], [75W + 12.5W + 50W], [75W + 25W + 50W], [75W + 12.5W + 25W + 50W].
15	Turn the main load switch off to check regulation.
16	Compare no-load and full-load voltage to determine regulation characteristics.
17	Determine the current limiting value of the ringing generator by referring to the manufacturer's instruction manual for LS 2000.
18	Check the present current limiting value by increasing the load until the voltage and current stop increasing.
19	If the current limiting value is too high, reset the load until the desired value is reached.
20	Adjust the current limiting control on the ringing generator until the load current meter shows a decrease.
21	Record current limiting values on the Central Office Power Evaluation Inspection Sheet form.

7.6.3 Special Service and CXR Ringing

Use the same procedure described in Sections 7.6.1 and 7.6.2 to evaluate Special Services and CXR ringing plant. Record the results on the Special Services and CXR Ringing section of the Central Office Power Evaluation Inspection Sheet form as required for each step.

7.7 Interrupters

Complete each line of the interrupters section of the Central Office Power Evaluation Inspection Sheet form as required in each step. Use the instructions in the following chart when evaluating office interrupters.

Step	Evaluating Office Interrupters
1	Record interrupter equipment type, specifications, and location on the Central Office Power Evaluation Inspection Sheet form.
2	Perform a visual and physical inspection of the interrupt equipment, checking for: • Loose wiring. • Worn contacts. • Smooth mechanical operation. • Cleanliness.
3	Record the results on the Central Office Power Evaluation Inspection Sheet form.
4	Turn off AC power to the AC interrupter at the AC circuit panel. The unit should transfer to the DC interrupter equipment. Verify and record on the Central Office Power Evaluation Inspection Sheet form.
5	Observe Transfer Alarm and Interrupter Fail Alarm. Verify and record on the Central Office Power Evaluation Inspection Sheet form. Correct problems as required.

7.8 Test Systems Power Supplies

Use the following chart when completing each line of the Central Office Power Evaluation Inspection Sheet form Test Systems Power Supplies section.

Use the instructions in the following chart when evaluating miscellaneous test systems power in the office.

Step	Evaluating Test Systems Power
1	Record the type and location of each power supply of the system under test on the Central Office Power Evaluation Inspection Sheet form.
2	Measure the input voltages of all the power supplies. Record the results on the Central Office Power Evaluation Inspection Sheet form.
3	Measure the output voltages of all the power supplies. Record the results on the Central Office Power Evaluation inspection Sheet form. Verify that the measurements meet the manufacturer's specifications.
4	Measure the noise level on the input power (DC only). Record the results on the Central Office Power Evaluation Inspection Sheet form.

8. Commercial AC Entrance Grounding

8.1 Questionnaire

WARNING: Hazardous voltage could cause injury to personnel. Exercise extreme caution.

Complete the Commercial AC Entrance Grounding questionnaire (see Exhibit 8) and attach to the Central Office Power Evaluation Inspection Sheet (Form 00-205-0006, see Exhibit 1).

9. Discrepancy

9.1 Discrepancy List

Use the instructions in the following chart when completing the COPE Discrepancy List form (Form 00-205-0003, see Exhibit 6).

Step	Completing Discrepancy List
1	Review the Central Office Power Evaluation Inspection Sheet form and summarize all discrepancies found, fixed, and/or referred to on the COPE Discrepancy List form.
2	All problems listed on the COPE Discrepancy List form are corrected: • By the COPE Team and/or site personnel. • Before the COPE Team leaves the site.
3	File the completed COPE report on site. Retain a copy of all COPE Discrepancy List forms for a minimum of two years for use as a reference and bench mark for subsequent inspections.
4	Refer all discrepancies that require correction by personnel other than the COPE Team or site personnel on the COPE Discrepancy Referral form (Form 00-205-0004, see Exhibit 7). A response is required within 30 days of receipt by the responsible department. **NOTE: The local site manager is responsible for the follow-up and escalation of all discrepancies not responded to within 30 days.**

Form: 00-205-0006 CENTRAL OFFICE POWER EVALUATION

INSPECTION SHEET

COPE

CENTRAL OFFICE: TYPE:

LOCATION (CITY): STATE:

SUPERVISOR'S NAME: MC:

INSPECTOR'S NAME: MC:

DATE: I I

ACTIVITIES:

OFFICE NOISE TESTS

1. Transmission Batter Noise Test
2. Power Board Noise Test
3. Cross Office Noise Test
4. Equipment Bay Noise Test
5. Bay Filter Noise Test

POWER EQUIPMENT TESTS

6. Bus System
7. Power Cable
8. Rectifiers
9. End Cell Equipment
10. Battery Inspection
11. Battery Load
12. Inverters
13. Converters
14. Ringing Plant

GROUNDING

15. Inside Ground Inspection
16. Outside Ground Inspection
17. Lightning Protection - Outside
18. Lightning Protection - Inside
19. OSP Cable Bonding and Grounding
20. CVGB - Cable Vault Ground Bar
21. MGB - Master Ground Bar
22. Floor Ground Bar
23. Low Voltage Ground Bar
24. CDF/MDF Ground Bar
25. High Frequency Cable Grounding

EMERGENCY GENERATORS

26. Emergency Generator Batteries

Exhibit 1 - Central Office Power Evaluation Inspection Sheet form, Form 00-205-0006 (Page 1 of 29)

OFFICE NOISE TESTS:

TRANSMISSION BATTERY NOISE TESTING (3.1 thru 3.4 & 5.4)

A. Measure voltage drop and noise at the input to power boards.

	Noise	Volts	Noise Obj.	Voltage Obj.
Batteries			32 dBrnC	<0.25 Vdc Drop
DSC Bay			30 dBrnC	<0.25 Vdc Drop
-PCU Bay			30 dBrnC	<0.25 Vdc Drop
PDU Bay			30 dBmC	<0.25 Vdc Drop
PDU Bay			30 dBmC	<0.25 Vdc Drop
PDU Bay			30 dBrnC	<0.25 Vdc Drop

B. Voltage at equipment bay furthest from battery: _____
Obj. < 1.50 Vdc Drop.

POWER BOARDS (7.2)

A. Inspect and evaluate power boards.

a. Bay Location _____ Type _____

b. Visual and Physical Inspecti_____
_____
_____

B. Inspect and evaluate power boards.

a. Bay Location _____ Type _____

b. Visual and Physical Inspection _____
_____
_____

C. Inspect and evaluate power boards

Exhibit 1 - Central Office Power Evaluation Inspection Sheet form, Form 00-205-0006 (Page 2 of 29)

OFFICE NOISE TESTS (cont'd.):

2. POWER BOARDS (7.2)(cont'd)

a. Bay Location _____ Type _____

b. Visual and Physical Inspection _____

_____

_____

D. inspect and evaluate power boards

a. Bay Location _____ Type _____

b. Visual and Physical Inspection _____

_____

_____

E. inspect and evaluate power boards

a. Bay Location _____ Type _____

b. Visual and Physical Inspection _____

_____

_____

F. Measure ground connections. Obj. 2 mV: _____

G. Verify Ammeters.

Millivolt range on ammeter should match millivolt specifications on ammeter shunt.

Meters: _____

Shunt: _____

NOTE: **To calibrate meters use the procedures outlined in GTEP 205-001-805 Section 7.2.3.**

H. Read the total host/remote Central Office discharge ammeter.

"A" Bus Amps - (If Remote): _____ Time: _____
"B" Bus Amps - (If Remote): _____ Time: _____
Total Host or Remote Office Amps: _____ Time: _____

Exhibit 1 - Central Office Power Evaluation Inspection Sheet form, Form 00-205-0006 (Page 3 of 29)

OFFICE NOISE TESTS (cont'd):

2. POWER BOARDS **(7.2)(cont'd)**
   1. Verify **alarms** (7.2.4).

      Fuse: _____ Equipment: _____

      Local: _____ Remote: _____

      High Volts: _____ BOD: _____

   J. Power Monitor Controller (SMART System)(7.2.5).

      Alarm: _____ Settings: _____

   K. Low Voltage Disconnect.

      a. Setting Lo Voltage Disconnect: _____

      b. Setting Lo Voltage Re-Connect: _____

3. CROSS OFFICE NOISE TEST - LEVEL (3.8)

   TEST 1 _____ TEST 4 _____
   TEST 2 _____ TEST 5 _____
   TEST 3 _____

   Obj. -18: Per GTEP 331-310-510

Exhibit 1 - Central Office Power Evaluation Inspection Sheet form, Form 00-205-0006 (Page 4 of 29)

OFFICE NOISE TESTS (cont'd):

4. **EQUIPMENT BAY NOISE (3.5)**
A Non-filtered Power Board Fuse Output Noise Test (3.5.1) and Fuse Connection Millivolt Drop Test (7.2.2).
Noise Obj.: -30 dBrnC Millivolt Drop Obj.: 80 mVdc

Bav Location: TWX

Panel:					Panel:				
	Size	Amps	Noise	mVDrop		Size	Amps	Noise	mV Drop
1					1				
2					2				
3					3				
4					4				
5					5				
6					6				
7					7				
8					8				
9					9				
IO					10				

Bay Location: Type:

Panel:					Panel:				
	Size	Amps	Noise	mVDrop		Size	Amps	Noise	mV Drop
1					1				
2					2				
3					3				
4					4				
5					5				
6					6				
7					7				
8					8				
9					9				
10					10				

Exhibit 1 - Central Office Power Evaluation Inspection Sheet form, Form 00-205-0006 (Page 5 of 29)

OFFICE NOISE TESTS (cont'd):

4. EQUIPMENT **BAY NOISE (3.5) (cont'd)**
A Non-filtered Power Board Fuse Output Noise Test (3.5.1) and Fuse Connection Millivolt Drop Test (7.2.2).
Noise Obj.: -30 dBmC Millivolt Drop Obj.: 80 mVdc

Bay Location: Type;
Panel: Panel:

	Size	Amps	Noise	mVDrop		Size	Amps	Noise	mV Drop
1					1				
2					2				
3					3				
4					4				
5					5				
6					6				
7					7				
8					8				
9					9				
10					10				

Bay Location: Type:
Panel; Panel:

	Size	Amps	Noise	mVDrop		Size	Amps	Noise	mV Drop
1					1				
2					2				
3					3				
4					4				
5					5				
6					6				
7					7				
8					8				
9					9				
10					10				

Exhibit 1 - Central Office Power Evaluation Inspection Sheet form, Form 00-205-0006 (Page 6 of 29)

OFFICE NOISE TESTS (cont'd):

4. EQUIPMENT BAY NOISE (3.5) (cont'd)

A Non-filtered Power Board Fuse Output Noise Test (3.5.1) and Fuse Connection Millivolt Drop Test (7.2.2).

Noise Obj.: -30 dBrnC Millivolt Drop Obj.: 80 mVdc

Bay Location: Type:

Panel: Panel:

	Size	Amps	Noise	mVDrop		Size	Amps	Noise	mV Drop
1					1				
2					2				
3					3				
4					4				
5					5				
6					6				
7					7				
8					8				
9					9				
10					10				

Bay **Location:** Type:

Panel: Panel:

	Size	AmPS	Noise	mVDrop		Size	Amps	Noise	mV Drop
2					**2**				
3					**3**				
4					**4**				
5					**5**				
6					**6**				
7					**7**				
6					a				
9					9				
10					10				

Exhibit 1 11 Central Office Power Evaluation Inspection Sheet form, Form 00-205-0006 (Page 7 of 29)

OFFICE NOISE TESTS (cont'd):

4. EQUIPMENT BAY NOISE (3.5) (confd)

A Non-filtered Power Board Fuse Output Noise Test (3.51) and Fuse Connection Millivolt Drop Test (7.2.2).

Noise Obj.: -30 dBrnC Millivolt Drop Obj.: 80 mVdc

Bay Location: Type:

Panel: Panel:

	Size	Amps	Noise	mVDrop		Size	Amps	Noise	mV Drop
1					1				
2					2				
3					3				
4					4				
5					5				
6					6				
7					7				
8					8				
9					9				
10					10				

Bay Location: Type:

Panel: Panel:

	Size	Amps	**Noise**	mVDrop		Size	Amps	Noise	mV Drop
1					1				
2					2				
3					3				
4					4				
5					5				
6					6				
7					7				
8					8				
9					9				
10					10				

Exhibit 1 - Central Office Power Evaluation Inspection Sheet form, Form 00-205-0006 (Page 8 of 29)

OFFICE NOISE TESTS (cont'd):

4. EQUIPMENT BAY NOISE (3.5) (cont'd)

B. Non-filtered Bay Fuse Output Noise Test (3.5.1): Obj.: -30 dBrnC

		Main Battery #I	Main Battery #2
Bay			
Bay			
Bay			
Bay			
Bay			
Bay			
Bay			
Bay			
Bay			
Bay			
Bay			
Bay			
Bay			
Bay			
Bay			
Bay			
Bay			
Bay			
Bay			
Bay			
Bay			
Bay			
Bay			
Bay			
Bay			
Bay			
Bay			

Exhibit 1 - Central Office Power Evaluation Inspection Sheet form, Form 00-205-0006 (Page 9 of 29)

OFFICE NOISE TESTS (cont'd):

5. **BAY FILTERS (3.5.2)**

A. GTD-5 **BAY FILTER NOISE** READINGS (3.5.2)

Battery Filter Noise Test

	TSA Block	1-4 (Obj.: -30)	2-4 (Obj.: -20)	3-4 (Obj.: -20)
Bay				
Bay				
Bay				
Bay				
Bay				
Bay				
BaY				
Bay				
Bay				
Bay				
Bay				
Bay				
Bay				
Bay				
Bay				
BaY				
Bay				
Bay				
BaY				
Bay				
Bay				
Bay				
Bay				
Bay				
Bay				
Bay				

Exhibit 1 - Central Office Power Evaluation Inspection Sheet form, Form 00-205-0006 (Page 10 of 29)

OFFICE NOISE TESTS (cont'd):

5. **BAY FILTERS (3.5.2) (cont'd)**

B. DMS BAY FILTER NOISE **READING -1S6X35(3.5.2)**

Battery Filter Noise Test

		A Battery		B Battery	
		INPUT TB1 TB2 7 - I Obj.: -30	OUTPUT TB1 TB2 7 - I Obj.: -20	INPUT TB1 TB2 8 - 2 Obj.: -30	INPUT TB1 TB2 8 - 2 Obj. : -20
Bay					
Bay					
Bay					
Bay					
Bay					
Bay					
Bay					
Bay					
Bay					
Bay					
Bay					
Bay					
Bay					
Bay					
Bay					
Bay					
Bay					
Bay					
Bay					
Bay					
Bay					
Bay					
Bay					

Exhibit **1 - Central Office Power Evaluation Inspection Sheet form, Form 00-205-0006 (Page 11 of 29)**

POWER EQUIPMENT TESTS:

INSPECT BUS SYSTEM (5.2)

A. Check torque pressure of bolted clamps: _____

Reference GTEP 205-705-201 (4.2 Initial Review - Check all clamps)
Reference GTEP 205-001-502 (12.1 Repeat Review - Check 10 clamps)

INSPECT CABLE TO BUS SYSTEM CONNECTIONS (5.3)

A. Inspect for loose connections: _____

B. Measure millivolt drop at Bus to Bus splice connections and note any exceptions. Obj. 9 mV _____

C. Inspect power cables for **proper bend** ratios and separation:

RECTIFIERS (7.3)

A. Rectifier # 1 Model number _____ Spec. number _____

Rectifier # 2 Model number _____ Spec number _____

Rectifier # 3 Model number _____ Spec number _____

Rectiier # 4 Model number _____ Spec number _____

Rectifier # 5 Model number _____ Spec number _____

Rectifier # 6 Model number _____ Spec number _____

B. Amp Meter Verification: _____

NOTE: **Total of all equipped rectifiers should equal amp meter reading on power board for the charge bus. If readings differ then follow meter calibration procedure in section 7.2.3 of G T E P 205-001-502**

C. Rectifier internal wiring and component inspection: (7.3.1)

Exhibit 1 - Central Office Power Evaluation Inspection Sheet form, Form 00-205-0006 (Page 12 of 29)

POWER EQUIPMENT (cont'd):

RECTIFIERS (7.3) (cont'd)

C.1 Rectifier AC **Input Voltage**

NOTE: **This measurement only needs to be performed on one rectifier, provided, all rectifiers use the same AC source.**

	Rectifier: #		
	A/N	B/N	C/N
Phase to Neutral			
	A/B	A/C	B/C
Phase to **Phase**			

C.2. Verify voltage taps and phase shift settings,

Rectifier	1	2	3	4	5	6
Voltage Taps						
Phase Shift Set						

D. Inspect fuse for proper size and condition if equipped: _____

E. Measure fuse connection. Obj. 80 mV

Rectifier	1	2	3	4	5	6
Fuse Connection						

F. Verify Rectifier High Voltage Shutdown.

NOTE: **Refer to rectifier manual for procedure. Shutdown voltage varies by switch type.**

Rectifier	1	2	3	4	5	6
H.V. Shutdown						

Exhibit 1 - Central Office Power Evaluation Inspection Sheet form, Form 00-205-0006 (Page 13 of 29)

POWER EQUIPMENT (cont'd):

8. RECTIFIERS (7.3) **(cont'd)**

G. Load Sharing. Obj. 5%

Rectifier	1	2	3	4	5	6
Load Sharing						

H. Verify Current Limit of each rectifier. Obj. 11 0"h of rated

Rectifier	1	2	3	4	5	6
Current Limit						

I. Verify Rectifier Alarms (7.3.3).

Rectifier	1	2	3	4	5	6
RFA						
Low Current						
Fuse						

J. Rectifier Remote Sense Leads. Internal External

If external; One fused pair for each rectifier: _____

K. Voltage Readings

Rectifier	1	2	3	4	5	6
Volts Float						
Volts Equalized						

9. END CELL EQUIPMENT TESTS - if required (7.3.4)

A. Float Voltage _____ B. Equalize Voltage: _____

C. Cut-in Vottage _____ D. Cut-out Voltage: _____

E. Inspection of End Cell Rectifier, switch wiring and operation:

_____

_____

Exhibit 1 - Central Office **Power Evaluation Inspection Sheet form, Form 00-205-0006 (Page 14 of 29)**

POWER EQUIPMENT (cont'd):

BATTERY INSPECTION **AND TESTS** (6.1)

A. Battery String Configuration

Battery String	1	2	3	4	5
Manufacturer					
Amp Hour Capacity					
Battery Noise					
Number of Cells					
Battery Voltage					
Battery String	6	7	8	9	10
Manufacturer					
Amp Hour Capacity					
Battery Noise					
Number of Cells					
Battery Voltage					

B. Review site **Battery** Record for indication **of** weak cells or poor strapping: _____

C. Measure voltage across each cell. Record lowest call voltage and lowest cell temperature reading in each string.

Battery String	1	2	3	4	5
Cell Number					
Voltage - Low Cell					
Cell Temperature					
Battery String	6	7	**a**	**9**	**10**
Cell Number					
Voltage - **Low** Cell					
Cell Temperature					

Exhibit 1 - Central Office Power Evaluation Inspection Sheet form, Form 00-205-0006
(Page 15 of 29)

POWER EQUIPMENT (cont'd):

10. **BATTERY INSPECTION AND TESTS (6.1) (cont'd)**

D. Check **battery strap** torque. See manufacturer specifications.

NOTE: **Torque batter inter-cell straps and inter-tier cables using re-torque values; do not over torque.**

Battery String-l	Record proper torque value: _____
Battery Sring-2	Record proper torque value: _____
Battery String-3	Record proper torque value _____
Battery String4	Record proper torque value _____
Battery String-5	Record proper torque value _____
Battery String-6	Record proper torque value _____
Battery String-7	Record proper torque value _____
Battery String-8	Record proper torque value _____
Battery String-9	Record proper torque value _____
Battery String- 10	Record proper torque value _____

Exhibit 1 - Central Office Power Evaluation Inspection Sheet form, Form 00-205-0006 (Page 16 of 29)

POWER EQUIPMENT (cont'd):

BATTERY LOAD TEST (6.1)
Batteries

A. Initial voltage dip Obj.: NO LESS THAN 46.0 Vdc _____

B. RecoveryIStablized Voltage: _____

C. Voltage drop across each battery cell strap.

Battery String: _____ Battery String Load Current: _____

Battery Strap: Obj. 20 mV Inter-tier Strap Obj.: 80 mV

Cell I- 2		Cell 2 - 3		Cell 3 - 4	
Cell 4 - 5		Cell 5 - 6		Cell 6 - 7	
Cell 7 - 8		Cell 8 - 9		Cell 9- 10	
Cell IO- 11		Cel1 11-12		Cell 12 - 13	
Cell 13 - 14		Cell 14-15		Cell 15 - 16	
Cell 16 - 17		Cell 17 - 18		Cell 18 - 19	
Cell 19 - 20		Cell 20 - 21		Cell 21 - 22	
Cell 22 - 23		Cell 23 - 24		----------	
Inter-tier strap located between cells _____					
Inter-tier strap located between cells _____ _____					

D. Are multiple inter-tier cables carrying equial current (Yes/No)?: _____

Exhibit 1 - Central Office Power Evaluation Inspection Sheet form, Form 00-205-0006 (Page 17 of 29)

POWER EQUIPMENT (cont'd):

BATTERY LOAD TEST(6.1) (cont'd)

Batteries:

A. Initial voltage dip Obj.: NO LESS THAN 46.0 Vdc _____

B. Recovery/Stablized Voltage: _____

C. Voltage drop across each battery cell strap.

Battery String: _____ Battery String Load Current: _____

Battery Strap: Obj. 20 mV Inter-tier Strap Obj.: 80 mV

Cell I- 2		Cell 2 - 3		Cell 3 - 4	
Cell **4 - 5**		Cell 5 - 6		Cell 6 - 7	
Cell 7 - 8		Cell 8 - 9		Cell 9-10	
Cell 10-		**Cell 11 - 12**		Cell12-13	
Cell 13- 14		**Cell 14 - 15**		Cell15-16	
Cell16-17		Cell 17 - 18		**Cell 18 - 19**	
Cell 19-20		Cell 20 - 21		Cell 21 - 22	
Cell 22 - 23		**Cell 23 - 24**		----------	
Inter-tier strap located between cells _____ _____					
Inter-tier strap located between cells _____ _____					

D. Are multiple inter-tier cables carrying equial current (Yes/No)?: _____

Exhibit 1 - Central Office Power Evaluation Inspection Sheet form, Form 00-205-0006 (Page 18 of 29)

POWER EQUIPMENT (cont'd):

INVERTERS (7.4)

1. Inspect Inverter and measure voltages.

	1	2	3	4	5
Model Number					
Spec Number					
AC Output					
DC Input					

2. Test Inverter transfer: _____

3. Verify alarms: _____

CONVERTERS (7.5)

1. Inspect Converters and measure voltages.

	1	2	3	4	5	6
Type						
Model Number						
Spec Number						
Location						
output Volts						
Verify Alarms						
Output Noise						

Exhibit 1 - Central Office Power Evaluation Inspection Sheet form, Form 00-205-0006
(Page 19 of 29)

POWER EQUIPMENT (cont'd):

RINGING PLANT (7.6)
Ringing Machines (7.6.1)

A. Inspect/Test Ringing Machines

	Gen Fl	Gen F2	Gen F3	Gen F4	Gen F5
Type					
Location					
Load					
Voltage					
Frequency					
Noise on input voltage. Obj.: 30 dBrnC					

B. Test **Programmable** Standby Ringing. Check that standby generator is adjusted to match the most predominant frequency in the Central Office.

	Gen Fl	Gen F2	Gen F3	Gen F4	Gen F5
Voltage					
Frequency					
Noise on input voltage. Obj.: 30 dBrnC					

C. Verify alarms.

Fuse: _____

Generator Fail: _____

D. Load testing ringing generators.

Current Limit Value					

Exhibit 1 - Central Office Power Evaluation Inspection Sheet form, Form 00-205-0006 (Page 20 of 29)

POWER EQUIPMENT (cont'd):

PINGING PLANT (7.6) (cont'd)
Special Services and CXR Ringing Machines (7.6.2)

A. Inspect Ringing Machines

	PRI	SEC	PRI	SEC	PRI	SEC
TYW						
Location						
Frequency						

B. Test Ringing Machines

	PRI	SEC	PRI	SEC	PRI	SEC
Type						
Location						
Frequency						

C. Measure noise on input voltage.Obj.: 30 dBmC

	PRI	SEC	PRI	SEC	PRI	SEC
Noise						

D. Verify Alarms

Fuse: _____

Generator Fail: _____

	PRI	SEC	PRI	SEC	PRI	SEC
Current						
Limit Value						

Exhibit 1 - Central Office Power Evaluation Inspection Sheet form, Form 00-205-0006 (Page 21 of 29)

GROUNDING:

15. **INSIDE GROUND INSPECTION (4.1)**

A. Measure lead 58 current with a clamp type amp meter at the end of each GTD-5 equipment line-up.

Line-Up	AC	DC

B. Visually inspect all isolated equipment frames to ensure isolation from floor and superstructure is maintained.

_____

C, Visually inspect all power equipment installed in isolated frames (MIS, MISC, FTUF, etc.) to ensure that a positive battery terminal is not connected to the chassis ground:

_____

D. Visually inspect isolated mounting hardware in GTD-5 frames is mounted horizontally and not vertically: _____

Exhibit 1 - Central Office Power Evaluation Inspection Sheet form, Form 00-205-0006 (Page 22 of 29)

GROUNDING (cont'd):

16. OUTSIDE GROUND INSPECTION **(4.2)**

A. Loose, broken, and/or corroded connections:

17. **LIGHTNING PROTECTION - OUTSIDE (If Equipped) (4.3)**

A. Loose, broken, or corroded connections:

8. Inspect all air terminal points:

18. **LIGHTNING PROTECTION - INSIDE (4.4)**

A. Ensure that large metal bodies within six feet of lightning conductor are bonded to lightning conductor:

B. Verify that a lightning protection device (AC Surge Arrestor) is installed at the AC main power panel and all indicator lights are properly illuminated;

Exhibit 1 - Central Office Power Evaluation Inspection Sheet form, Form 00-205-0006 (Page 23 of 29)

GROUNDING (cont'd):

18. LIGHTNING PROTECTION - INSIDE **(4.4)(cont'd)**

C. AC ground isolation (4.1.2)

a. AC receptacles wired correctly: _____

_____

b. AC receptacles used correctly: _____

_____

19. OSP CABLE BONDING AND GROUNDING **(4.7)**

A. Inspect Lead 17 for correct size, tight connections, direct path, no splices, no sharp bends, correct bonding: _____

_____

B. Inspect Lead 16 (and/or 16A) for correct size, tight connection, no splices, no sharp bends, correct bonding: _____

_____

C. Inspect OSP cables, not encircled by metallic supports, have a continuous shields, entrance holes are sealed: _____

_____

NOTE: Former **Contel locations** may **have a gap and a ground rod on the field side of the cable.**

20. CVGB - CABLE VAULT GROUND BAR (4.9)

A. All cables labeled: _____

B. Measure ground bar connections. Obj.: 2 mV _____

C. Connectors are 2 hole compression type: _____

GROUNDING (cont'd):

MGB - MASTER GROUND BAR (4.9)

A. Inspect all cables: _____

B. All cables labeled: (Yes/No) _____

C. Measure ground bar connection. Obj. 2mv: _____

D. Verify connectors are 2 hole compressed type: _____

E. Measure the following leads with **a clamp** type **amp meter.**

Lead #	AC	DC	Obj.: (5.8)
5			< 5 amps (Grd Ring)
5			<5 amps (Grd Ring)
7			<5 amps (Well)
10			< 5 amps (Interior **Water Pipe)**
13			N/A
16			< 5 amps (Cable Ground)
31			N/A
* 41			0 amps (Equip Frame Grd Sw)
* 41A			0 amps (CXR Frame Grd (SPG))
** 57			0 AC amps (Ctr SW Sys Grid/Cable Rack)
* 57A			0 AC amps (Ctr CXR Grid/Cable Rack)

* Note: Must ensure no current is flowing in this lead.
** Note: Optional

Exhibit 1 - Central Office Power Evaluation Inspection Sheet form, Form 00-205-0006
(Page 25 of 29)

GROUNDING (cont'd):

21. **MGB - MASTER GROUND BAR (4.9) (cont'd)**

F. Perform annual **resistance** test per GTEP 887-600-072.

1. CAUTION: NEVER DISCONNECT LEAD 13 AT ANYTIME.

2. CAUTION: NEVER DISCONNECT MORE THAN ONE LEAD AT A TIME.

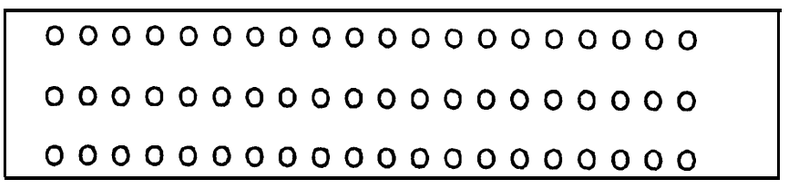
MGB: _____ ohms.

Lead 5: _____ ohms.

Lead 7: _____ ohms.

G. MGB drawing indicate lead, zones, and other pertinent information.

1.



2. If MGB ground bar is zoned. Is it correct? _____

A. Is **zone** sequence either PANI or INAP? _____

B. Are standoff insulators provided? _____

Exhibit 1 - Central Office Power Evaluation Inspection Sheet form, Form 00-205-0006
(Page 26 of 29)

GROUNDING (cont'd):

21. MGB - **MASTER GROUND BAR (4.9) (cont'd)**

C. Possible MGB leads by zone:

ZONE	LEAD	FROM
P-Producer	16	Cable Vault Ground Bar (CVGB)
	21	Radio Room Ground Ring
	23	CDF Ground Bar
	23A	CXR HF Protector
	55	Building Entrance CoaxW.G.
	56	Radio Xmtr Cabinet
	61	GTD-5 EL Frame (Lead 62)
	"TANK GRD"	Andover Tank Monitor
I-Isolated Ground Equipment	41	SW Sys Frame Ground
	41A	CXR Frame Ground
	47	Electra-mechanical Frame Ground
	53A	Remote PDUF Safety Ground

22. **FLOOR GROUND BAR. Floor Number: _____ (4.9)**

A. Inspect **all** cables: _____
B. All cable labeled: _____
C. Measure ground bar connections. Obj. 2 mV: _____
D. Connectors are 2 hole compression type: _____
E. Measure the following leads with a clamp type amp meter:

Lead	AC	DC	
31			Bond PDU
41			Equip Frame Grd Sw
41A			CXR Frame Grd (SPG)

1. If current is detected in **lead** 41 and/or 41A, continue measuring the lead towards the equipment to determine the source(s).
2. After removing current from lead 41 and/or 41A, carefully remove lead from ground bar **and** insert an analog VOM in series with the lead. Measure the resistance of the lead(s).

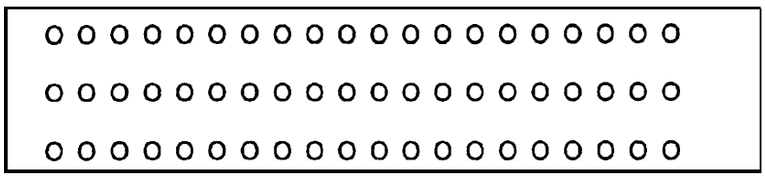
Lead	Ohms	Obj. > 2 Megohms
41		Equip Frame Grd Sw
41A		CXR Frame Grd (SPG)

Exhibit 1 - Central Office Power Evaluation Inspection Sheet form, Form 00-205-0006 (Page 27 of 29)

GROUNDING (cont'd):

22. FLOOR GROUND BAR (4.9) (cont'd):

F. Mark FGB drawing, indicating lead and other pertinent information.



23. LOW VOLTAGE GROUND BAR (4.9)

A. Inspect all cables: _____

B. All cables labeled: _____

C. Measure ground bar connections. Obj. 2 mV: _____

D. Connectors are 2 hole compression type: _____

24. CDF/MDF FRAME **GROUND (4.10)**

A. Inspect the following leads:

23 _____

24 _____

24A _____

25. HIGH FREQUENCY CABLE GROUNDING (4.8)

A. Inspect protector module: _____

B. Inspect cable shield: _____

C. Inspect DSX panels: _____

Exhibit 1 - Central Office Power Evaluation Inspection Sheet form, Form 00-205-0006
(Page 28 **of 29)**

EMERGENCY GENERATORS:

26. EMERGENCY GENERATOR BATTERIES (6.2)

1. Is the battery system?

   6 cell: _____

   12 cell: _____

2. Inspect batteries.

   a. Corrosion and cleanliness: _____

   b. Cable connections: _____

3. Measure battery voltage with charger off: _____

4. Measure battery charger voltages.

   A. Float voltage: _____

   B. Equalizer voltage: _____

Exhibit 1 - Central Office Power Evaluation Inspection Sheet form, Form 00-205-0006 (Page 29 of 29)

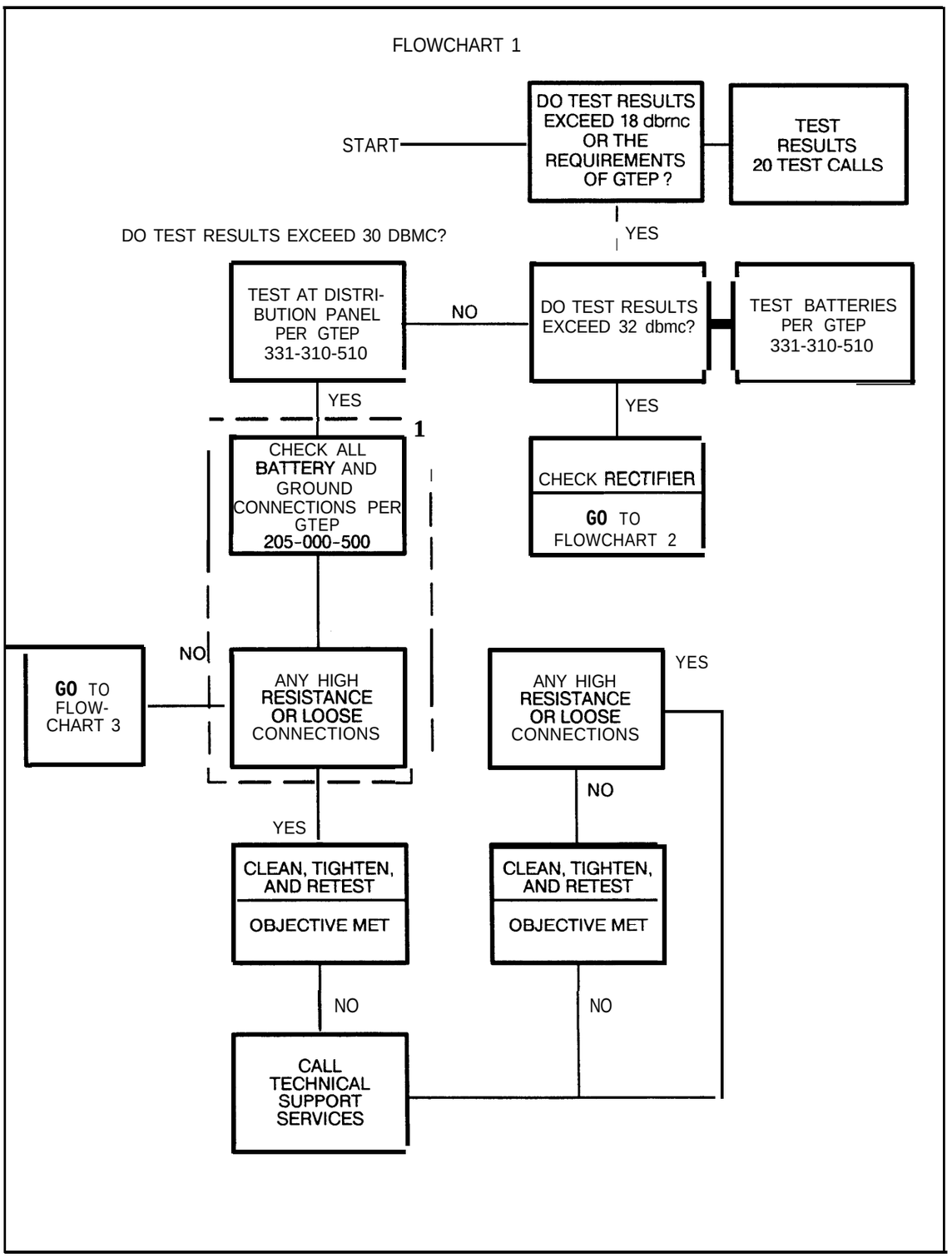


Exhibit 2 - Cross-Office Noise Trouble Locating Flowcharts (Page 1 of 3)

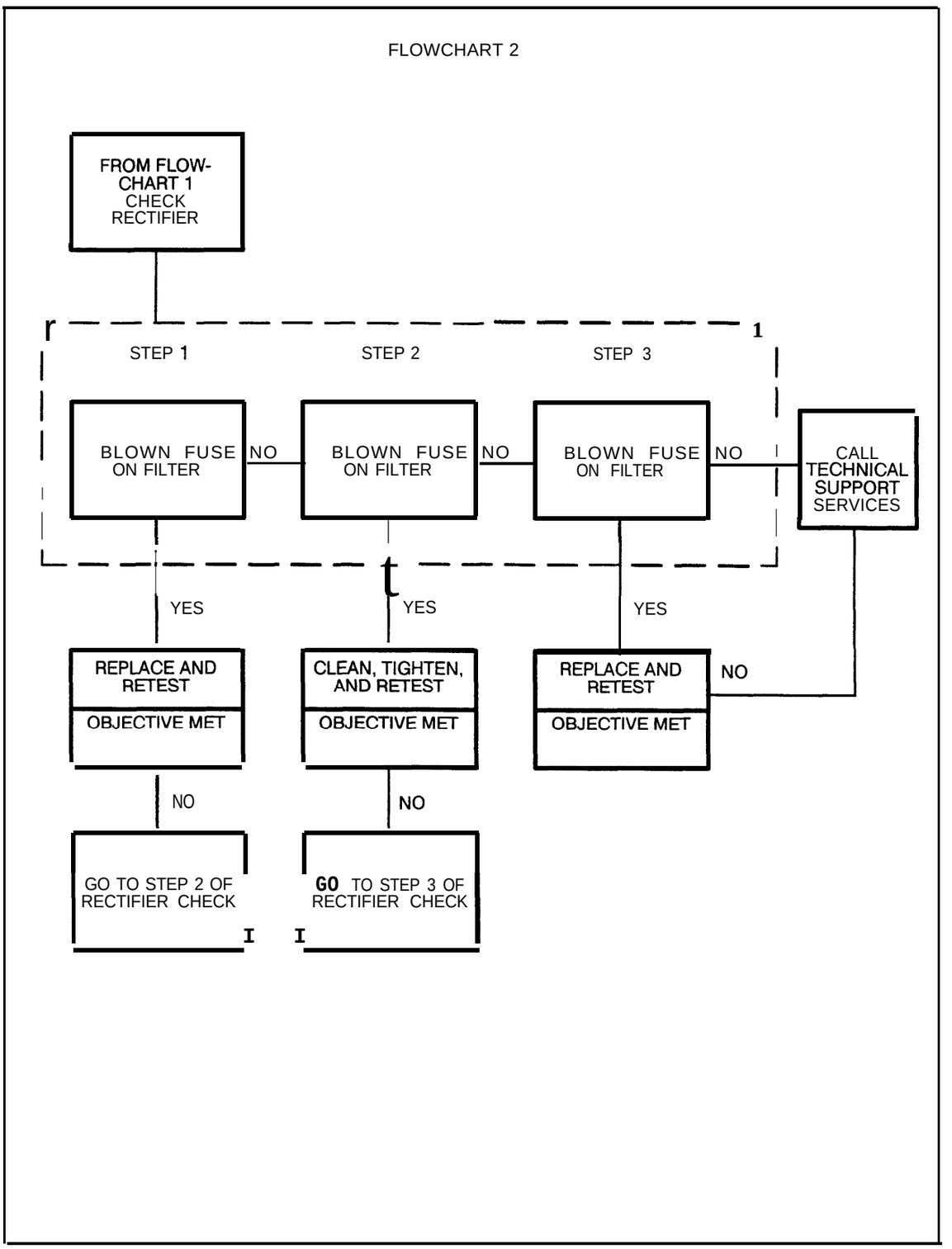


Exhibit 2 - Cross-Office Noise Trouble Locating Flowcharts (Page 2 of 3)

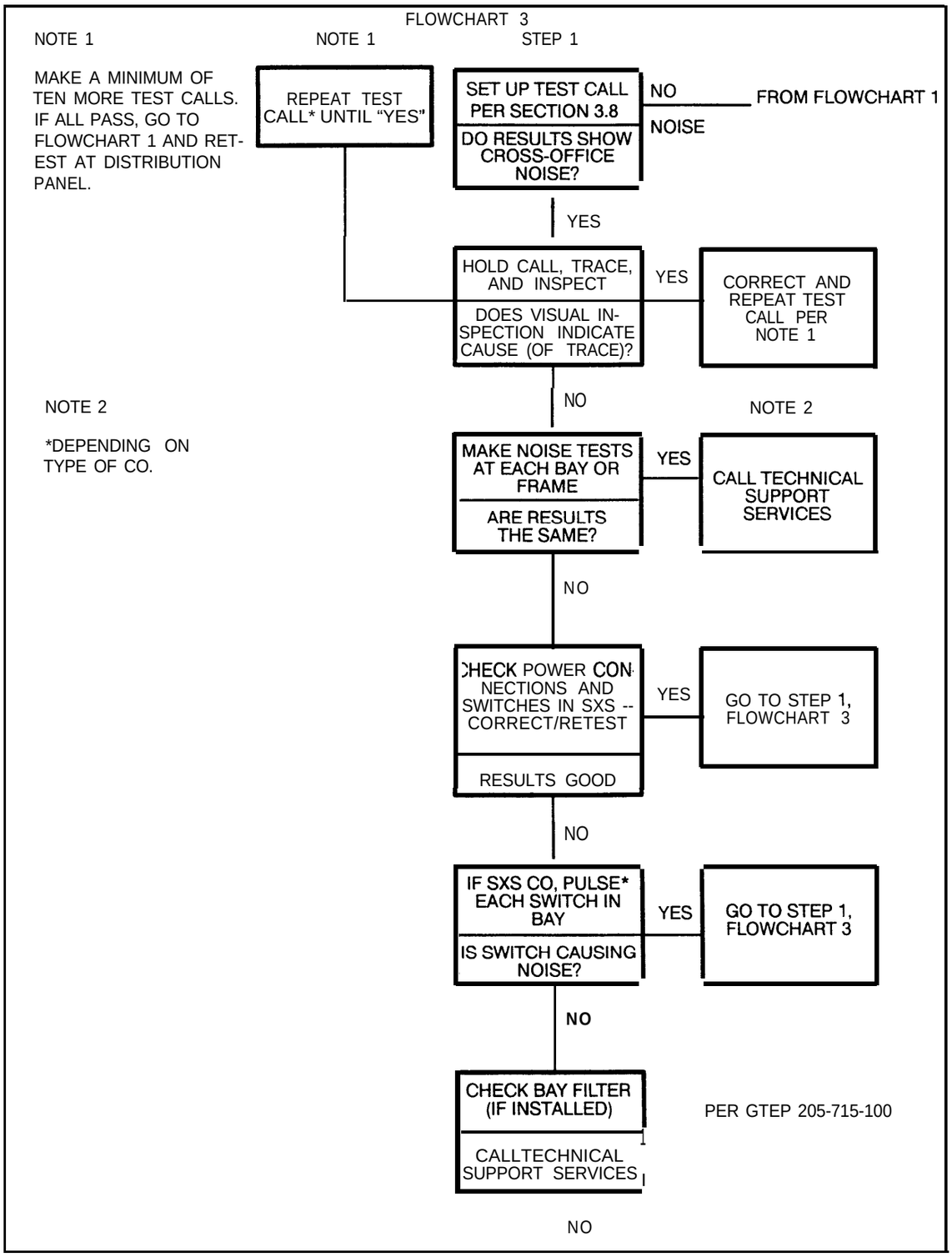


Exhibit 2 - Cross-Office Noise Trouble Locating Flowcharts (Page 3 of 3)

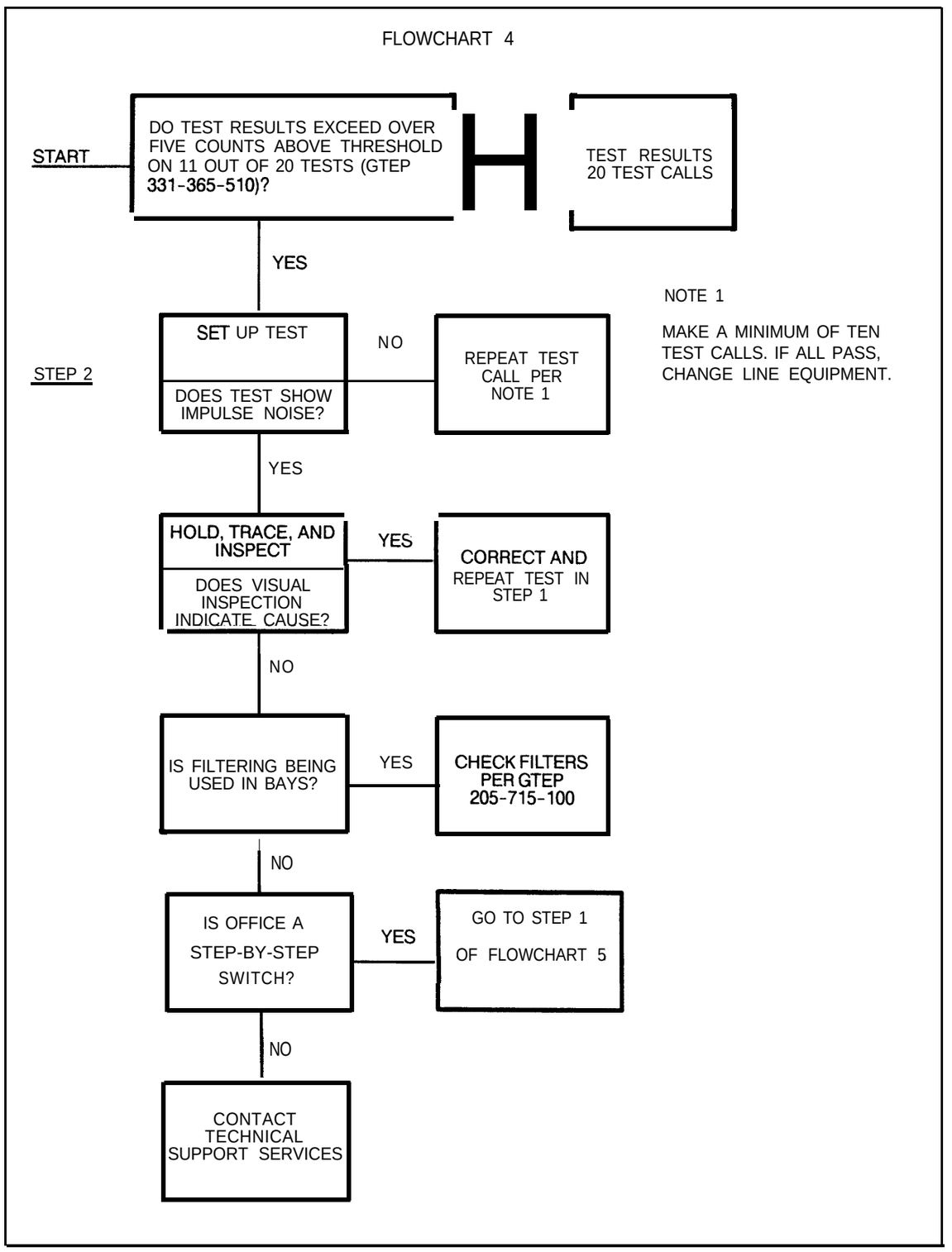
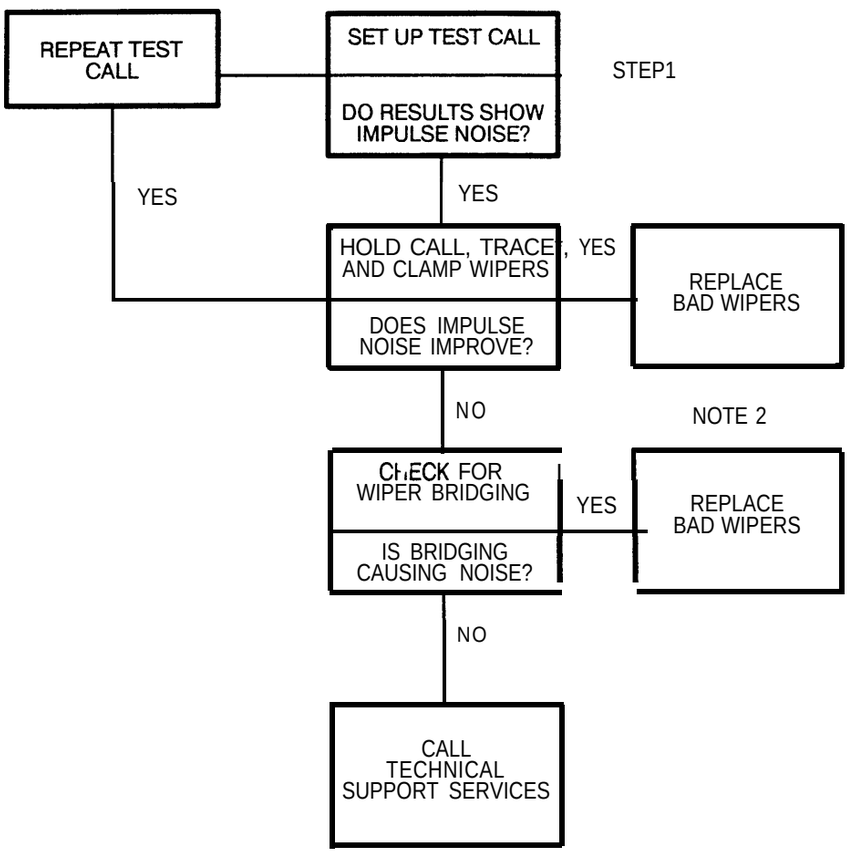


Exhibit 3 - **Impulse Noise Trouble Locating Flowcharts (Page 1 of 2)**

FLOWCHART 5



NOTE 1: Make a minimum of ten test calls.

*Clamping of switch line wipers is accomplished by using plastic clips. The purpose of clamping is to lock the wipers to the banks.

Exhibit 3 - Impulse Noise Trouble Locating Flowcharts (Page 2 of 2)

CONTINUITY TEST FORM

Form:00=20S4002

SITE: _____ EXCHANGE: _____ DATE:___ - / f -

Batt Mfg: _____ Model: _____ #Cells: _____ BatType: _____

Batt A. I-I.: _____ Offke Load: _____

(A.H. x -8) ! Office Load = Reserve: _____ Hr.

Batt Date: _____ String #: _____ Float Voltage: _____

Start / V.D.C. _____ Stab - 20 = _____ (Target is -. 1 volt)

5 sec: _____ 20 sec: _____ 3 min: _____ 10 min: _____

10 sec: _____ Low Point: _____ 4 min: _ _ 15 min: _____

15 set: _____ **2** min: _____ 5 min: _____ 20 min: _____

Stab: _____

WARNING: DO NOT ALLOW VOLTAGE TO DROP BELOW 46 VDC

NOTE: GRAPH ABOVE VALUES ON THE CHART BELOW

	5	10	15	**20**	**LP**	**Stab**	**2**	**3**	**4**	**5**	10	15	**20**
54 vdc													
53 vdc													
52 vdc													
51 vdc													
50 vdc													
49 vdc													
48 vdc													
47 vdc													
46 vdc													

Exhibit 4 - Continuity Test form, Form 00-205-0002

SMART MONITOR/CONTROL SYSTEM

Form: OO-205-000 5

SITE NAME AND STATE: _____ CLLI CODE: _____

DATE: _____/_____/_____

UNIT LOCATION: _____ UNIT TYPE: _____

FUSES LOCATION _____ LABELED YES NO

EQUIPMENT EVALUATION

A. ACCESS

1. Does unit have a telephone line connected to it? Yes No

   If yes, record telephone number: _____

2. Does unit have a RS232 port, for local PC access? Yes No

3. Is unit connected to the X.25 network by a cable Tom the unit RS232 or 485 connector and the PAD connector? Yes No

   If yes, record PAD address and port number: _____

   Example; 3110752 - 6281014 = 62810 PAD ADDRESS
   14 PAD PORT NUMBER

B. FRONT PANEL and METERS

1. Is front panel screen **active** (lite up)? Yes No

   NOTE: Some units need to be awakened by touching screen or turning panel rotary switch.

2. **Can** voltage and amperage of the site **be** displayed **on the** meter or screen? Yes No

   If yes, record voltage _____ and amperage _____

3. Does the screen indicate an alarm condition? Yes No

Exhibit 5 - Smart Monitor/Control System form, Form 00-205-0005 (Page 1 of 6)

NOTE: The screen or meter will either tell you **there is an alarm or will be flashing to indicate an alarm.**

C. WIRING

1. Check for loose connections on all termi& blocks and cable jack terminations, using a plastic or wooden wire probe. Tighten or record all discrepancies on the COPE Form.

2. Check all connections from the Monitor and Control Panel to:

   The Battery Plant
   The Battery Plant Shunt
   The Rectifiers
   The Transducers - Units used at the equipment location to monitor noise, ground isolation, temperature and mid-sting battery voltage.

3. If unit is using output relays to report alarms, check all wiring and connections from output alarm terminals to switch sense points or INAS alarm unit.

4. Verify that the unit FAIL alarm is wired to a switch sense point or INAS sense point. Yes No

   NOTE 1: **Without this alarm if unit fails** ALL POWER ALARM **reporting is lost.**

   NOTE 2: Use manufacturer's user's manual to locate output terminals..

   Tighten all connections or report wiring discrepancies on COPE Form.

D. ALARMS

1. What method of alarm reporting is being used?

   X.25 TL-1
   INAS - Dantel/Harris
   Switch Sense Points
   Other _____

2. Does unit have TL-1 capability? Yes No

   NOTE: Lucent ECS/URC and NORTEL RPM2000 units can not send alarms TL-1.

Exhibit 5 - Smart Monitor/Control System form, Form 00-205-0005 (Page 2 of 6)

3. Does site have an X.25 PAD? Yes No

NOTE: Most common types are the APCSO and Sprint PAD.

4. If the answers to questions 2 and 3 are "yes", report this as a discrepancy. GTE uses TL-1 X.25 alarm sending when 2 & 3 are true.

5. Verify that the following alarms are being reported by the power monitor and control equipment.

"Unit Fail" - remove power to unit using procedures outlined in manufacturer's user's manual:

Expected alarm report "PWR 025 PWR MISC POWER EQ. ALARM"
Alarm Level - MAJOR

"Rectifier Fail" - activate RFA in a rectifier

Expected alarm report "PWROO 1 PWR RECTIFIER FAIL"
Alarm Level - MAJOR

"Battery on Discharge" - reduce plant voltage by turning off rectifiers or using unit programming (see User's manual)

Expected alarm report "PWROO6 PWR BATTERY ON DISCHARGE"
Alarm Level - CRITICAL

"All Rectifier Fail" - Turn off any two rectifiers at AC power panel

"Fuse or circuit breaker alarm" - activate any fuse alarm in vacant position

Expected alarm report 'PWROI 3 PWR FUSEKB FAILURE"
Alarm Level - CRITICAL

"High Voltage, High Battery Temperature, Site load Warning and Battery Fail" will be tested using program threshold manipulation.

6. Correct or report all alarm failures on COPE Form.

7. Verify all visual alarm lamps **or** LED's on unit for proper indications.

8. Correct or report on COPE Form.

Exhibit 5 - Smart Monitor/Control System form, Form 00-205-0005 (Page 3 of 6)

E. HARDWARE CONFIGURATION

1. Verify the strapping, addressing and dip switch setting(s) on the Smart Power equipment.

Fill out the following requirements prior to proceeding:

Number **of** Rectifiers	_____
Maximum Capacity of Rectifiers	_____
Number of Cells	__ 23 _____ 24 __
Type Batteries, i.e., lead calcium valve regulated, lead alimony	_____

NOTE: This information is needed to set or verify alarm threshold for BOD (Battery on Discharge), HV (High Voltage), site disconnect pending and site load.

A. Use table in GTEP 200-005-200 for correct settings for all alarm thresholds.

B. Use User's manual for switch and strap locations and dip switch "on/off' positions.

F. PROGRAMMING CONFIGURATION

1. The evaluation of the software programming of a Smart Power System is performed using the front panel access using the screen and/or using the RS232 local port.

2. The User's manuaI for each unit will provide the evaluation procedures for using the SCREEN on the front of the unit or a PC to access it.

3. Use the tables below to verify the following alarm threshold(s), if applicable:

HIGH VOLTAGE
BOD
SITE DISCONNECT PENDING
SITE LOAD WARNING
HIGH TEMPERATURE
LOW TEMPERATURE
AUTO-EQUALIZE
RECTIFIER CONTROL
ENERGY MANAGEMENT

Exhibit 5 - Smart Monitor/Control System form, Form 00-205-0005 (Page 4 of 6)

NOTE: **Auto-equalize, Rectifier control and Energy Management features are to be DISABLED unless authorized by the Region Network Reliability Management.**

a.

HIGH VOLTAGE		
# of Cells	Type Battery	Voltage
23	Lead Antimony	54V
23	Calcium	51.5V
23	VRLA	53V
24	Lead Antimony	55V
24	Calcium	54V
24	VRLA	55V

b.

BOD		
# of Cells	Type Battery	Voltage
23	Lead Antimony	49v
23	Calcium	49.5V
23	VRLA	51v
24	Lead Antimony	51V
24	Calcium	52V
24	VRLA	53v

Exhibit 5 - Smart Monitor/Control System form, Form OO-205-0005 (Page 5 of 6)

c.

SITE DISC PENDING			
# of Cells	Type Battery	Voltage	
23	Lead Antimony	47V	
23	Calcium	49v	1
23	VRLA	47.5V	
24	Lead Antimony	50V	
24	Calcium	49v	
24	VRLA	51V	

d.

SITE LOAD WARNING		
80% Rectifier Capacity	All Plants	1

e.

TEMPERATURE		
High Temperature	92 Degrees F	1
Low Temperature	62 Degrees F	1

f Correct or report on the COPE Form.

Exhibit 5 - **Smart Monitor/Control System form, Form 00-205-0005 (Page 6 of 6)**

Form:00_2054MO3

CENTRAL OFFICE POWER EVALUATION

COPE

DISCREPANCY LIST

CENTRAL: _____ DATE: _____

The results of the COPE performed in your office on _____ are:

CORRECTED	NOT CORRECTED	OUTSIDE GROUNDING AND INSIDE DISCREPANCY
CORRECTED	NOT CORRecTED	CENTRAL OFFICE NOISE DISCREPANCY

Exhibit 6 - Central Office Power Evaluation COPE Discrepancy List form, Form 00-205-0003

Fomx 00-2050004

CENTRAL OFFICE POWER EVALUATION
COPE
DISCREPANCY REFERRAL FORM

TO: MC: DATE:

FROM: MC: PHONE:

SUBJECT: Discrepancies Found in the _____ Central Office

Your assistance is required to correct the discrepancies listed below. Please take whatever action is needed to correct these problems, Return this form to me at MC _____ within thirty working days of above date. Thank you for your cooperation and assistance.

ITEM NO.	ACTION IMMEDLATE/PLANNED		DISCREPANCY
			ACTION TAKEN
			DISCREPANCY
			ACTION TAKEN
			DISCREPANCY
			ACTION TAKEN
			DISCREPANCY
			ACTION TAKEN

Exhibit 7 - Central Office Power Evaluation Discrepancy COPE Referral form, Form 00-205-0004

Commercial AC Entrance Grounding Questionnaire

(Complete the following questionnaire and file a copy with the Central Office Power **Evaluation** Inspection Sheet form (Form 00-205-0006)

WARNING: **Hazardous Voltage Present - Extreme Caution! If any discrepancies noted, refer to a qualified/licensed electrician for repair.**

LOCATION: _____ **DATE:** _____

INSPECTED BY: _____ PHONE #: _____

1. **Auxiliary Generator**

   A. Is the generator frame common with the chassis of the transfer cabinet:? _____

   Additional Comments: _____

2. **Transfer Panel**

   Sometimes the transfer panel cannot be opened for inspection without running the generator. Some main disconnects cannot be opened without running the generator. Co-ordinate the inspections of housings with this in **mind.**

   A. Is the neutral continuous through the transfer panel, making connection with the commercial AC neutral and the stand-by generators? (NOT Switched) _____

   B. Is the chassis connected via green wire to the main service disconnect cabinet?

   Additional Comments: _____

3. **Main Service Disconnect**

   See NOTE on transfer panel.

   A. Is the incoming neutral connected to an earth ground via Lead 4? _____

   B. Is the neutral bus bar connected to the office MGB via Lead 131 _____

   C. Is the surge arrestor neutral leg connected to the neutral bus? _____

   D. **Has** a green wire bus been established with **a** connection to the neutral bus and the disconnect cabinet? _____

   E. Is the interior water pipe grounded to the neutral bus via Lead 8? _____

   Additional Comments: _____

Exhibit 8 - Commercial AC Entrance Grounding Questionnaire (Page **1 of 2)**

4. **Surge** Arrestor

A. Is the surge arrestor connected to the load side of the main disconnect system? _____

B. is the lead length between the arrestor and the disconnect switch less than 3 feet? _____

C. Is the ground lead as straight as possible? _____

D. Is the discharge lead of the arrestor connected to the neutral in the main disconnect switch? _____

E. Is the chassis connected via a green wire to the main disconnect cabinet? _____

Additional Comments: _____

5. AC Dlstribution Panels

A. Is the panel chassis connected to the MGB via Lead 20? _____

8. Are green wires for circuits serving non-isolated equipment in place, connected to the panel chassis and isolated from the neutral? _____

C. Are green wires for circuits serving isolated equipment in place, not connected to the panel chassis and isolated from the neutral? _____

Additional Comments: _____

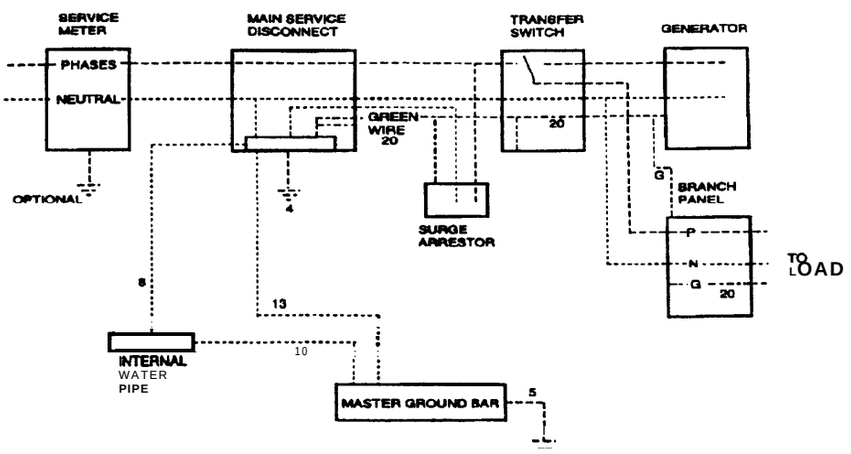


Exhibit 8 - Commercial AC Entrance Grounding Questionnaire (Page 2 of 2)