



GUAM POWER AUTHORITY
AGANA, GUAM

SPECIFICATION No. E-040

PAGE 1 OF 8
REVISION: 0
January 22, 2007

PREPARED BY THE ENGINEERING DEPARTMENT

GUAM POWER AUTHORITY
Post Office Box 2977
Agana, Guam 96932

TRANSMISSION & DISTRIBUTION SPECIFICATION

Specification No. E-040

for

SUBSTATION POWER METERS

for

LARGE US MILITARY INSTALLATIONS

EFFECTIVE DATE: 01/23/07

ISSUED:

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SUBSTATION POWER METERS FOR MILITARY INSTALLATIONS

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US Navy Metering Schematic Drawings	(Sheets 1 thru 19)

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1.0 Scope

- 1.1 This specification covers the requirements of the electricity revenue meters to be installed within outdoor metering cubicles at US Navy Metering locations shown on the attached drawings.
- 1.2 The meters will be used to meter specific medium and high voltage substation transformers and circuit breakers via new and existing current and potential transformers (CTs and PTs).
- 1.3 The meters and associated equipment shall be suitable for transmission of metering data to a remote Master Station at GPA's Power System Control Center or T&D Facility via telephone lines or a radio telemetry system.

2.0 Conformance to Standards and Specifications

The meters and associated equipment shall meet the requirements of the latest issue of the following standards in whole or in part as applicable:

- (i) National Electrical Code (NEC) and National Electrical Safety Code (NESC)
- (ii) American National Standards Institute (ANSI) and IEEE including: ANSI/IEEE C37.90, ANSI/IEEE C62.41, ANSI C12.13 and ANSI C12.1 (code for electricity metering), IEEE 587 and IEC 801-2, 3, and 4
- (iii) National Electrical Manufacturers Association (NEMA)
- (iv) American Society for Testing and Materials (ASTM)
- (v) Underwriters Laboratory

3.0 Deviation and Non-Conformance Requirements

- 3.1 Deviations from this specification or changes in materials or design after the Purchase Order has been placed must be approved by the GPA Engineering Department and acknowledged by a Purchase Order Amendment.
- 3.2 Units received with deviations or non-conformances which are not acknowledged as specified in Sub-Paragraph 2.2.1 are subject to rejection. The Supplier is responsible for any corrective action including but not limited to materials, labor and transportation necessary to dispose of, or make the units conform to the specification.

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- 3.3 Notification of defects discovered before or after installation that are believed to be inherent to manufacturing problems or workmanship shall be made and forwarded to the Supplier. The description of the item, documentation of the problem and the described information, disposition and/or follow-up (as appropriate) that GPA expects from the Supplier will be specified. The Supplier's response shall be made within thirty (30) days unless an extension is acknowledged and approved in writing by the GPA Manager of Engineering.
- 3.4 GPA shall be allowed two (2) weeks to review and approve drawings or specifications without affecting the shipping date. Delays in delivery due to drawings/specifications which are not approved during this review period are the responsibility of the Supplier.

4.0 Meter Types and Performance

4.1 General

- 4.1.1 The meters shall be of the electronic type with high accuracy and suitable for operation under harsh operating conditions.
- 4.1.2 The meters shall be programmable, either from the remote Master Station or from a laptop computer via an optical fiber link or RS232 connection.
- 4.1.3 The meter shall have multi-level security features to limit users access to certain functions and preserve the integrity of the meter data.
- 4.1.4 The meters shall have a non-volatile mass-memory so that on loss of AC power, the programmed settings shall not be lost and the information in the registers may be retrieved either remotely or locally.
- 4.1.5 The meters shall be of the low burden type to effectuate minimal CT and PT burden requirements. A preferred design of the meters will be such that they are self-powered from the PT inputs.
- 4.1.6 The voltage rating of the meter shall be appropriate to the source voltage to preserve the accuracy of the meter.
- 4.1.7 The meter type shall be the **Itron QUANTUM Q1000**.
- 4.1.8 A typical connection diagram is shown on the drawings for each metering site.

4.2 Construction

- 4.2.1 The meters shall house the following standard modules:

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- Transformer module
- Power supply module
- Analog to Digital (A/D) conversion module
- Register processor module
- Display module
- I/O module

4.2.2 In addition, the following optional modules shall be furnished with each meter:

- Mass memory / real time clock module
- Modem module (suitable for 4-wire analog telephone lines)

4.2.3 All meters shall be of the drawout/switchboard case type.

4.3 Electrical Characteristics

The meters shall have the following characteristics as a minimum:

Accuracy Class	0.1%
Accuracy Range	5% to 200% of current input rating
Design	Electronic type
Connections:	
Current	3-phase unbalanced load (3 element)
Voltage	3-phase 4 wire WYE
Current	3-phase unbalanced load (2 element)
Voltage	3-phase, 3 wire DELTA
Input Ratings:	
Current	5 A (ANSI CL10 or 20)
Voltage	67 Vac (69 Vac nominal) for DELTA connected 115 Vac (120 Vac nominal) for WYE-connected
Frequency	60 Hz
Auxiliary Power Voltage	Derived from PT inputs (69 or 120 Vac)



Measuring Quantities (Minimum Requirements)

Demand
(15 or 30 min. selectable)

kW (bidirectional)
kVA (bidirectional)
kVAr (bidirectional)
Current (A)

Energy

kWh (bidirectional)
kVArh (bidirectional)
kVA (bidirectional)
 V^2h
 A^2h

Instantaneous

Voltage (each phase)
Current (each phase)
kW (bidirectional)
kVA (bidirectional)
kVAr(bidirectional)
Power Factor

Load Profiling

24 channels with programmable interval lengths

In addition, demand registers shall be provided for peak (maximum), cumulative, continuous cumulative and present values.

Mounting

Flush (Switchboard) Panel inside
outdoor metering cubicle

Temperature Range

-40°C to 70°C (-40°F to 158°F)

Humidity

0 to 95% condensing

4.4 Programming

4.4.1 The meters shall be programmable through the following methods:

- Locally or remote via the RS-232 Direct Connect Port
- Locally via the Optical Coupler
- Remotely via the 4-wire modem port



- 4.4.2 The appropriate meters shall be selected and programmed such that only two current inputs, A and C phases, are sufficient to provide information on total kW and kWh values for two specific power transformers where it is not physically viable to install the middle phase (B-phase) CTs.
- 4.4.3 In addition, the meters shall have the ability to perform transformer loss compensation. The meter shall be fully supported by Itron's (UTS) MV-90 software system.

4.5 Internal Option Board/Module

- 4.5.1 Each meter shall be fitted with an intelligent internal option board/module having two serial ports. The module shall have the ability to provide simultaneous access to the meter through each of these ports.
- 4.5.2 In areas where two or more metering devices will be installed, at least one electronic power meter shall have one of the serial ports configured to communicate directly to the Master Station via a 4-wire analog (modem) telephone line. The other serial port shall be configured as an RS-232C interface to enable connection of an RTU. The other meter(s) in the same area will be daisy-chained with the "master" meter in able to link with the Master Station.
- 4.5.3 The minimum baud rate for the 4-wire modem port or RS-232 port shall be 2400 bps in full duplex mode.
- 4.5.4 The power meter shall include DNP 3.0 protocol for communication to SCADA systems. All instantaneous data and average data shall be available using DNP 3.0 protocol. User shall be able to custom map data into DNP protocol using Windows based software.

4.6 Import/Export Metering

- 4.6.1 The meters shall be capable of determining the direction of power flow. This directional information will be relayed to the Master Station for summation.
- 4.6.2 The Master Station shall be able to interrogate individual meters to determine if they are importing or exporting at any instant in time.
- 4.6.3 The meter design shall observe the IEEE paper 83 WM 092-4 for bidirectional power flow definitions.



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5.0 Warranty

The Supplier shall warrant the satisfactory and successful operation of the apparatus furnished under this specification at the rating, under the conditions, and for the service specified for a period of not less than one (1) year. The Supplier shall further warrant the apparatus against defects of design, material and workmanship.

6.0 Quality Control

- 6.1 The Supplier shall have a quality control program to ensure compliance with the requirements of this specification. The program shall be documented and available for GPA's review if requested.
- 6.2 Documentation of the quality control program shall indicate where in the production and manufacturing process the quality checks are taken, describe the purpose of the checks, and describe the nature of the check, e.g. if check is visual only or if electrical or mechanical testing is used.

7.0 Packing and Shipping

The Supplier shall have adequate work and inspection instructions for handling, interim storage, preservation, packaging, and shipping to protect the quality of the meters and prevent damage, loss and deterioration.

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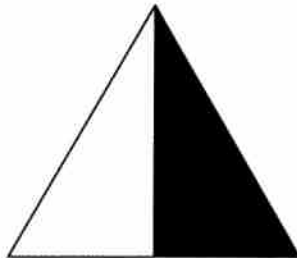
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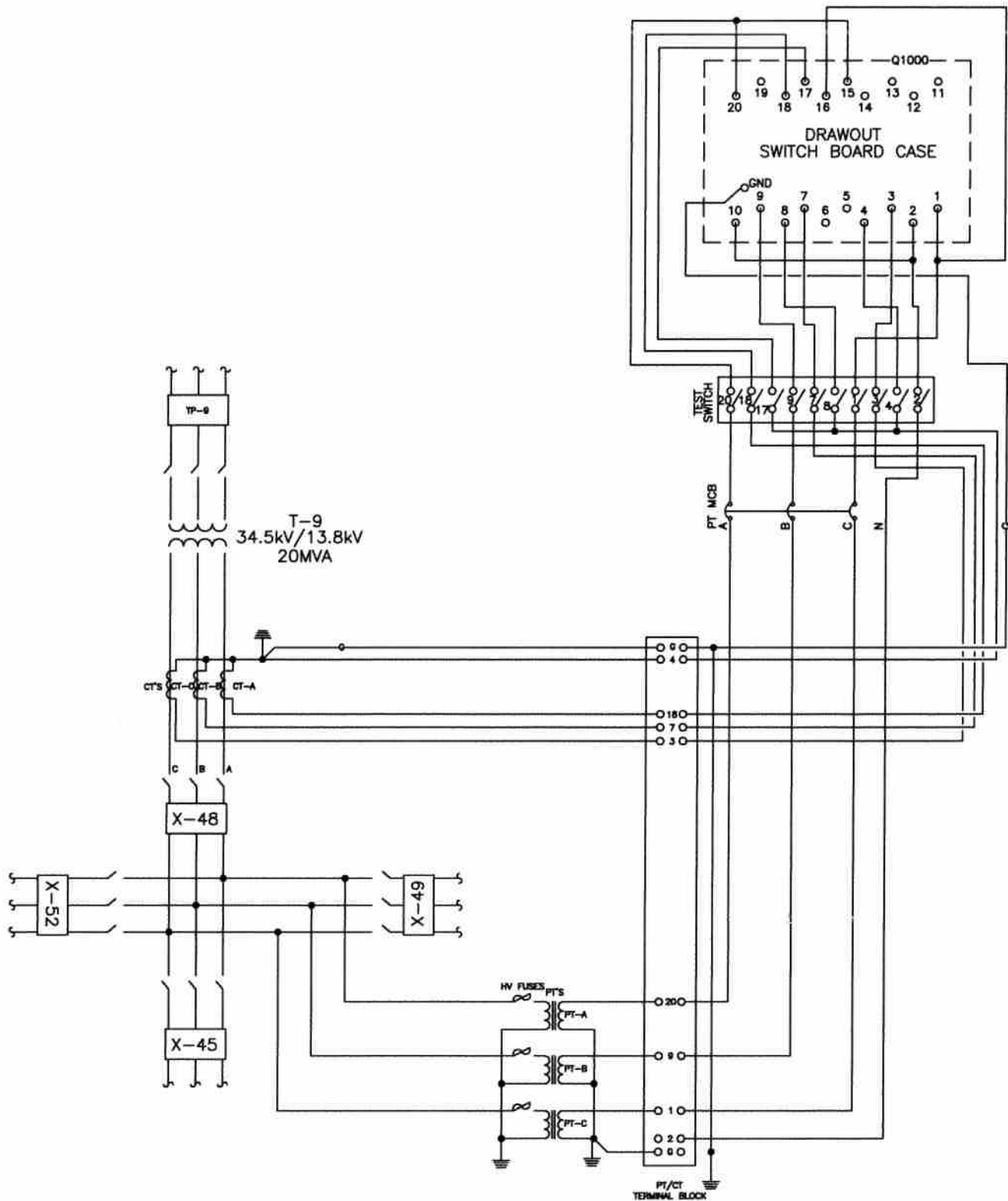
METERING OF U.S. NAVY LOADS

METERING CUBICLE THREE LINE DIAGRAM

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METERING OF U.S. NAVY LOADS METERING CUBICLE THREE LINE DIAGRAM COVER SHEET						
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01/15/07	MPO	GPA	JGA	M. CAMACHO, P.E. MANAGER OF ENGINEERING		
				SHEET NO. 1 OF 19		



AGANA T-9 METERING CUBICLE



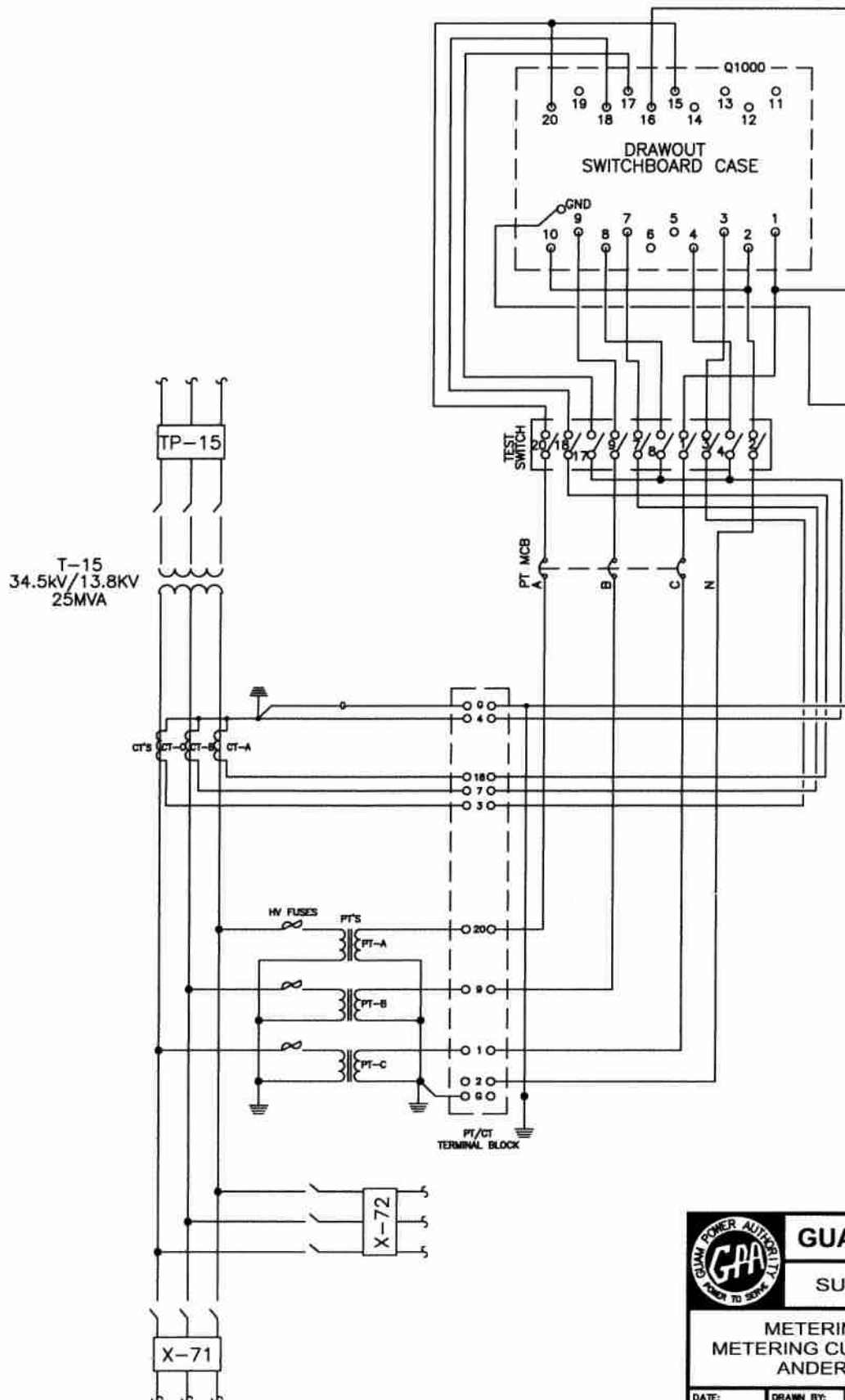
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SUBSTATION TRANSMISSION

**METERING OF U.S. NAVY LOADS
METERING CUBICLE THREE LINE DIAGRAM
AGANA SUBSTATION T-9**

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ANDERSEN T-15 METERING CUBICLE



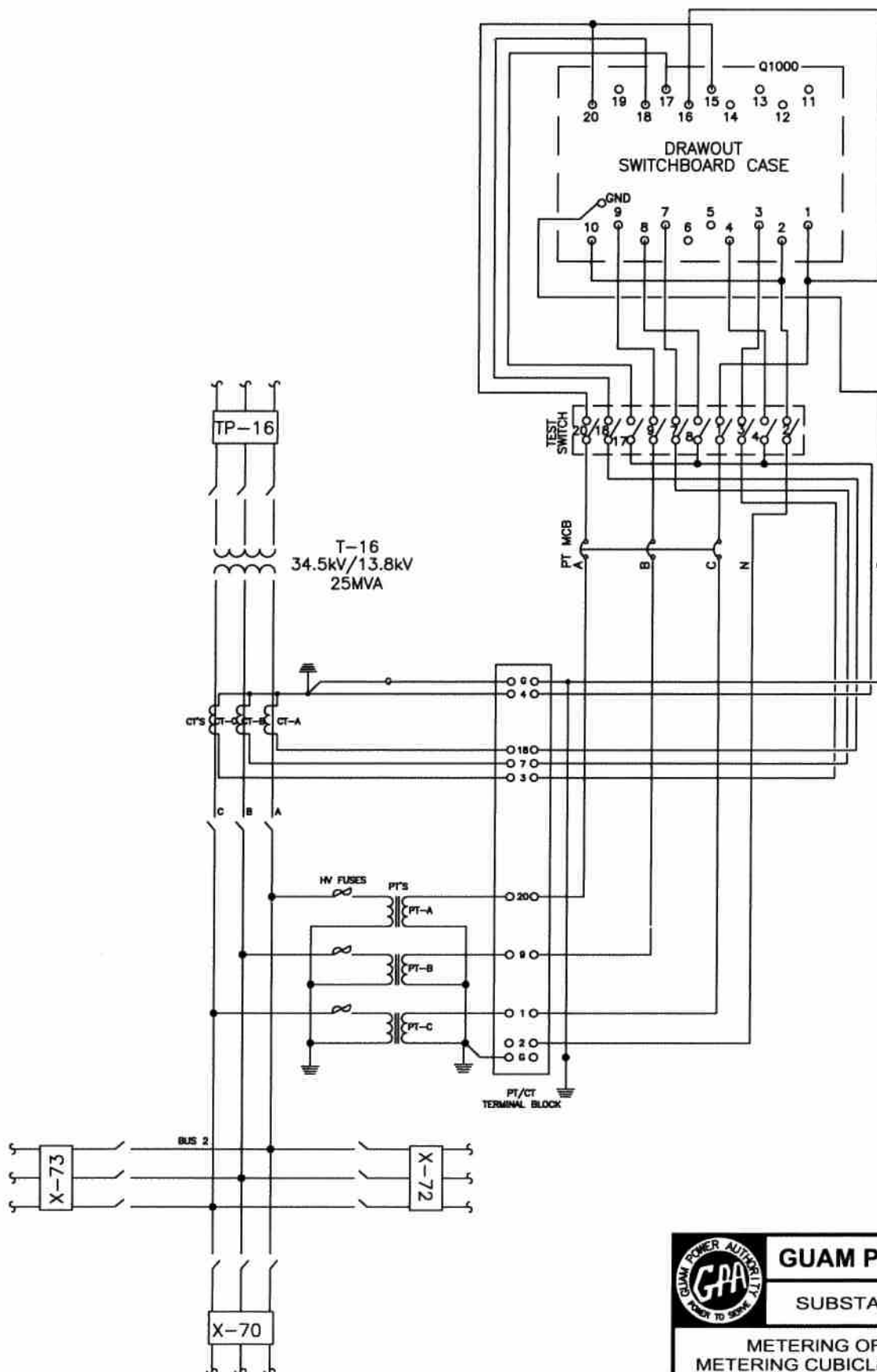
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SUBSTATION TRANSMISSION

**METERING OF U.S. NAVY LOADS
METERING CUBICLE THREE LINE DIAGRAM
ANDERSEN SUBSTATION T-15**

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ANDERSEN T-16 METERING CUBICLE



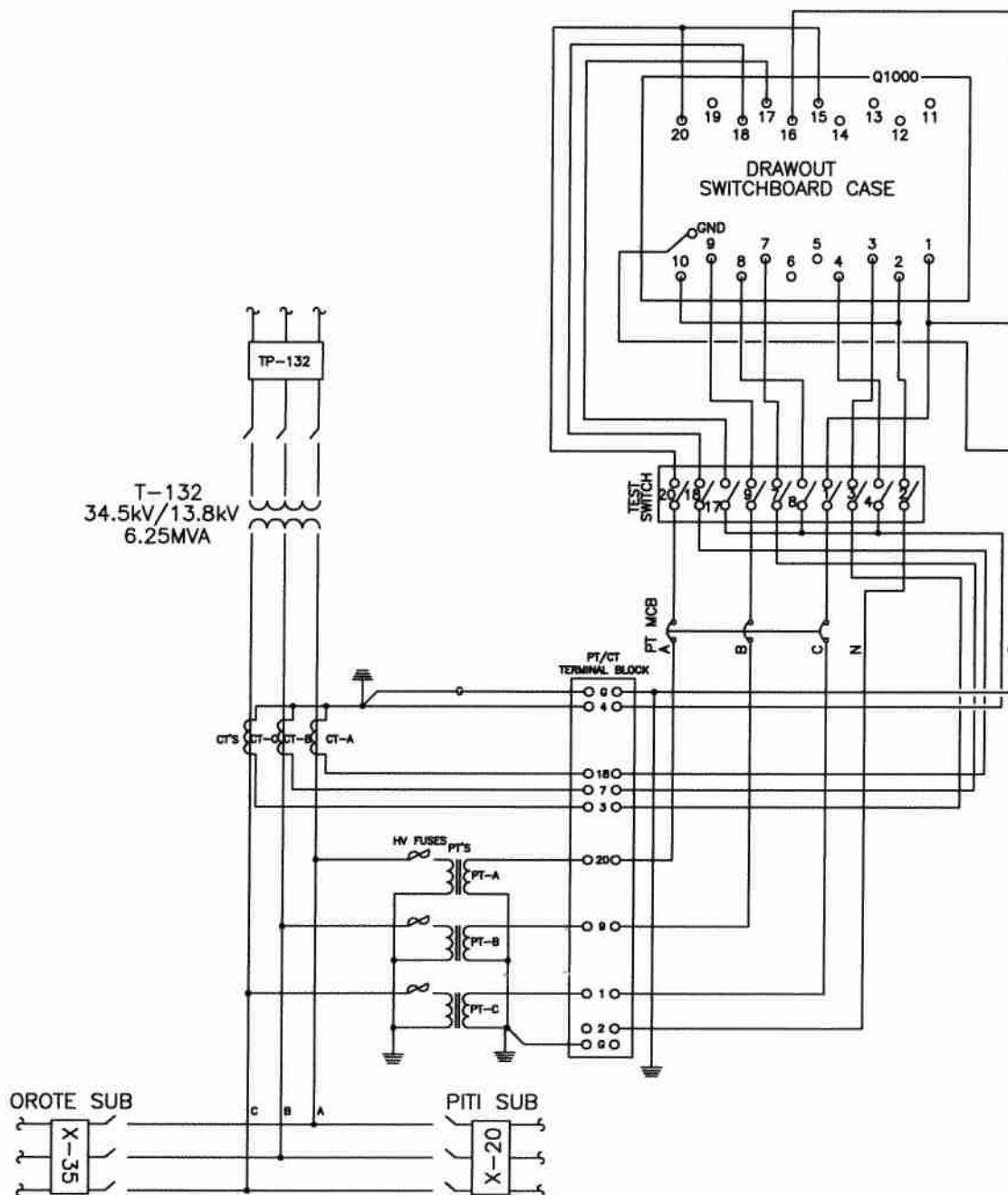
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SUBSTATION TRANSMISSION


**METERING OF U.S. NAVY LOADS
METERING CUBICLE THREE LINE DIAGRAM
ANDERSEN SUBSTATION T-16**

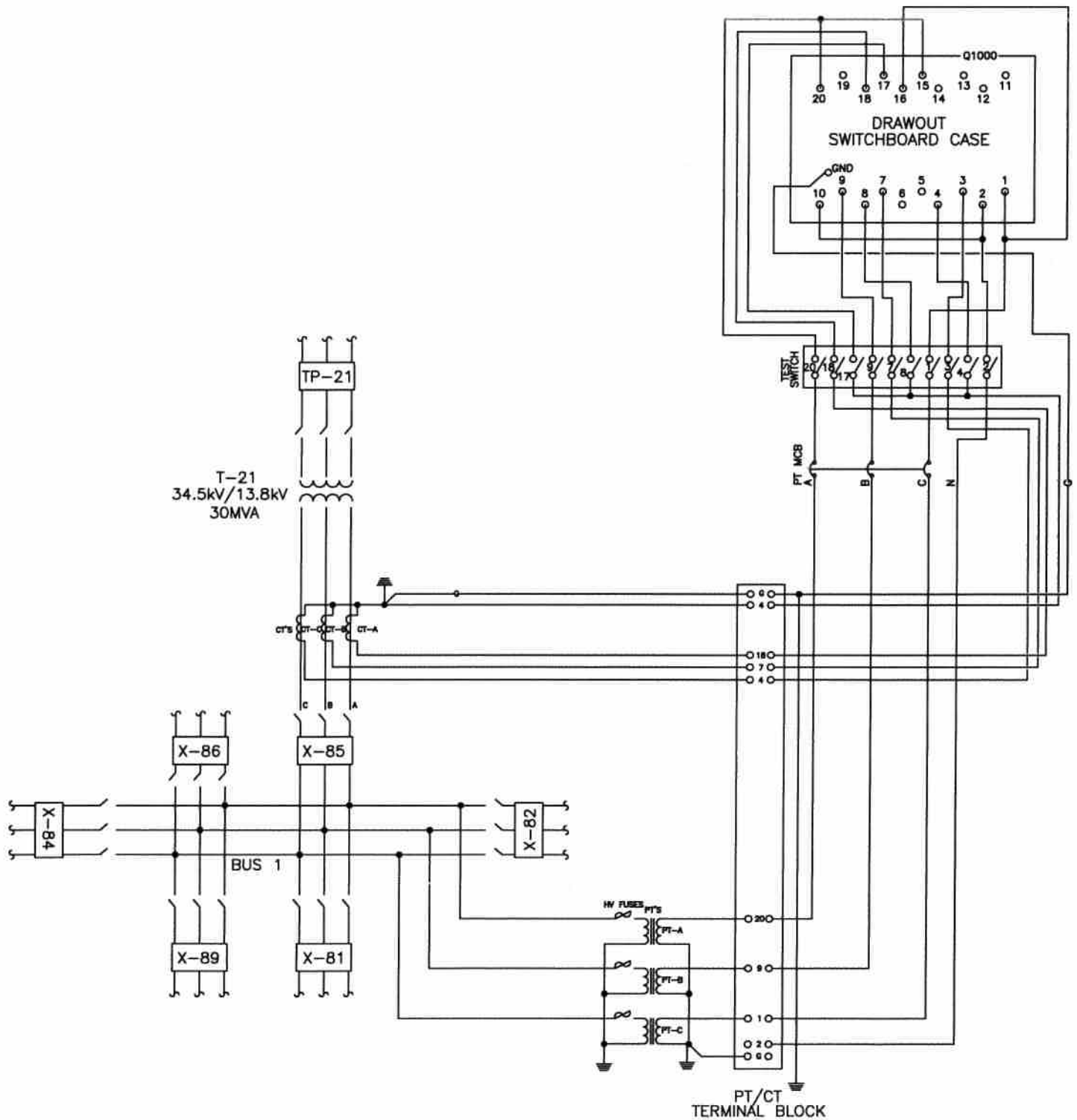
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COLD STORAGE T-132 METERING CUBICLE

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METERING OF U.S. NAVY LOADS METERING CUBICLE THREE LINE DIAGRAM COLD STORAGE SUBSTATION T-132			
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HARMON T-21 METERING CUBICLE



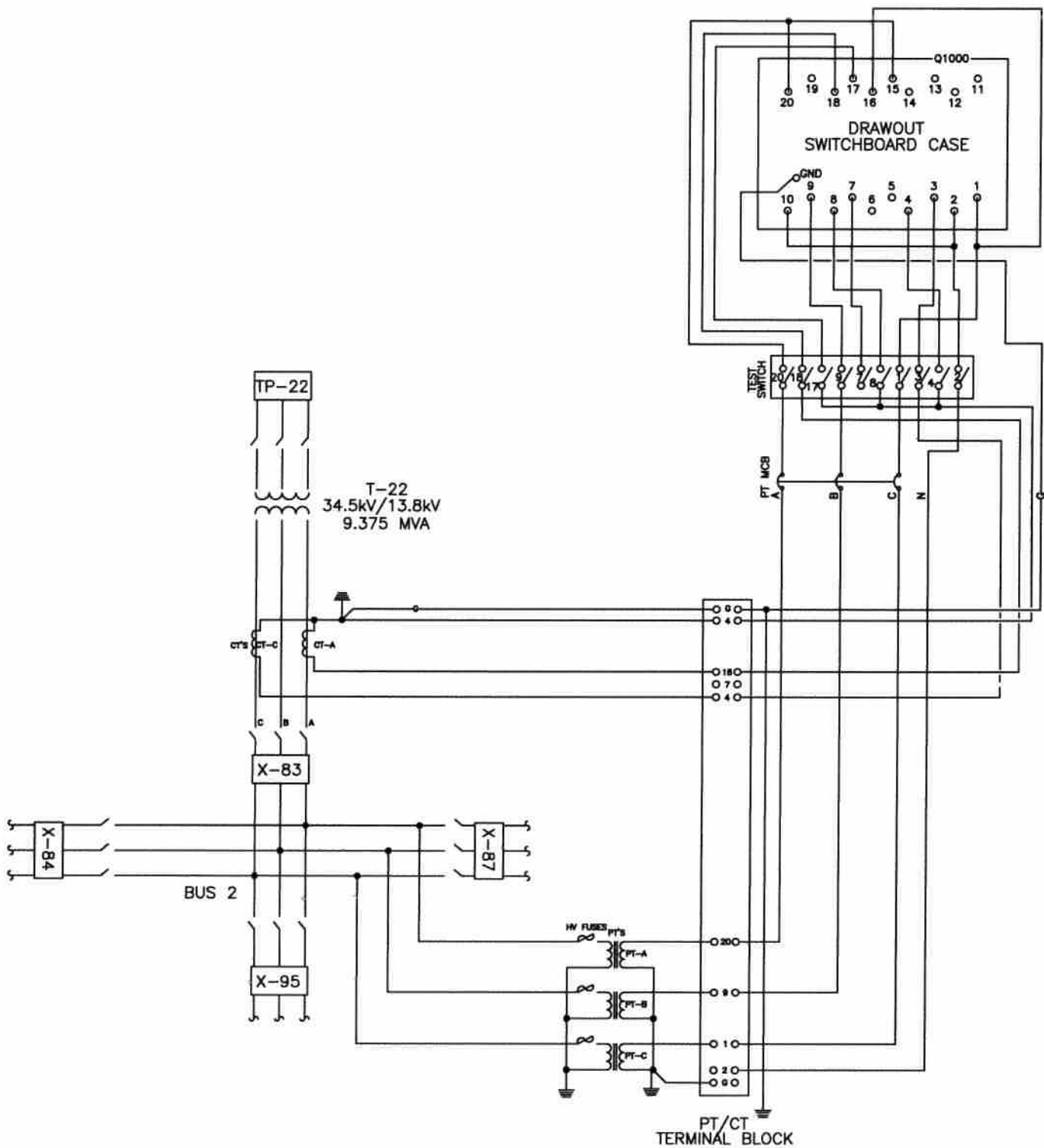
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SUBSTATION TRANSMISSION

**METERING OF U.S. NAVY LOADS
METERING CUBICLE THREE LINE DIAGRAM
HARMON SUBSTATION T-21**

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HARMON T-22 METERING CUBICLE



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HARMON SUBSTATION T-22

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MARBO T-14 METERING CUBICLE

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METERING OF U.S. NAVY LOADS
METERING CUBICLE THREE LINE DIAGRAM
MARBO SUBSTATION T-14

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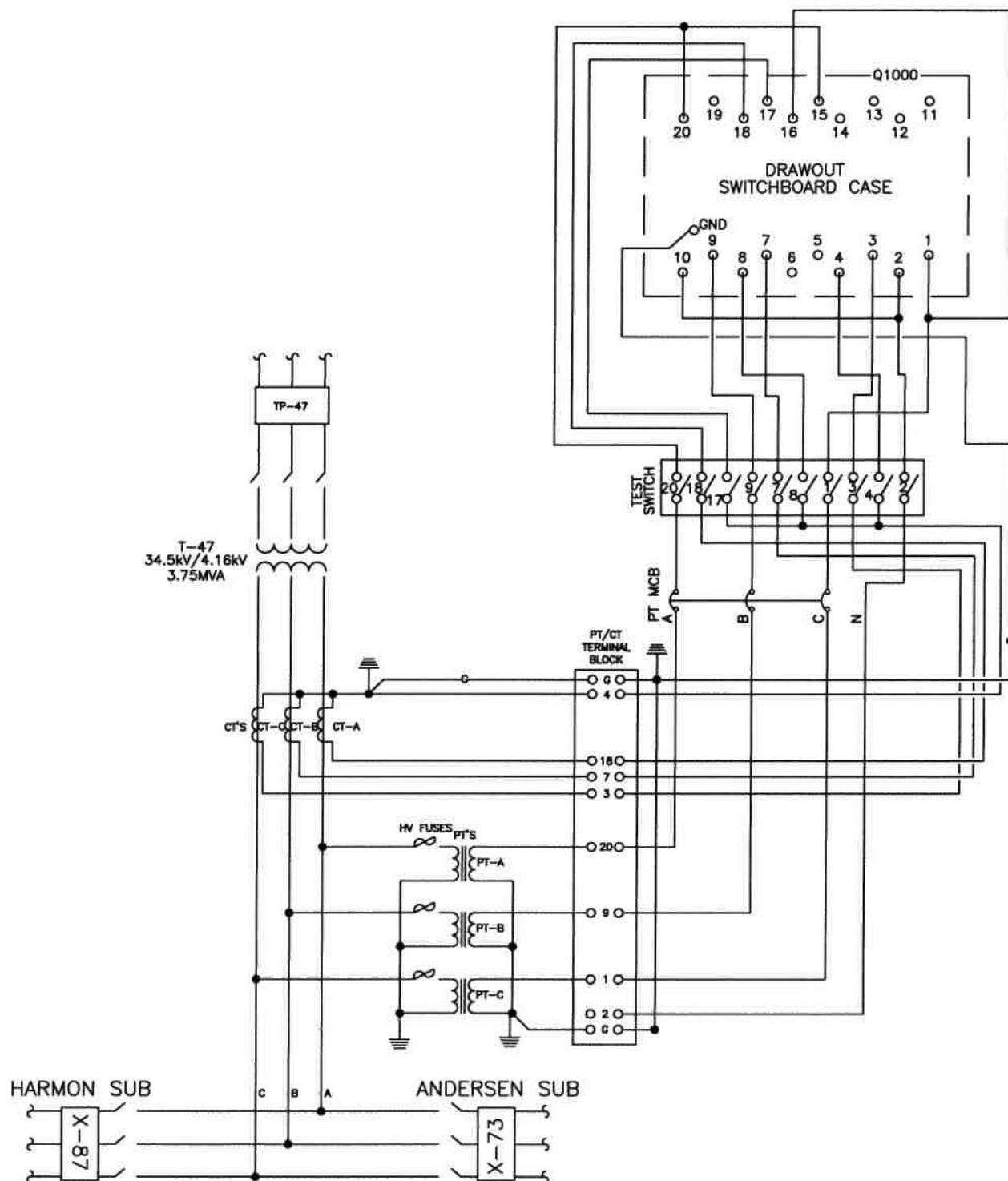
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JGA

APPROVED BY:
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MANAGER OF ENGINEERING

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NCS T-47 METERING CUBICLE



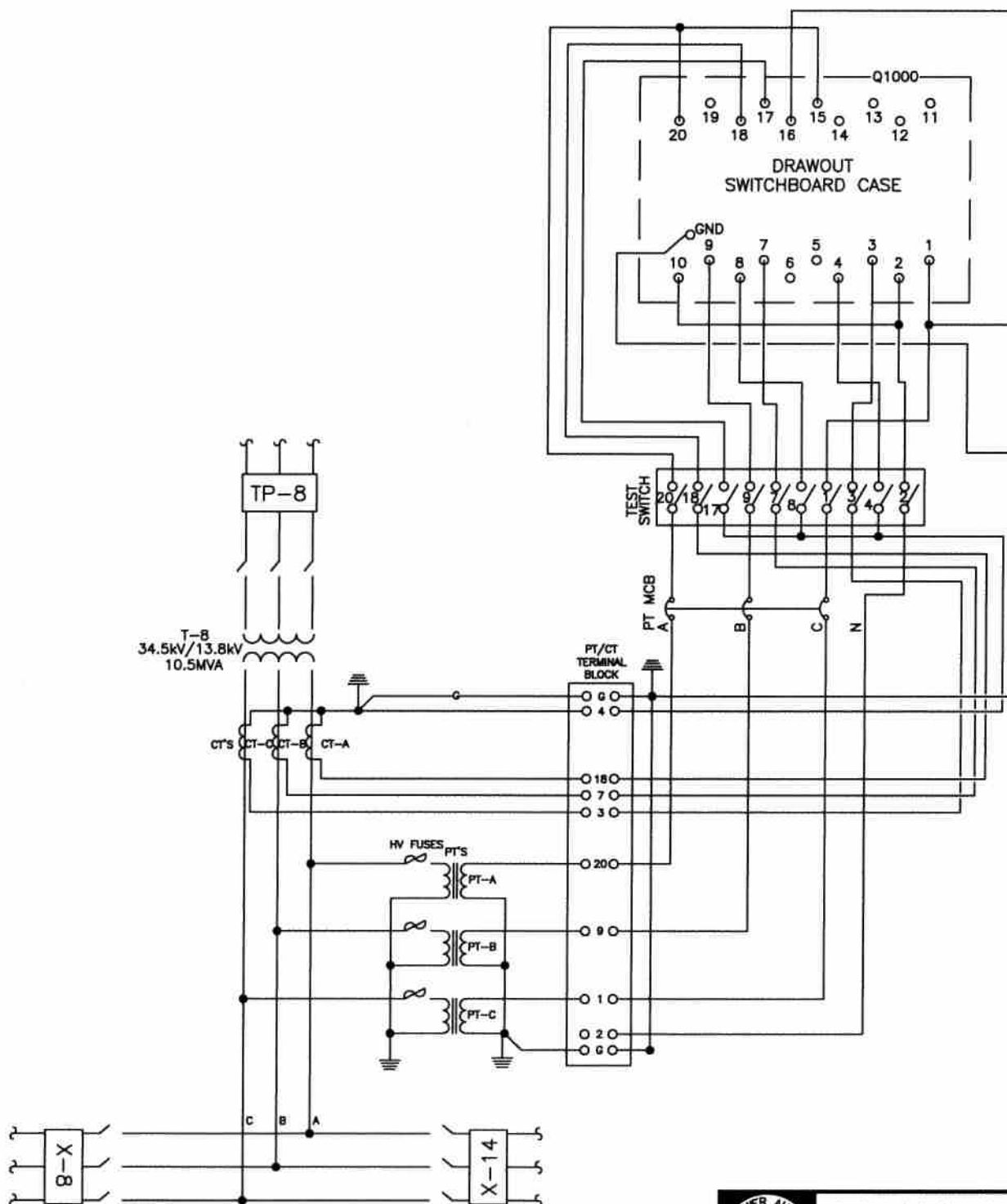
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**METERING OF U.S. NAVY LOADS
METERING CUBICLE THREE LINE DIAGRAM
NCS FINEGAYAN SUBSTATION T-47**

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PITI T-8 SUBSTATION METERING CUBICLE



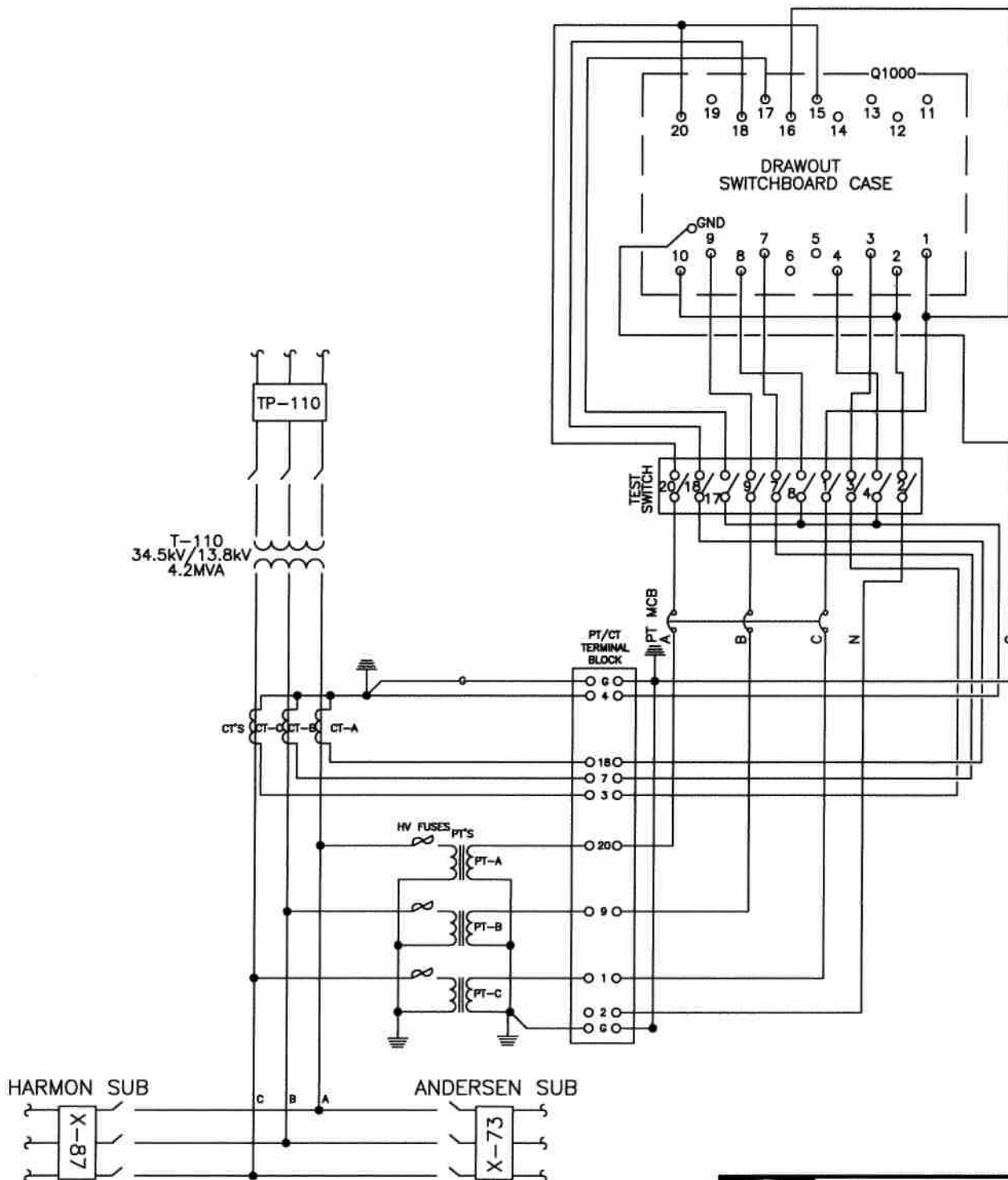
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**METERING OF U.S. NAVY LOADS
METERING CUBICLE THREE LINE DIAGRAM
PITI SUBSTATION T-8**

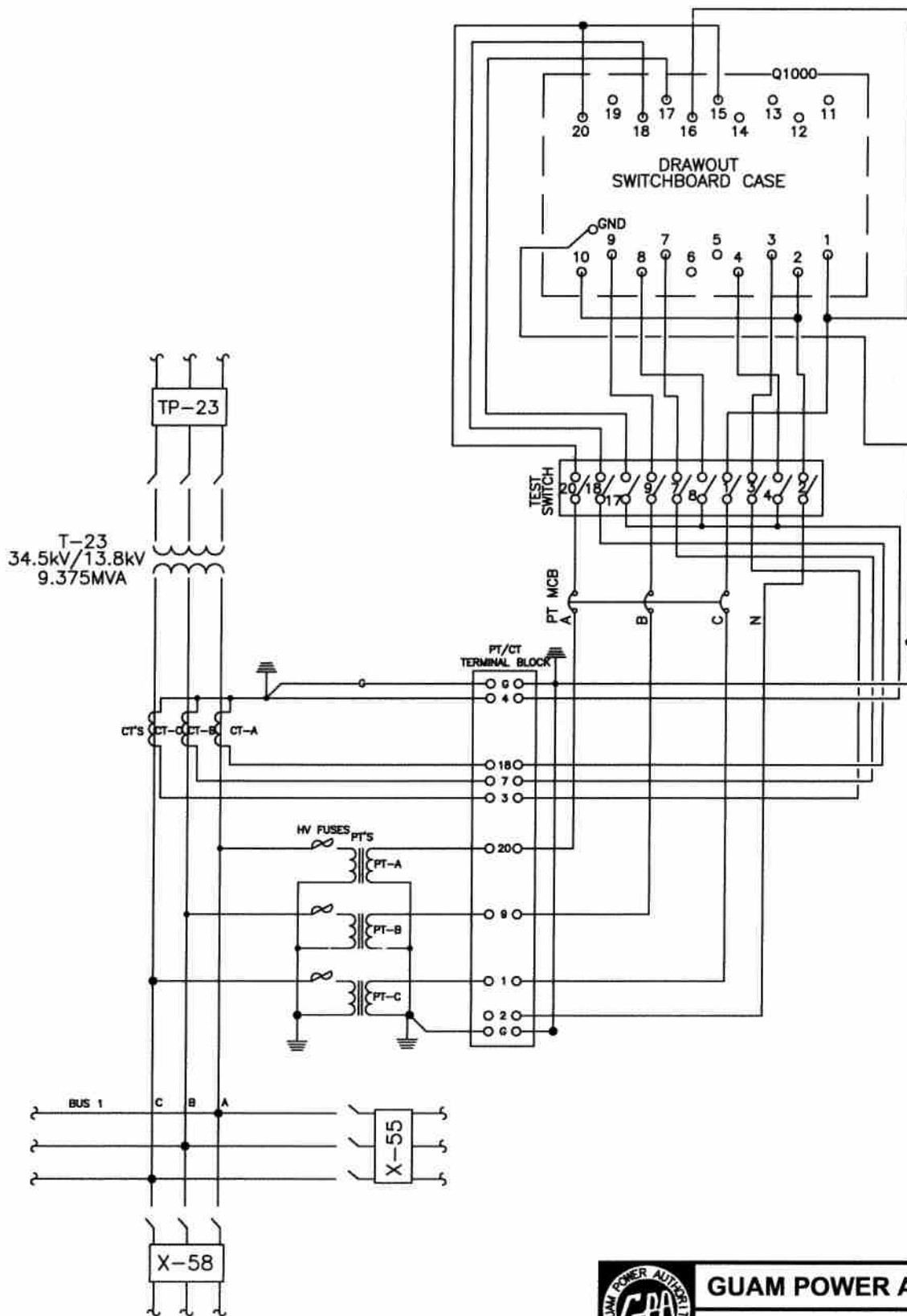
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POTTS T-110 JUNCTION METERING CUBICLE

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RADIO BARRIGADA T-23 METERING CUBICLE



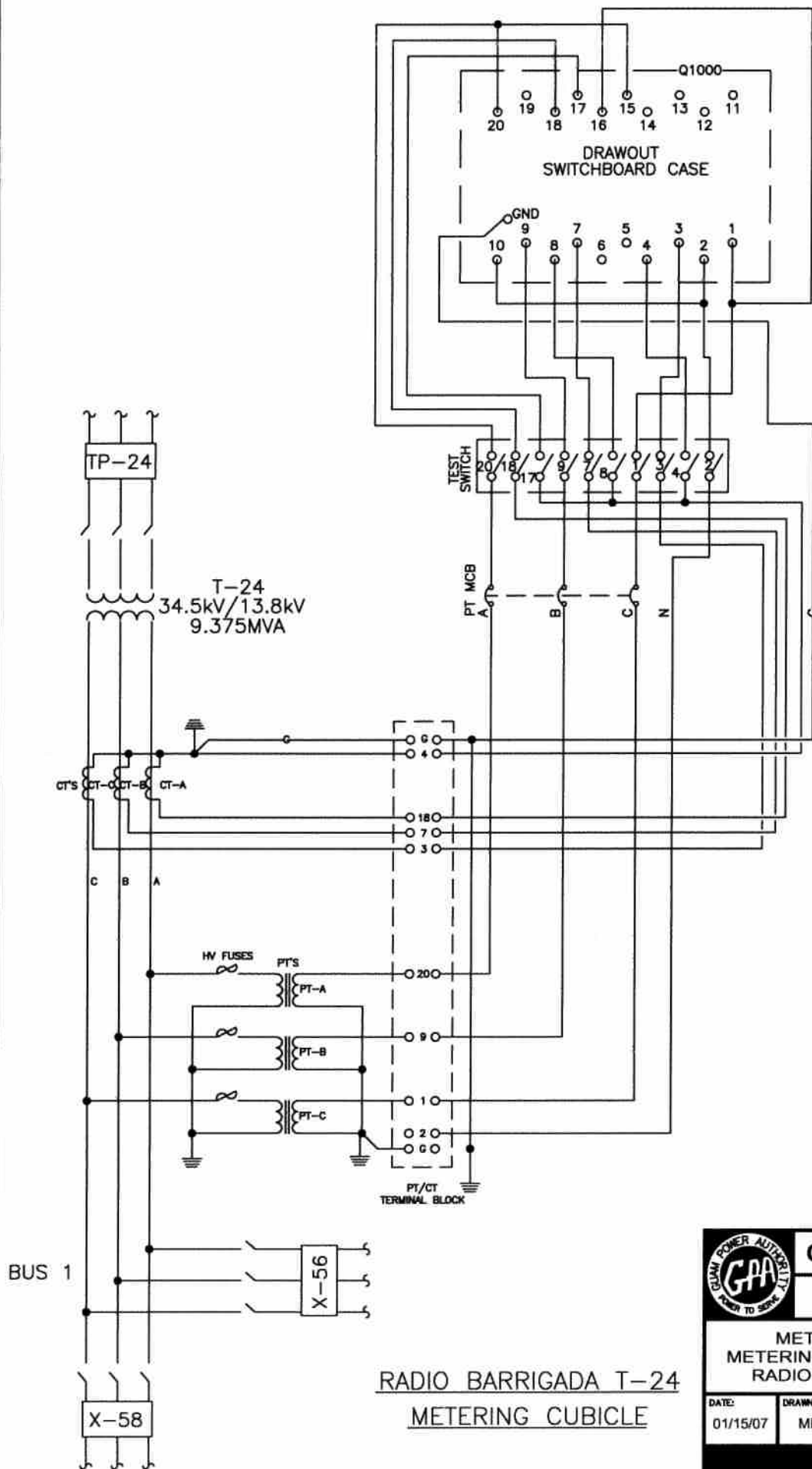
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SUBSTATION TRANSMISSION

**METERING OF U.S. NAVY LOADS
METERING CUBICLE THREE LINE DIAGRAM
RADIO BARRIGADA SUBSTATION T-23**

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RADIO BARRIGADA T-24
METERING CUBICLE



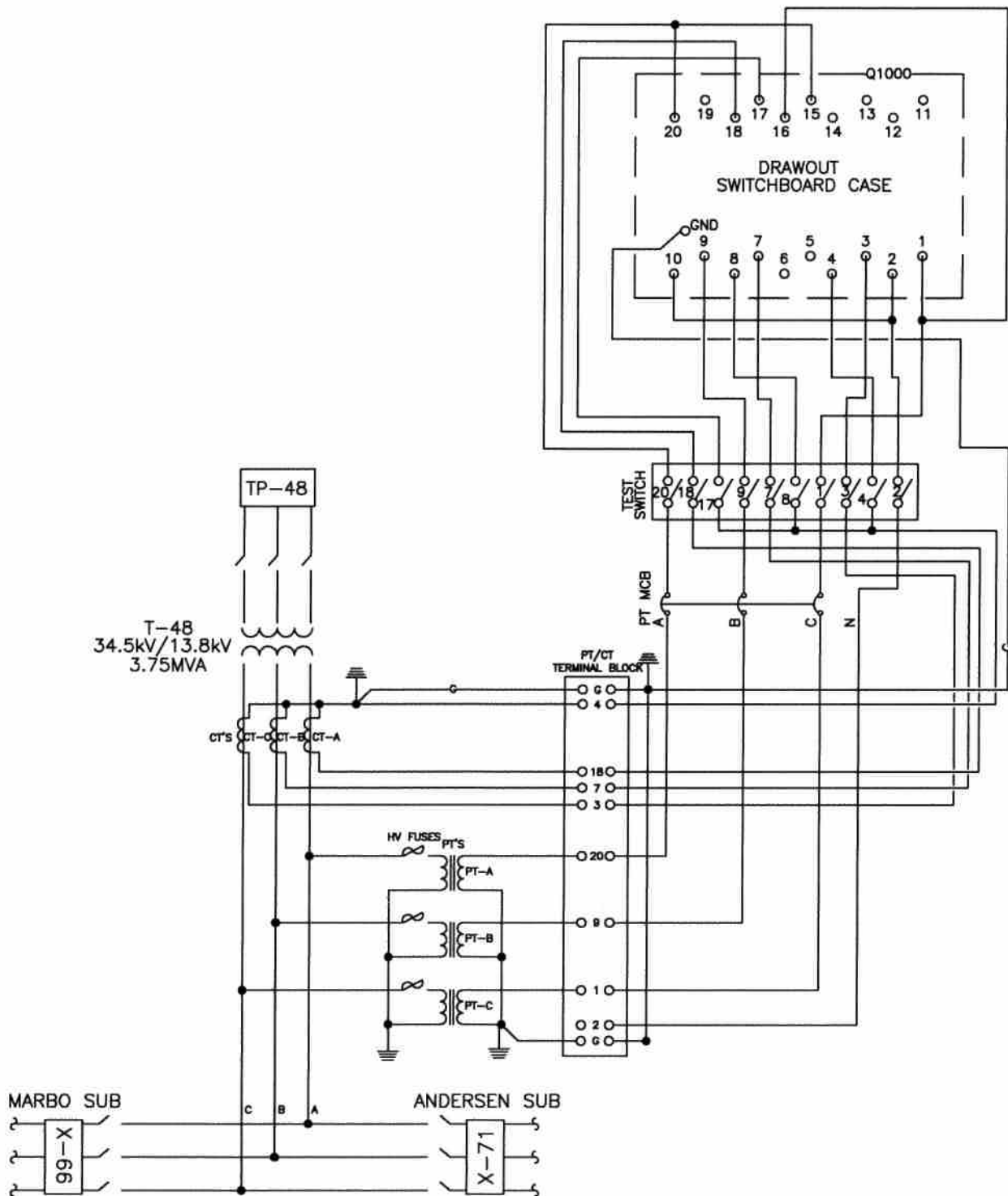
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METERING OF U.S. NAVY LOADS
METERING CUBICLE THREE LINE DIAGRAM
RADIO BARRIGADA SUBSTATION T-24

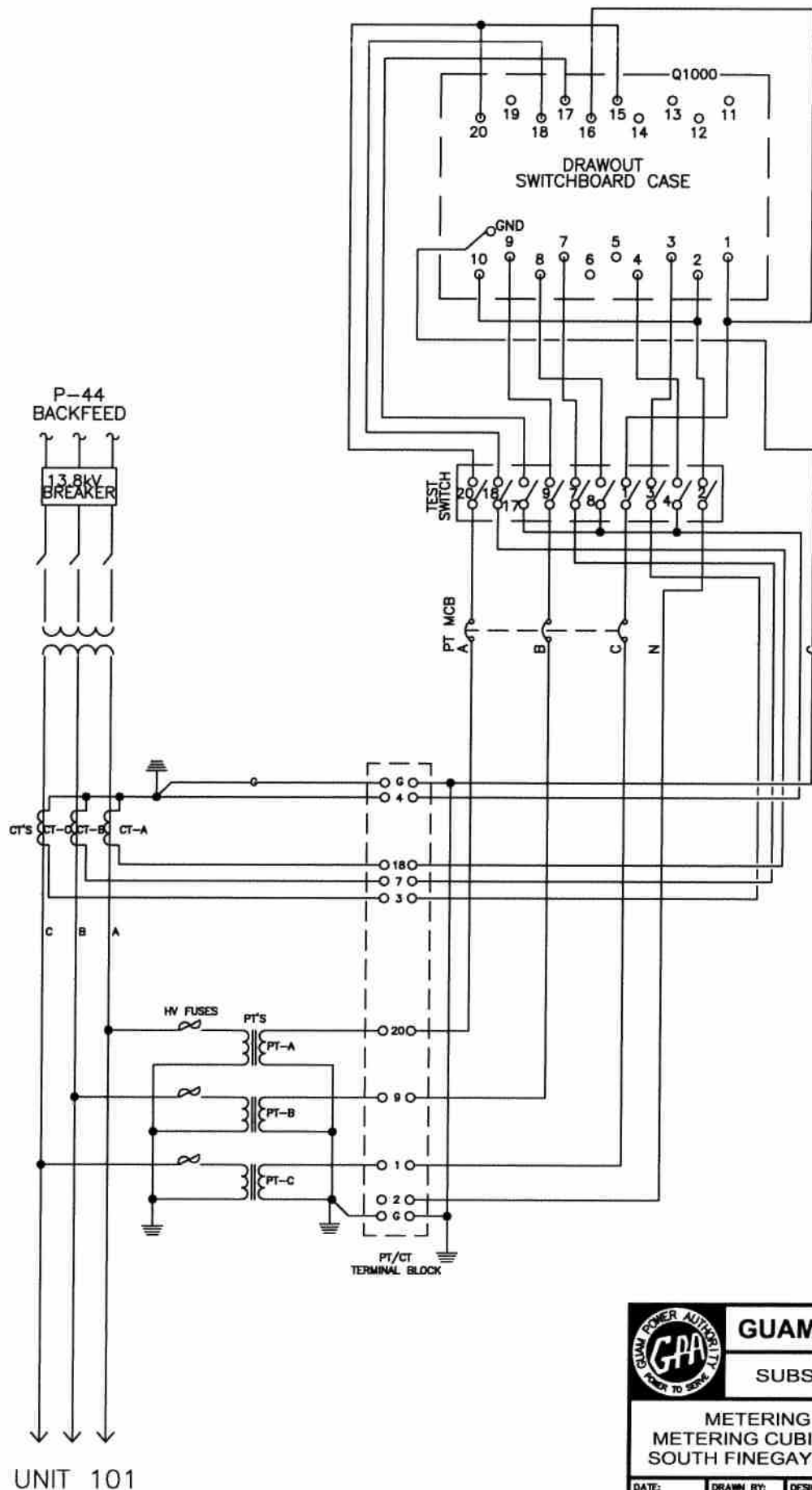
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WILSON HOMES T-48 METERING CUBICLE

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SOUTH FINEGAYAN HOUSING
P-44 UNIT 101 METERING CUBICLE



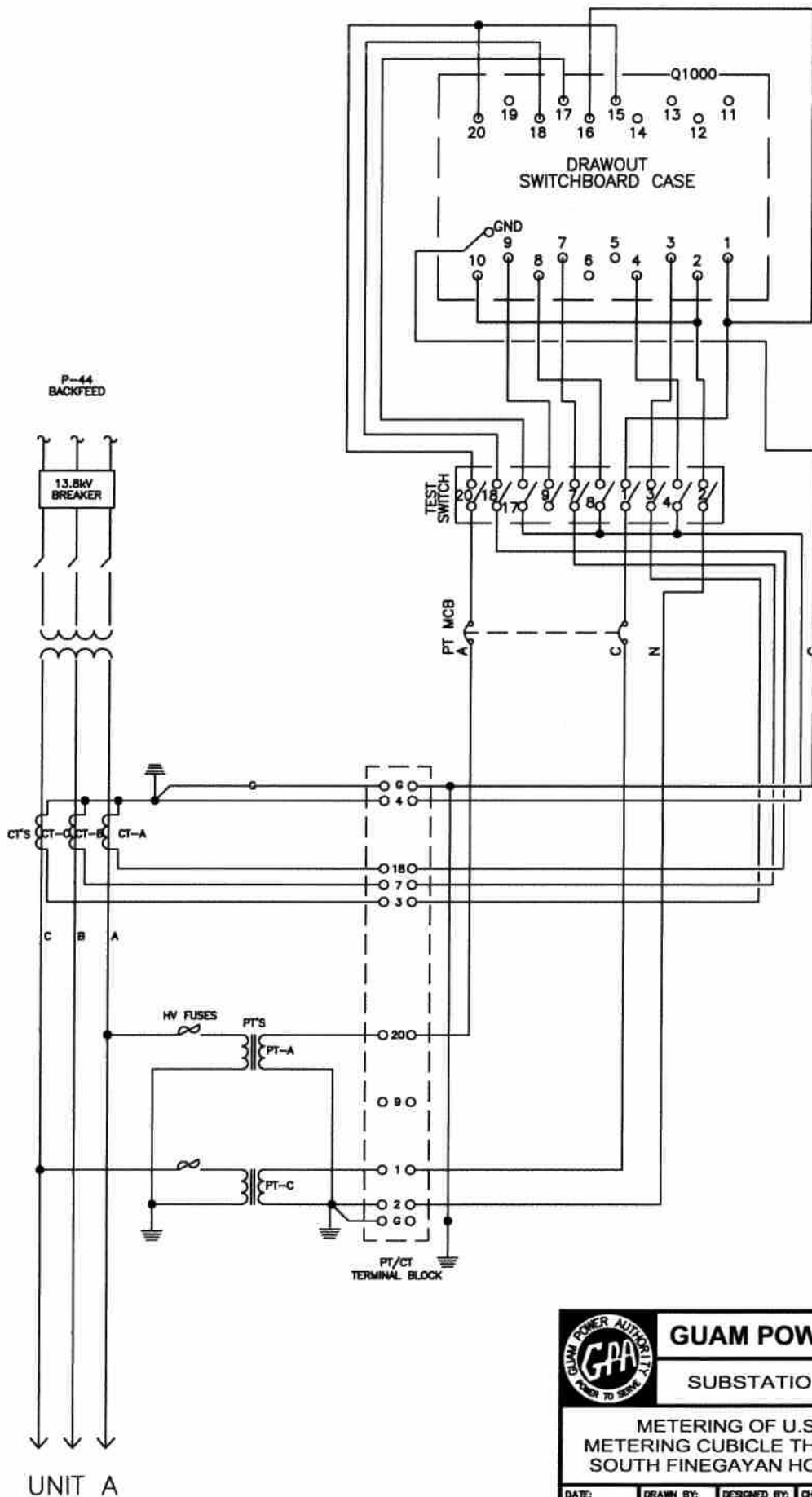
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METERING CUBICLE THREE LINE DIAGRAM
SOUTH FINEGAYAN HOUSING P-44 UNIT 101

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SOUTH FINEGAYAN HOUSING
P-44 UNIT A METERING CUBICLE



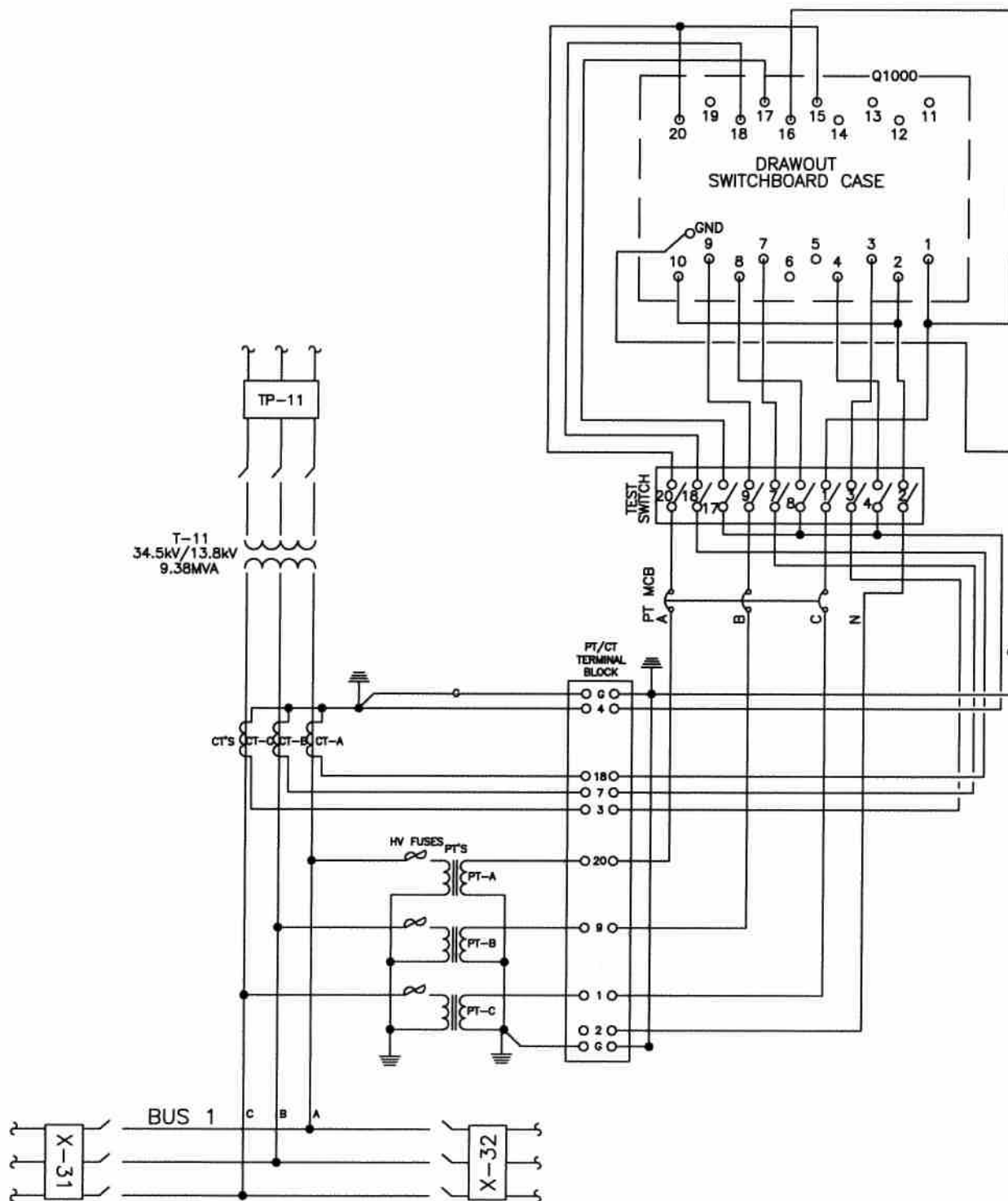
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METERING OF U.S. NAVY LOADS
METERING CUBICLE THREE LINE DIAGRAM
SOUTH FINEGAYAN HOUSING P-44 UNIT A

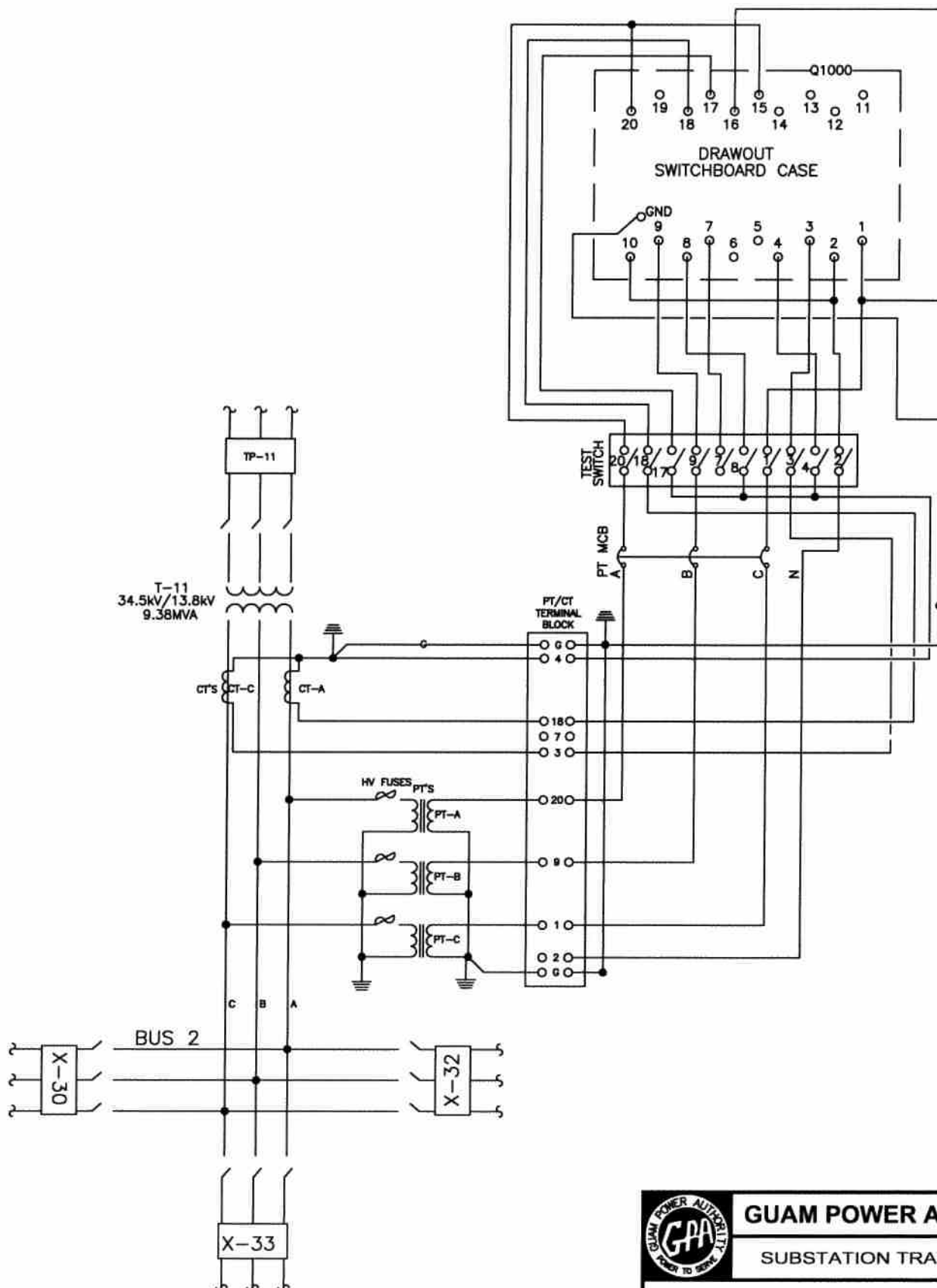
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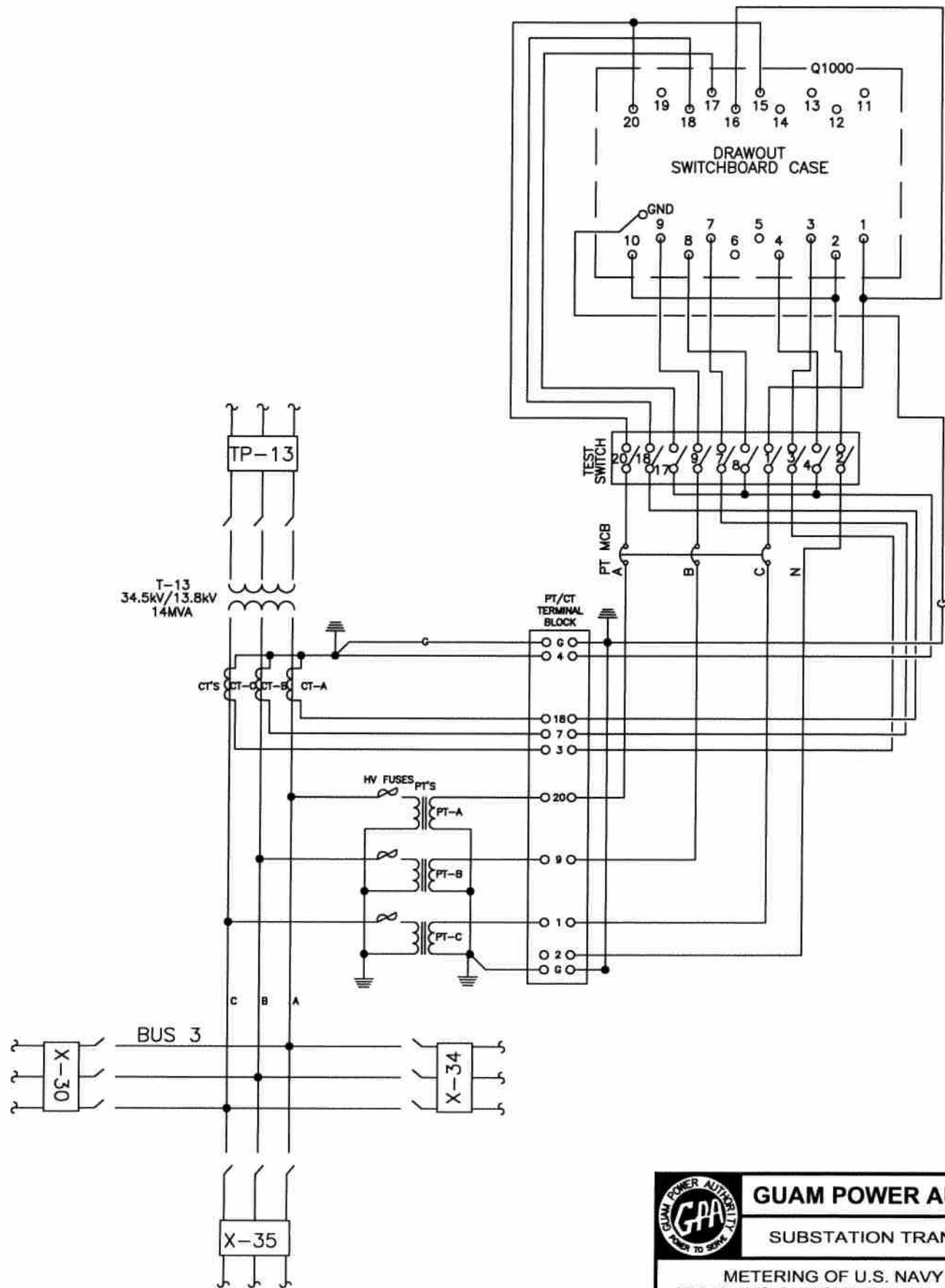
OROTE T-11 METERING CUBICLE

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METERING OF U.S. NAVY LOADS METERING CUBICLE THREE LINE DIAGRAM OROTE SUBSTATION T-11			
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OROTE T-12 METERING CUBICLE

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OROTE T-13 METERING CUBICLE



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SUBSTATION TRANSMISSION

**METERING OF U.S. NAVY LOADS
METERING CUBICLE THREE LINE DIAGRAM
OROTE SUBSTATION T-13**

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