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November 2, 1987

Re: Indian Point Unit No. 2  
Docket No. 50-247

Document Control Desk  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555

Subject: Response to NRC Questions on the AMSAC and SAS/SPDS Submittals

By letter dated January 16, 1987, Con Edison responded to the NRC's September 19, 1986 Safety Evaluation Report (SER) for the Westinghouse Owners Group generic design of the ATWS Mitigation System Actuation Circuitry (AMSAC) required by 10CFR50.62. By letter dated July 31, 1986, we submitted the Safety Analysis Report (SAR) for the Safety Assessment System/Safety Parameter Display System (SAS/SPDS). Attachment 2 to that submittal included Con Edison's response to NRC's April 3, 1986 "generic" request for information regarding SAS/SPDS isolation devices.

Subsequent to those submittals, on July 20, 1987, the NRC staff requested additional information concerning the isolation devices for the SAS/SPDS and AMSAC, as well as design information on the AMSAC. That additional information is provided in Attachments I and II to this letter. Attachment I contains additional information in support of Con Edison's AMSAC submittal. Attachment II contains additional information in support of Con Edison's SAS/SPDS submittal. Attachment III provides our current detailed engineering design sketches depicting the proposed implementation of the SAS/SPDS computer at Indian Point 2.

Should you or your staff have any additional questions, please contact us.

Very truly yours,



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PDR ADOCK 05000247  
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cc: Ms. Marylee M. Slosson  
Project Directorate I-1  
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ATTACHMENT I

Response to NRC's Questions on AMSAC

Consolidated Edison Company of New York, Inc.  
Indian Point Unit No. 2  
Docket No. 50-247  
November 2, 1987

1. Which Class 1E isolator will be used in the AMSAC design?

Response:

We are currently in the preliminary design stages of hardware selection. Signals to AMSAC from the Steam Generator level instrument loops will be derived from existing Foxboro 66BR approved isolators. Approved isolation will be provided in the design between AMSAC logic and First Stage Turbine Pressure signal. Safety systems actuated by AMSAC will be appropriately isolated from AMSAC by qualified relay logic devices.

2. Supply a logic diagram of AMSAC. In particular, take the generic Westinghouse diagram from the WCAP and:
  - a) Show the plant specific interfaces.
  - b) Show specific instrument and control logic flows.

In addition, identify which diagram is used from the WCAP.

Response:

The plant specific AMSAC design for the Indian Point Unit No. 2 (IP-2) AMSAC is based on the generic logic 1 option (Steam Generator Low Level Actuation) described in Westinghouse WCAP-10858P-A Figure 1-3, which is attached (Figure I-2.1).

The attached preliminary logic diagram SK-15805-12 (Figure I-2.2) and the Test Panel assembly diagram SK-15805-22 (Figure I-2.3) depict the information requested. We wish to point out that this is our preliminary AMSAC design, and as work progresses the design may be revised. The final design modification package will be available onsite prior to installation.

WESTINGHOUSE PROPRIETARY

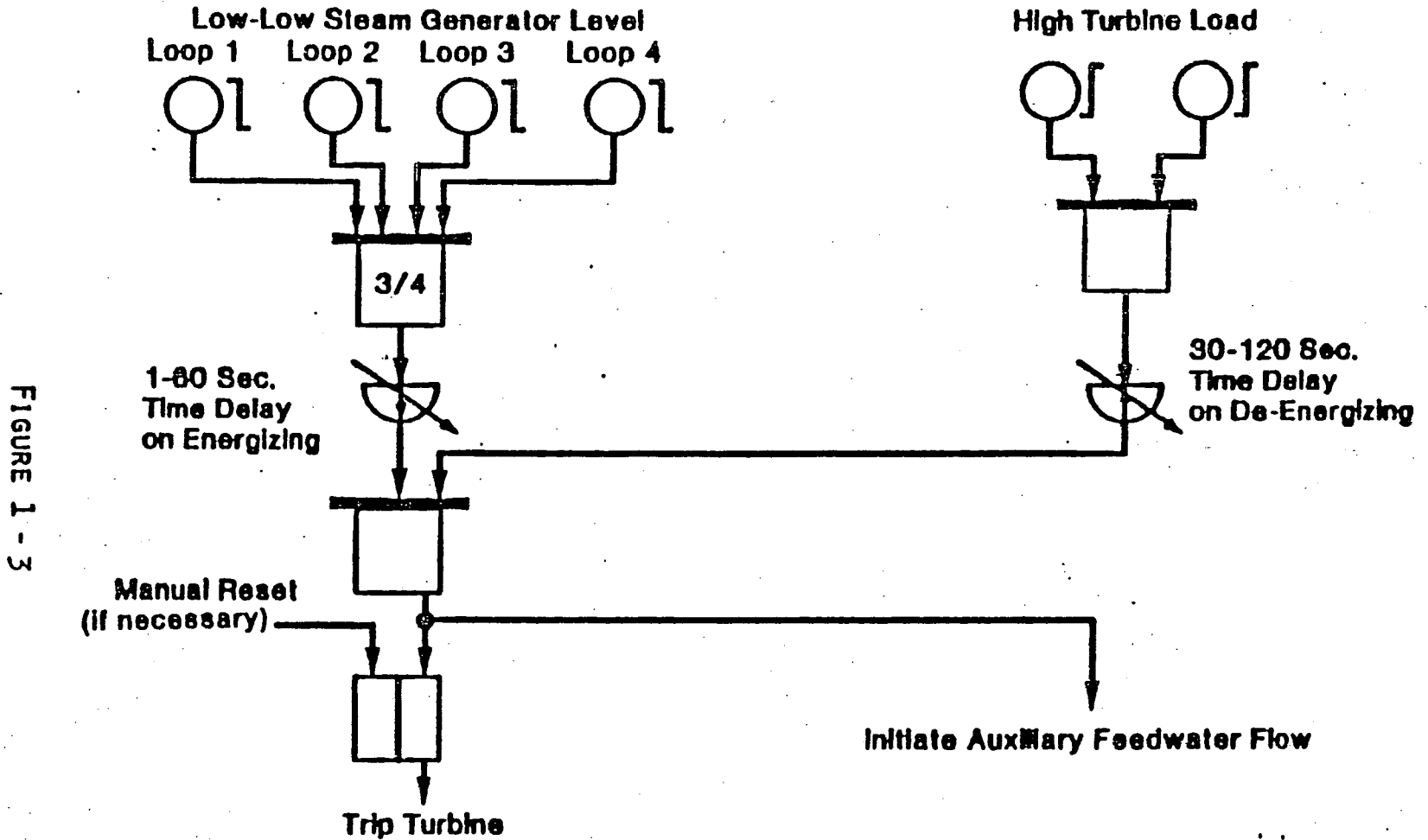
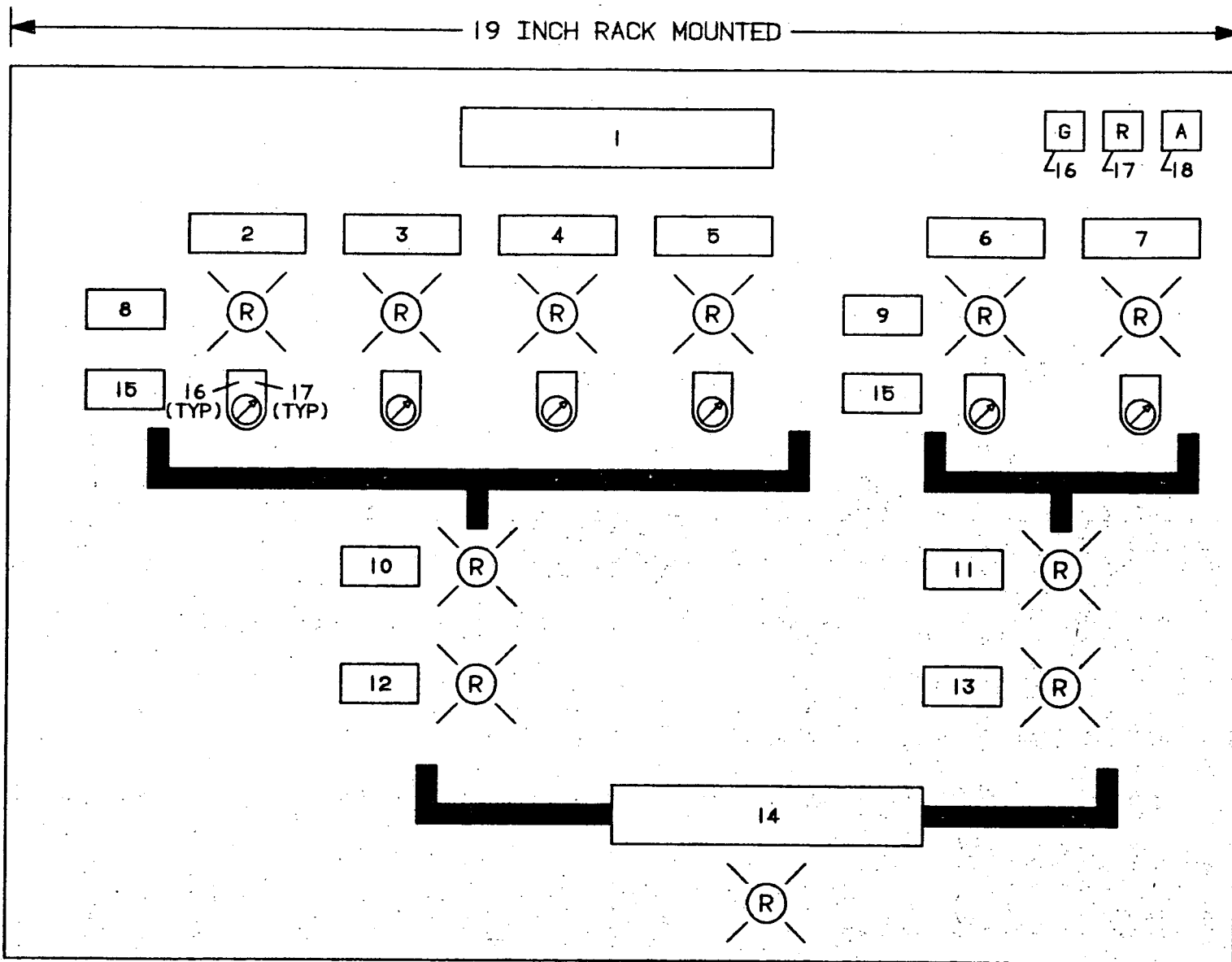










FIGURE 1 - 3

FIGURE 1-2.1

# LOGIC DIAGRAM - STEAM GENERATOR LOW LEVEL



**SYMBOLS**

-  NAME PLATES W/B
-  BLACK DEMARCATION
-  W/B
-  WHITE WITH BLACK LETTERS
-  INDICATING LIGHT
-  LEGEND LIGHT IND.
-  R-RED; G-GREEN; A-AMBER
-  LC-LOGIC CIRCUIT

**NAME PLATE LEGEND (W/B):**

1. AMSAC LOGIC CIRCUIT-1, SEE NOTE (2)
2. LT-417A S.G. LOOP 1
3. LT-427B S.G. LOOP 2
4. LT-437C S.G. LOOP 3
5. LT-447C S.G. LOOP 4
6. PT-412A TURBINE PRESS.
7. PT-412B TURBINE PRESS.

8. VERY LOW LEVEL
9. HIGH TURBINE PRESS.
10. 3/4 LOGIC TRIP
11. 2/2 PERMISSIVE
12. TIME DELAY TRIP
13. TIME DELAY PERMISSIVE
14. AMSAC INITIATED
15. BYPASS, MAINT / PUSH TO TEST

**EQUIPMENT LEGEND**

16. TEST
17. NORMAL
18. POWER

**NOTES:**

- (1) NUREG-0700 GUIDELINES FOR HUMAN ENGINEERING PRACTICES SHALL BE USED.
- (2) LC-1 SHOWN TYPICAL FOR LC-2 EXCEPT NAMEPLATE NO. 1 IS "AMSAC LOGIC CIRCUIT-2"

DATE

REVIEW

CHK.

SUPV.

**PRELIMINARY**

DRAWN BY

SCALE

REC'D.

TITLE: AMSAC TEST PANEL  
ASSEMBLY LOGIC CIRCUIT-1  
(LOGIC CIRCUIT-2)

**Edison**

STATION  
INDIAN PT 2

ENG. SK - 15805-22

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3. Supply the following information on the AMSAC 1E power panel:
- a) Discuss in detail the method to be employed to isolate the 1E power side from the non-1E power side. In particular, show how the class 1E power supply is not degraded.
  - b) Discuss the AMSAC 1E power panel line up (i.e. is it in series, redundant, etc.).
  - c) Discuss how the 1E power panel operates.

Response:

The AMSAC logic circuits will be connected to the DC power panels via class 1E circuit breakers that provide both overcurrent and short circuit protection. The circuit breakers are acceptable isolation devices that protect the class 1E buses from faults on the load side; whatever the load, be it class 1E or non-class 1E.

Power for AMSAC, a non-safety grade system, will be derived from the class 1E 125 VDC power panels Nos. 23 and 24. These 1E panels are safety-related battery-backed and capable of being operated from either an off-site power source or on-site emergency diesel generators.

The attached Figure I-3.1 is from the IP-2 Updated FSAR Figure 8.2-17 and is a one-line diagram depicting bus arrangement from the 480VAC buses down to the 125VDC and 118VAC buses for all four channels (trains) of power supply. This figure shows the line-up to 125 VDC power panels Nos. 23 and 24.



4. How will the AMSAC design meet the physical separation criteria? Issues that require addressing consist of: Seismic failures not degrading 1E side, EQ, the consideration and discussion of credible faults, the use of different conduits, cable trays, etc. If we intend to meet the separation guidelines of R.G. 1.75, we should explicitly state it.

Response:

Electrical physical separation at IP-2 was designed and approved by the Atomic Energy Commission (AEC) prior to the issuance of Regulatory Guide 1.75 "Physical Independence of Electrical Systems." AMSAC will follow the physical separation criteria established for IP-2, as described in Section 7.2.4.1 of the Updated FSAR in lieu of R.G. 1.75 guidelines. In our January 16, 1987 submittal we stated, in part, that as available space permits, the AMSAC logic, logic test panel, setpoint comparators and isolation devices will be installed in existing control room cabinets and that existing reactor protection system separation criteria will not be violated as a consequence of AMSAC installation. In addition, separation criteria in the Plant are also discussed in Section 8.2.2.6 of the IP-2 Updated FSAR, as it pertains to equipment layout and load distribution. Since it is the original criteria, this too will be followed in lieu of R.G. 1.75. We believe that these sections of our Updated FSAR and our January 16, 1987 response address AMSAC physical separation.

5. Quality Assurance Program for AMSAC

Response:

In our response to item No. 4 "Quality Assurance", contained in our January 16, 1987 submittal, we stated that we will treat the AMSAC equipment as "Class A" which for Quality Assurance purposes invokes Con Edison's 10 CFR 50 Appendix B program. Should any aspect of our 10 CFR 50 Appendix B QA program prove overly restrictive or otherwise unnecessary, provision will be made to waive only that aspect provided that, as a minimum, the quality assurance guidance contained in Generic Letter 85-06 is met.

ATTACHMENT II

Response to NRC Questions on SAS/SPDS

Consolidated Edison Company of New York, Inc.  
Indian Point Unit No. 2  
Docket No. 50-247  
November 2, 1987

1. By letter dated April 3, 1986, NRC requested that we verify that the Class 1E isolators for the SAS/SPDS are powered from a Class 1E power source. In Attachment 2 of our July 31, 1986 submittal that aspect of the SAS/SPDS was still under review. On April 16, 1987, we confirmed, by telephone, that the safety-related isolators for the SAS/SPDS signals are Class 1E, powered from the 1E instrument busses. That telephone conversation and the additional information provided below complete our response to item g of the April 3, 1986 NRC letter.

In our July 31, 1986 SAR transmittal, we stated that in two cases, for non-safety grade signals, the I/I isolation amplifiers manufactured by Moore Industries of Sepulveda, California are used. The Moore isolators are not Class 1E, nor do they have to be. These isolators are in the two normal non-Class 1E containment sump water level channels. The safety grade Class 1E containment water level instrumentation installed post-TMI are appropriately isolated. The two normal sump level channels do not require safety grade isolation because they are not safety related and there is no protection channel to isolate from. The Moore isolators are in the channels to be current repeaters only; not isolators as was erroneously described in Attachment 2 of our July 31, 1986 SAR.

At the request of NRC staff, we have reviewed our July 31, 1986 response to the April 3, 1986 request. We confirm that our response is adequate for items a, b, d, e, f, and g. In item c the NRC requested data to verify that the maximum credible faults applied during the test were the maximum voltage/current to which the device could be exposed (item b), and to verify that the maximum credible fault was applied to the output of the device in the transverse mode (item c). The testing of our Class 1E isolators is described in WCAP-9011 entitled "Test Reports of Isolation Amplifiers." These isolators were accepted by NRC at the time of original licensing of IP-2. The maximum credible fault was the test voltage used in WCAP-9011. Test results and data are provided in WCAP-9011.

2. Supply a block diagram showing SAS/SPDS input/output signals and isolators. The block diagram should:
  - a) Show Class 1E signals coming in, show the isolation, show the signal going out to SAS/SPDS and the SAS/SPDS display.
  - b) Show the power supply going into the SAS/SPDS.
  - c) Show the non-1E signal going into and out of the SAS/SPDS.

Response:

Figure II-2.1, attached, shows the power supply going into the SAS/SPDS in response to item b.

In addition, the attached document (Attachment III) entitled, "SAS Engineering Sketch Verifications of Signals" provides our response to items a and c above. A single block diagram, as requested, is not viable due to the number of instrument loops involved and the different loop configurations. A descriptive "walkthrough" of one of these engineering sketches is provided below for guidance.

Attachment III provides our current detailed engineering design sketches, depicting the implementation of the SAS/SPDS computer at IP-2. The sketches demonstrate that the non-Class 1E SAS/SPDS computer system, is properly interfaced with the safety related and non-safety related analog channel instrumentation. Emphasis is placed on ensuring that safety related channels are properly isolated from the SAS/SPDS computer. We wish to point out that as an Engineering document Attachment III will be revised, as necessary, without resubmittal to the NRC each time and that this will not be a controlled copy for the receipt of updates.

The methodology employed is as follows. Each SAS/SPDS computer point has been individually verified utilizing the as-built IP-2 interconnection wiring diagrams. Any design changes made subsequent to the as-built design have been incorporated into the sketches.

A typical channel contains two sketch sheets. The first sheet illustrates the necessary design detail modifications to implement the SAS/SPDS computer system. Only the modifications with respect to SAS are shown. Included in the design detail are symbolic representations of the instrumentation devices of concern, wiring changes depicting or listing terminations, reference drawings, sketches, and design changes, and any applicable notes.

The second sheet depicts a block diagram(s) representation of the instrument loop. These block diagrams clearly illustrate the point in the channel where the SAS/SPDS computer was implemented. An impedance calculation is performed to demonstrate that the additional load introduced by the SAS/SPDS computer is within the capabilities of the instrumentation. An engineering justification is given to ensure that the SAS/SPDS computer was implemented appropriately.

An equipment reference list containing manufacturer and model numbers, is provided on the reference sketch (SAS-REF). Certain sketches contain only one sheet depicting the SAS/SPDS computer implementation, as the necessary modifications can be obtained from the design detail.

A sample descriptive "walkthrough" of how to interpret these sketches follows.

Figure II-2.2 and II-2.3 concern a Pressurizer Level channel (L-459). Sheet 1 contains two symbolic representations of instrumentation devices; LM-459B represents a Foxboro Model No. 66BR-OH isolator/current repeater, and CT-3 represents a resistor block module. The detailed design of the CT resistor block itself is shown on the reference drawing. Wiring shown connecting the two devices represents the as-built field condition. Wiring terminations to distribution block 7 (DB-7), Proteus, and SAS/SPDS are shown. The note lists the SAS/SPDS signal destination points at the Barrier Terminal Strip Cable Assembly (BTSCA) of the multiplexer cabinets. It should be noted that shield connections at the multiplexer cabinets are floating.

Figure II.2-3 contains two block diagrams and an equivalent impedance circuit. The first block diagram illustrates a Pressurizer Level channel in the Reactor Protection System (RPS). This current loop consists of a level transmitter (LT-459), a test input assembly (TS/L459), an isolator/current repeater (LM-459A), an alarm unit (LC-459A/B), a test point block (TP/L459), and a power supply (LQ-459). The second block diagram illustrates the Pressurizer Level channel in the reactor control system. This current loop begins with LM-459A (Isolator/current repeater), and represents the isolation device required to separate the RPS from the reactor control system. LM-459A represents the RPS boundary (i.e. the isolator circuit). This isolator loop contains a test point block (TP/L459A), an isolator current repeater (LM-459B), an indicator (LI-459), and a selector switch (L/460A). The third circuit represents the equivalent impedance load of the Foxboro Model 66BR-OH isolator/current repeater (LM-459B). The impedance calculation demonstrates that the 100 ohm dropping resistor for Proteus, in series with the 100 ohm dropping resistor for SAS/SPDS, results in a total impedance of 200 ohms. The impedance calculations assume the wire resistance is negligible, input impedance of the Proteus and SAS/SPDS computers is high (thereby retaining

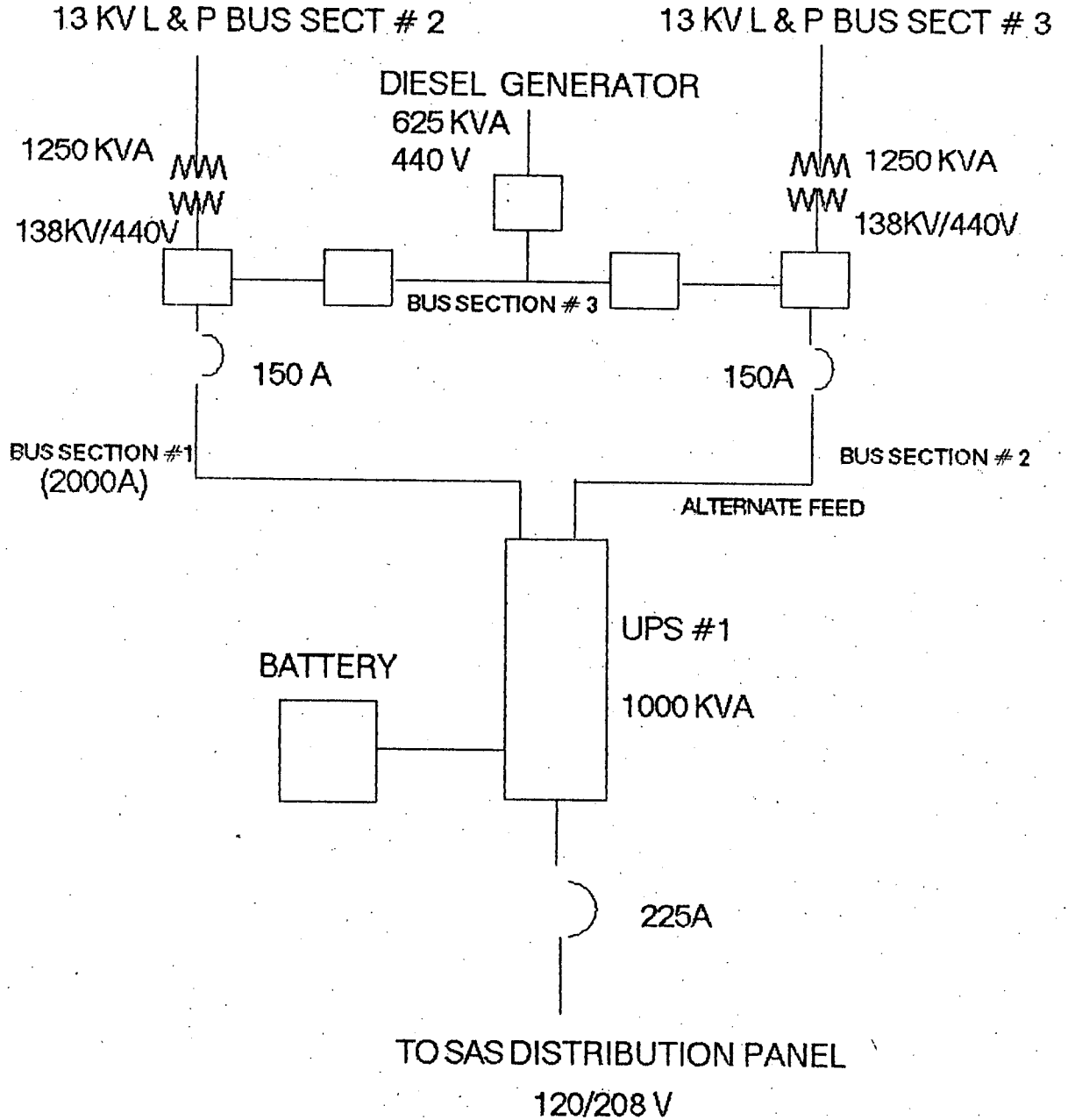
the full value of the dropping resistor), and the equivalent reactance is zero. The Engineering Justification portion of the sketch shows that SAS/SPDS computer can be appropriately implemented in the Pressurizer Level channel while ensuring that isolation requirements are maintained. Also, the calculated impedance value (200 ohms) is compared with the output load capabilities (660 ohms) of LM-459B. A determination is then made of whether the SAS/SPDS implementation is appropriate or whether any other loop changes are necessary to make implementation appropriate.

REVISION

FIGURE II-2.1

# SAS ELECTRICAL POWER

## NON CLASS UPS



REF DWGS : A226804  
A226828

STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	<b>CON</b> <b>EDISON</b> ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. N/A DATE	
ELECTRICAL POWER		C&I	
SKETCHED BY: R MCV		ENG. N/A DATE	
CHECKED BY: N/A		ENG. N/A DATE	SKETCH NO. N/A
			REV. SH. OF

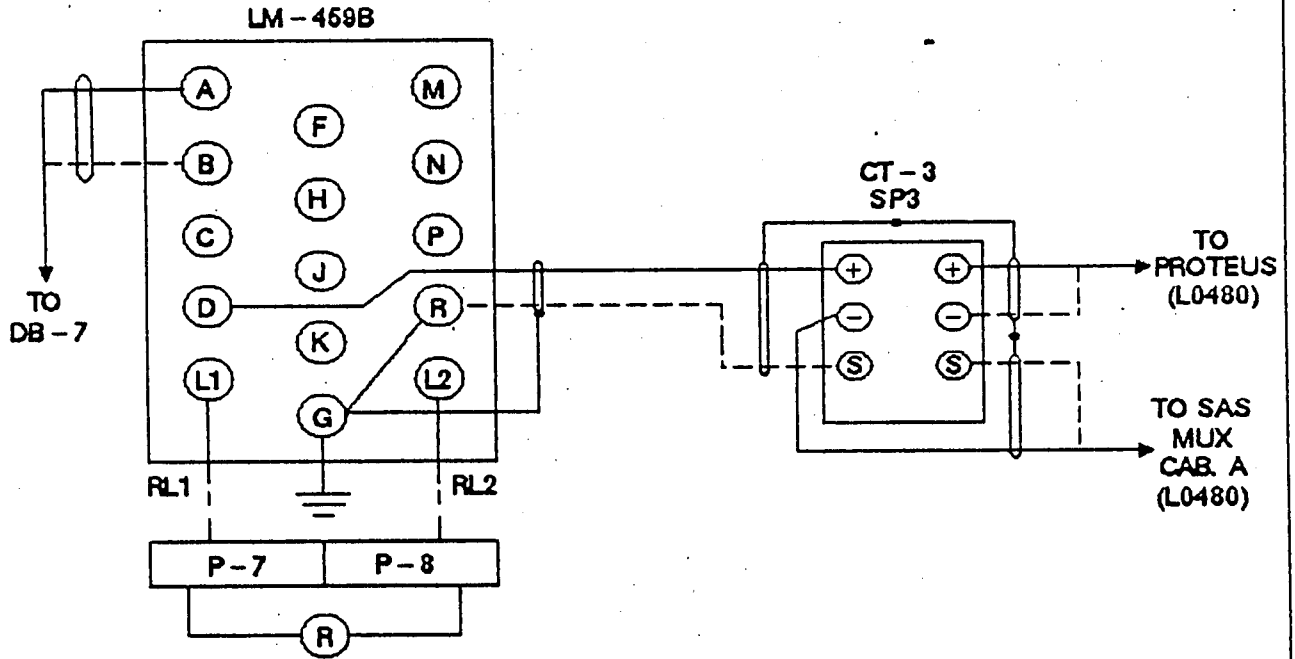


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DESIGN DETAIL

FIGURE II-2.2



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R05, POINTS 23 (POS.), 24 (NEG), AND 25 (SHIELD).

REF. DWGS.: A225406, A225314  
REF. SKETCH SAS - REF

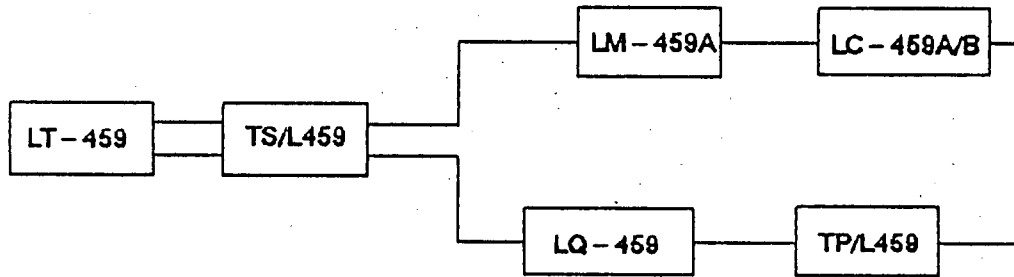
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG.. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>W/A</i> DATE	
PRESSURIZER LVL 1 (L-459)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 4/17/87	
CHECKED BY: <i>King Lake</i>		ENG. <i>VAD</i> DATE 4-17-87	SKETCH NO. SAS-44 REV. 0 SH. 1 OF 2

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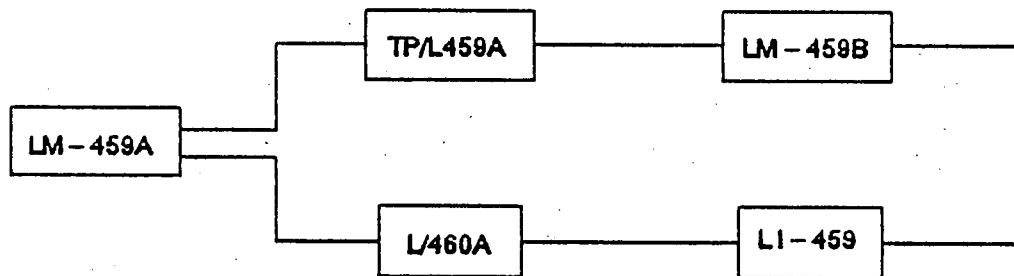
# IMPEDANCE CALCULATION

FIGURE II-2.3

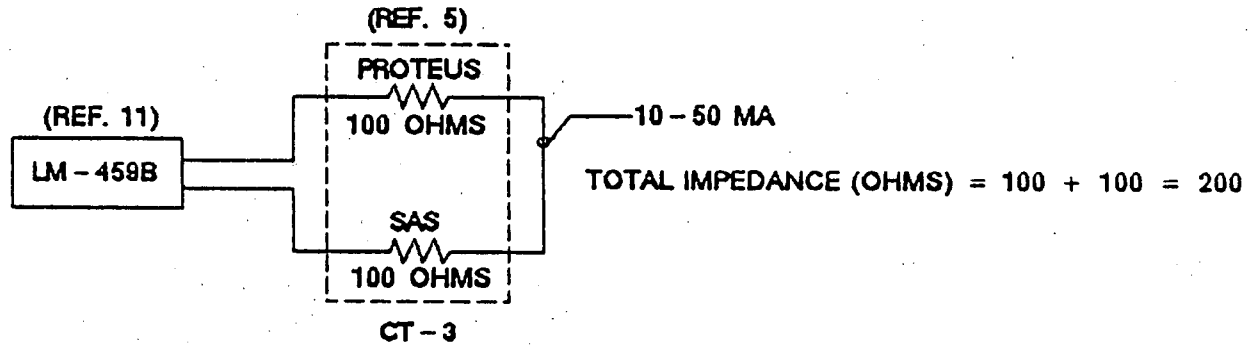
## LT-459 REACTOR PROTECTION SYSTEM CIRCUIT



## LM-459A REACTOR CONTROL SYSTEM CIRCUIT



## LM-459B CIRCUIT (Z EQUIV.)



### ENGINEERING JUSTIFICATION:

THE LT-459 PRIMARY LOOP IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT SIGNAL CANNOT BE IMPLEMENTED HERE. LM-459A (FOXBORO 66BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM. LM-459B (FOXBORO 66BR-OH) SERVES AS A CURRENT REPEATER IN THIS LOOP, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (200 OHMS) FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

STATION: INDIAN POINT 2	A P P R O V E S	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
PRESSURIZER LVL 1 (L-459)		C&I	SKETCH NO. SAS-44 REV. 0 SH. 2 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 4/17/87	
CHECKED BY: <i>King Lusk</i>		ENG. <i>VAD</i> DATE 4-17-87	

50-247

SAS ENGINEERING SKETCH VERIFICATION OF SIGNALS

Docket # 50-247  
Control # 871090263  
Date 11/2/87 of Document  
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ATTACHMENT III

SAS Engineering Sketch Verification of Signals

Consolidated Edison Company of New York, Inc.  
Indian Point Unit No. 2  
Docket No. 50-247  
November 2, 1987

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.  
4 IRVING PLACE  
NEW YORK, N.Y. 10003

INDIAN POINT GENERATING STATION

UNIT NO. 2

SAS ENGINEERING SKETCH  
VERIFICATION OF SIGNALS

MECHANICAL ENGINEERING DEPARTMENT  
GENERATION PROGRAMS & CONTROLS SECTION  
PROCESS COMPUTER SUBSECTION

REVISION

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# INDEX

SKETCH NO.	TAG	DESCRIPTION
SAS- 1	FT1200	AUX FEED WATER FLOW SG21
SAS- 2	FT1201	AUX FEED WATER FLOW SG22
SAS- 3	FT1202	AUX FEED WATER FLOW SG23
SAS- 4	FT1203	AUX FEED WATER FLOW SG24
SAS- 5	WD-E	WIND DIRECTION-ELEVATED
SAS- 6	WD-G	WIND DIRECTION-GROUND
SAS- 7	WS-G	WIND SPEED- GROUND
SAS- 8	WS-E	WIND SPEED-ELEVATED
SAS- 9	DT-U	METEROLOGICAL DELTA TEMP-UPPER
SAS- 10	DT-L	METEROLOGICAL DELTA TEMP-LOWER
SAS- 11	SURN35	INT RNG START UP RATE 35
SAS- 12	SURN36	INT RNG START UP RATE 36
SAS- 13	NM35B	INTERM RNG DETECTOR 1 LOG Q
SAS- 14	NM36B	INTERM RNG DETECTOR 2 LOG Q
SAS- 15	LT1128A	CONDENSATE STORAGE TANK LEVEL
SAS- 16	PT1180	CONDENSER PRESSURE
SAS- 17	AE1102	CONTAINMENT DEW POINT
SAS- 18	PT3300	CONTAINMENT PRESS WR PT3300
SAS- 19	PT3301	CONTAINMENT PRESS WR PT3301
SAS- 20	LT3300	CONTAINMENT SUMP LEVEL LT3300
SAS- 21	LT3303	CONTAINMENT SUMP LEVEL LT3303
SAS- 22	LT3304	CONTAINMENT SUMP LEVEL LT3304
SAS- 23	TE1203	CONTAINMENT TEMPERATURE
SAS- 24	RE32G	CCR RADIATION GAS
SAS- 25	RE32P	CCR RADIATION-PARTICULATE
SAS- 26	TM411B	RCL 21 DELTA T
SAS- 27	TM421B	RCL 22 DELTA T
SAS- 28	TM431B	RCL 23 DELTA T
SAS- 29	TM441B	RCL 24 DELTA T
SAS- 30	AR5109-1	HYDROGEN CONCENTRATION (VC)
SAS- 31	AR5110-1	HYDROGEN CONCENTRATION (VC)
SAS- 32	LT3301	RECIRCULATION SUMP LEVEL
SAS- 33	TE411A/1	LOOP 1 HOT LEG TEMP (WR)
SAS- 34	TE422A/1	LOOP 2 HOT LEG TEMP (WR)
SAS- 35	TE431A/1	LOOP 3 HOT LEG TEMP (WR)
SAS- 36	TE440A/1	LOOP 4 HOT LEG TEMP (WR)
SAS- 37	PT413	OVER PRESSURE SYSTEM PRESSURE
SAS- 38	PT433	OVER PRESSURE SYSTEM PRESSURE
SAS- 39	PT443	OVER PRESSURE SYSTEM PRESSURE

STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	<b>CON</b> <b>EDISON</b> ENG. C&I SKETCH
TITLE: INDEX		ENG. DATE	
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			SKETCH NO. i

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# INDEX

SKETCH NO.	TAG	DESCRIPTION
SAS- 40	PT455	PRESSURIZER 1 PRESS (NR)
SAS- 41	PT456	PRESSURIZER 2 PRESS (NR)
SAS- 42	PT457	PRESSURIZER 3 PRESS (NR)
SAS- 43	PT474	PRESSURIZER 4 PRESS (NR)
SAS- 44	LT459	PRESSURIZER LVL 1
SAS- 45	LT460	PRESSURIZER LVL 2
SAS- 46	LT461	PRESSURIZER LVL 3
SAS- 47	LT462	PRESSURIZER LVL COLD WR
SAS- 48	LT470	PRESSURIZER RELIEF TANK LEVEL
SAS- 49	PT472	PRESSURIZER RELIEF TANK PRESS
SAS- 50	TE413	LOOP 1 COLD LEG TEMP (WR)
SAS- 51	TE423	LOOP 2 COLD LEG TEMP (WR)
SAS- 52	TE433	LOOP 3 COLD LEG TEMP (WR)
SAS- 53	TE443	LOOP 4 COLD LEG TEMP (WR)
SAS- 54	PT402	RCS WIDE RANGE PRESSURE
SAS- 55	PT403	RCS WIDE RANGE PRESSURE
SAS- 56	FT414	REACTOR COOLANT FLOW 21
SAS- 57	FT415	REACTOR COOLANT FLOW 21
SAS- 58	FT424	REACTOR COOLANT FLOW 22
SAS- 59	FT425	REACTOR COOLANT FLOW 22
SAS- 60	FT434	REACTOR COOLANT FLOW 23
SAS- 61	FT435	REACTOR COOLANT FLOW 23
SAS- 62	FT444	REACTOR COOLANT FLOW 24
SAS- 63	FT445	REACTOR COOLANT FLOW 24
SAS- 64	FT418A	STM GEN A FEED WTR IN 1 FLOW
SAS- 65	FT418B	STM GEN A FEED WTR IN 2 FLOW
SAS- 66	LT417C	STM GEN A NAR RNG 3 LVL
SAS- 67	LT417B	STM GEN A NAR RNG 2 LVL
SAS- 68	LT417A	STM GEN A NAR RNG 1 LVL
SAS- 69	FT419A	STM GEN A STM OUT 1 FLOW
SAS- 70	PT419A	STM GEN A STM OUT 1 PRESS
SAS- 71	FT419B	STM GEN A STM OUT 2 FLOW
SAS- 72	PT419B	STM GEN A STM OUT 2 PRESS
SAS- 73	LT417D	STM GEN A WIDE RNG LVL
SAS- 74	FT428A	STM GEN B FEED WTR IN 1 FLOW
SAS- 75	FT428B	STM GEN B FEED WTR IN 2 FLOW
SAS- 76	LT427C	STM GEN B NAR RNG 3 LVL
SAS- 77	LT427B	STM GEN B NAR RNG 2 LVL
SAS- 78	LT427A	STM GEN B NAR RNG 1 LVL

STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: INDEX		ENG. DATE	
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CHECKED BY:		ENG. DATE	
			SKETCH NO. ii

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# INDEX

SKETCH NO.	TAG	DESCRIPTION
SAS- 79	FT429A	STM GEN B STM OUT 1 FLOW
SAS- 80	PT429A	STM GEN B STM OUT 1 PRESS
SAS- 81	FT429B	STM GEN B STM OUT 2 FLOW
SAS- 82	PT429B	STM GEN B STM OUT 2 PRESS
SAS- 83	LT427D	STM GEN B WIDE RNG LVL
SAS- 84	FT438A	STM GEN C FEED WTR IN 1 FLOW
SAS- 85	FT438B	STM GEN C FEED WTR IN 2 FLOW
SAS- 86	LT437C	STM GEN C NAR RNG 3 LVL
SAS- 87	LT437B	STM GEN C NAR RNG 2 LVL
SAS- 88	LT437A	STM GEN C NAR RNG 1 LVL
SAS- 89	FT439A	STM GEN C STM OUT 1 FLOW
SAS- 90	PT439A	STM GEN C STM OUT 1 PRESS
SAS- 91	FT439B	STM GEN C STM OUT 2 FLOW
SAS- 92	PT439B	STM GEN C STM OUT 2 PRESS
SAS- 93	LT437D	STM GEN C WIDE RNG LVL
SAS- 94	FT448A	STM GEN D FEED WTR IN 1 FLOW
SAS- 95	FT448B	STM GEN D FEED WTR IN 2 FLOW
SAS- 96	LT447C	STM GEN D NAR RNG 3 LVL
SAS- 97	LT447B	STM GEN D NAR RNG 2 LVL
SAS- 98	LT447A	STM GEN D NAR RNG 1 LVL
SAS- 99	FT449A	STM GEN D STM OUT 1 FLOW
SAS-100	PT449A	STM GEN D STM OUT 1 PRESS
SAS-101	FT449B	STM GEN D STM OUT 2 FLOW
SAS-102	PT449B	STM GEN D STM OUT 2 PRESS
SAS-103	LT447D	STM GEN D WIDE RNG LVL
SAS-104	TM412N	TAVG LOOP 21
SAS-105	TM422N	TAVG LOOP 22
SAS-106	TM432N	TAVG LOOP 23
SAS-107	TM442N	TAVG LOOP 24
SAS-108	FT640	RESIDUAL HEAT REMOVAL LOOP FLOW
SAS-109	TE636	RESIDUAL HX IN LOOP HDR TEMP
SAS-110	TE639	RESIDUAL HX OUT LOOP HDR TEMP
SAS-111	T-SAT	SAT TEMP MARGIN
SAS-112	LT1311	REACTOR VESSEL LEVEL NR
SAS-113	LT1321	REACTOR VESSEL LEVEL NR
SAS-114	LT1312	REACTOR VESSEL LEVEL WR
SAS-115	LT1322	REACTOR VESSEL LEVEL WR
SAS-116A		GENERAL NOTE
SAS-116	R 1	AREA 1 R-CENTRAL CNTL ROOM
SAS-117	R 2	AREA 2 R-CONTAINMENT

STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	<b>CON EDISON ENG.</b>
TITLE: INDEX		ENG. DATE	
SKETCHED BY: R MCV		ENG. DATE	SKETCH NO. iii
CHECKED BY:		ENG. DATE	



REVISION

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Issued for record.

# INDEX

SKETCH NO.	TAG	DESCRIPTION
SAS-118	R 4	AREA 4 R CHARGING PUMP ROOM
SAS-119	R 5	AREA 5 R FUEL STORAGE BLDG
SAS-120	R 6	AREA 6 R-SAMPLING ROOM
SAS-121	R 7	AREA 7 R-INCORE INSTR ROOM
SAS-122	R 8	AREA 8 R-DRUMMING STATION
SAS-123	R11	CONT AIR PARTICULATE RAD
SAS-124	R12	CONT RADIO GAS RAD
SAS-125	R13	PLANT VENT
SAS-126	R14	AUX BLDG EXHAUST GAS RAD
SAS-127	R15	STEAM JET AIR EJECT EXHAUST
SAS-128	R16	CONT CLNG HX SERV WTR OUT 1 RAD
SAS-129	R17	COMP CLNG PMP SUCT HDR RAD
SAS-130	R18	WASTE DISPOSASL LIQUID RAD
SAS-131	R19	ST GENER BLOWDOWN DRAIN RAD
SAS-132	R20	WASTE DISPOSAL GAS ANALYZER
SAS-133	R23	CONT CLNG SERV WTR OUT 2 RAD
SAS-134	R25	HI RANGE CONTAINMENT RAD R25
SAS-135	R26	HI RANGE CONTAINMENT RAD R26
SAS-136	R27	PLANT VENT HI RAD
SAS-137	R28	STEAM LINE RAD LOOP 1
SAS-138	R29	STEAM LINE RAD LOOP 2
SAS-139	R30	STEAM LINE RAD LOOP 3
SAS-140	R31	STEAM LINE RAD LOOP 4
SAS-141	LT920	REFUELING WTR STORAGE TANK LVL
SAS-142	JB-B1	INCORE T JUNCTION BOX B 1 TEMP
SAS-142	JB-A1	INCORE T JUNCTION BOX A 1 TEMP
SAS-142	JB-A2	INCORE T JUNCTION BOX A 2 TEMP
SAS-142	JB-B2	INCORE T JUNCTION BOX B 2 TEMP
SAS-143	TC-E 8	INCORE T E08-(T/C 08)
SAS-143	TC-H 9	INCORE T H09-(T/C 50)
SAS-143	TC-H10	INCORE T H10-(T/C 17)
SAS-143	TC-D 4	INCORE T D04-(T/C 38)
SAS-143	TC-H13	INCORE T H13-(T/C 18)
SAS-143	TC-D 9	INCORE T D09-(T/C 40)
SAS-143	TC-N 9	INCORE T N09-(T/C 61)
SAS-143	TC-E 4	INCORE T E04-(T/C 07)
SAS-143	TC-E10	INCORE T E10-(T/C 09)
SAS-143	TC-J 7	INCORE T J07-(T/C 52)
SAS-143	TC-E 5	INCORE T E05-(T/C 42)

STATION: INDIAN POINT 2

TITLE: INDEX

SKETCHED BY: R MCV

CHECKED BY:

MECH. PROGRAM

APP ENG. DATE

PRV C&I ENG. DATE

LS ENG. DATE

CON EDISON ENG. C&I SKETCH

SKETCH NO. iv

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Issued for record.

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SKETCH NO.	TAG	DESCRIPTION
SAS-143	TC-J10	INCORE T J10-(T/C 19)
SAS-143	TC-F 9	INCORE T F09-(T/C 46)
SAS-143	TC-J11	INCORE T J11-(T/C 20)
SAS-143	TC-G 4	INCORE T G04-(T/C 47)
SAS-143	TC-K 3	INCORE T K03-(T/C 21)
SAS-143	TC-G 9	INCORE T G09-(T/C 12)
SAS-143	TC-K11	INCORE T K11-(T/C 53)
SAS-143	TC-H 5	INCORE T H05-(T/C 49)
SAS-143	TC-K13	INCORE T K13-(T/C 54)
SAS-143	TC-C 8	INCORE T C08-(T/C 05)
SAS-143	TC-L 5	INCORE T L05-(T/C 56)
SAS-143	TC-N 8	INCORE T N08-(T/C 29)
SAS-143	TC-L 7	INCORE T L07-(T/C 57)
SAS-143	TC-F 5	INCORE T F05-(T/C 45)
SAS-143	TC-L11	INCORE T L11-(T/C 58)
SAS-143	TC-G 8	INCORE T G08-(T/C 48)
SAS-143	TC-L12	INCORE T L12-(T/C 24)
SAS-143	TC-H 8	INCORE T H08-(T/C 16)
SAS-143	TC-M 5	INCORE T M05-(T/C 25)
SAS-143	TC-E11	INCORE T E11-(T/C 43)
SAS-143	TC-M 8	INCORE T M08-(T/C 26)
SAS-143	TC-H 3	INCORE T H03-(T/C 15)
SAS-143	TC-F12	INCORE T F12-(T/C 10)
SAS-143	TC-D 7	INCORE T D07-(T/C 39)
SAS-143	TC-M10	INCORE T M10-(T/C 27)
SAS-144	NM41F	PWR RNG CH41 (QUAD4) DET Q
SAS-145	NM41D	PWR RNG CH41 (QUAD4) DET Q BOT
SAS-146	NM41C	PWR RNG CH41 (QUAD4) DET Q TOP
SAS-147	NM42F	PWR RNG CH42 (QUAD2) DET Q
SAS-148	NM42D	PWR RNG CH42 (QUAD2) DET Q BOT
SAS-149	NM42C	PWR RNG CH42 (QUAD2) DET Q TOP
SAS-150	NM43F	PWR RNG CH43 (QUAD1) DET Q
SAS-151	NM43D	PWR RNG CH43 (QUAD1) DET Q BOT
SAS-152	NM43C	PWR RNG CH43 (QUAD1) DET Q TOP
SAS-153	NM44F	PWR RNG CH44 (QUAD3) DET Q
SAS-154	NM44D	PWR RNG CH44 (QUAD3) DET Q BOT
SAS-155	NM44C	PWR RNG CH44 (QUAD3) DET Q TOP
SAS-156	NM31E	SOURCE RNG DETECTOR 1 LOG Q
SAS-157	NM32F	SOURCE RNG DETECTOR 2 LOG Q

STATION: INDIAN POINT 2

TITLE: INDEX

SKETCHED BY: R MCV

CHECKED BY:

APPROVALS

MECH. PROGRAM  
ENG. DATE

C&I  
ENG. DATE

ENG. DATE

CON  
EDISON ENG.  
C&I SKETCH

SKETCH NO. V

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SKETCH NO.	TAG	DESCRIPTION
SAS-158	SURN31	SOURCE RNG START UP RATE 31
SAS-159	SURN32	SOURCE RNG START UP RATE 32
SAS-160	LT3302	CAVITY PIT SUMP LEVEL
SAS-REF		SAS REFERENCE

STATION: INDIAN POINT 2

TITLE: INDEX

SKETCHED BY: R MCV

CHECKED BY:

APPROVALS

MECH. PROGRAM  
ENG. DATE

C&I  
ENG. DATE

ENG. DATE

**CON**  
**EDISON** ENG.  
C&I SKETCH

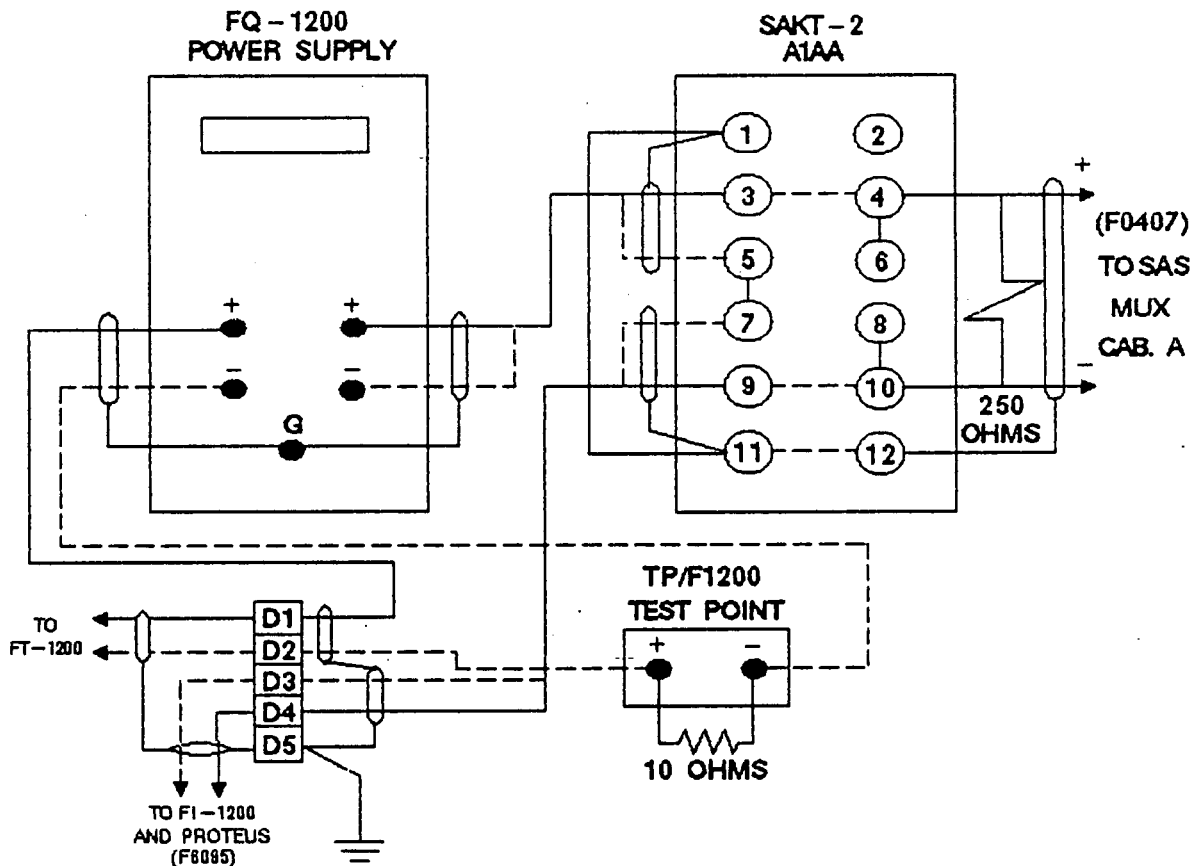
SKETCH NO. VI

# DESIGN DETAIL

REVISION

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- NOTE 1. PROTEUS COMPUTER ADDRESS POINT F6095 IS PLANNED FOR RELABELING AS F0407.  
 2. SAS SIGNAL DESTINATION: TERMINAL BLOCK 01R02, POINTS 6 (POS.), 7 (NEG.), AND 8 (SHIELD).

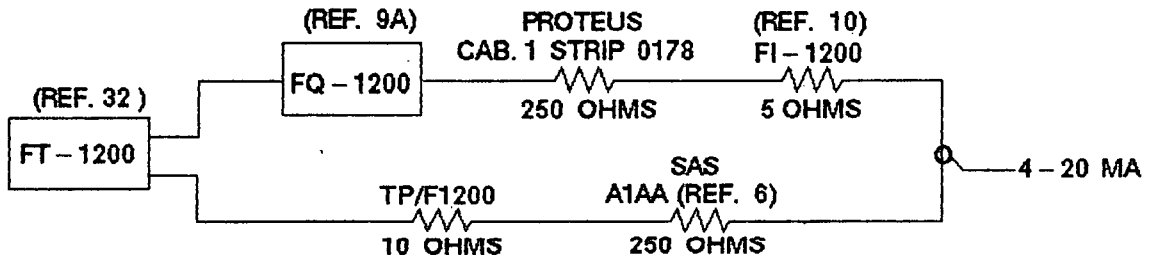
REF. DWGS.: A225329  
 REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	MECH. PROGRAM	<b>CON EDISON ENG.</b>
TITLE: SAS COMPUTER INTERFACE	ENG. <i>N/A</i> DATE	
ALX FEEDWATER FLOW SG21 (F-1200)	C&I	<b>C&amp;I SKETCH</b>
SKETCHED BY: VICTOR S. D'AMORE	ENG. <i>TM</i> DATE <i>8/13/87</i>	SKETCH NO. SAS-1
CHECKED BY: <i>King Loh</i>	ENG. <i>VAD</i> DATE <i>8.13.87</i>	REV. 0 SH. 1 OF 2

REVISION

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# IMPEDANCE CALCULATION



TOTAL IMPEDANCE (OHMS) = 250 + 5 + 250 + 10 = 515

**ENGINEERING JUSTIFICATION:**

FQ - 1200 IS A FOXBORO MODEL 610AT 27 VDC POWER SUPPLY (CUSTOM), AND PROVIDES A 4 - 20 MA OUTPUT. FT - 1200 IS A ROSEMOUNT 1153HA4 TRANSMITTER, AND PROVIDES 4 - 20 MA OUTPUT INTO APPROXIMATELY 750 OHMS (27 VDC POWER SUPPLY CONSIDERED). THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (250 OHMS), THE TOTAL IMEPDANCE (515 OHMS), FALLS WITHIN THE LOAD LIMIT (750 OHMS).

THE AUXILIARY FEEDWATER FLOW SG21 CHANNEL IS SAFETY - RELATED. AN ISOLATOR WILL BE PROVIDED TO SEPARATE THE SAS AND PROTEUS COMPUTER INPUTS FROM THE SAFETY - RELATED PORTION OF THE CHANNEL.

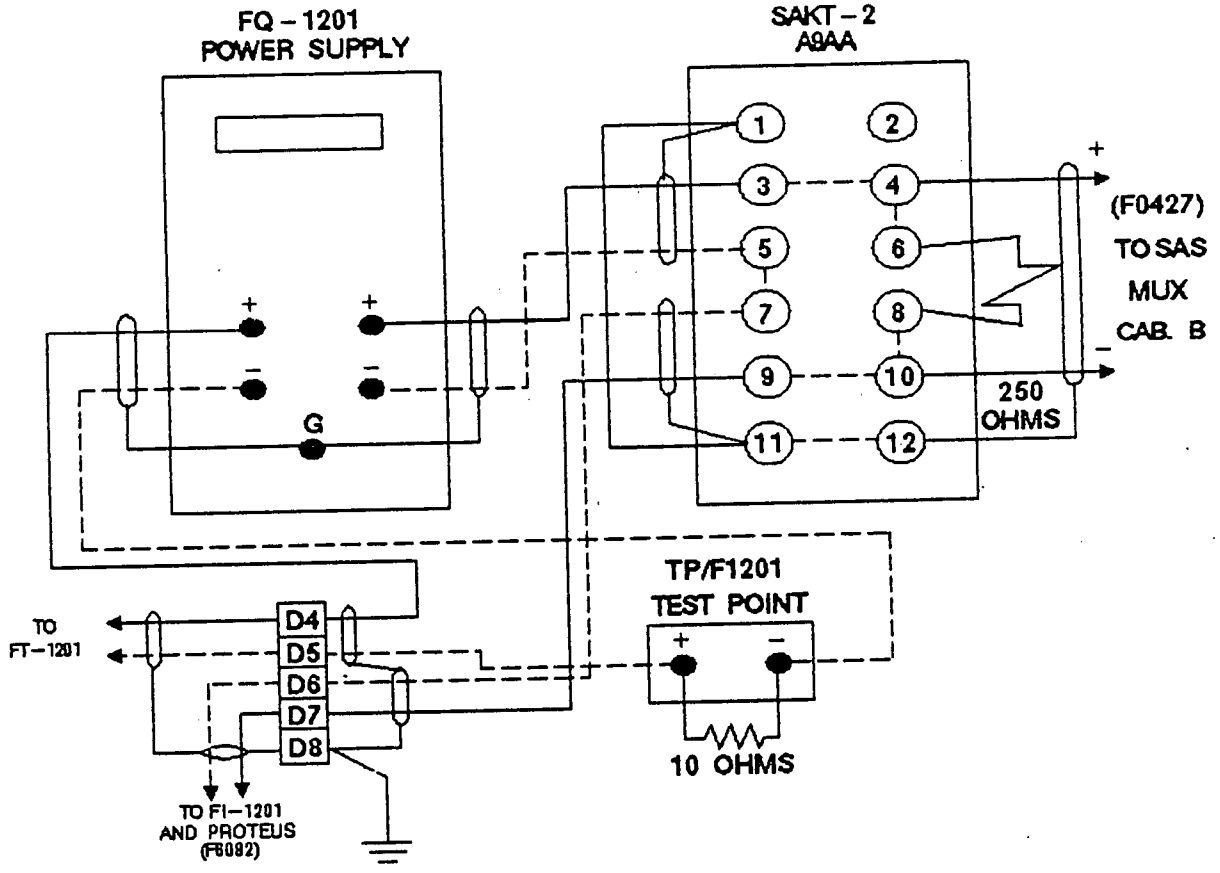
STATION: INDIAN POINT 2 TITLE: SAS COMPUTER INTERFACE AUX FEEDWATER FLOW SG21 (F - 1200) SKETCHED BY: VICTOR S. D'AMORE CHECKED BY: <i>R M CV.</i>	A P P R V E D	MECH. PROGRAM ENG. <i>N/A</i> DATE C&I ENG. <i>TM</i> DATE <i>10/22/87</i> ENG. <i>VAD</i> DATE <i>10/22/87</i>	<b>CON EDISON ENG. C&amp;I SKETCH</b>  SKETCH NO. SAS - 1 REV. 0 SH. 2 OF 2
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REVISION

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**DESIGN DETAIL**



NOTE: 1. PROTEUS COMPUTER ADDRESS POINT F6092 IS PLANNED FOR RELABELING AS F0427.  
 2. SAS SIGNAL DESTINATION: TERMINAL BLOCK 01R09, POINTS 10 (POS.), 11 (NEG.), AND 12 (SHIELD).

REF. DWGS.: A225349  
 REF. SKETCH: SAS - REF

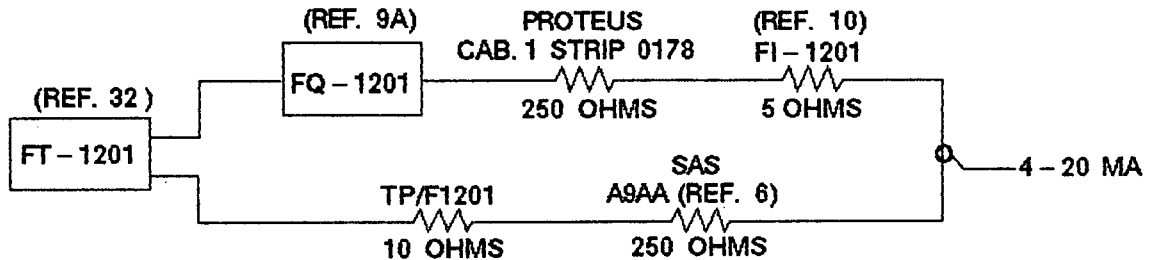
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG.
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
ALX FEEDWATER FLOW SG22 (F-1201)	S	C&J	SKETCH NO. SAS-2 REV. 0 SH. 1 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 8/13/87	
CHECKED BY: <i>King Look</i>		ENG. <i>VSD</i> DATE 8.13.87	

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# IMPEDANCE CALCULATION



TOTAL IMPEDANCE (OHMS) = 250 + 5 + 250 + 10 = 515

ENGINEERING JUSTIFICATION:

FQ-1201 IS A FOXBORO MODEL 610AT 27 VDC POWER SUPPLY (CUSTOM), AND PROVIDES A 4-20 MA OUTPUT. FT-1201 IS A ROSEMOUNT 1153HA4 TRANSMITTER, AND PROVIDES 4-20 MA OUTPUT INTO APPROXIMATELY 750 OHMS (27 VDC POWER SUPPLY CONSIDERED). THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (250 OHMS), THE TOTAL IMEPDANCE (515 OHMS), FALLS WITHIN THE LOAD LIMIT (750 OHMS).

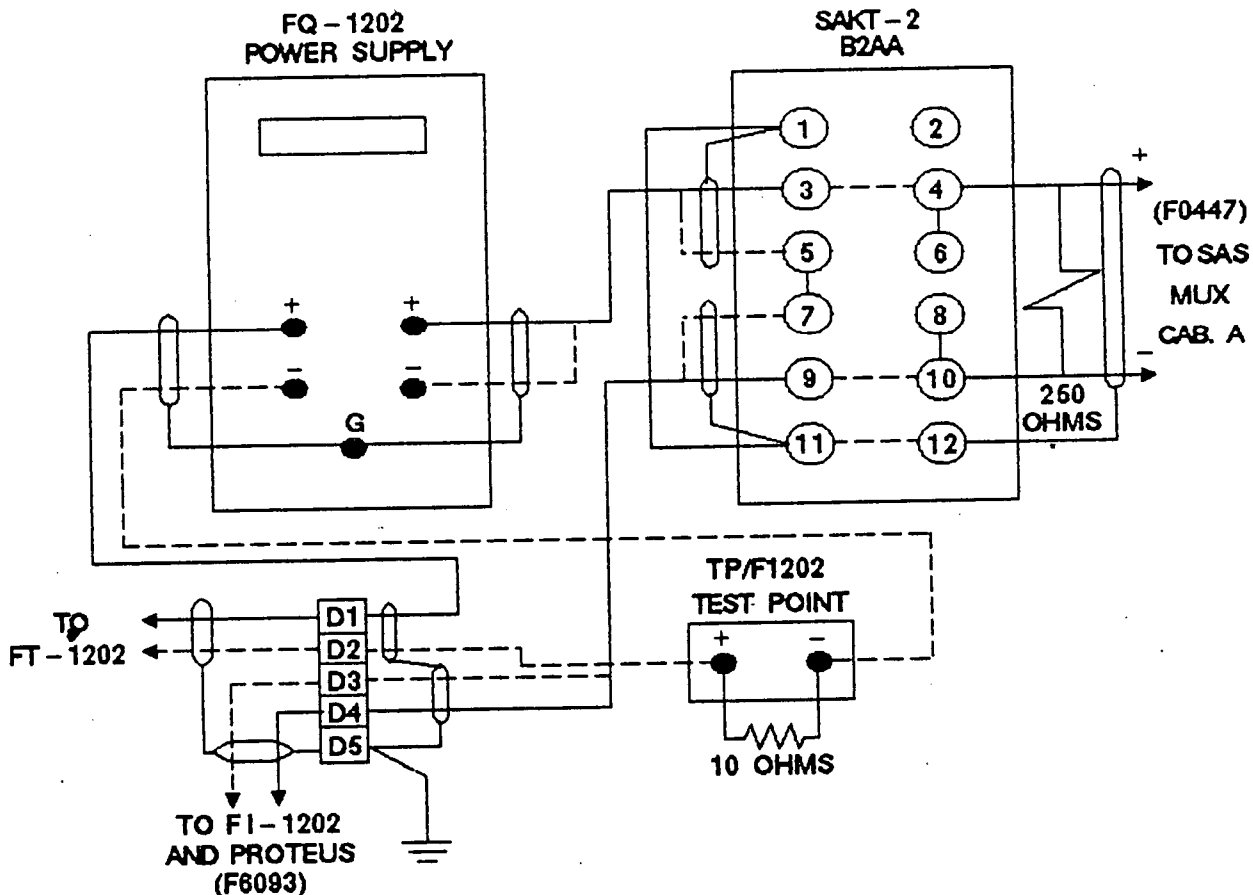
THE AUXILIARY FEEDWATER FLOW SG22 CHANNEL IS SAFETY-RELATED. AN ISOLATOR WILL BE PROVIDED TO SEPARATE THE SAS AND PROTEUS COMPUTER INPUTS FROM THE SAFETY-RELATED PORTION OF THE CHANNEL.

STATION: INDIAN POINT 2	A P P R V E S	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
AUX FEEDWATER FLOW SG22 (F-1201)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>10/22/87</i>	
CHECKED BY: <i>K.M.V.</i>		ENG. <i>VAD</i> DATE <i>10/22/87</i>	
		SKETCH NO. SAS-2	REV. 0 SH. 2 OF 2

# DESIGN DETAIL

REVISION

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- NOTE: 1. PROTEUS COMPUTER ADDRESS POINT F6093 IS PLANNED FOR RELABELING AS F0447  
 2. SAS SIGNAL DESTINATION: TERMINAL BLOCK 01R04, POINTS 10 (POS.), 11 (NEG.) AND 12 (SHIELD).

REF. DWGS.: A225358  
 REF. SKETCH: SAS - REF

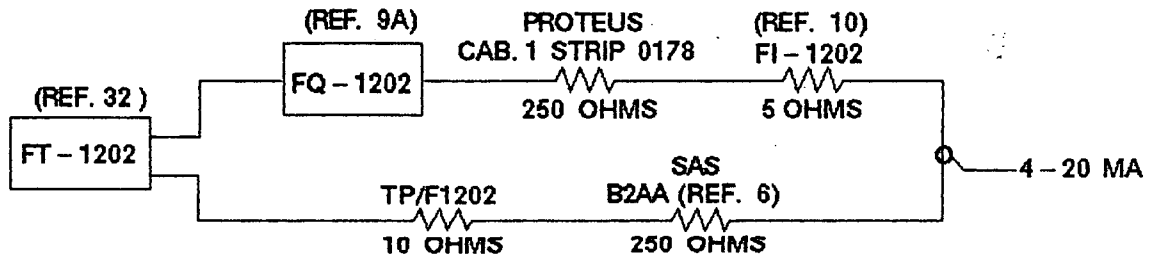
STATION: INDIAN POINT 2 TITLE: SAS COMPUTER INTERFACE ALX FEEDWATER FLOW SG23 (F-1202) SKETCHED BY: VICTOR S. D'AMORE CHECKED BY: <i>King Look</i>	A P P R V E D	MECH. PROGRAM ENG. <i>N/A</i> DATE C&I ENG. <i>TM</i> DATE <i>8/13/87</i> ENG. <i>VLD</i> DATE <i>8-13-87</i>	<b>CON EDISON ENG. C&amp;I SKETCH</b> SKETCH NO. SAS-3 REV. 0 SH. 1 OF 2
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REVISION

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# IMPEDANCE CALCULATION



TOTAL IMPEDANCE (OHMS) = 250 + 5 + 250 + 10 = 515

ENGINEERING JUSTIFICATION:

FQ-1202 IS A FOXBORO MODEL 610AT 27 VDC POWER SUPPLY (CUSTOM), AND PROVIDES A 4-20 MA OUTPUT. FT-1202 IS A ROSEMOUNT 1153HA4 TRANSMITTER, AND PROVIDES 4-20 MA OUTPUT INTO APPROXIMATELY 750 OHMS (27 VDC POWER SUPPLY CONSIDERED). THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (250 OHMS), THE TOTAL IMEPDANCE (515 OHMS), FALLS WITHIN THE LOAD LIMIT (750 OHMS).

THE AUXILIARY FEEDWATER FLOW SG23 CHANNEL IS SAFETY-RELATED. AN ISOLATOR WILL BE PROVIDED TO SEPARATE THE SAS AND PROTEUS COMPUTER INPUTS FROM THE SAFETY-RELATED PORTION OF THE CHANNEL.

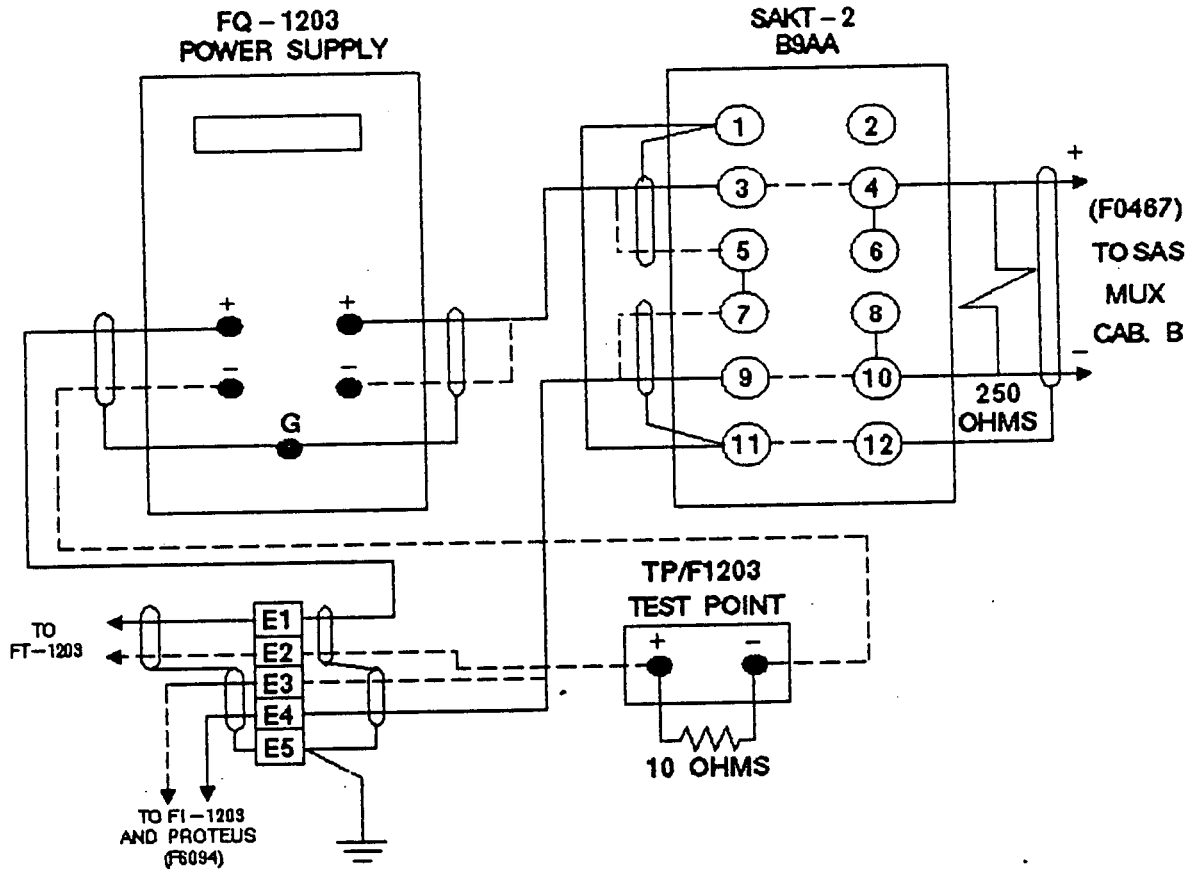
STATION: INDIAN POINT 2 TITLE: SAS COMPUTER INTERFACE AUX FEEDWATER FLOW SG23 (F-1202) SKETCHED BY: VICTOR S. D'AMORE CHECKED BY: <i>LM/V</i>	A P P R V E D	MECH. PROGRAM ENG. <i>N/A</i> DATE C&I ENG. <i>TM</i> DATE <i>10/22/87</i> ENG. <i>VAS</i> DATE <i>10/22/87</i>	<b>CON EDISON ENG. C&amp;I SKETCH</b>  SKETCH NO. SAS-3 REV. 0 SH. 2 OF 2
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REVISION

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DESIGN DETAIL



- NOTE: 1. PROTEUS COMPUTER ADDRESS POINT F6094 IS PLANNED FOR RELABELING AS F0467.  
 2. SAS SIGNAL DESTINATION: TERMINAL BLOCK 01R06, POINTS 23 (POS.), 24 (NEG.), AND 25 (SHIELD).

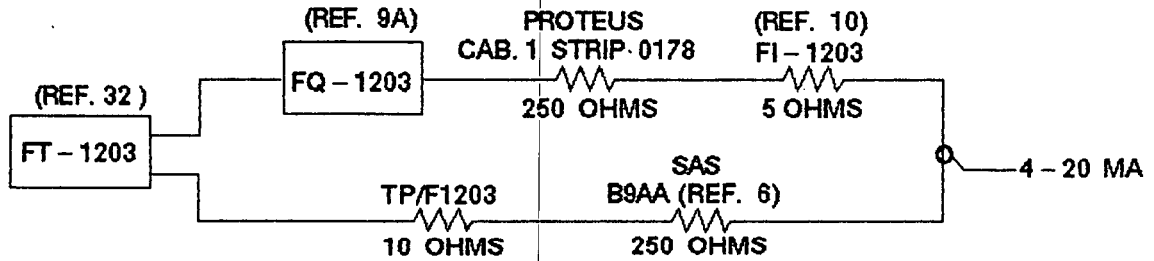
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 REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	A P P R V I S	MECH. PROGRAM	CON EDISON ENG. C&J SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
ALX FEEDWATER FLOW SG24 (F-1203)		C&J	SKETCH NO. SAS-4 REV. 0 SH. 1 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 8/13/87	
CHECKED BY: <i>King Lock</i>		ENG. <i>VAD</i> DATE 8.13.87	

REVISION

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Issued for record.

# IMPEDANCE CALCULATION



TOTAL IMPEDANCE (OHMS) = 250 + 5 + 250 + 10 = 515

ENGINEERING JUSTIFICATION:

FQ-1203 IS A FOXBORO MODEL 610AT 27 VDC POWER SUPPLY (CUSTOM), AND PROVIDES A 4-20 MA OUTPUT. FT-1203 IS A ROSEMOUNT 1153HA4 TRANSMITTER, AND PROVIDES 4-20 MA OUTPUT INTO APPROXIMATELY 750 OHMS (27 VDC POWER SUPPLY CONSIDERED). THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (250 OHMS), THE TOTAL IMEPDANCE (515 OHMS), FALLS WITHIN THE LOAD LIMIT (750 OHMS).

THE AUXILIARY FEEDWATER FLOW SG24 CHANNEL IS SAFETY-RELATED. AN ISOLATOR WILL BE PROVIDED TO SEPARATE THE SAS AND PROTEUS COMPUTER INPUTS FROM THE SAFETY-RELATED PORTION OF THE CHANNEL.

STATION: INDIAN POINT 2 TITLE: SAS COMPUTER INTERFACE AUX FEEDWATER FLOW SG24 (F-1203) SKETCHED BY: VICTOR S. D'AMORE CHECKED BY: <i>Rmev.</i>	A P P R V E D	MECH. PROGRAM ENG. <i>N/A</i> DATE C&I ENG. <i>TM</i> DATE <i>10/22/87</i> ENG. <i>VAS</i> DATE <i>10/22/87</i>	<b>CON EDISON ENG. C&amp;I SKETCH</b>  SKETCH NO. SAS-4 REV. 0 SH. 2 OF 2
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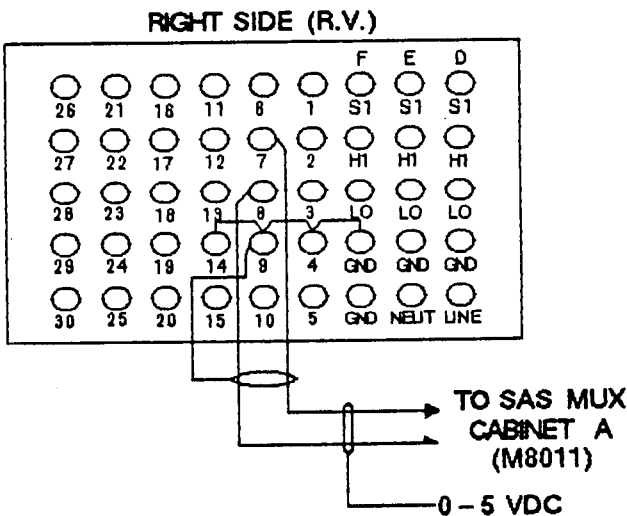
REVISION

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Incorporated  
FEI - 860042  
Revision 1

**DESIGN DETAIL**



- NOTE: 1. THIS SKETCH SHOWS ONLY THE SAS CONNECTIONS TO THE RECORDER FOR CHANNEL WD-E.  
 2. SAS SIGNAL DESTINATION: BTSCA 01R12, POINTS 2 (POS.), 3 (NEG.), AND 4 (SHIELD).

ENGINEERING JUSTIFICATION:

WD-E IS A NON-SAFETY RELATED CHANNEL, THEREFORE, THE SAS INPUT CAN BE IMPLEMENTED WITHOUT ISOLATION. FIGURE 4.4 OF THE ESTERLINE ANGUS MINISERVO VI STRIP CHART RECORDER INSTRUCTION MANUAL (REF. 26), ILLUSTRATES THAT TERMINAL BLOCK POINTS 7 (COM.) AND 8 (POS.) PROVIDE A 0-5 VDC RETRANSMITTED OUTPUT. A 5 KOHM OUTPUT LOAD (MINIMUM) IS REQUIRED. THE 0-5 VDC OUTPUT IS CONNECTED TO THE SAS MUX VIA A CPI RTP7436/50 UNIVERSAL HIGH SPEED WIDE-RANGE GATE CARD (REF. 27). THIS GATE CARD HAS AN INPUT IMPEDANCE OF > 5 MEGOHMS FOR A SAMPLING RATE OF 100 SAMPLES/SEC OR LESS. THE SAS MUX HAS A 10 SAMPLES/SEC RATE, THEREFORE, THE 5 KOHM MINIMUM RECORDER OUTPUT LOAD IS SATISFIED.

REF. DWG.: B228228  
REF. SKETCH: SAS-REF.

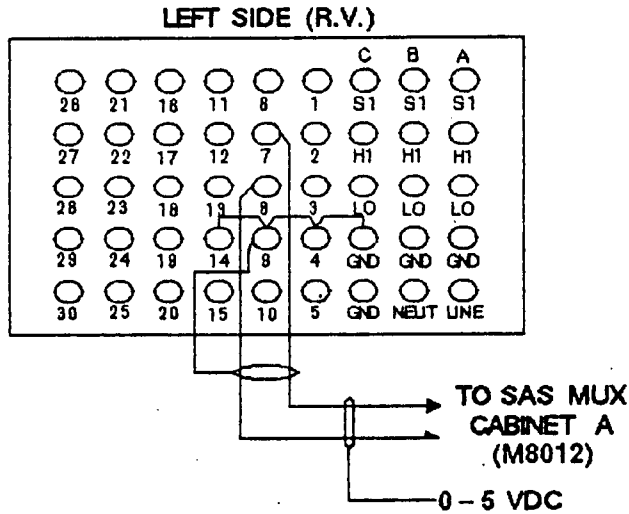
REF. UDC: FEI - 860042 REV. 1

STATION: INDIAN POINT 2 TITLE: SAS COMPUTER INTERFACE WIND DIRECTION - ELEVATED (WD-E) SKETCHED BY: VICTOR S. D'AMORE CHECKED BY: <i>King Cook</i>	A P P R O V E S	MECH. PROGRAM ENG. <i>N/A</i> DATE C&I ENG. <i>TM</i> DATE <i>3/17/87</i> ENG. <i>VAD</i> DATE <i>3/17/87</i>	<b>CON EDISON ENG. C&amp;I SKETCH</b>
			SKETCH NO. SAS-5 REV. 1 SH. 1 OF 1

REVISION

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 Issued for record.  
 Incorporated  
 FEI-860042  
 Revision 1

**DESIGN DETAIL**



- NOTE 1. THIS SKETCH SHOWS ONLY THE SAS CONNECTIONS TO THE RECORDER FOR CHANNEL WD - G.  
 2. SAS SIGNAL DESTINATION: BTSCA 01R11, POINTS 19 (POS.), 20 (NEG.), AND 21 (SHIELD).

ENGINEERING JUSTIFICATION:

WD - G IS A NON - SAFETY RELATED CHANNEL, THEREFORE, THE SAS INPUT CAN BE IMPLEMENTED WITHOUT ISOLATION. FIGURE 4.4 OF THE ESTERLINE ANGUS MINISERVO VI STRIP CHART RECORDER INSTRUCTION MANUAL (REF. 26), ILLUSTRATES THAT TERMINAL BLOCK POINTS 7 (COM.) AND 8 (POS.) PROVIDE A 0 - 5 VDC RETRANSMITTED OUTPUT. A 5 KOHM OUTPUT LOAD (MINIMUM) IS REQUIRED. THE 0 - 5 VDC OUTPUT IS CONNECTED TO THE SAS MUX VIA A CPI RTP7436/50 UNIVERSAL HIGH SPEED WIDE - RANGE GATE CARD (REF. 27). THIS GATE CARD HAS AN INPUT IMPEDANCE OF > 5 MEGOHMS FOR A SAMPLING RATE OF 100 SAMPLES/SEC OR LESS. THE SAS MUX HAS A 10 SAMPLES/SEC RATE, THEREFORE, THE 5 KOHM MINIMUM RECORDER OUTPUT LOAD IS SATISFIED.

REF. DWG.: B228228  
 REF. SKETCH: SAS - REF.

REF. UDC: FEI - 860042 REV. 1

STATION: INDIAN POINT 2	A P P R V E D	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
WIND DIRECTION - GROUND (WD - G)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>3/17/87</i>	
CHECKED BY: <i>King Loh</i>		ENG. <i>VAD</i> DATE <i>3/17/87</i>	
		SKETCH NO. SAS - 6 REV. 1 SH. 1 OF 1	

REVISION

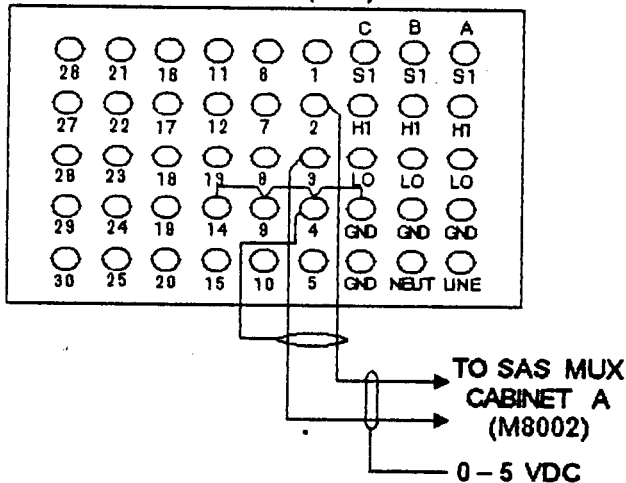
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Incorporated  
FEI-860042  
Revision 1.

DESIGN DETAIL

LEFT SIDE (R.V.)



- NOTE: 1. THIS SKETCH SHOWS ONLY THE SAS CONNECTIONS TO THE RECORDER FOR CHANNEL WS - G.  
2. SAS SIGNAL DESTINATION: BTSCA 01R11, POINTS 23 (POS.), 24 (NEG.), AND 25 (SHIELD).

ENGINEERING JUSTIFICATION:

WS - G IS A NON - SAFETY RELATED CHANNEL, THEREFORE, THE SAS INPUT CAN BE IMPLEMENTED WITHOUT ISOLATION. FIGURE 4.4 OF THE ESTERLINE ANGUS MINISERVO VI STRIP CHART RECORDER INSTRUCTION MANUAL (REF. 26), ILLUSTRATES THAT TERMINAL BLOCK POINTS 2 (COM.) AND 3 (POS.) PROVIDE A 0 - 5 VDC RETRANSMITTED OUTPUT. A 5 KOHM OUTPUT LOAD (MINIMUM) IS REQUIRED. THE 0 - 5 VDC OUTPUT IS CONNECTED TO THE SAS MUX VIA A CPI RTP7436/50 UNIVERSAL HIGH SPEED WIDE - RANGE GATE CARD (REF. 27). THIS GATE CARD HAS AN INPUT IMPEDANCE OF > 5 MEGOHMS FOR A SAMPLING RATE OF 100 SAMPLES/SEC OR LESS. THE SAS MUX HAS A 10 SAMPLES/SEC RATE, THEREFORE, THE 5 KOHM MINIMUM RECORDER OUTPUT LOAD IS SATISFIED.

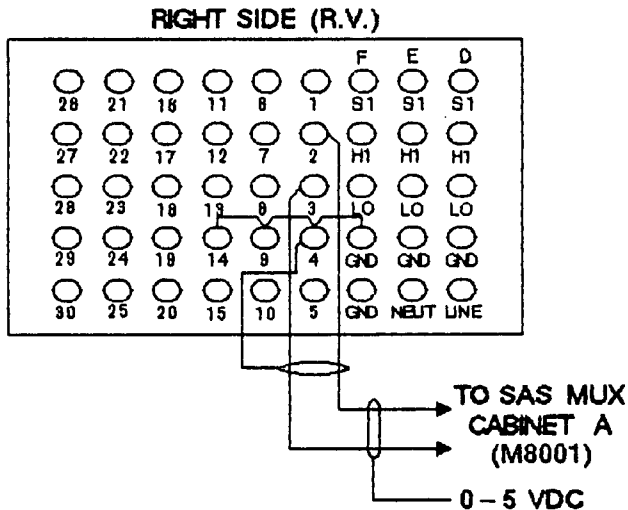
REF. DWG.: B228228  
REF. SKETCH: SAS - REF.

REF. UDC: FEI - 860042 REV. 1

STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
WIND SPEED - GROUND (WS - G)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>3/17/87</i>	
CHECKED BY: <i>King Look</i>		ENG. <i>VAD</i> DATE <i>3/17/87</i>	
		SKETCH NO. SAS - 7 REV. 1 SH. 1 OF 1	

REVISION  
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 FEI-860042  
 Revision 1

**DESIGN DETAIL**



- NOTE: 1. THIS SKETCH SHOWS ONLY THE SAS CONNECTIONS TO THE RECORDER FOR CHANNEL WS - E.  
 2. SAS SIGNAL DESTINATION: BTSCA 01R12, POINTS 6 (POS.), 7 (NEG.), AND 8 (SHIELD).

**ENGINEERING JUSTIFICATION:**

WS - E IS A NON - SAFETY RELATED CHANNEL, THEREFORE, THE SAS INPUT CAN BE IMPLEMENTED WITHOUT ISOLATION. FIGURE 4.4 OF THE ESTERLINE ANGUS MINISERVO VI STRIP CHART RECORDER INSTRUCTION MANUAL (REF. 26), ILLUSTRATES THAT TERMINAL BLOCK POINTS 2 (COM.) AND 3 (POS.) PROVIDE A 0-5 VDC RETRANSMITTED OUTPUT. A 5 KOHM OUTPUT LOAD (MINIMUM) IS REQUIRED. THE 0-5 VDC OUTPUT IS CONNECTED TO THE SAS MUX VIA A CPI RTP7436/50 UNIVERSAL HIGH SPEED WIDE - RANGE GATE CARD (REF. 27). THIS GATE CARD HAS AN INPUT IMPEDANCE OF >5 MEGOHMS FOR A SAMPLING RATE OF 100 SAMPLES/SEC OR LESS. THE SAS MUX HAS A 10 SAMPLES/SEC RATE, THEREFORE, THE 5 KOHM MINIMUM RECORDER OUTPUT LOAD IS SATISFIED.

REF. DWG.: B228228  
 REF. SKETCH: SAS - REF.

REF. UDC: FEI - 860042 REV. 1

STATION: INDIAN POINT 2	A P P R V E D	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>	
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE		
WIND SPEED - ELEVATED (WS - E)		C&I	ENG. <i>TM</i> DATE <i>3/17/87</i>	SKETCH NO. SAS - 8 REV. 1 SH. 1 OF 1
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>VAS</i> DATE <i>3/17/87</i>		
CHECKED BY: <i>King Toth</i>				

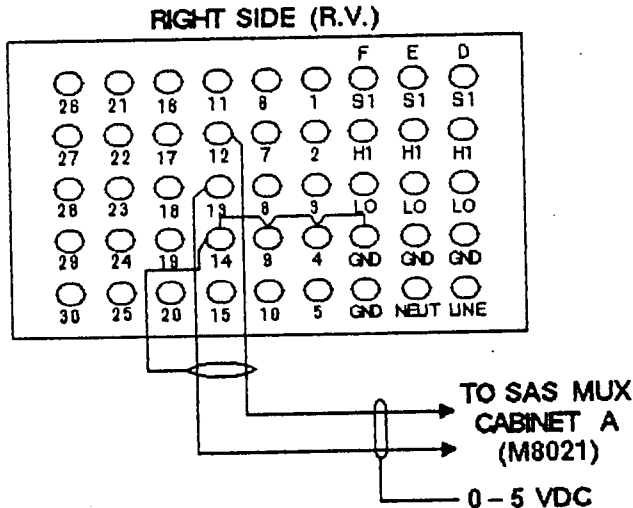
REVISION

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Incorporated  
FEI-860042  
Rev. 1

**DESIGN DETAIL**



- NOTE 1. THIS SKETCH SHOWS ONLY THE SAS CONNECTIONS TO THE RECORDER FOR CHANNEL DT-U.  
 2. SAS SIGNAL DESTINATION: BTSCA 01R11, POINTS 27 (POS.), 28 (NEG.), AND 29 (SHIELD).

**ENGINEERING JUSTIFICATION:**

DT-U IS A NON-SAFETY RELATED CHANNEL, THEREFORE, THE SAS INPUT CAN BE IMPLEMENTED WITHOUT ISOLATION. FIGURE 4.4 OF THE ESTERLINE ANGUS MINISERVO VI STRIP CHART RECORDER INSTRUCTION MANUAL (REF. 26), ILLUSTRATES THAT TERMINAL BLOCK POINTS 12 (COM.) AND 13 (POS.) PROVIDE A 0-5 VDC RETRANSMITTED OUTPUT. A 5 KOHM OUTPUT LOAD (MINIMUM) IS REQUIRED. THE 0-5 VDC OUTPUT IS CONNECTED TO THE SAS MUX VIA A CPI RTP7436/50 UNIVERSAL HIGH SPEED WIDE-RANGE GATE CARD (REF. 27). THIS GATE CARD HAS AN INPUT IMPEDANCE OF > 5 MEGOHMS FOR A SAMPLING RATE OF 100 SAMPLES/SEC OR LESS. THE SAS MUX HAS A 10 SAMPLE/SEC RATE, THEREFORE, THE 5 KOHM MINIMUM RECORDER OUTPUT LOAD IS SATISFIED.

REF. DWG.: B228228  
 REF. SKETCH: SAS-REF.

REF. UDC: FEI 860042 REV. 1

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM ENG. <i>N/A</i> DATE	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		C&I ENG. <i>TM</i> DATE <i>3/17/87</i>	
MET DELTA TEMP-UPPER (DT-U)		ENG. <i>VAD</i> DATE <i>3/17/87</i>	SKETCH NO. SAS-9
SKETCHED BY: VICTOR S. D'AMORE			REV. 1 SH. 1 OF 1
CHECKED BY: <i>King John</i>			



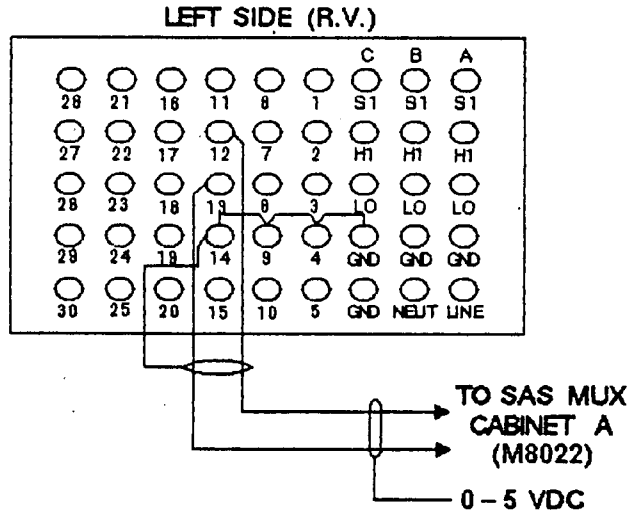
REVISION

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FEI-860042  
Rev. 1

DESIGN DETAIL



- NOTE: 1. THIS SKETCH SHOWS ONLY THE SAS CONNECTIONS TO THE RECORDER FOR CHANNEL DT-L  
 2. SAS SIGNAL DESTINATION: BTSCA 01R12, POINTS 10 (POS.), 11 (NEG.), AND 12 (SHIELD).

ENGINEERING JUSTIFICATION:

DT-L IS A NON-SAFETY RELATED CHANNEL, THEREFORE, THE SAS INPUT CAN BE IMPLEMENTED WITHOUT ISOLATION. FIGURE 4.4 OF THE ESTERLINE ANGUS MINISERVO VI STRIP CHART RECORDER INSTRUCTION MANUAL (REF. 26), ILLUSTRATES THAT TERMINAL BLOCK POINTS 12 (COM.) AND 13 (POS.) PROVIDE A 0-5 VDC RETRANSMITTED OUTPUT. A 5 KOHM OUTPUT LOAD (MINIMUM) IS REQUIRED. THE 0-5 VDC OUTPUT IS CONNECTED TO THE SAS MUX VIA A CPI RTP7436/50 UNIVERSAL HIGH SPEED WIDE-RANGE GATE CARD (REF. 27). THIS GATE CARD HAS AN INPUT IMPEDANCE OF > 5 MEGOHMS FOR A SAMPLING RATE OF 100 SAMPLES/SEC OR LESS. THE SAS MUX HAS A 10 SAMPLES/SEC RATE, THEREFORE, THE 5 KOHM MINIMUM RECORDER OUTPUT LOAD IS SATISFIED.

REF. DWG.: B228228  
 REF. SKETCH: SAS - REF.

REF. UDC: FEI 860042 REV.1

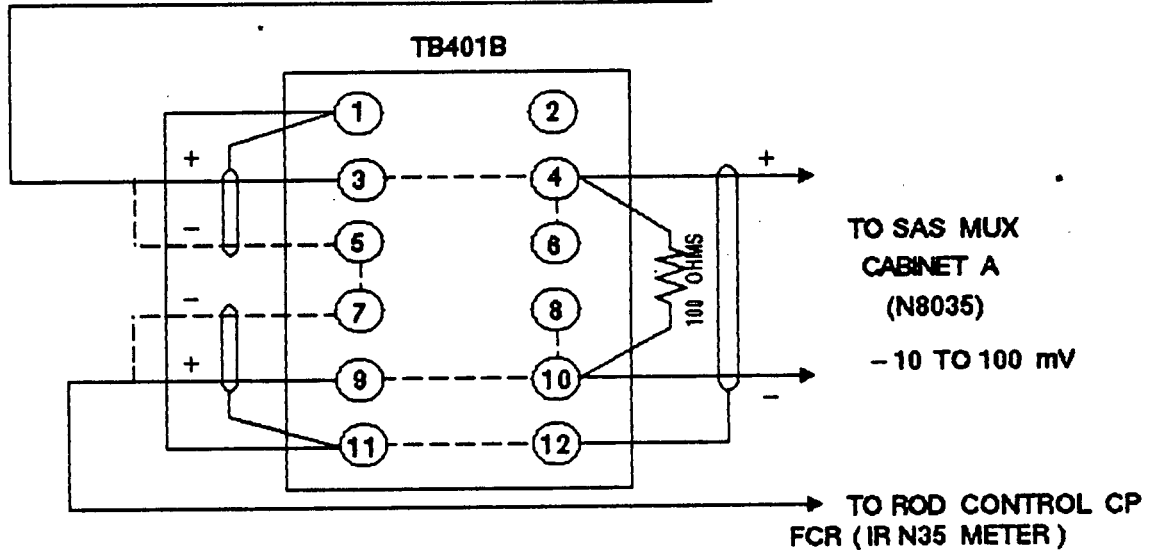
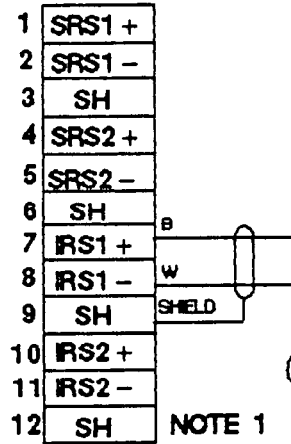
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
MET DELTA TEMP - LOWER (DT-L)		C&I	SKETCH NO. SAS-10 REV. 1 SH. 1 OF 1
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 3/17/87	
CHECKED BY: <i>Roy Cook</i>		ENG. <i>VAD</i> DATE 3/17/87	

REVISION

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 Incorporated  
 FEI-860023  
 Revision 1

**DESIGN DETAIL**

NIS RACK C-8  
 TB 401



NOTE 1. EXISTING CONNECTIONS TO TB401 NOT SHOWN.  
 2. SAS SIGNAL DESTINATION: BTSCA 01R17, POINTS 6 (POS.), 7 (NEG.), AND 8 (SHIELD).

**ENGINEERING JUSTIFICATION**

TB 401 POINTS 7 AND 8 PROVIDE A - 0.1 TO 1.0 MA OUTPUT (SEE REF. 28, FIG 10-25 SHEET 7 OF 8). SR N35 REMOTE METER R409 ADJUSTED PER SECTION 5.8.8.4 TO COMPENSATE FOR 100 OHM SAS INPUT RESISTOR (SEE REF. 28, FIG 10-5, SHEET 2 OF 2). SURN 35 IS NON-SAFETY RELATED.

REF. DWG.: 9321-F-3316, 9321-F-3273 REF. UDC: FEI-860023 REV. 1  
 REF. SKETCH: SAS-REF

STATION: INDIAN POINT 2	A P P R V E D	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. N/A DATE	
INT RNG START UP RATE 35 (SURN35)	L S	C&I	SKETCH NO. SAS-11 REV. 1 SH. 1 OF 1
SKETCHED BY: VICTOR S. D'AMORE		ENG. TM DATE 8/13/87	
CHECKED BY: King Toole		ENG. VAD DATE 8.13.87	

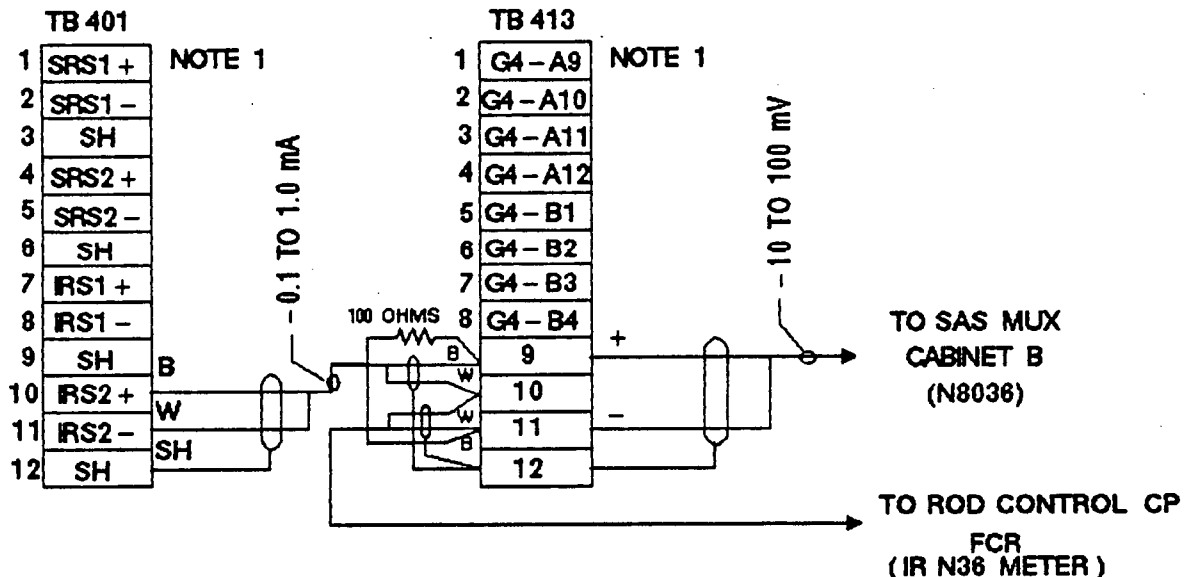
REVISION

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Incorporated UDC FEI-860046 Revision 1.

**DESIGN DETAIL**



- NOTE: 1. EXISTING CONNECTIONS TO TB 401 AND TB 413 NOT SHOWN  
 2. SAS SIGNAL DESTINATION: BTSCA 01R07, POINTS 23 (POS.), 24 (NEG.), AND 25 (SHIELD).

**ENGINEERING JUSTIFICATION**

TB 401 POINTS 10 AND 11 PROVIDE A - 0.1 TO 1.0 MA OUTPUT (SEE REF. 28, FIG 10-25 SHEET 7 OF 8). SR N36 REMOTE METER R411 ADJUSTED PER SECTION 5.6.6.4 TO COMPENSATE FOR 100 OHM SAS INPUT RESISTOR (SEE REF. 28, FIG 10-5, SHEET 2 OF 2). SURN 36 IS NON-SAFETY RELATED.

REF. DWG.: 9321 - F - 3316, 9321 - F - 3273 REF. UDC: FEI - 860046 REV.1  
 REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG.
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
INT RING START UP RATE 36 (SURN36)		C&I	SKETCH NO. SAS - 12
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 8/13/87	
CHECKED BY: <i>King Lock</i>		ENG. <i>VAS</i> DATE 8.13.87	

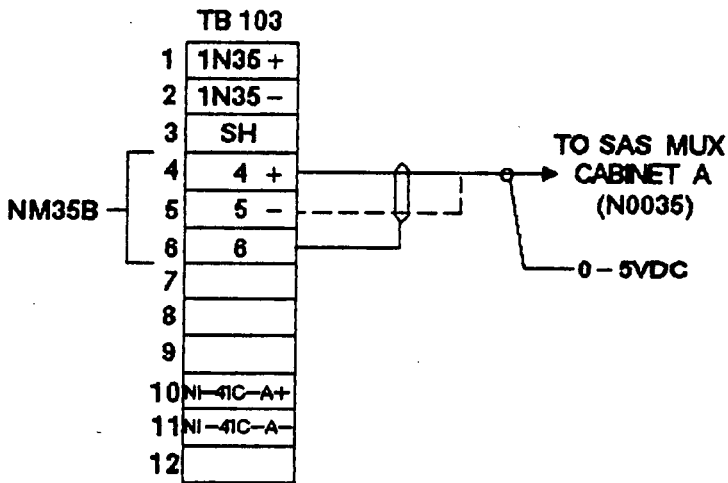
REVISION

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**DESIGN DETAIL**

NIS RACK C-5



NOTE 1

- NOTE: 1. EXISTING CONNECTIONS TO TB 103 TERMINAL POINTS (OTHER THAN 4, 5, AND 6) ARE NOT SHOWN.
- 2. SAS SIGNAL DESTINATION: BTSCA 01R07, POINTS 10 (POS.), 11 (NEG.), AND 12 (SHIELD).

**ENGINEERING JUSTIFICATION:**

THE INTERMEDIATE RANGE DETECTOR 1 LOG SIGNAL PROVIDES CURRENT SIGNALS TO LOG CURRENT AMPLIFIER NM201, WHICH PROVIDES A 0-10 VDC SIGNAL TO ISOLATION AMPLIFIER NM202. NM202 PROVIDES AN 0-5 VDC ADJUSTABLE OUTPUT AT TB-103 (POINTS 4, 5, AND 6), IN THE NIS RACK C-5. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE (SEE SECTION 1.3.3.3, FIGURE 2-5, AND FIGURE 10-25 SHEET 1 OF 8 IN REFERENCE 28).

REF. DWG.: 9321 - F - 3313  
REF. SKETCH: SAS - REF

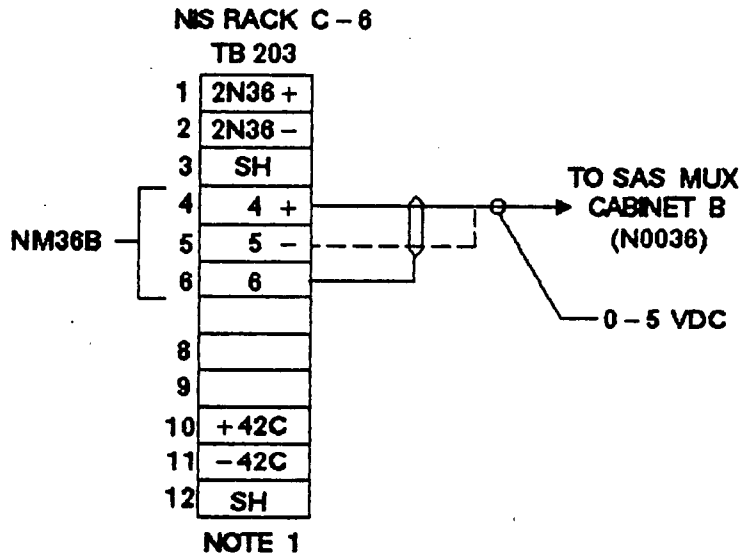
STATION: INDIAN POINT 2	A P P R O V E S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
INTERM RNG DETECTOR 1 LOG Q (NM35B)		C&I	SKETCH NO. SAS-13 REV. 0 SH. 1 OF 1
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 4/17/86	
CHECKED BY: <i>King Fook</i>		ENG. <i>VAD</i> DATE 4-17-87	

REVISION

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Issued for record.

**DESIGN DETAIL**



- NOTE:** 1. EXISTING CONNECTIONS TO TB 203 TERMINAL POINTS (OTHER THAN 4, 5, AND 6) ARE NOT SHOWN.  
 2. SAS SIGNAL DESTINATION: BTSCA 01R06, POINTS 19 (POS.), 20 (NEG.), AND 21 (SHIELD).

**ENGINEERING JUSTIFICATION:**

THE INTERMEDIATE RANGE DETECTOR 1 LOG SIGNAL PROVIDES CURRENT SIGNALS TO LOG CURRENT AMPLIFIER NM201, WHICH PROVIDES A 0-10 VDC SIGNAL TO ISOLATION AMPLIFIER NM202. NM202 PROVIDES A 0-5 VDC ADJUSTABLE OUTPUT AT TB-203 (POINTS 4, 5, AND 6), IN THE NIS RACK C-6. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE (SEE SECTION 1.3.3.3, FIGURE 2-5, AND FIGURE 10-25 SHEET 1 OF 8 IN REFERENCE 28).

REF. DWG.: 9321 - F - 3314  
 REF. SKETCH: SAS - REF

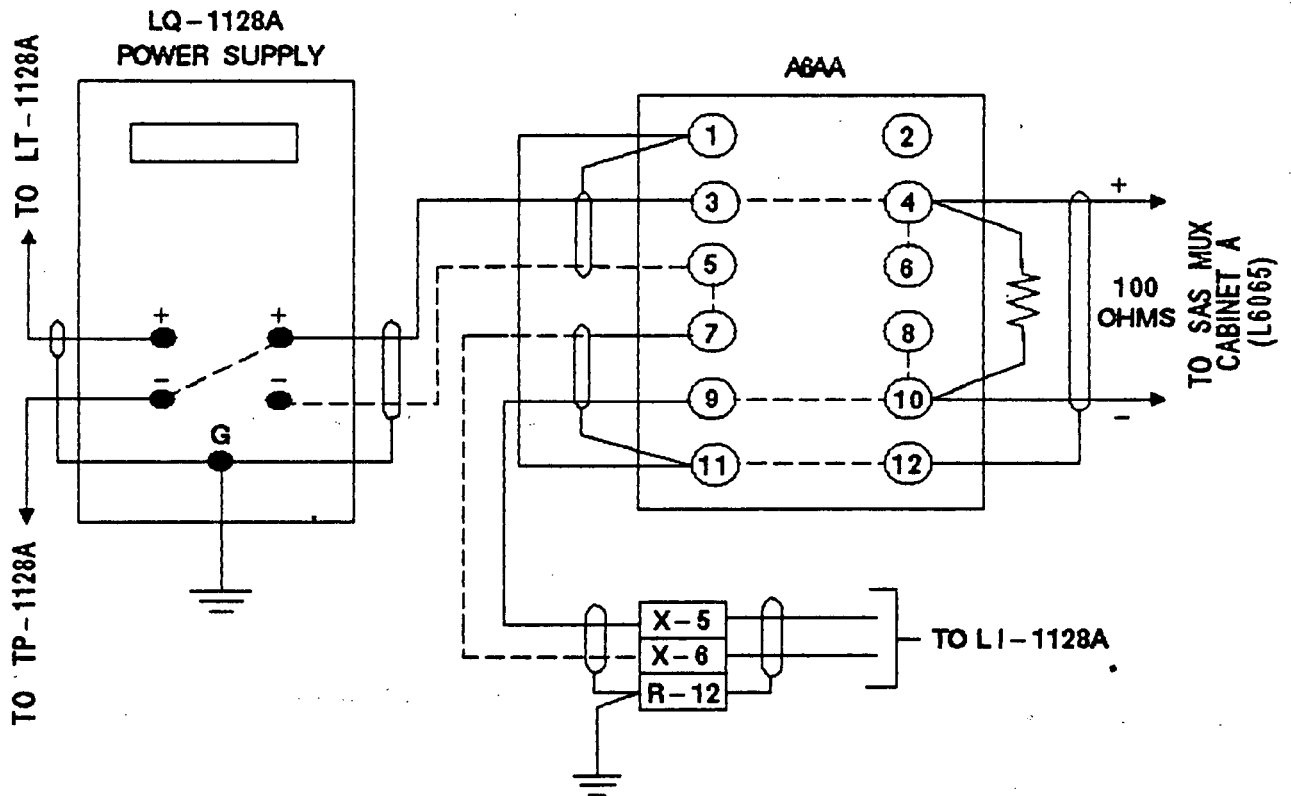
STATION: INDIAN POINT 2	A P P R O V E S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
INTERM RNG DETECTOR 2 LOG Q (NM36B)		C&I	SKETCH NO. SAS-14 REV. 0 SH. 1 OF 1
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 4/17/86	
CHECKED BY: <i>King Look</i>		ENG. <i>VAS</i> DATE 4-17-87	

REVISION

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**DESIGN DETAIL**



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R02, POINTS 14 (POS), 15 (NEG), AND 16 (SHIELD).

REF. DWG.: A225421  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	A P P R V E S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
CNDNST STORAGE TNK LEVEL (LT - 1128A)		C&I	SKETCH NO. SAS - 15 REV. 0 SH. 1 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>8/13/87</i>	
CHECKED BY: <i>King Lash</i>		ENG. <i>VAD</i> DATE <i>8.13.87</i>	

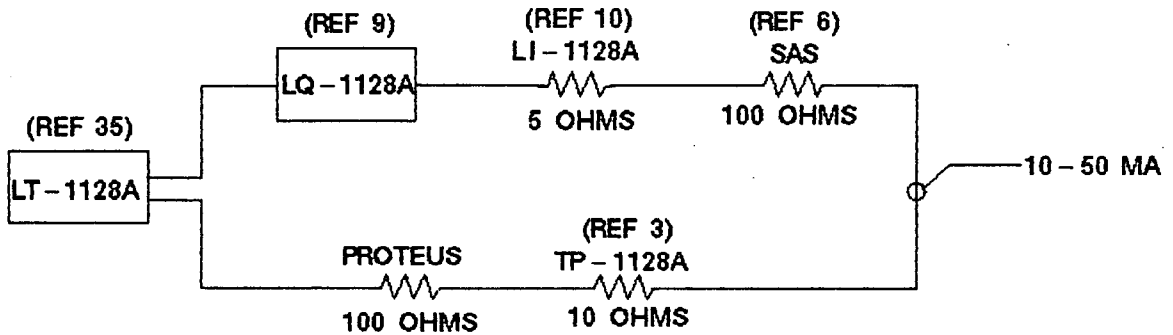
REVISION

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**IMPEDANCE CALCULATION**

LT-1128A CIRCUIT (Z EQUIVALENT)



IMPEDANCE CALCULATION

TOTAL IMPEDANCE (OHMS) = 5 + 100 + 10 + 100 = 215

ENGINEERING JUSTIFICATION

LQ-1128A IS A FOXBORO 610AT-OH POWER SUPPLY WHICH PROVIDES A 10-50 MA OUTPUT AT 80 VDC (NOMINAL). LT-1128A IS A ROSEMOUNT 1151DP DP TRANSMITTER, PROVIDING A 10-50 MA OUTPUT INTO 1000 OHMS (80 VDC POWER SUPPLIED ASSUMED). THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (215 OHMS), FALLS WITHIN THE LOAD LIMIT (1000 OHMS).

THE CONDENSATE STORAGE TANK LEVEL CHANNEL IS SAFETY-RELATED. AN ISOLATOR WILL BE PROVIDED TO SEPARATE THE SAS AND PROTEUS COMPUTER INPUTS FROM THE SAFETY-RELATED PORTION OF THE CHANNEL.

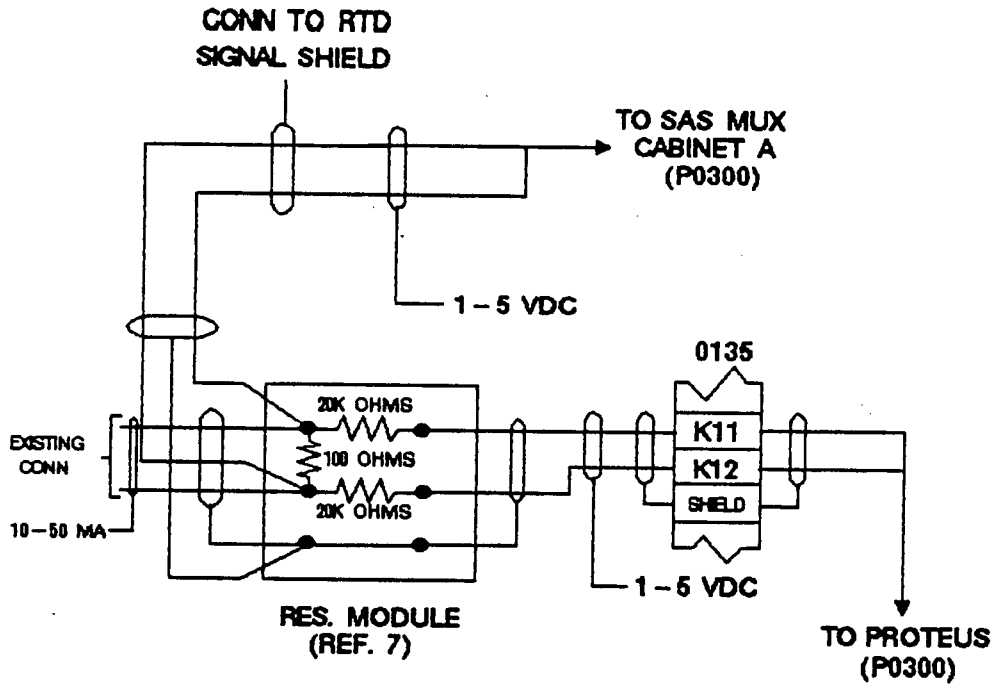
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. N/A DATE	
CNDNST STORAGE TANK LEVEL (LT-1128A)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. TM DATE 10/22/87	
CHECKED BY: RMCU		ENG. VAS DATE 10/22/87	
		SKETCH NO. SAS-15	REV. 0 SH. 2 OF 2

REVISION

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Incorporated FEI-880040 Revision 0.

**DESIGN DETAIL**



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R12, POINTS 19 (POS.), 20 (NEG.), AND 21 (SHIELD).

**ENGINEERING JUSTIFICATION**

THE RESISTOR MODULE UTILIZES A 100 OHM RESISTOR TO PROVIDE A 1-5 VDC INPUT TO THE PROTEUS COMPUTER. A 1-5 VDC INPUT TO SAS CAN BE DERIVED BY WIRING SAS IN PARALLEL WITH THE 100 OHM RESISTOR.

CHANNEL PT-1180 IS NON-SAFETY RELATED, AND REQUIRES NO ISOLATION FOR SAS.

REF. DWG.: B228227  
REF. SKETCH: SAS - REF

REF. UDC: 880040 REV. 0

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. N/A DATE	
CONDENSER PRESSURE (PT-1180)		C&I	SKETCH NO. SAS-16
SKETCHED BY: VICTOR S. D'AMORE		ENG. TM DATE 8/13/87	
CHECKED BY: <i>King Lusk</i>	ENG. VAD DATE 8-13-87	REV. 1 SH. 1 OF 1	

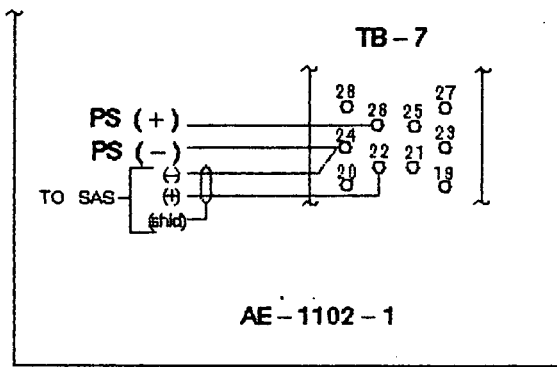


**REVISION**

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record.

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Incorporated  
UDC-860064  
Revision 1.

**DESIGN DETAIL**



AE-1102-1

**NOTE:**

1. SAS SIGNAL DESTINATION: BTSCA 01R10, POINTS 19 (POS.), 20 (NEG.), AND 21 (SHIELD).
2. SHIELD GROUNDED AT AE-1102-1

**ENGINEERING JUSTIFICATION:**

TB-7 WAS SUPPLIED FOR USE WITH A 1000 OHM (NOMINAL) RETRANSMITTING SLIDEWIRE (REF. 38). THE POWER SUPPLY (REF. 39) PROVIDES 0-5 VDC, HENCE, THE SAS INPUT VOLTAGE IS 0-5VDC.

THE CONTAINMENT DEW POINT CHANNEL IS NON-SAFETY RELATED.

REF. DWG.: 1972-M-7376  
REF. SKETCH: SAS-REF

UDC-860064 REV. 1

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM ENG. <i>N/A</i> DATE	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		C&I ENG. <i>TM</i> DATE <i>10/22/87</i>	
CONTAINMENT DEW POINT (AE-1102)		ENG. <i>VA</i> DATE <i>10/22/87</i>	REV. 1 SH. 1 OF 1
SKETCHED BY: VICTOR S. D'AMORE			
CHECKED BY: <i>R.M. CV</i>			

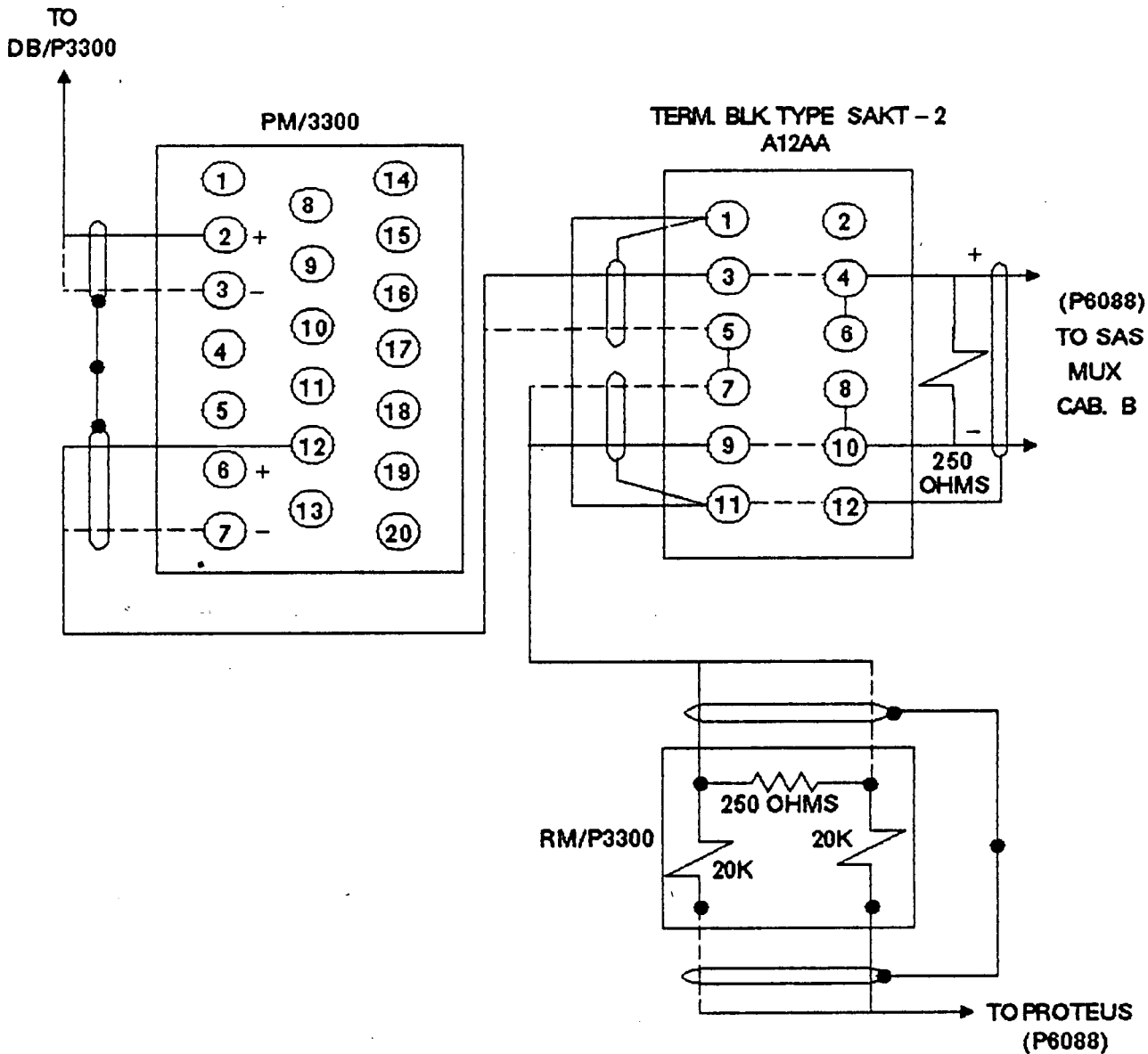
REVISION

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Incorporated  
FEI-860053  
Revision 0

**DESIGN DETAIL**



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R03, POINTS 14 (POS.), 15 (NEG.), AND 16 (SHIELD).

REF. DWGS.: A208564

REF. UDC: FEI-860053 REV. 0

REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
CNTMT PRESS WR (P-3300)		C&I	SKETCH NO. SAS-18 REV. 1 SH. 1 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>3/17/87</i>	
CHECKED BY: <i>King Lode</i>		ENG. <i>VSD</i> DATE <i>3/17/87</i>	

REVISION

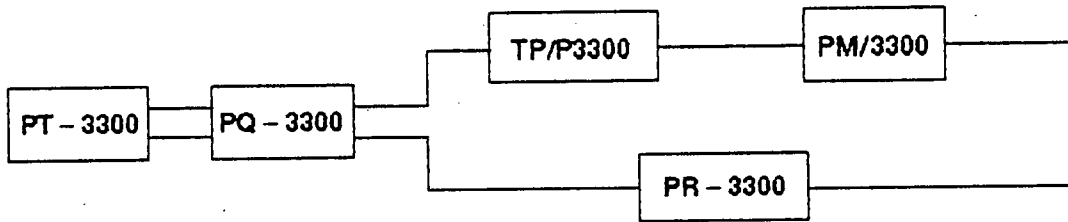
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Issued for record.

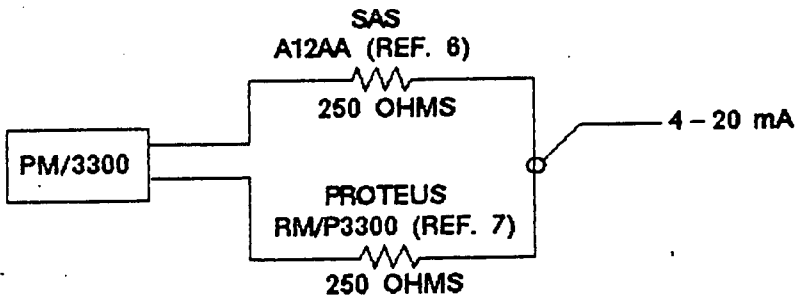
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FEI-860053  
Revision 0.

# IMPEDANCE CALCULATION

## PRIMARY LOOP



## PM/3300 SECONDARY LOOP (Z EQUIV.)



TOTAL IMPEDANCE (OHMS) = 250 + 250 = 500

### ENGINEERING JUSTIFICATION:

PM/3300 IS A FOXBORO MODEL 66BT - OJ CURRENT REPEATER, CAPABLE OF DRIVING A 1650 OHM LOAD. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE IMPLEMENTATION OF THE SAS INPUT (250 OHMS), THE TOTAL IMPEDANCE (500 OHMS) IS WITHIN THE ALLOWABLE LOAD LIMIT.

STATION: INDIAN POINT 2  
 TITLE: SAS COMPUTER INTERFACE  
 CNTMT PRESS WR (P-3300)  
 SKETCHED BY: VICTOR S. D'AMORE  
 CHECKED BY: *King Look*

APPROVALS

MECH. PROGRAM  
 ENG. *N/A* DATE  
 C&I  
 ENG. *TM* DATE *3/17/87*  
 ENG. *VAS* DATE *3/17/87*

**CON  
EDISON ENG.**  
 C&I SKETCH  
 SKETCH NO. SAS-18  
 REV. 1 SH. 2 OF 2

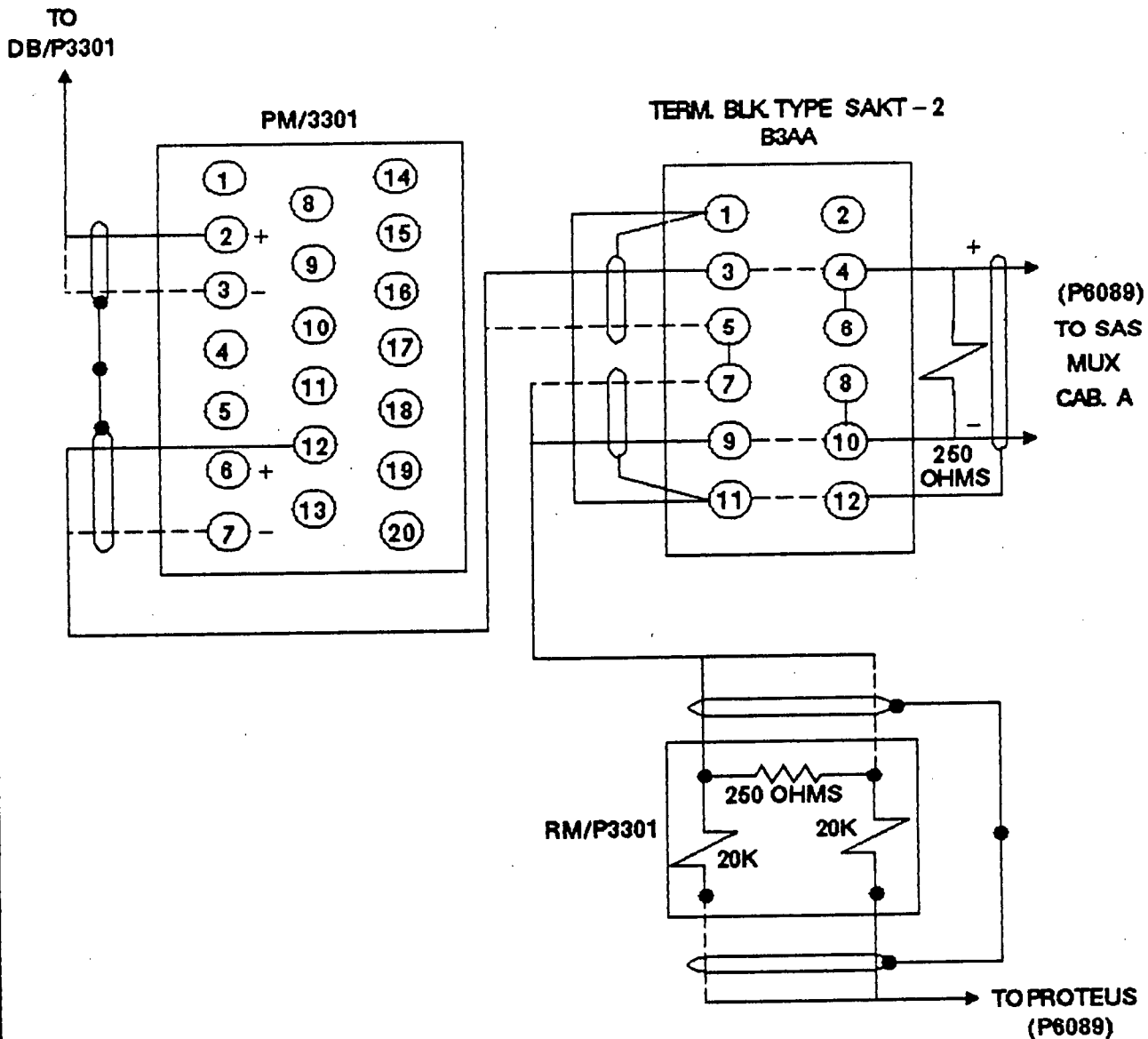
REVISION

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Incorporated  
FEI-860053  
Revision 0.

**DESIGN DETAIL**



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R03, POINTS 10 (POS.), 11 (NEG.), AND 12 (SHIELD).

REF. DWGS.: A208564  
REF. SKETCH: SAS-REF

REF. UDC: FEI-860053 REV. 0

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG.	
TITLE: SAS COMPUTER INTERFACE		ENG. <i>n/A</i> DATE		C&I SKETCH
CNTMT PRESS WR (P-3301)	VLS	C&I	SKETCH NO. SAS-19	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>JM</i> DATE <i>4/7/87</i>		REV. 1 SH. 1 OF 2
CHECKED BY: <i>King Look</i>		ENG. <i>VAD</i> DATE <i>4-17-87</i>		

REVISION

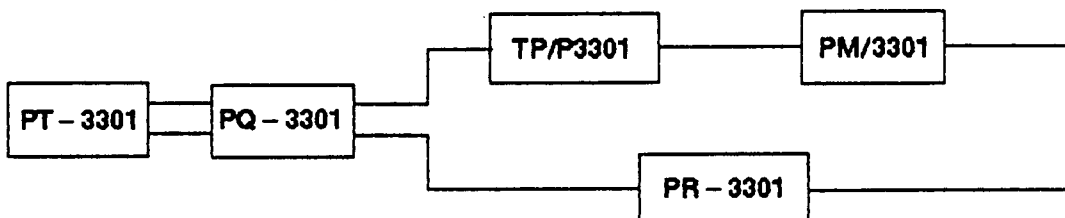
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Issued for record.

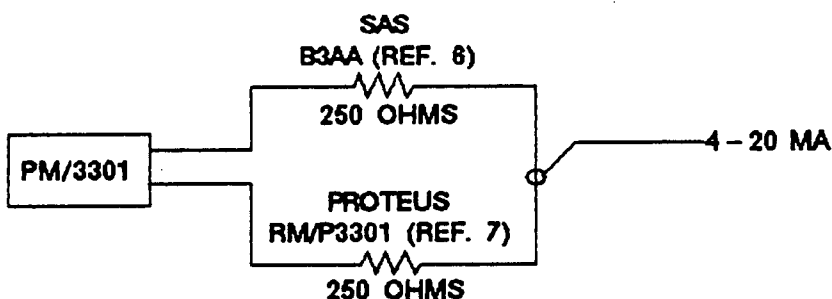
Incorporated FEI-860053 Revision 0.

# IMPEDANCE CALCULATION

## PT-3301 PRIMARY LOOP



## PM/3301 SECONDARY LOOP (Z EQUIV.)



TOTAL IMPEDANCE (OHMS) = 250 + 250 = 500

### ENGINEERING JUSTIFICATION:

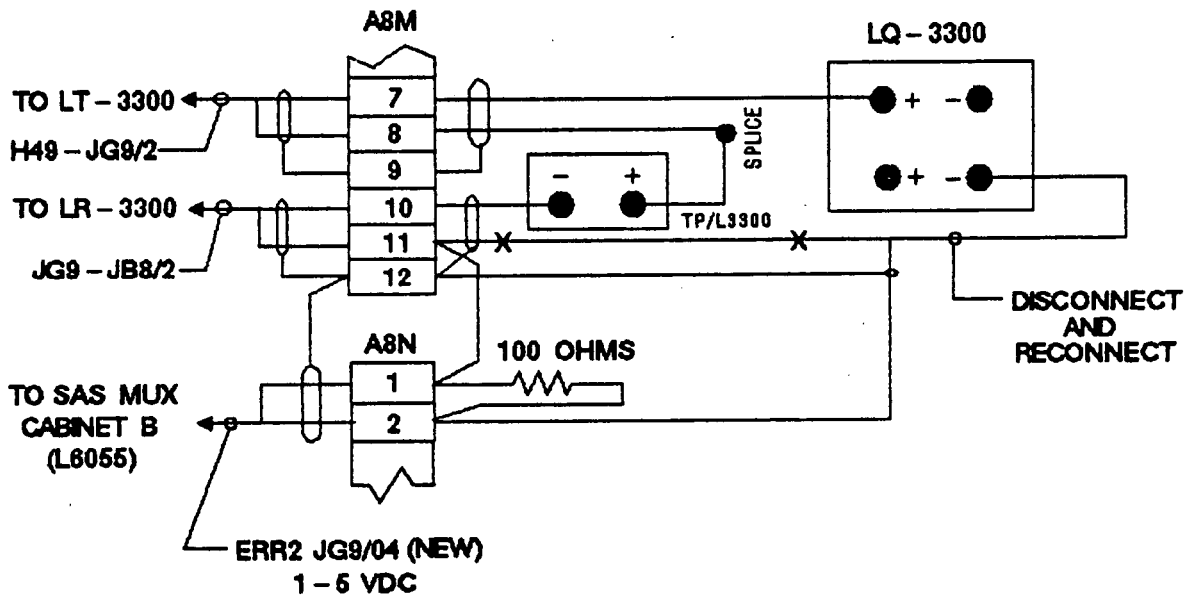
THE PT-3301 CIRCUIT HAS BEEN DESIGNATED AS A TYPE C, CATEGORY 1 VARIABLE. THE SAS INPUT CAN NOT BE IMPLEMENTED HERE. PM/3301 IS A FOXBORO MODEL 66BT-OJ VI ISOLATOR, CAPABLE OF DRIVING A 1650 OHM LOAD. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (250 OHMS), THE TOTAL IMPEDANCE (500 OHMS) FALLS WITHIN THE LOAD LIMIT.

STATION: INDIAN POINT 2	A	MECH. PROGRAM	<b>CON</b>
TITLE: SAS COMPUTER INTERFACE	P	ENG. <i>N/A</i> DATE	<b>EDISON ENG.</b>
CNTMT PRESS WR (P-3301)	R	C&I	<b>C&amp;I SKETCH</b>
SKETCHED BY: VICTOR S. D'AMORE	V	ENG. <i>TM</i> DATE <i>7/17/87</i>	SKETCH NO. SAS-19
CHECKED BY: <i>King Look</i>	L	ENG. <i>VAD</i> DATE <i>4-17-87</i>	REV. 1 SH. 2 OF 2

REVISION

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 Issued for  
 record.  
 Incorporated  
 FEI-860032  
 Revision 0.

DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R02, POINTS 19 (POS.), 20 (NEG.), AND 21 (SHIELD).

REF. DWG.: A208554  
 REF. SKETCH: SAS-REF

REF. UDC: FEI-860032 REV. 0

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
CONTAINMENT SUMP LEVEL (LT-3300)		C&I	<b>C&amp;I SKETCH</b>
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>8/13/87</i>	SKETCH NO. SAS-20
CHECKED BY: <i>King Lock</i>		ENG. <i>VAD</i> DATE <i>8.13.87</i>	REV. 1 SH. 1 OF 2

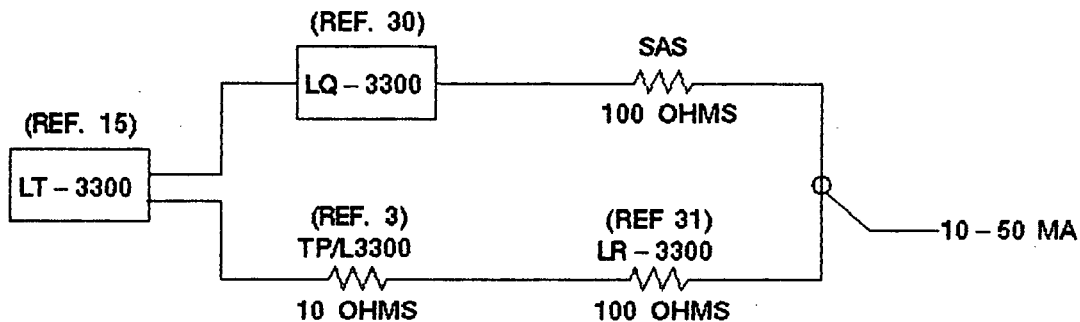
REVISION

0  
Issued for record.

1  
Incorporated FEI-860032 Revision 0.

**IMPEDANCE CALCULATION**

**LT-3300 CIRCUIT**



TOTAL IMPEDANCE (OHMS) = 100 + 100 + 10 = 210

**ENGINEERING JUSTIFICATION:**

LT-3300 IS A BARTON MODEL 764 TRANSMITTER WITH A LOAD RANGE OF 20 OHMS PER VOLT ABOVE 15 VDC POWER SUPPLY. LQ-3300 IS A FOXBORO M/610AC POWER SUPPLY, MODIFIED TO PROVIDE A 52 ±1 VDC OUTPUT. FOR A POWER SUPPLY VOLTAGE OF 53 VDC, THE TRANSMITTER HAS A LOAD RANGE OF 760 OHMS. THE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (210 OHMS), FALLS WITHIN THE LOAD LIMIT (760 OHMS).

THE CONTAINMENT SUMP LEVEL CHANNEL IS SAFETY-RELATED. AN ISOLATOR WILL BE PROVIDED TO SEPARATE THE SAS COMPUTER INPUT FROM THE SAFETY-RELATED PORTION OF THE CHANNEL.

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>NA</i> DATE	
CONTAINMENT SUMP LEVEL (LT-3300)		C&I	SKETCH NO. SAS-20 REV. 1 SH. 2 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 10/22/87	
CHECKED BY: <i>Rmcf.</i>		ENG. <i>VAD</i> DATE 10/22/87	

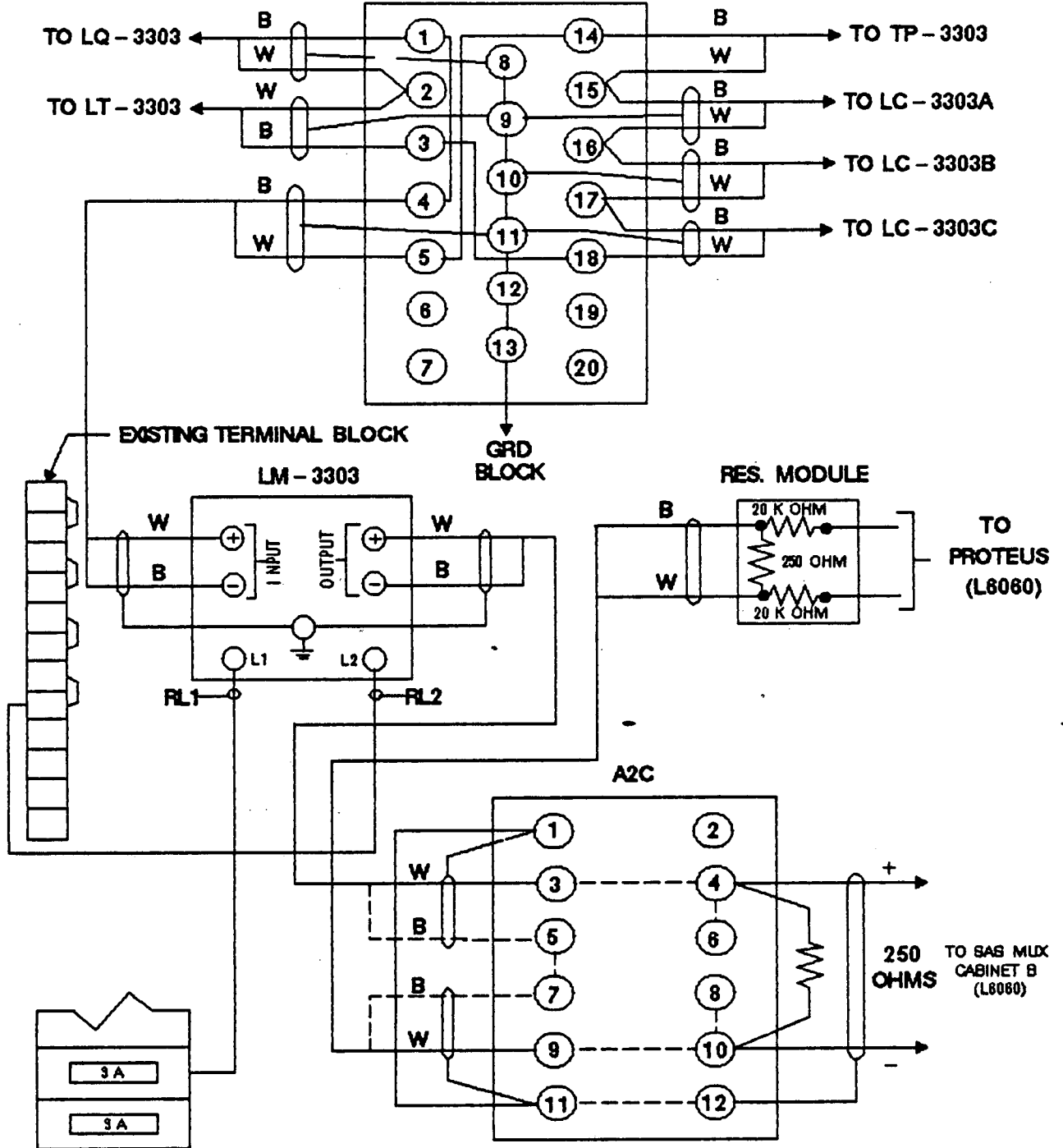
REVISION

0  
Issued for record.

Incorporated  
FEI - 860019  
Revision 0.

DESIGN DETAIL

DB - 2



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R01, POINTS 10 (POS.), 11 (NEG.), AND 12 (SHIELD).

REF. DWG.: A226584  
REF. SKETCH: SAS - REF

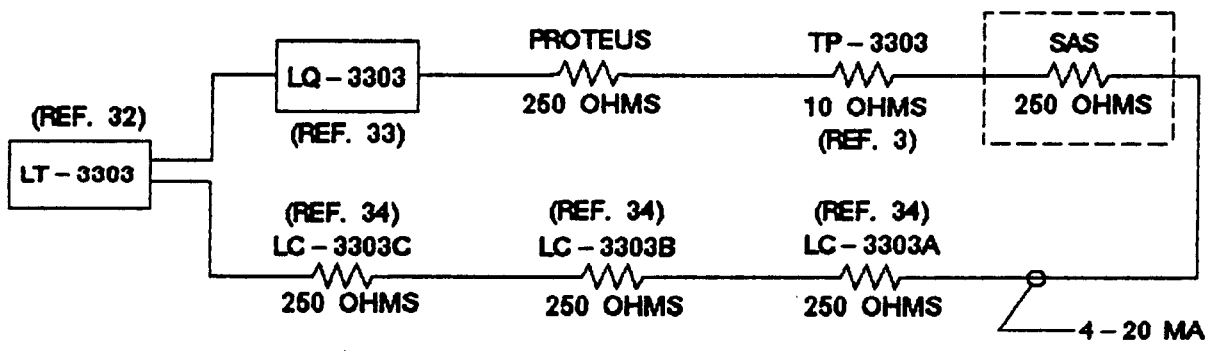
REF. UDC: FEI - 860019 REV. 0

STATION: INDIAN POINT 2	A P P R V E L S	MECH. PROGRAM	<b>CON</b> <b>EDISON ENG.</b> <b>C&amp;J SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
CONTAINMENT SUMP LEVEL (LT3303)		C&J	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 8/13/87	
CHECKED BY: <i>King Fook</i>		ENG. <i>VAD</i> DATE 8.13.87	
			SKETCH NO. SAS - 21
			REV. 1 SH. 1 OF 3



REVISION
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Issued for record.
1
Incorporated FEI-880018 Rev. 0

ALTERNATE CHANNEL CONFIGURATION WITH SAS INPUT ADDED



LQ-3303 IS A ROSEMOUNT MODEL SPS-2101-P PROVIDING 20-30 VDC AT 0-100 MA. AT 30 VOLTS, LT-3303 (ROSEMOUNT MODEL 1153 A) HAS A LOAD LIMIT OF APPROXIMATELY 900 OHMS. IF THE SAS INPUT (250 OHMS) WAS INSTALLED IN THIS LOOP, THE TOTAL LOOP IMPEDANCE WOULD BE AS FOLLOWS:

TOTAL IMPEDANCE (OHMS) = 250 + 10 + 250 + 250 + 250 + 250 = 1260

THIS WOULD EXCEED THE TRANSMITTER LOAD LIMIT OF 900 OHMS, THEREFORE, AN I CURRENT REPEATER WILL BE REQUIRED TO IMPLEMENT THE SAS INPUT. THE CHANNEL WILL BE RECONFIGURED AS SHOWN ON SHEET 3.

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG.
TITLE: SAS COMPUTER INTERFACE		ENG. N/A DATE	
CONTAINMENT SUMP LEVEL (LT-3303)		C&I	SKETCH NO. SAS-21
SKETCHED BY: VICTOR S. D'AMORE		ENG. TM DATE 8/13/87	
CHECKED BY: <i>King Look</i>	ENG. VAD DATE 8-13-87		

REVISION

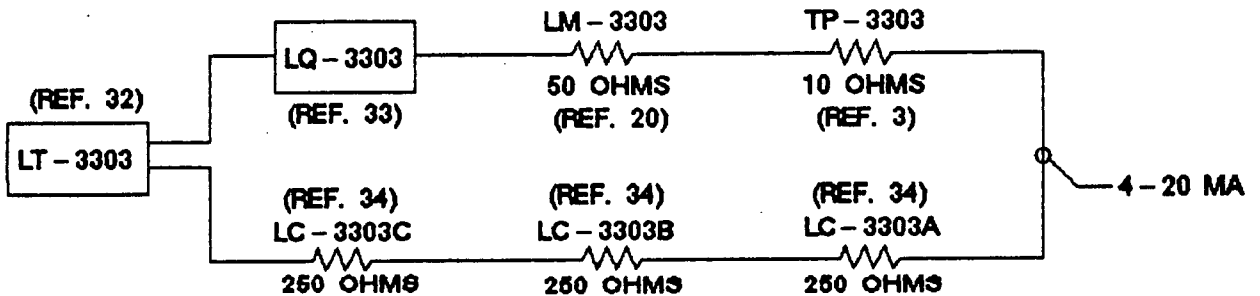
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Issued for record.

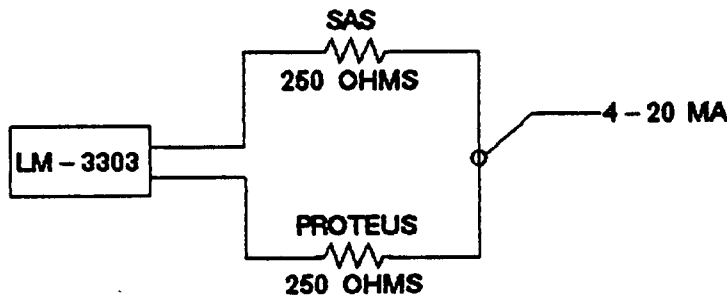
Incorporated  
FEI-880019  
Rev. 0

**IMPEDANCE CALCULATION**

**LT-3303 CIRCUIT WITH ISOLATOR (LM-3303) INSTALLED**



**LM-3303 CIRCUIT**



**ENGINEERING JUSTIFICATION**

A MOORE INDUSTRIES ISOLATOR/CURRENT REPEATER (LM3303) WILL BE IMPLEMENTED IN THE CIRCUIT. THE PROTEUS INPUT WILL BE REWIRED TO THE SECONDARY SIDE OF THE MOORE ISOLATOR/CURRENT REPEATER, AND THE SAS INPUT WILL BE ADDED IN SERIES. THE TOTAL LOOP IMPEDANCE IN THE LT-3303 CIRCUIT WILL BE:

LT-3303 TOTAL LOOP IMPEDANCE (OHMS) = 50 + 10 + 250 + 250 + 250 = 810

AN IMPEDANCE OF 810 OHMS FALLS WITHIN THE 900 OHM LOAD LIMIT OF THE TRANSMITTER CIRCUIT (SEE SHEET 2), AND IS THEREFORE ACCEPTABLE.

THE MOORE ISOLATOR/CURRENT REPEATER HAS AN OUTPUT LOAD RANGE OF 4-20 MA INTO 0-1200 OHMS. THE TOTAL LOOP IMPEDANCE CALCULATION FOR THE LM-3303 CIRCUIT WILL BE:

LM-3303 TOTAL LOOP IMPEDANCE (OHMS) = 250 + 250 = 500

THE TOTAL LOOP IMPEDANCE (500 OHMS) FALLS WITHIN THE ISOLATOR LOAD RANGE (1200 OHMS) THEREFORE, SAS CAN BE IMPLEMENTED AS SHOWN ABOVE. IT SHOULD BE NOTED THAT CHANNEL LT-3303 SERVES AS BACKUP TO CHANNEL LT-3300, AND IS NOT CONSIDERED SAFETY RELATED.

STATION: INDIAN POINT 2	A P P R V I S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. N/A DATE	
CONTAINMENT SUMP LEVEL (LT-3303)		C&I	SKETCH NO. SAS-21 REV. 1 SH. 3 OF 3
SKETCHED BY: VICTOR S. D'AMORE		ENG. TM DATE 8/13/87	
CHECKED BY: King Took		ENG. VAD DATE 8.13.87	

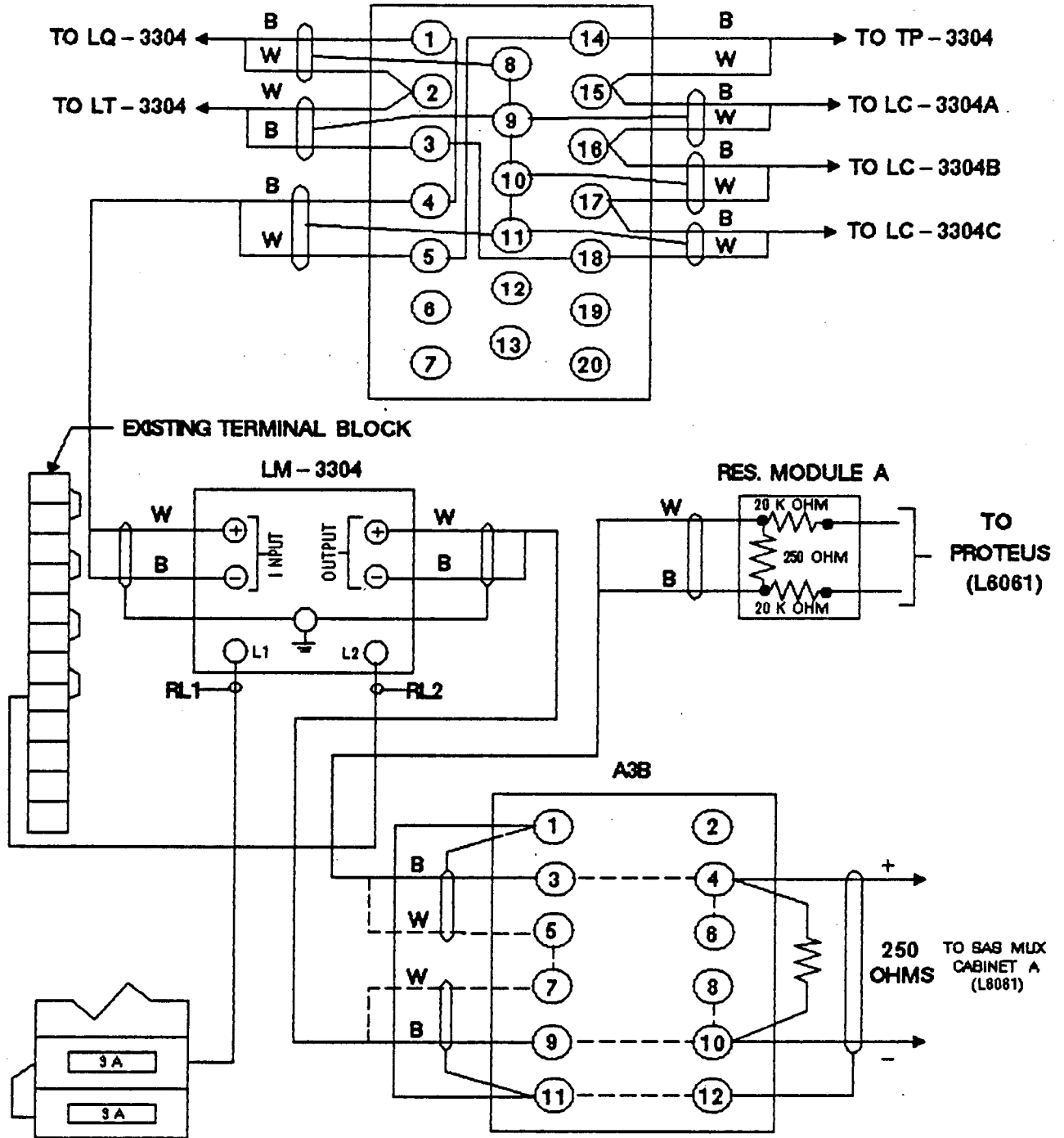
REVISION

0  
 Issued for record.

Incorporated  
 FEI - 880021  
 Revision 0.

**DESIGN DETAIL**

DB - 2



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R01, POINTS 23 (POS.), 24 (NEG.), AND 25 (SHIELD).

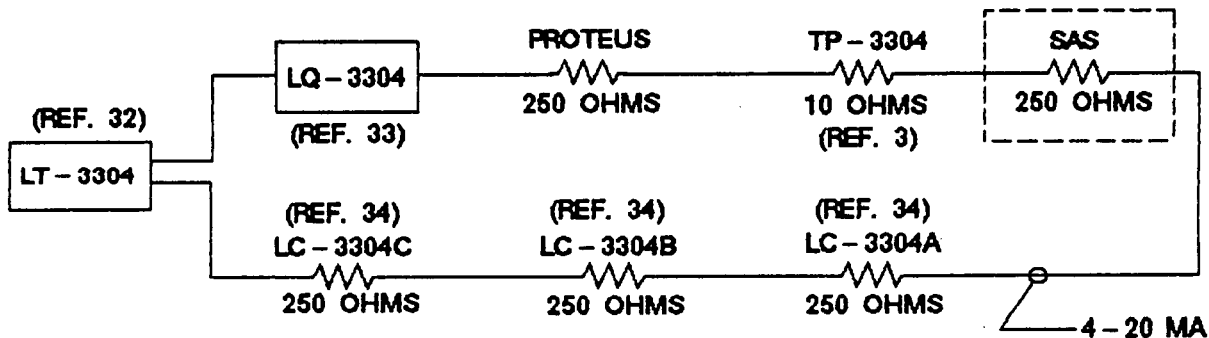
REF. DWG.: A226581  
 REF. SKETCH: SAS - REF

REF. UDC: FEI - 880021 REV. 0

STATION: INDIAN POINT 2	A P P R V E D	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. N/A DATE	
CONTAINMENT SUMP LEVEL (LT3304)		C&I	SKETCH NO. SAS - 22 REV. 1 SH. 1 OF 3
SKETCHED BY: VICTOR S. D'AMORE		ENG. TM DATE 8/13/87	
CHECKED BY: <i>King Toole</i>		ENG. VAD DATE 8.13.87	

REVISION  
 0  
 Issued for record.  
 Incorporated  
 FEI-880021  
 Rev. 0

ALTERNATE CHANNEL CONFIGURATION WITH SAS INPUT ADDED



LQ-3304 IS A ROSEMOUNT MODEL SPS-2101-P PROVIDING 20-30 VDC AT 0-100 MA. AT 30 VOLTS, LT-3304 (ROSEMOUNT MODEL 1153 A) HAS A LOAD LIMIT OF APPROXIMATELY 900 OHMS. IF THE SAS INPUT (250 OHMS) WAS INSTALLED IN THIS LOOP, THE TOTAL LOOP IMPEDANCE WOULD BE AS FOLLOWS:

TOTAL IMPEDANCE (OHMS) = 250 + 10 + 250 + 250 + 250 + 250 = 1260

THIS WOULD EXCEED THE TRANSMITTER LOAD LIMIT OF 900 OHMS, THEREFORE. AN IN CURRENT REPEATER WILL BE REQUIRED TO IMPLEMENT THE SAS INPUT. THE CHANNEL WILL BE RECONFIGURED AS SHOWN ON SHEET 3.

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. N/A DATE	
CONTAINMENT SUMP LEVEL (LT3304)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. TM DATE 8/13/87	SKETCH NO. SAS-22
CHECKED BY: <i>King Loh</i>		ENG. VAD DATE 8-13-87	REV. 1 SH. 2 OF 3

REVISION

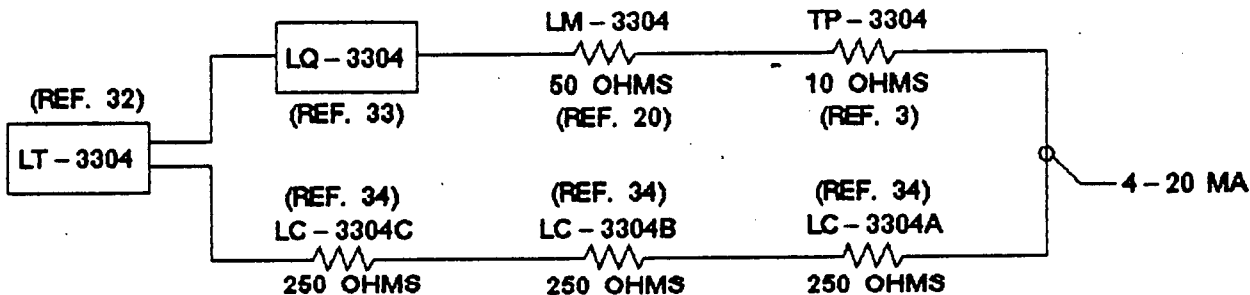
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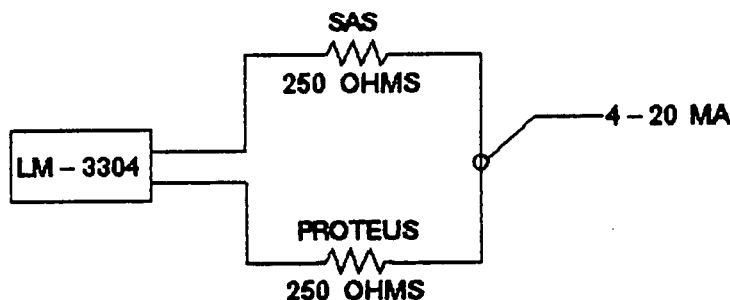
Incorporated  
FEI-860021  
Rev. 0

# IMPEDANCE CALCULATION

## LT-3304 CIRCUIT WITH ISOLATOR (LM-3304) INSTALLED



## LM-3304 CIRCUIT



### ENGINEERING JUSTIFICATION

A MOORE INDUSTRIES ISOLATOR/CURRENT REPEATER (LM3304) WILL BE IMPLEMENTED IN THE CIRCUIT. THE PROTEUS INPUT WILL BE REWIRED TO THE SECONDARY SIDE OF THE MOORE ISOLATOR/CURRENT REPEATER, AND THE SAS INPUT WILL BE ADDED IN SERIES. THE TOTAL LOOP IMPEDANCE IN THE LT-3304 CIRCUIT WILL BE:

$$LT-3304 \text{ TOTAL LOOP IMPEDANCE (OHMS)} = 50 + 10 + 250 + 250 + 250 = 810$$

AN IMPEDANCE OF 810 OHMS FALLS WITHIN THE 900 OHM LOAD LIMIT OF THE TRANSMITTER CIRCUIT (SEE SHEET 2), AND IS THEREFORE ACCEPTABLE.

THE MOORE ISOLATOR/CURRENT REPEATER HAS AN OUTPUT LOAD RANGE OF 4-20 MA INTO 0-1200 OHMS. THE TOTAL LOOP IMPEDANCE CALCULATION FOR THE LM-3304 CIRCUIT WILL BE:

$$LM-3304 \text{ TOTAL LOOP IMPEDANCE (OHMS)} = 250 + 250 = 500$$

THE TOTAL LOOP IMPEDANCE (500 OHMS) FALLS WITHIN THE ISOLATOR LOAD RANGE (1200 OHMS) THEREFORE, SAS CAN BE IMPLEMENTED AS SHOWN ABOVE. IT SHOULD BE NOTED THAT CHANNEL LT-3304 SERVES AS BACKUP TO CHANNEL LT-3300, AND IS NOT CONSIDERED SAFETY RELATED.

STATION: INDIAN POINT 2 TITLE: SAS COMPUTER INTERFACE CONTAINMENT SUMP LEVEL (LT-3304) SKETCHED BY: VICTOR S. D'AMORE CHECKED BY: <i>King Cook</i>	A P P R V E D	MECH. PROGRAM ENG. <i>N/A</i> DATE C&J ENG. <i>JM</i> DATE <i>8/13/87</i> ENG. <i>VLD</i> DATE <i>8.13.87</i>	<b>CON EDISON ENG. C&amp;J SKETCH</b>  SKETCH NO. SAS-22 REV. 1 SH. 3 OF 3
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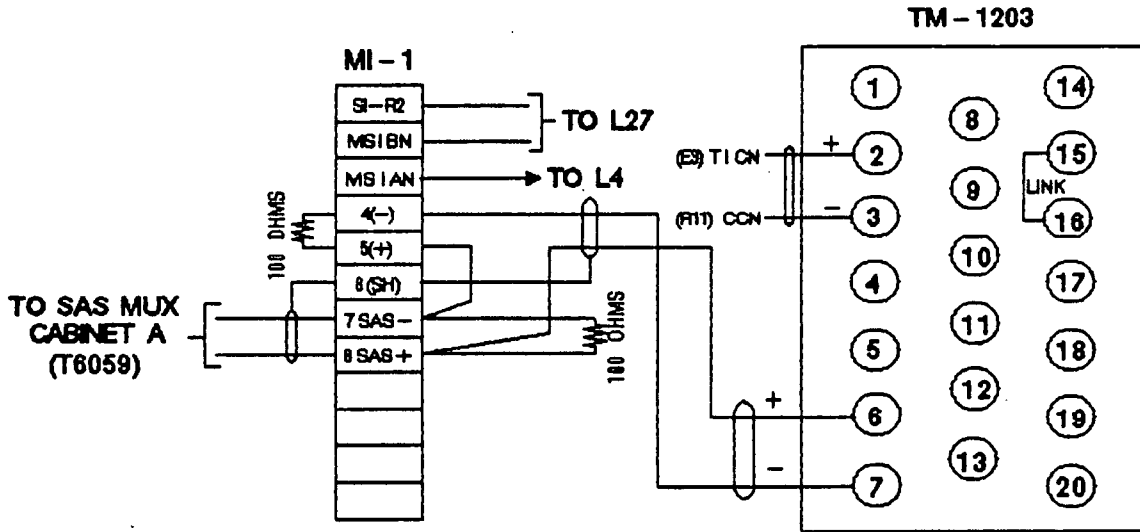
REVISION

0

Issued for record.

Incorporated  
FEI-880041  
Rev. 1

**DESIGN DETAIL**



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R12,, POINTS 23 (POS), 24 (NEG), AND 25 (SHIELD).

REF. DWG.: 204B37, A225546, A227015, A208823  
REF. SKETCH: SAS - REF

REF. UDC: FEI - 860041 REV. 1

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>W/A</i> DATE	
CONTAINMENT TEMPERATURE (TT - 1203)	S	C&I	SKETCH NO. SAS - 23 REV. 1 SH. 1 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 8/13/87	
CHECKED BY: <i>King Fook</i>		ENG. <i>VAN</i> DATE 8-13-87	

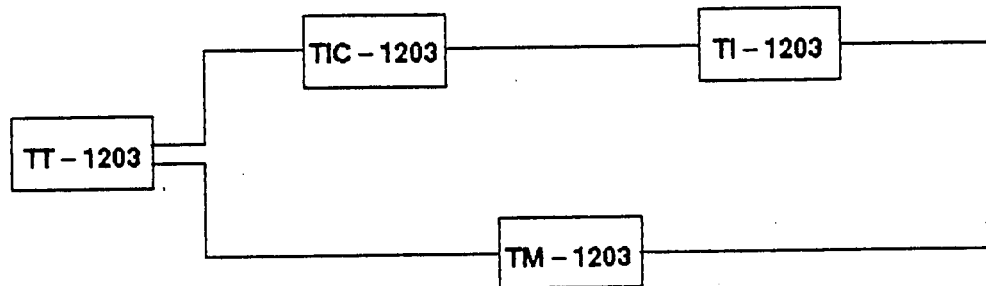
REVISION

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Issued for record.

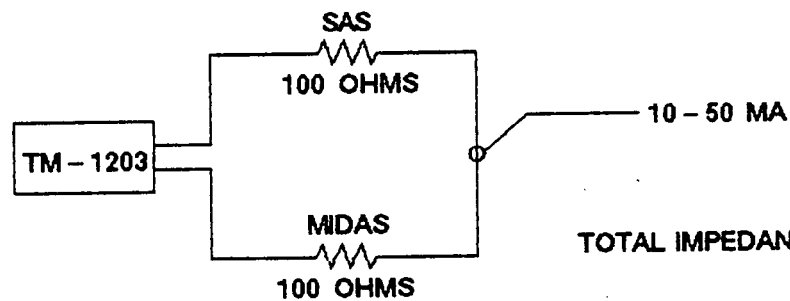
Incorporated  
FEI-860041  
Rev. 1

IMPEDANCE CALCULATION

TT-1203 CIRCUIT



TM-1203 CIRCUIT (Z EQUIV)



TOTAL IMPEDANCE (OHMS) = 100 + 100 = 200

ENGINEERING JUSTIFICATION:

TM-1203 IS A FOXBORO 66BT-OH CURRENT REPEATER/ISOLATOR, AND PROVIDES A 10-50 MA OUTPUT INTO 660 OHMS. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (200 OHMS), FALLS WITHIN THE LOAD LIMIT (660 OHMS).

THIS CHANNEL HAS BEEN DESIGNATED AS A TYPE D VARIABLE PER NUREG 1.97 REV. 3, AND DOES NOT REQUIRE ENVIRONMENTAL OR SEISMIC QUALIFICATION.

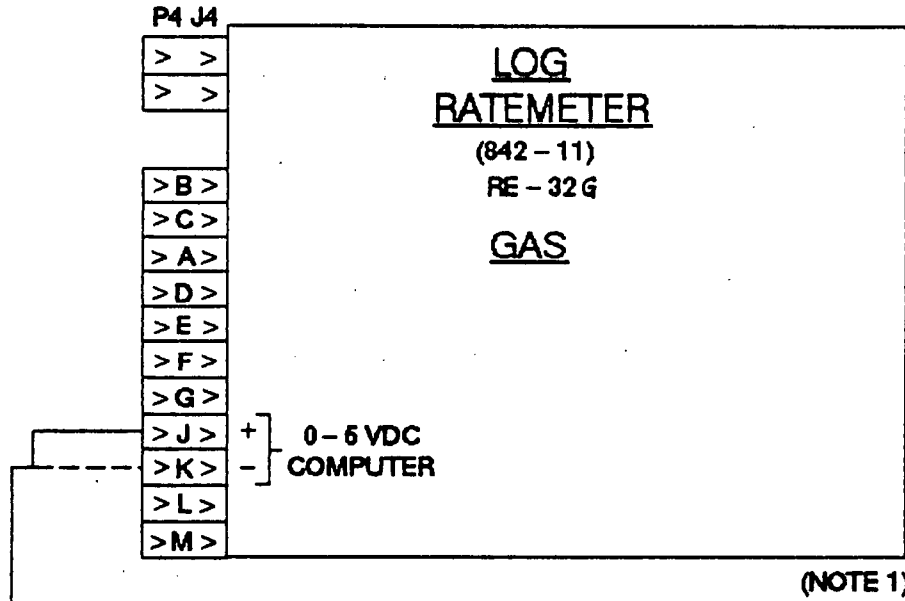
STATION: INDIAN POINT 2	A P P R V E L S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. N/A DATE	
CONTAINMENT TEMPERATURE (TT-1203)		C&I	SKETCH NO. SAS-23 REV. 1 SH. 2 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. TM DATE 8/13/87	
CHECKED BY: King Lock		ENG. VSD DATE 8-13-87	

REVISION

0

Issued for record.

DESIGN DETAIL



(NOTE 1)

- NOTE: 1. EXISTING CONNECTIONS TO LOG RATEMETER NOT SHOWN  
 2. SAS SIGNAL DESTINATION: BTSCA 01R01, POINTS 2 (POS.), 3 (NEG.), AND 4 (SHIELD).

ENGINEERING JUSTIFICATION

THE VICTOREEN LOG RATEMETER 842-11 PROVIDES A 0-5 VDC ( $\pm 2\%$ ) COMPUTER OUTPUT (SEE PAGE 14, TABLE 3 OF REFERENCE 35). THE SAS INPUT CAN BE WIRED IN PARALLEL WITH THE EXISTING PROTEUS INPUT AND THE TIGRAPH '100' GRAPHIC DISPLAY.

THIS RAD SYSTEM IS NOT SAFETY RELATED, AND DOES NOT REQUIRE ISOLATION.

REF. DWG.: A209855  
 REF. SKETCH: SAS - REF

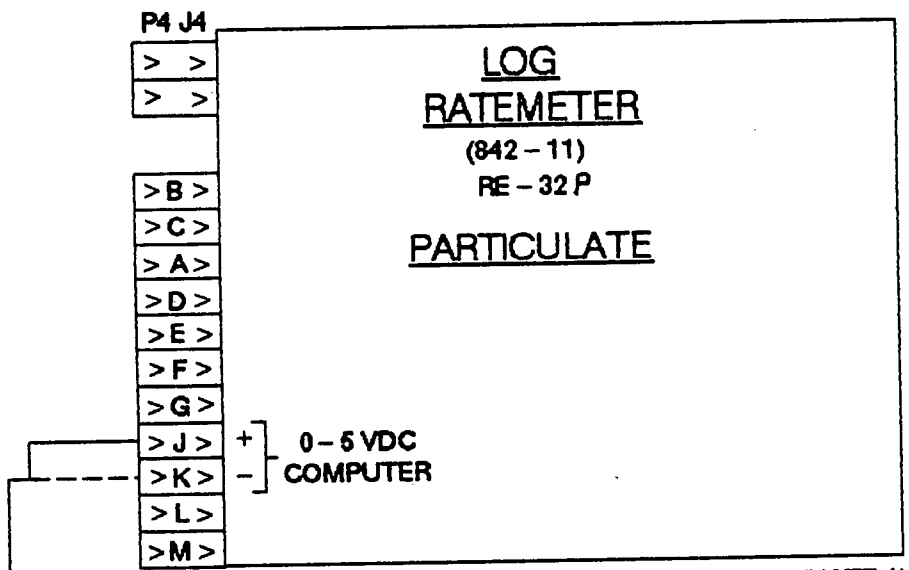
STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
CCR RADIATION - GAS (RE-32G)		C&I	SKETCH NO. SAS-24 REV. 0 SH. 1 OF 1
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 8/13/87	
CHECKED BY: <i>King Lock</i>		ENG. <i>VAD</i> DATE 8-13-87	



REVISION

0  
Issued for  
record.

DESIGN DETAIL



(NOTE 1)

- NOTE: 1. EXISTING CONNECTIONS TO LOG RATEMETER NOT SHOWN  
 2. SAS SIGNAL DESTINATION: BTSCA 01R01, POINTS 6 (POS.), 7 (NEG.), AND 8 (SHIELD).

ENGINEERING JUSTIFICATION

THE VICTOREEN LOG RATEMETER 842-11 PROVIDES A 0-5 VDC ( $\pm 2\%$ ) COMPUTER OUTPUT (SEE PAGE 14, TABLE 3 OF REFERENCE 35). THE SAS INPUT CAN BE WIRED IN PARALLEL WITH THE EXISTING PROTEUS INPUT AND THE TIGRAPH '100' GRAPHIC DISPLAY.

THIS RAD SYSTEM IS NOT SAFETY RELATED, AND DOES NOT REQUIRE ISOLATION.

REF. DWG.: A209855  
 REF. SKETCH: SAS - REF

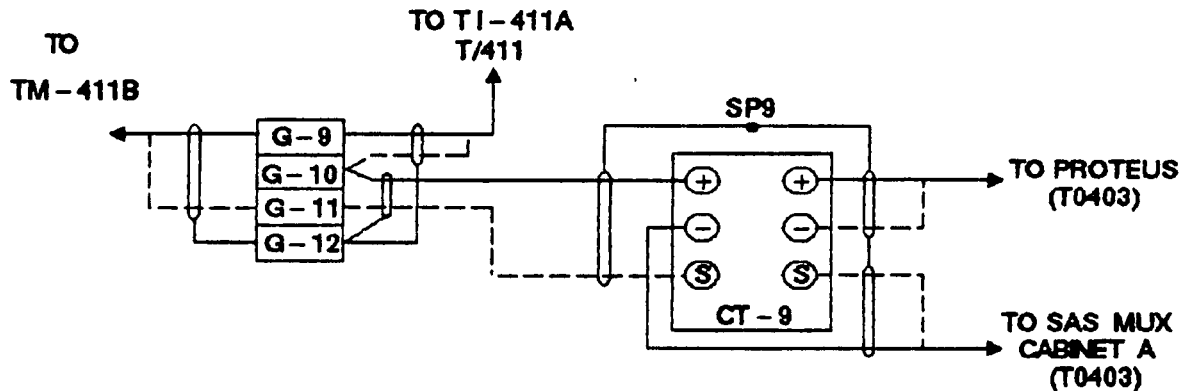
STATION: INDIAN POINT 2	APP R V L S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
CCR RADIATION - PARTICULATE (RE - 32P)		C&I	SKETCH NO. SAS - 25 REV. 0 SH. 1 OF 1
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>8/13/87</i>	
CHECKED BY: <i>King Lake</i>		ENG. <i>VAD</i> DATE <i>8-13-87</i>	

REVISION

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Issued for record.

**DESIGN DETAIL**



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R14, POINTS 31 (POS.), 32 (NEG.), AND 33 (SHIELD).

REF. DWGS.: A225396, A225313

REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON</b>
TITLE SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
RCL 21 DELTA T (TM-411B)		C&J	<b>C&amp;J SKETCH</b>
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>3/17/87</i>	SKETCH NO. SAS-28
CHECKED BY: <i>King Loh</i>	ENG. <i>VAS</i> DATE <i>3/17/87</i>	REV. 0 SH. 1 OF 2	

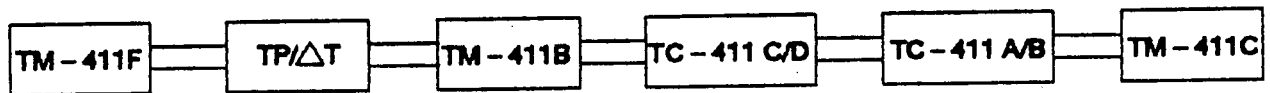
REVISION

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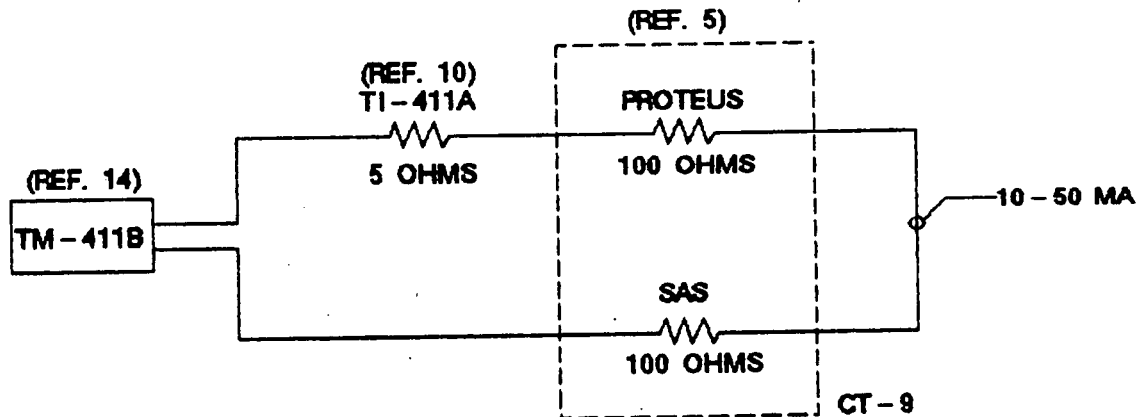
Issued for record.

# IMPEDANCE CALCULATION

## TM-411F REACTOR PROTECTION CIRCUIT



## TM-411B REACTOR CONTROL CIRCUIT (Z EQUIV.)



TOTAL IMPEDANCE (OHMS) = 5 + 100 + 100 = 205

### ENGINEERING JUSTIFICATION:

TM-411F IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. TM-411B (FOXBORO 86GR-OW) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A LOAD UP TO 660 OHMS. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (205 OHMS), FALLS WITHIN THE LOAD LIMIT (660 OHMS).

STATION: INDIAN POINT 2  
 TITLE: SAS COMPUTER INTERFACE  
 RCL 21 DELTA T (TM-411B)  
 SKETCHED BY: VICTOR S. D'AMORE  
 CHECKED BY: *King Lake*

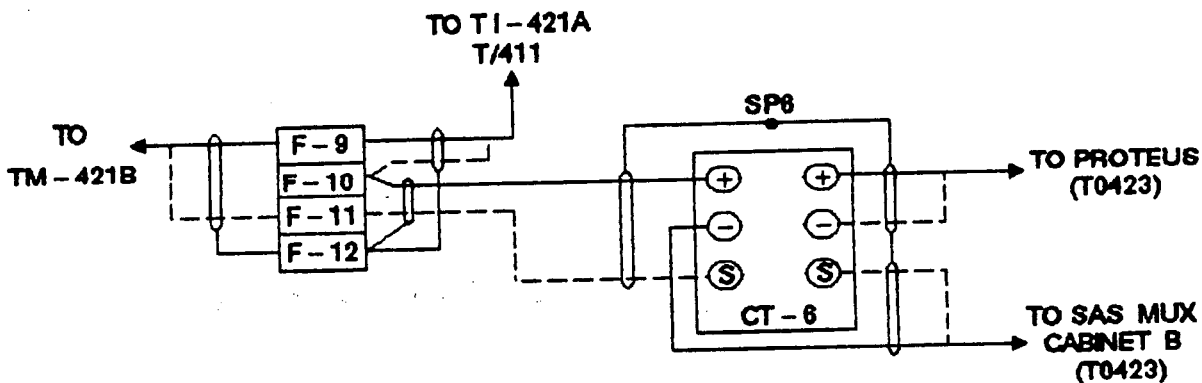
MECH. PROGRAM  
 ENG. N/A DATE  
 C&I  
 ENG. TM DATE 3/17/87  
 ENG. VAS DATE 3/17/87

**CON EDISON ENG.**  
**C&I SKETCH**  
 SKETCH NO. SAS-26  
 REV. 0 SH. 2 OF 2

REVISION

0  
Issued for record.

DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R14, POINTS 14 (POS.), 16 (NEG.), AND 16 (SHIELD).

REF. DWGS.: A225396, A225333

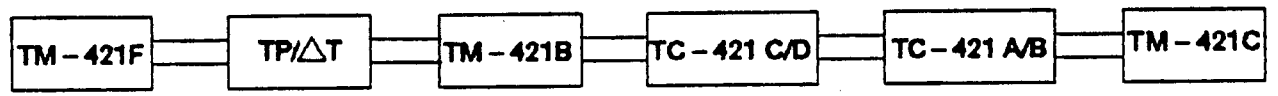
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
RCL 22 DELTA T (TM-421B)		C&I	SKETCH NO. SAS - 27
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>3/17/87</i>	
CHECKED BY: <i>King</i>		ENG. <i>VSD</i> DATE <i>3/17/87</i>	

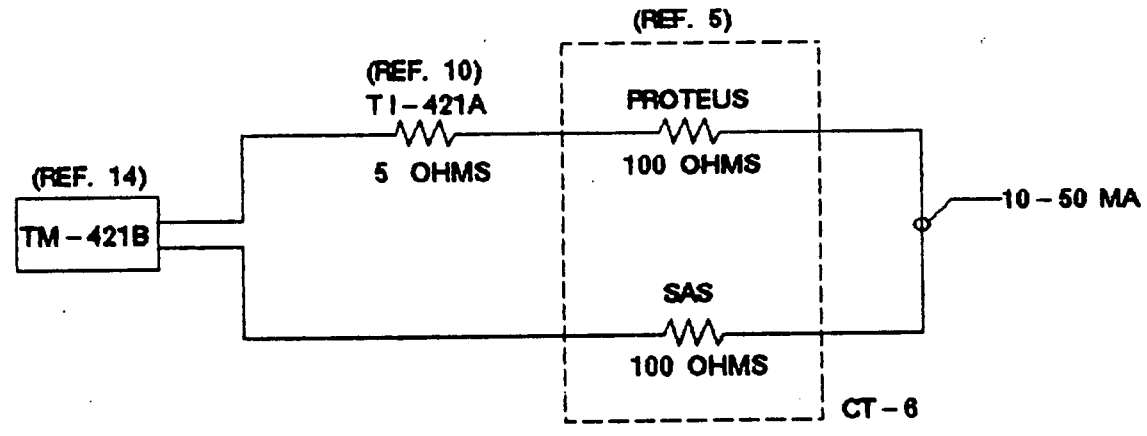
REVISION  
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Issued for record.

# IMPEDANCE CALCULATION

## TM-421F REACTOR PROTECTION CIRCUIT



## TM-421B REACTOR CONTROL CIRCUIT (Z EQUIV.)



TOTAL IMPEDANCE (OHMS) = 5 + 100 + 100 = 205

### ENGINEERING JUSTIFICATION:

TM-421F IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. TM-421B (FOXBORO 66GR-OW) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A LOAD UP TO 660 OHMS. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (205 OHMS), FALLS WITHIN THE LOAD LIMIT (660 OHMS).

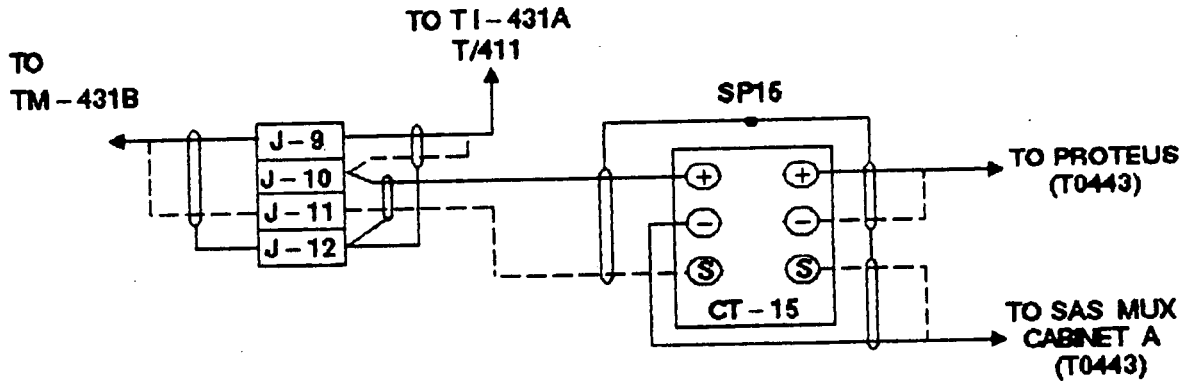
STATION: INDIAN POINT 2 TITLE: SAS COMPUTER INTERFACE RCL 22 DELTA T (TM-421B) SKETCHED BY: VICTOR S. D'AMORE CHECKED BY: <i>King Lake</i>	APP P R V L S	MECH. PROGRAM ENG. N/A DATE C&I ENG. TM DATE 3/17/87 ENG. VAD DATE 3/17/87	<b>CON EDISON</b>	ENG. <b>C&amp;I SKETCH</b> SKETCH NO. SAS-27 REV. 0 SH. 2 OF 2
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REVISION

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**DESIGN DETAIL**



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R15, POINTS 27 (POS.), 28 (NEG.), AND 29 (SHIELD).

REF. DWGS.: A225396, A225353

REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	A P P R V E S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
RCL 23 DELTA T (TM-431B)		C&I	SKETCH NO. SAS - 28 REV. 0 SH. 1 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>3/17/87</i>	
CHECKED BY: <i>King Lock</i>		ENG. <i>VAS</i> DATE <i>3/17/87</i>	

REVISION

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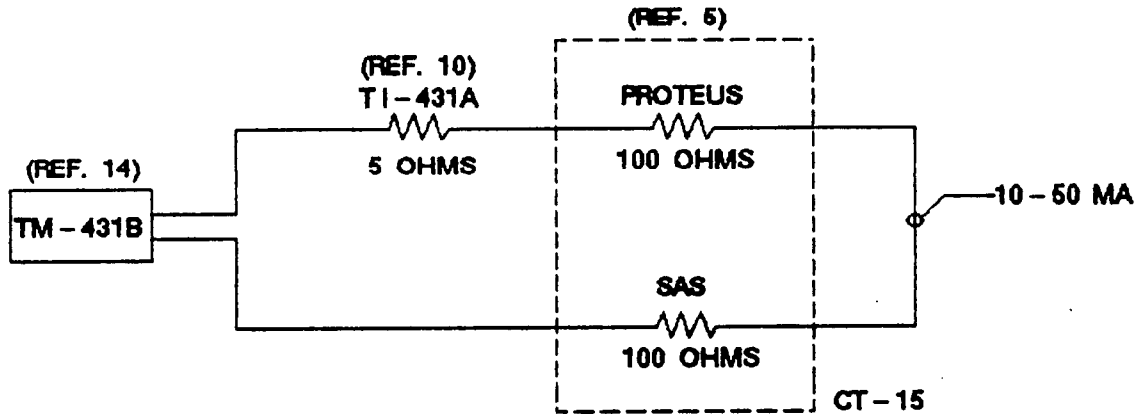
Issued for record.

**IMPEDANCE CALCULATION**

TM-431F REACTOR PROTECTION CIRCUIT



TM-431B REACTOR CONTROL CIRCUIT (Z EQUIV.)



TOTAL IMPEDANCE (OHMS) = 5 + 100 + 100 = 205

**ENGINEERING JUSTIFICATION:**

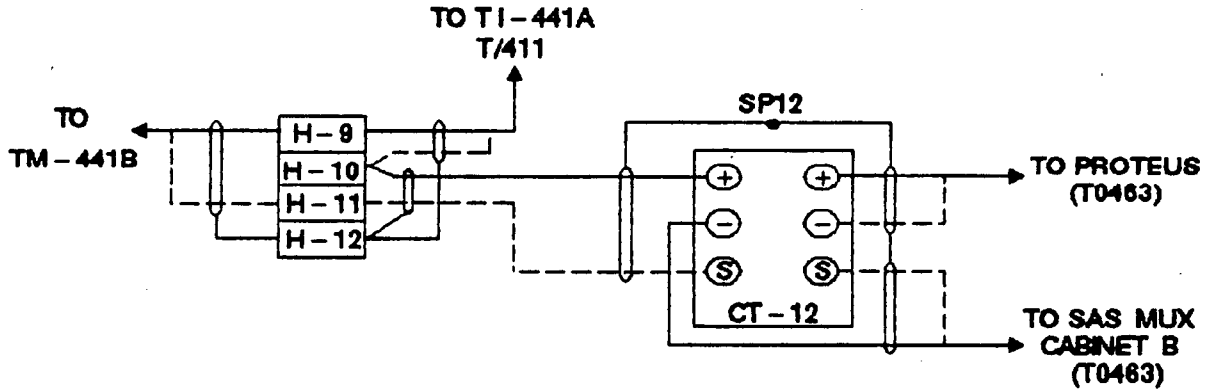
TM-431F IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. TM-431B (FOXBORO 68GR-OW) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A LOAD UP TO 660 OHMS. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (205 OHMS), FALLS WITHIN THE LOAD LIMIT (660 OHMS).

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM ENG. <i>N/A</i> DATE	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		C&I ENG. <i>TM</i> DATE <i>3/17/87</i>	
RCL 23 DELTA T (TM-431B)		ENG. <i>VAS</i> DATE <i>3/17/87</i>	SKETCH NO. SAS-28
SKETCHED BY: VICTOR S. D'AMORE			REV. 0 SH. 2 OF 2
CHECKED BY: <i>King Lusk</i>			

REVISION

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 Issued for record.

**DESIGN DETAIL**



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R16, POINTS 10 (POS.), 11 (NEG.), AND 12 (SHIELD).

REF. DWGS.: A226386, A226368

REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON</b>
TITLE SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
RCL 24 DELTA T (TM-441B)		ENG. <i>TM</i> DATE 3/17/87	SKETCH NO. SAS-29 REV. 0 SH. 1 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>VAD</i> DATE 3/17/87	
CHECKED BY: <i>King Lake</i>			



REVISION

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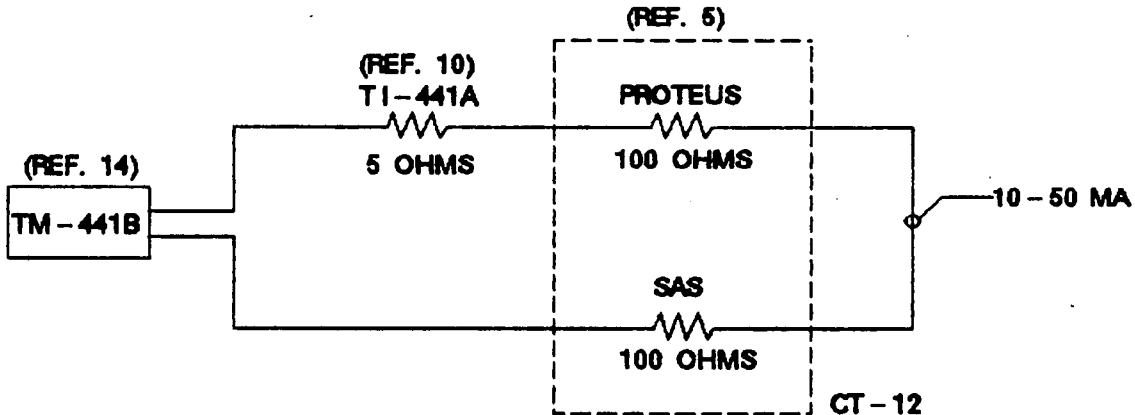
Issued for record.

# IMPEDANCE CALCULATION

TM-441F REACTOR PROTECTION CIRCUIT



TM-441B REACTOR CONTROL CIRCUIT (Z EQUIV.)



TOTAL IMPEDANCE (OHMS) = 5 + 100 + 100 = 205

ENGINEERING JUSTIFICATION:

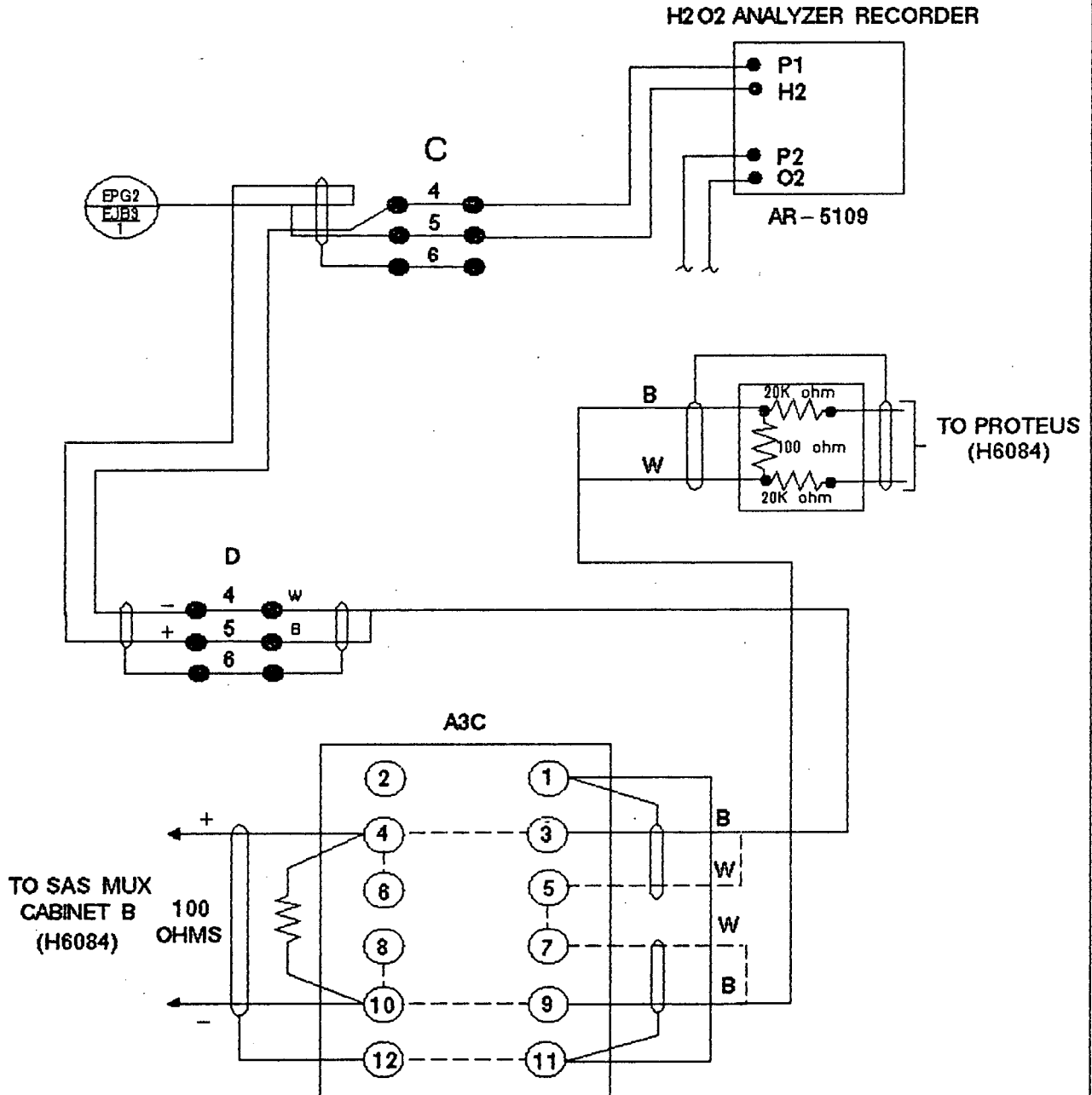
TM-441F IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. TM-441B (FOXBORO 66GR-OW) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A LOAD UP TO 860 OHMS. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (205 OHMS), FALLS WITHIN THE LOAD LIMIT (860 OHMS).

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM ENG. <i>N/A</i> DATE	<b>CON EDISON</b> ENG. C&I SKETCH
TITLE SAS COMPUTER INTERFACE RCL 24 DELTA T (TM-441B)		C&I ENG. <i>TM</i> DATE <i>3/17/87</i>	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>VAS</i> DATE <i>3/17/87</i>	SKETCH NO. SAS-29 REV. 0 SH. 2 OF 2
CHECKED BY: <i>King</i>			

REVISION

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Issued for record.

**DESIGN DETAIL**



- NOTE:
1. SAS SIGNAL DESTINATION: BTSCA 01R10, POINTS 6 (POS.), 7 (NEG.), AND 8 (SHIELD).
  2. THE CONTAINMENT H2 CHANNEL IS SAFETY RELATED. AN ISOLATOR WILL BE PROVIDED TO SEPARATE THE SAS AND PROTEUS COMPUTER INPUTS FROM THE SAFETY-RELATED PORTION OF THE CHANNEL.

REF. DWG.: A208838  
REF. SKETCH: SAS - REF

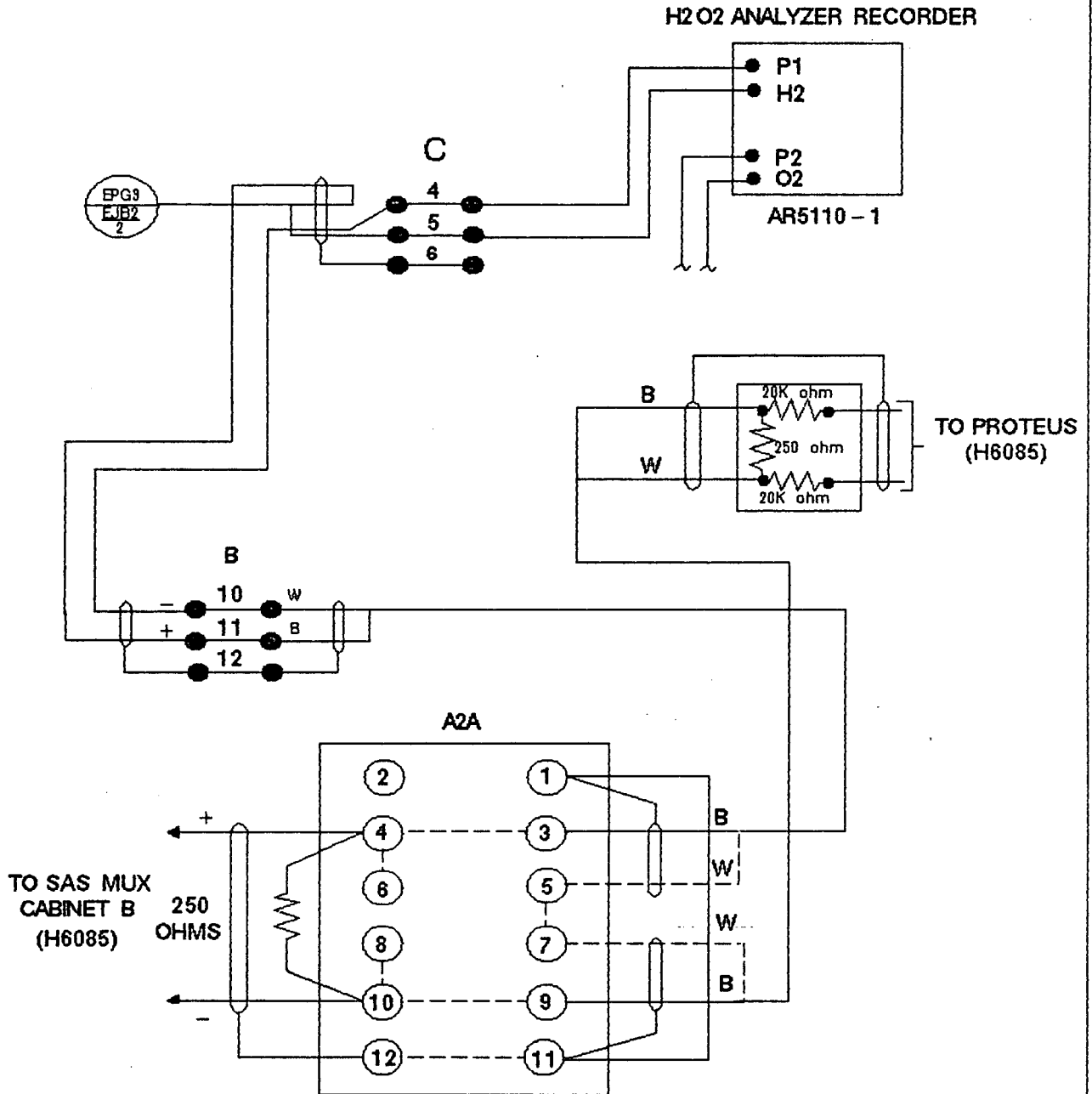
STATION: INDIAN POINT 2	A P P R V E S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
CONTAINMENT H2 (AR-5109-1)		ENG. <i>TMM</i> DATE 10/22/87	SKETCH NO. SAS-30
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>VMS</i> DATE 10/22/87	REV. 0 SH. 1 OF 1
CHECKED BY: <i>RMCV</i>			

REVISION

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Issued for record.

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Incorporated UDC 860061 Revision 0.

**DESIGN DETAIL**



NOTE:

1. SAS SIGNAL DESTINATION: BTSCA 01R01, POINTS 6 (POS.), 7 (NEG.), AND 8 (SHIELD).
2. THE CONTAINMENT H2 CHANNEL IS SAFETY RELATED. AN ISOLATOR WILL BE PROVIDED TO SEPARATE THE SAS AND PROTEUS COMPUTER INPUTS FROM THE SAFETY-RELATED PORTION OF THE CHANNEL.

REF. DWG.: A208840  
REF. SKETCH: SAS - REF

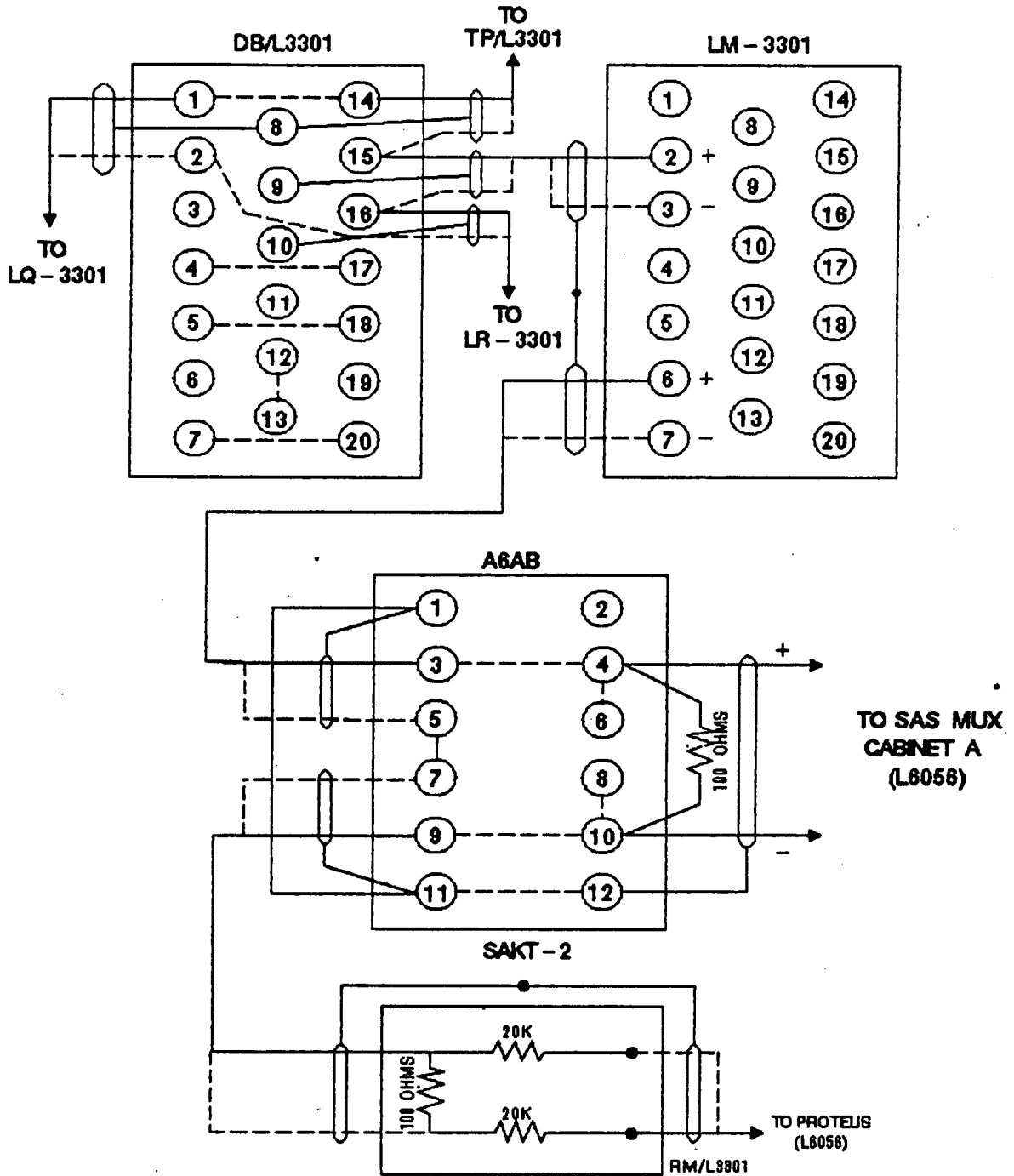
REF.: UDC 860061 REV. 0

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>VA</i> DATE	
CONTAINMENT H2 (AR-5110-1)	APPROVALS	C&I	SKETCH NO. SAS-31 REV. 1 SH. 1 OF 1
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 10/22/87	
CHECKED BY: <i>RMV</i>		ENG. <i>VA</i> DATE 10/22/87	

REVISION

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 record.

**DESIGN DETAIL**



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R02, POINTS 19 (POS.), 20 (NEG.) AND 21 (SHIELD).

REF. DWG.: A208654  
 REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
RECIRCULATION SUMP LEVEL (LT-3301)		C&I	SKETCH NO. SAS-32 REV. 0 SH. 1 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 8/13/87	
CHECKED BY: <i>King Cook</i>		ENG. <i>VAD</i> DATE 8-13-87	

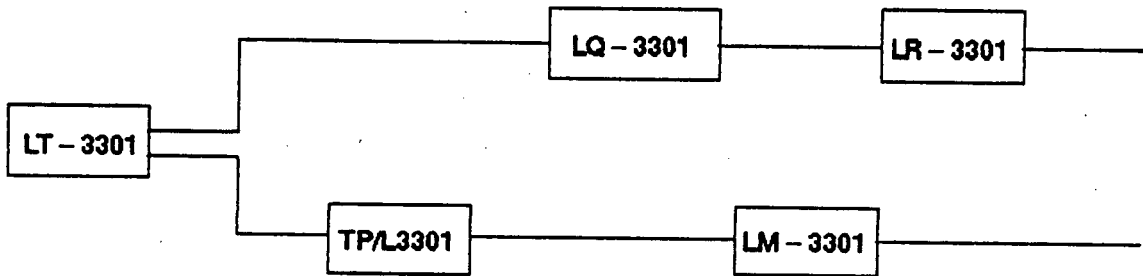
REVISION

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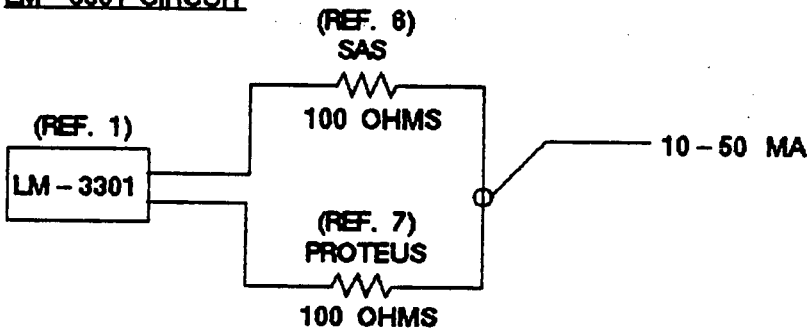
Issued for record.

**IMPEDANCE CALCULATION**

LT-3301 CIRCUIT



LM-3301 CIRCUIT



TOTAL IMPEDANCE (OHMS) = 100 + 100 = 200

**ENGINEERING JUSTIFICATION:**

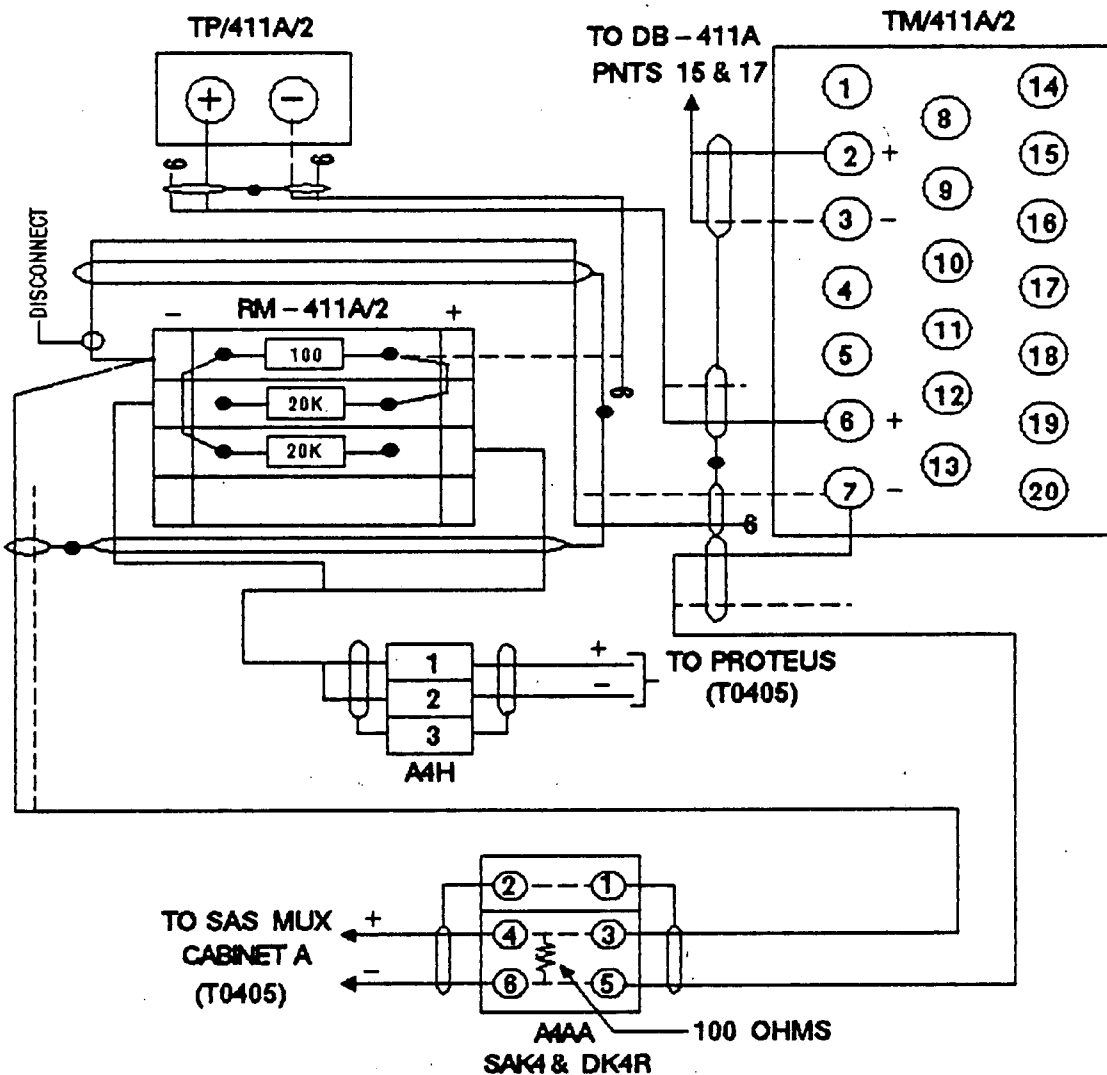
THE LT-3301 CIRCUIT IS DESIGNATED AS A TYPE A VARIABLE, THEREFORE, THE SAS INPUT CAN NOT BE DERIVED HERE. LM-3301 IS A FOXBORO 86BT-OH ISOLATOR, PROVIDING 10-50 MA INTO 660 OHMS. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE INPUT (100 OHMS), THE TOTAL IMPEDANCE (200 OHMS), FALLS WITHIN THE LOAD LIMIT (660 OHMS).

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG.</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
RECIRCULATION SUMP LEVEL (LT-3301)		C&I	SKETCH NO. SAS-32
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 8/13/87	
CHECKED BY: <i>King Lock</i>		ENG. <i>VAD</i> DATE 8-13-87	

REVISION

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record.

**DESIGN DETAIL**



NOTE: 1. SAS SIGNAL DESTINATION: BTSCA 01R02, POINTS 10 (POS.), 11 (NEG.), AND 12 (SHIELD).

REF. DWG.: A225314  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON</b> <b>EDISON ENG.</b> <b>C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
LOOP 1 HOT LEG TEMP WR (TE411A/1)		C&I	SKETCH NO. SAS - 33
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>4/17/87</i>	
CHECKED BY: <i>King Toole</i>		ENG. <i>VAD</i> DATE <i>4-17-87</i>	

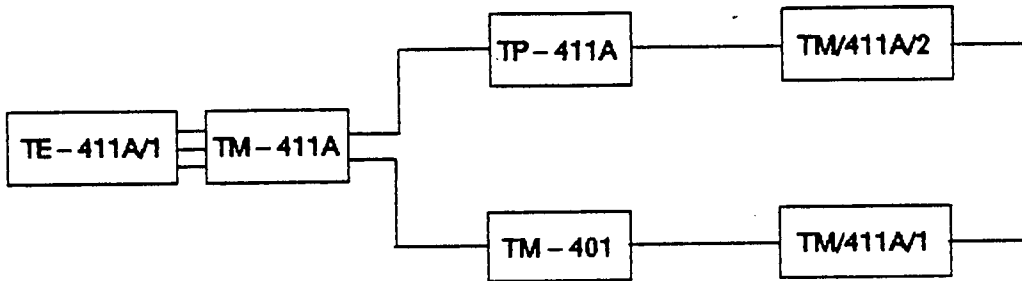
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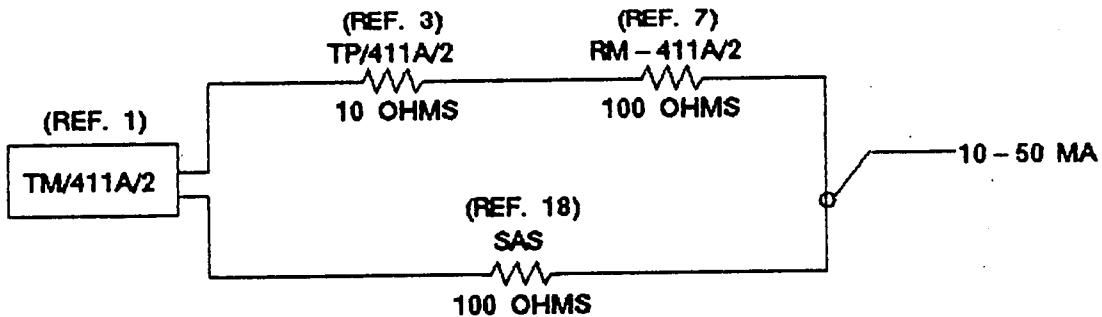
Issued for record.

**IMPEDANCE CALCULATION**

TE-411A/1 CIRCUIT:



TM/411A/2 CIRCUIT (Z EQUIV):



TOTAL IMPEDANCE (OHMS) = 10 + 100 + 100 = 210 OHMS

ENGINEERING JUSTIFICATION:

THE TE411A/1 CIRCUIT HAS BEEN DESIGNATED AS A TYPE A VARIABLE (VARIABLE REQUIRED FOR EVENT IDENTIFICATION), THEREFORE, THE SAS INPUT CAN NOT BE IMPLEMENTED HERE. TM/411A/2 (FOXBORO 86BT-OH) SERVES AS AN I/I ISOLATOR IN THIS CIRCUIT, AND PROVIDES A 10-50 MA OUTPUT INTO 660 OHMS. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (210 OHMS), FALLS WITHIN THE LOAD LIMIT.

STATION: INDIAN POINT 2  
 TITLE: SAS COMPUTER INTERFACE  
 LOOP 1 HOT LEG TEMP WR (TE411A/1)  
 SKETCHED BY: VICTOR S. D'AMORE  
 CHECKED BY: *King Look*

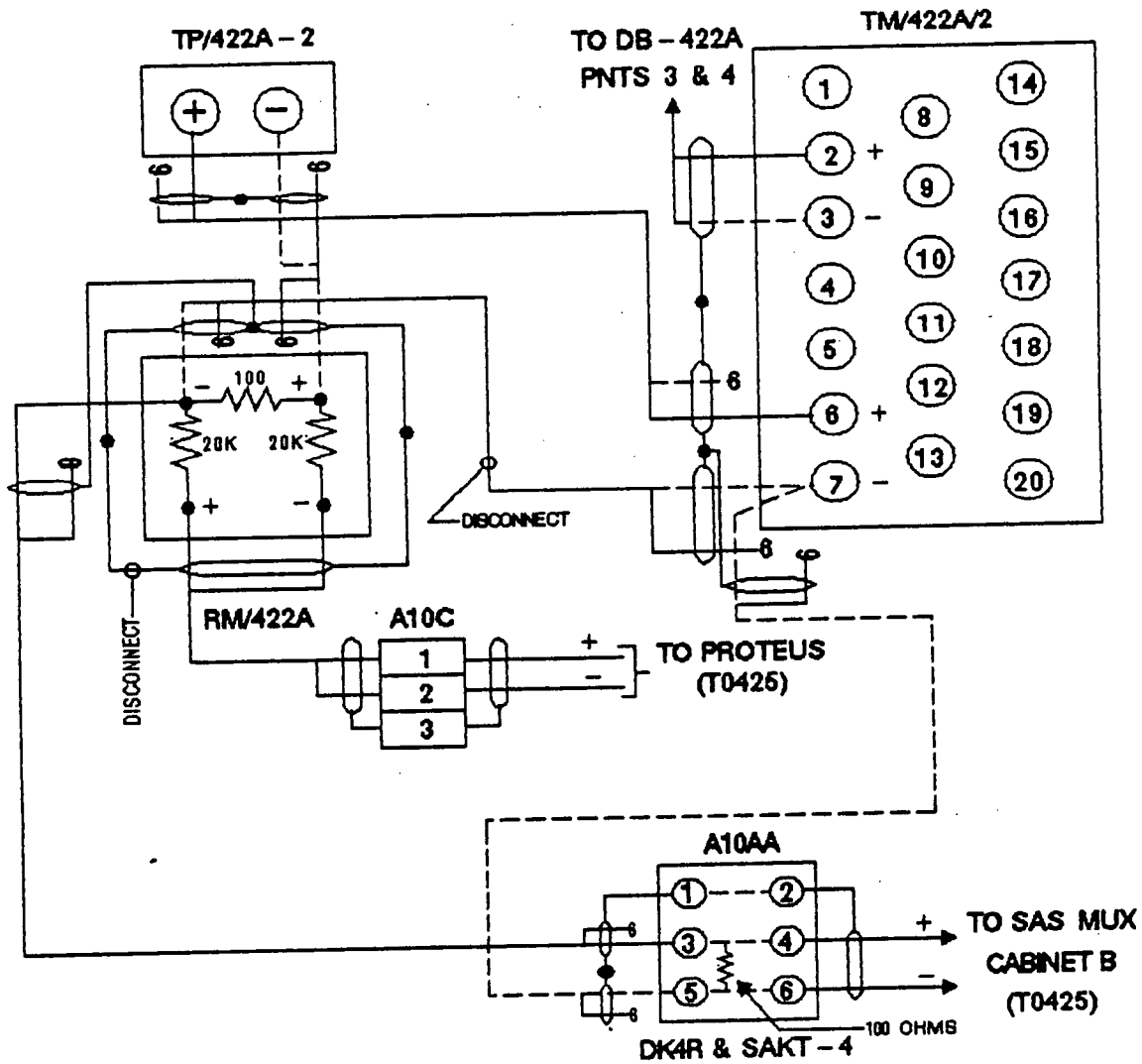
A  
P  
P  
R  
V  
E  
D  
S  
 MECH. PROGRAM  
 ENG. *N/A* DATE  
 C&I  
 ENG. *TM* DATE *4/17/87*  
 ENG. *VAD* DATE *4-17-87*

**CON EDISON ENG.**  
**C&I SKETCH**  
 SKETCH NO. SAS-33  
 REV. 0 SH. 2 OF 2

REVISION

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Issued for record.

DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R03, POINTS 10 (POS.), 11 (NEG.), AND 12 (SHIELD).

REF. DWG.: A225344, A225334  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2  
TITLE: SAS COMPUTER INTERFACE  
LOOP 2 HOT LEG TEMP WR (TE422A/1)  
SKETCHED BY: VICTOR S. D'AMORE  
CHECKED BY: *King Lock*

APPROVALS  
MECH. PROGRAM  
ENG. *N/A* DATE  
C&I  
ENG. *TM* DATE *4/17/87*  
ENG. *VSD* DATE *4-17-87*

CON EDISON ENG.  
C&I SKETCH  
SKETCH NO. SAS - 34  
REV. 0 SH. 1 OF 2



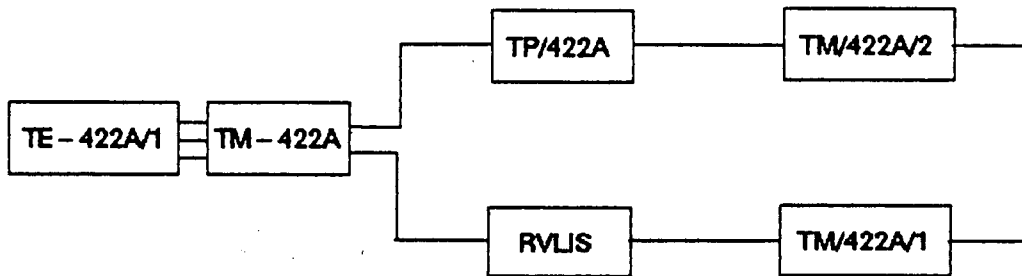
REVISION

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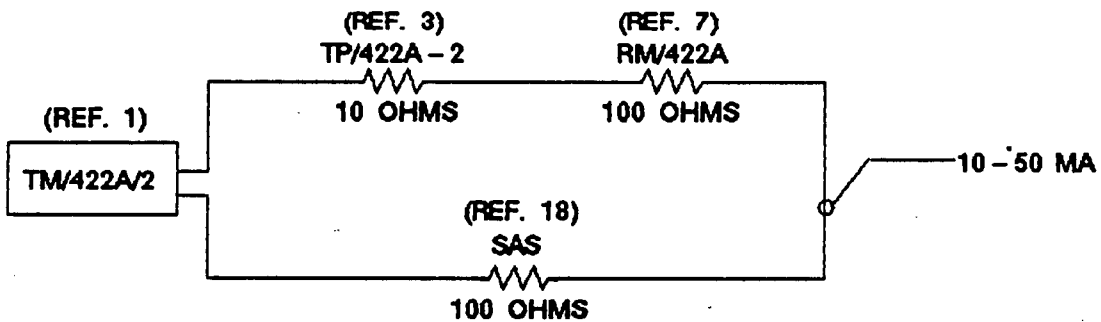
Issued for record.

**IMPEDANCE CALCULATION**

TE-422A/1 CIRCUIT:



TM/422A/2 CIRCUIT (Z EQUIV):



TOTAL IMPEDANCE (OHMS) = 10 + 100 + 100 = 210 OHMS

ENGINEERING JUSTIFICATION:

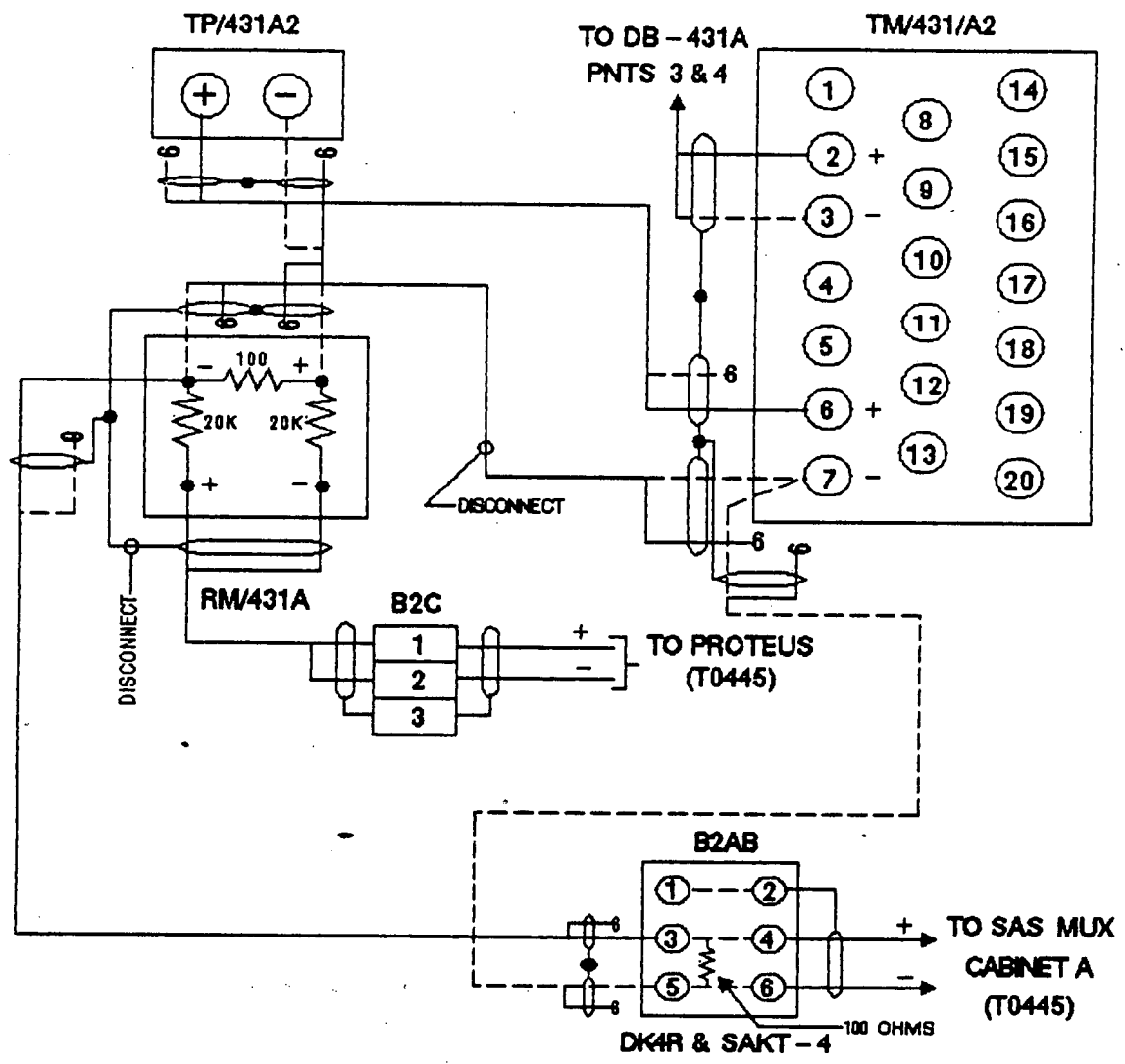
THE TE422A/1 CIRCUIT HAS BEEN DESIGNATED AS A TYPE A VARIABLE (VARIABLE REQUIRED FOR EVENT IDENTIFICATION), THEREFORE, THE SAS INPUT CAN NOT BE IMPLEMENTED HERE. TM422A/2 (FOXBORO 66BT-OH) SERVES AS AN I/I ISOLATOR IN THIS CIRCUIT, AND PROVIDES A 10-50 MA OUTPUT INTO 660 OHMS. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (210 OHMS), FALLS WITHIN THE LOAD LIMIT.

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON</b> <b>EDISON ENG.</b> <b>C&amp;I SKETCH</b>
TITLE SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
LOOP 2 HOT LEG TEMP WR (TE-422A/1)		C&I	SKETCH NO. SAS-34
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 4/17/87	
CHECKED BY: <i>King Look</i>		ENG. <i>VAD</i> DATE 4-17-87	

REVISION

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record.

**DESIGN DETAIL**



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R05, POINTS 2 (POS.), 3 (NEG.), AND 4 (SHIELD).

REF. DWG.: A225359, A225354  
REF. SKETCH: SAS - REF

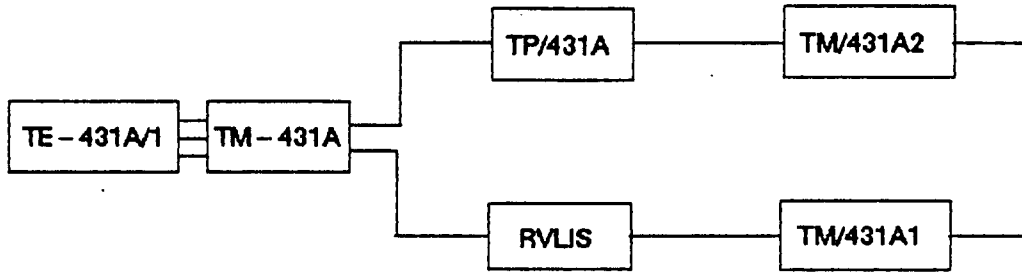
STATION: INDIAN POINT 2	A P P R V E S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
LOOP 3 HOT LEG TEMP WR (TE431A/1)		C&I	SKETCH NO. SAS - 35 REV. 0 SH. 1 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>4/17/87</i>	
CHECKED BY: <i>King Lock</i>		ENG. <i>V.S.D.</i> DATE <i>4-17-87</i>	

REVISION

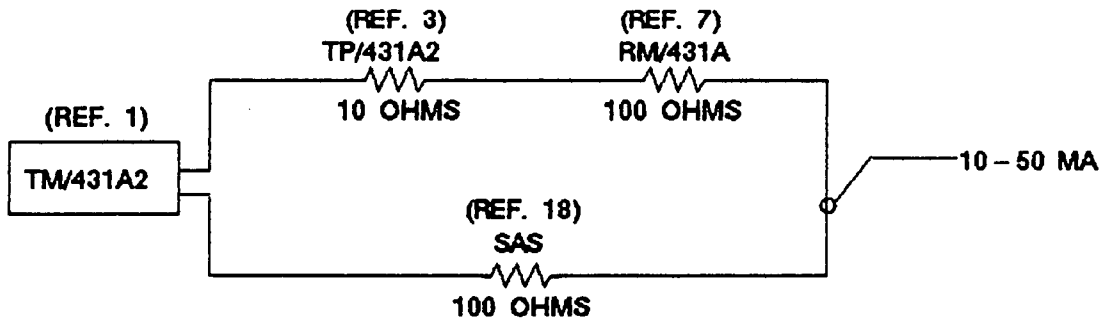
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Issued for record.

**IMPEDANCE CALCULATION**

TE-431A/1 CIRCUIT:



TM/431A2 CIRCUIT (Z EQUIV):



TOTAL IMPEDANCE (OHMS) = 10 + 100 + 100 = 210 OHMS

ENGINEERING JUSTIFICATION:

THE TE-431A/1 CIRCUIT HAS BEEN DESIGNATED AS A TYPE A VARIABLE (VARIABLE REQUIRED FOR EVENT IDENTIFICATION), THEREFORE, THE SAS INPUT CAN NOT BE IMPLEMENTED HERE. TM/431A2 (FOXBORO 86BT-OH) SERVES AS AN I/I ISOLATOR IN THIS CIRCUIT, AND PROVIDES A 10-50 MA OUTPUT INTO 660 OHMS. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (210 OHMS), FALLS WITHIN THE LOAD LIMIT.

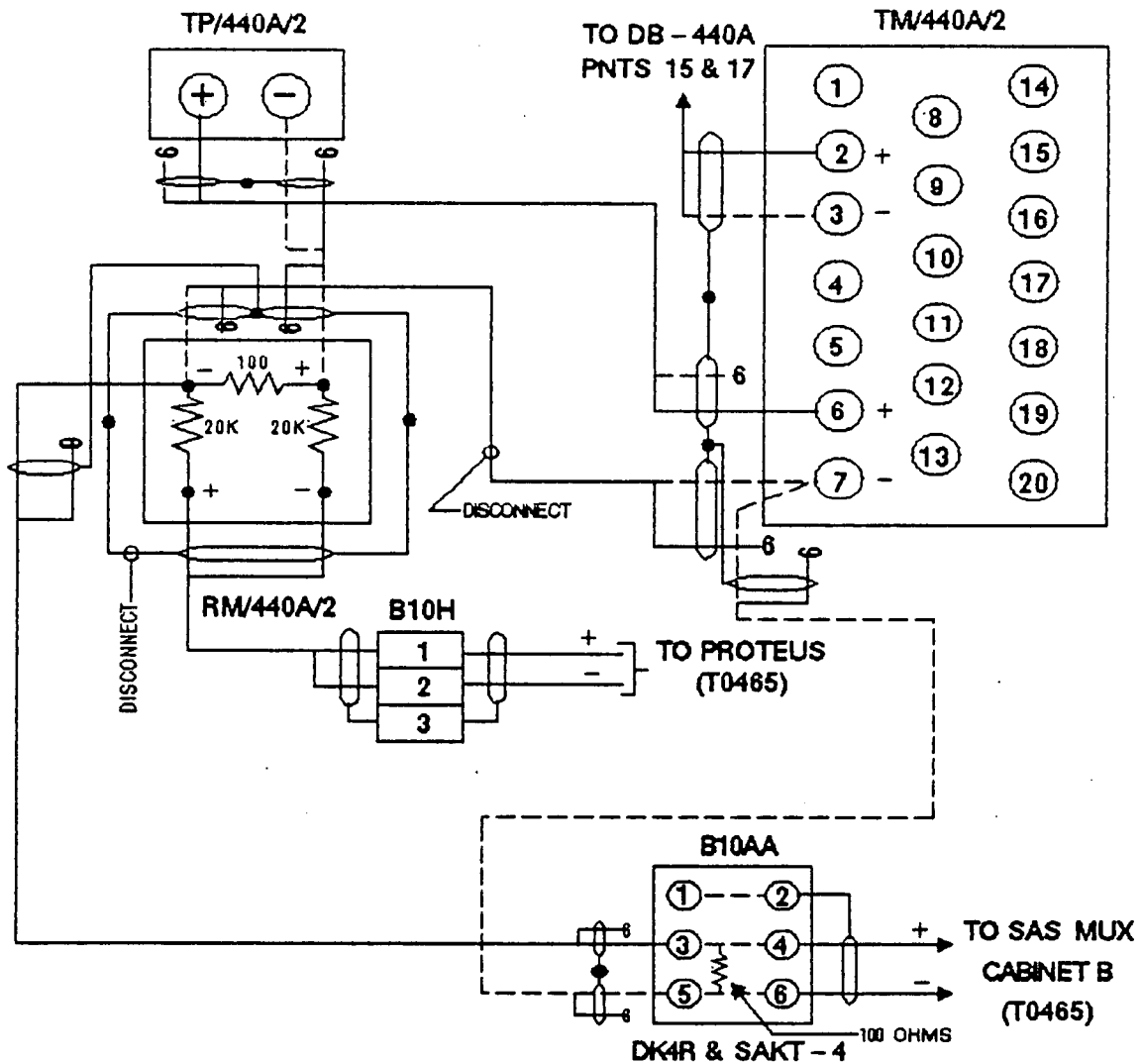
STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE SAS COMPUTER INTERFACE		ENG. N/A DATE	
LOOP 3 HOT LEG TEMP WR (TE-431A/1)		ENG. TM DATE 4/17/87	SKETCH NO. SAS-35
SKETCHED BY: VICTOR S. D'AMORE		ENG. VAS DATE 4-17-87	REV. 0 SH. 2 OF 2
CHECKED BY: <i>King Look</i>			

REVISION

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**DESIGN DETAIL**



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R10, POINTS 2 (POS.), 3 (NEG.), AND 4 (SHIELD).

REF. DWG.: A225389  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG. C&J SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
LOOP 4 HOT LEG TEMP WR (TE440A/1)		C&J	SKETCH NO. SAS - 36
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 4/17/87	
CHECKED BY: <i>King Look</i>	ENG. <i>VAS</i> DATE 4-17-87	REV. 0 SH. 1 OF 2	

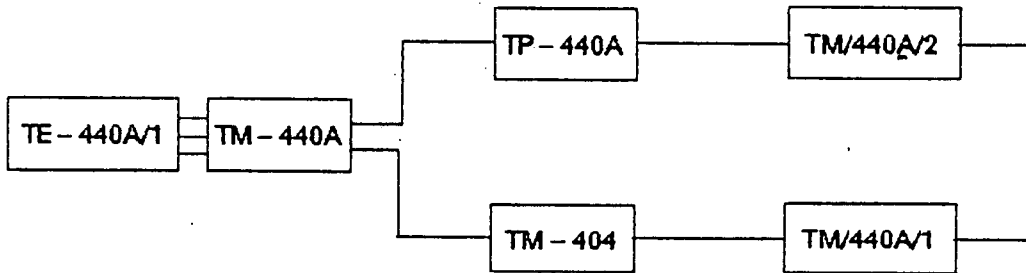
REVISION

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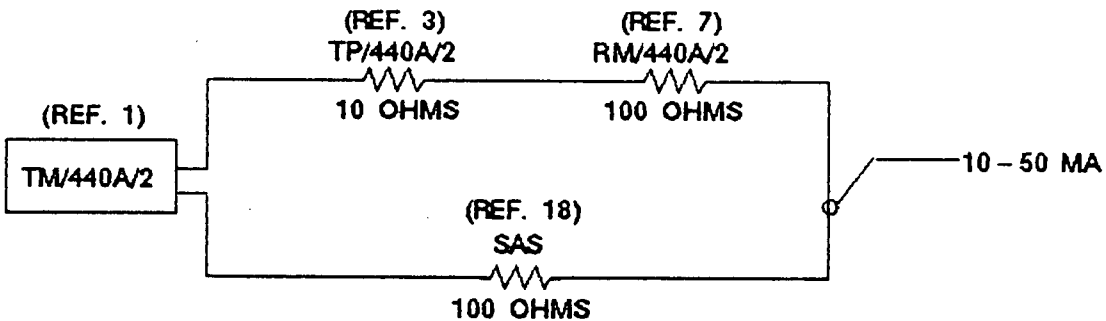
Issued for record.

IMPEDANCE CALCULATION

TE-440A/1 CIRCUIT:



TM/440A/2 CIRCUIT (Z EQUIV):



TOTAL IMPEDANCE (OHMS) = 10 + 100 + 100 = 210 OHMS

ENGINEERING JUSTIFICATION:

THE TE-440A/1 CIRCUIT HAS BEEN DESIGNATED AS A TYPE A VARIABLE (VARIABLE REQUIRED FOR EVENT IDENTIFICATION), THEREFORE, THE SAS INPUT CAN NOT BE IMPLEMENTED HERE. TM/440A/2 (FOXBORO 66BT-OH) SERVES AS AN VI ISOLATOR IN THIS CIRCUIT, AND PROVIDES A 10-50 MA OUTPUT INTO 660 OHMS. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (210 OHMS), FALLS WITHIN THE LOAD LIMIT.

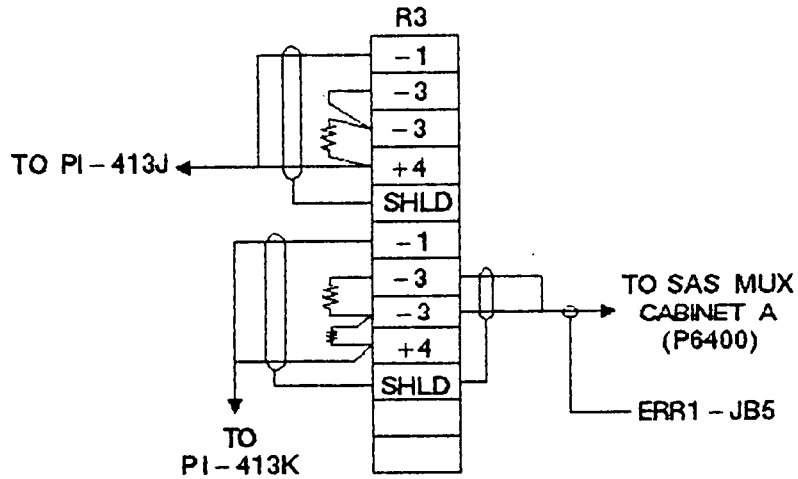
STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	<b>CON EDISON ENG.</b> C&J SKETCH SKETCH NO. SAS-36 REV. 0 SH. 2 OF 2
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
LOOP 4 HOT LEG TEMP WR (TE440A/1)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>4/17/87</i>	
CHECKED BY: <i>King Look</i>		ENG. <i>VAN</i> DATE <i>4-17-87</i>	

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FEI-860039  
Revision 0.

DESIGN DETAIL



NOTE:

1. SAS SIGNAL DESTINATION: BTSCA 01R16, POINTS 31 (POS.), 32 (NEG.), AND 33 (SHIELD).
2. ALL RESISTORS 100 OHMS (0.1 %)

REF. DWG.: A205792, 208356  
REF. SKETCH: SAS - REF

REF. UDC: FEI - 860039 Rev. 0

STATION: INDIAN POINT 2	A P P R V E S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
OVER PRESS SYSTEM PRESS (PT - 413)		C&I	SKETCH NO. SAS - 37 REV. 1 SH. 1 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 8/13/87	
CHECKED BY: <i>King Cook</i>		ENG. <i>V&amp;S</i> DATE 8.13.87	

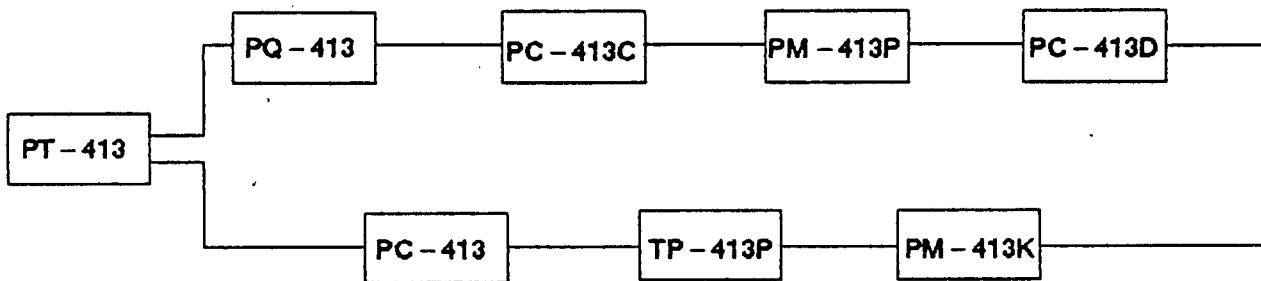
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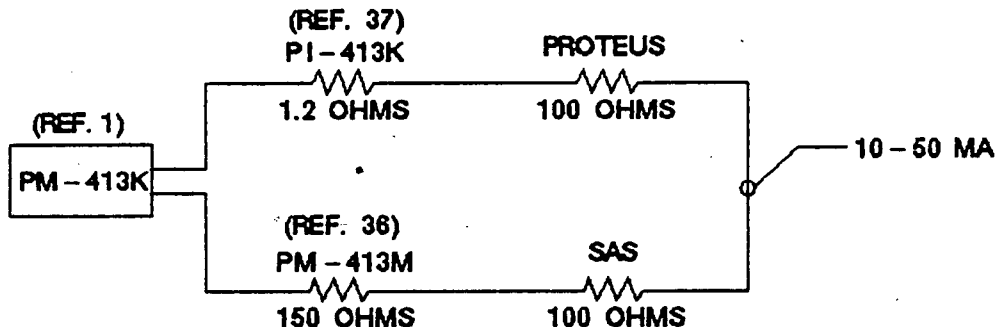
Incorporated  
FEI-880039  
Rev. 1

**IMPEDANCE CALCULATION**

**PT-413 RCS OVERPRESSURE PROTECTION CIRCUIT**



**PM-413K CIRCUIT (Z EQUIV)**



TOTAL IMPEDANCE (OHMS) = 1.2 + 100 + 100 + 150 = 351.2

**ENGINEERING JUSTIFICATION**

THE PT-413 CIRCUIT IS PART OF THE RCS OVERPRESSURE PROTECTION SYSTEM, THEREFORE, THE SAS INPUT CANNOT BE IMPLEMENTED HERE. PM-413K IS A FOXBORO 66BT-OH CURRENT REPEATER/ISOLATOR, WHICH PROVIDES A 10-50 MA OUTPUT INTO 660 OHMS. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (351.2 OHMS) FALLS WITHIN THE LOAD LIMIT (660 OHMS).

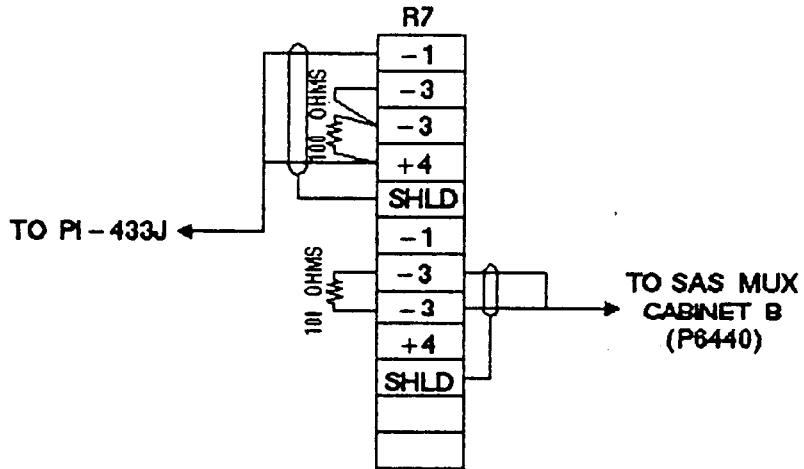
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG.
TITLE: SAS COMPUTER INTERFACE		ENG. <i>H/A</i> DATE	
OVER PRESS SYSTEM PRESS (PT-413)		C&I	SKETCH NO. SAS-37
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 8/13/87	
CHECKED BY: <i>King Lock</i>		ENG. <i>VSD</i> DATE 8.13.87	

REVISION

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 record.

INCORPORATED  
 UDC  
 FEI-860038

**DESIGN DETAIL**



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R16, POINTS 6 (POS.), 7 (NEG.), AND 8 (SHIELD).

REF. DWG.: A205792  
 REF. SKETCH: SAS - REF

REF. UDC: FEI-860038

STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
OVER PRESS SYSTEM PRESS (PT-433)		C&I	SKETCH NO. SAS-38 REV. 1 SH. 1 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>8/13/87</i>	
CHECKED BY: <i>King Look</i>		ENG. <i>VAD</i> DATE <i>8.13.87</i>	



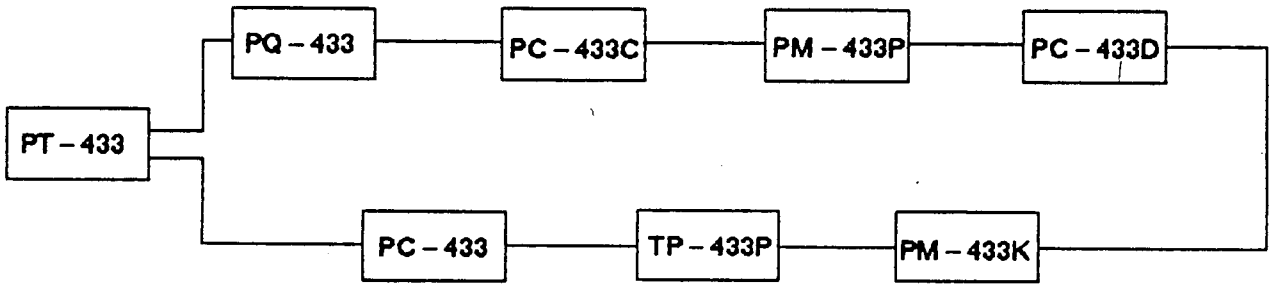
REVISION

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Issued for record.

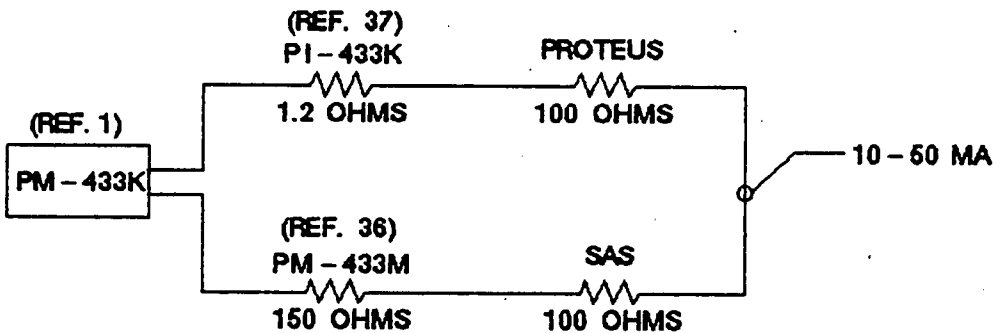
Incorporated  
FEI-880039  
Rev. 1

IMPEDANCE CALCULATION

PT-433 RCS OVERPRESSURE PROTECTION CIRCUIT



PM-433K CIRCUIT (Z EQUIV)



TOTAL IMPEDANCE (OHMS) = 1.2 + 100 + 100 + 150 = 351.2

ENGINEERING JUSTIFICATION

THE PT-433 CIRCUIT IS PART OF THE RCS OVERPRESSURE PROTECTION SYSTEM, THEREFORE, THE SAS INPUT CANNOT BE IMPLEMENTED HERE. PM-433K IS A FOXBORO 668T-OH CURRENT REPEATER/ISOLATOR, WHICH PROVIDES A 10-50 MA OUTPUT INTO 660 OHMS. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (351.2 OHMS) FALLS WITHIN THE LOAD LIMIT (660 OHMS).

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
OVER PRESS SYSTEM PRESS (PT-433)		C&J	SKETCH NO. SAS-38
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>8/13/87</i>	
CHECKED BY: <i>King Look</i>		ENG. <i>VAD</i> DATE <i>8-13-87</i>	

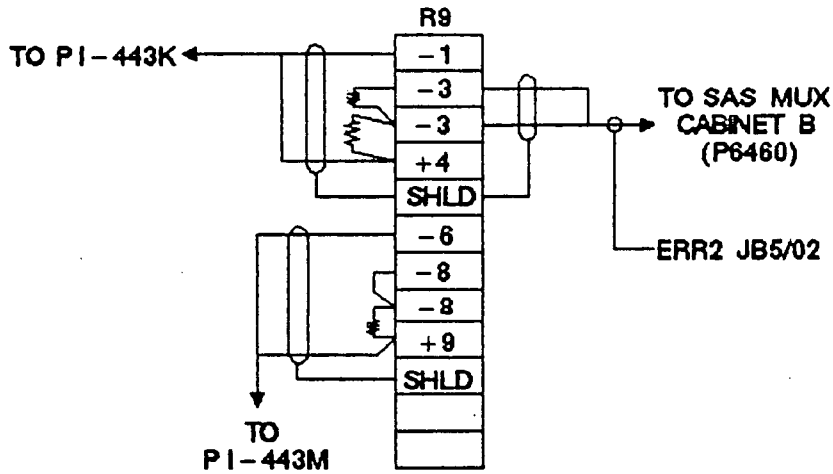
REVISION

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Issued for record.

Incorporated  
FEI-860039  
Revision 0.

DESIGN DETAIL



NOTE:

1. SAS SIGNAL DESTINATION: BTSCA 01R17, POINTS 2 (POS.), 3 (NEG.), AND 4 (SHIELD).
2. ALL RESISTORS 100 OHMS (0.1 %)

REF. DWG.: A205792, 208357  
REF. SKETCH: SAS - REF

REF. UDC: FEI-860039 Rev. 0

STATION: INDIAN POINT 2	A P P R V E S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. N/A DATE	
OVER PRESS SYSTEM PRESS (PT - 443)		C&I	SKETCH NO. SAS - 39 REV. 1 SH. 1 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. TJ DATE 8/13/87	
CHECKED BY: <i>King Lutz</i>		ENG. VAS DATE 8.13.87	

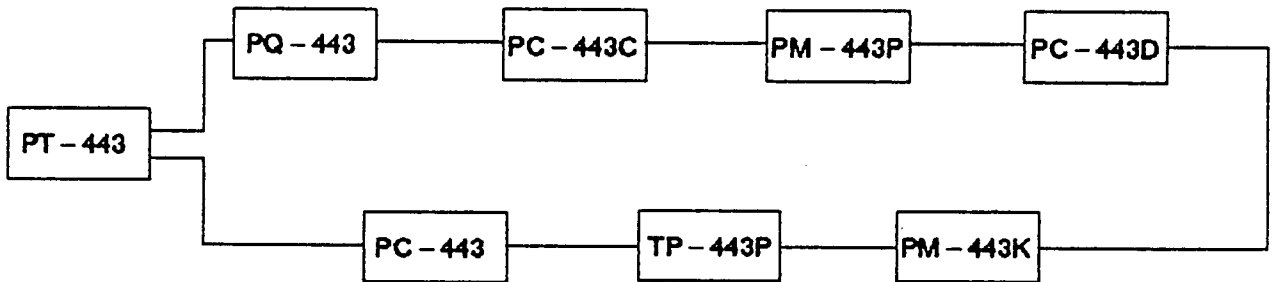
REVISION

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Issued for record.

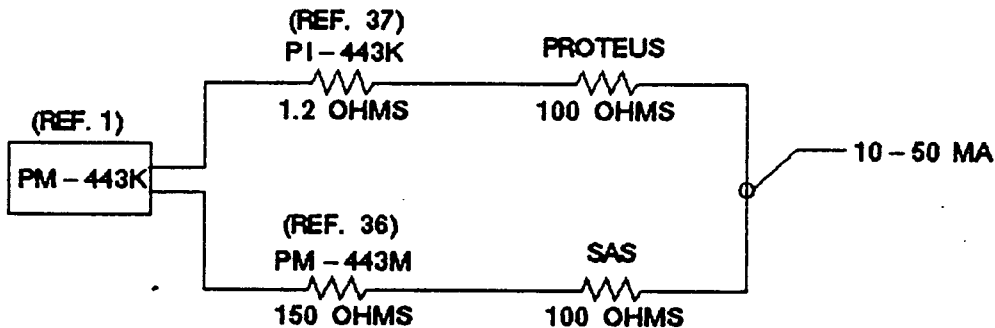
Incorporated  
FEI-860039  
Rev. 1

**IMPEDANCE CALCULATION**

PT-443 RCS OVERPRESSURE PROTECTION CIRCUIT



PM-443K CIRCUIT (Z EQUIV)



TOTAL IMPEDANCE (OHMS) = 1.2 + 100 + 100 + 150 = 351.2

ENGINEERING JUSTIFICATION

THE PT-443 CIRCUIT IS PART OF THE RCS OVERPRESSURE PROTECTION SYSTEM, THEREFORE, THE SAS INPUT CANNOT BE IMPLEMENTED HERE. PM-443K IS A FOXBORO 66BT-OH CURRENT REPEATER/ISOLATOR, WHICH PROVIDES A 10-50 MA OUTPUT INTO 660 OHMS. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (351.2 OHMS) FALLS WITHIN THE LOAD LIMIT (660 OHMS).

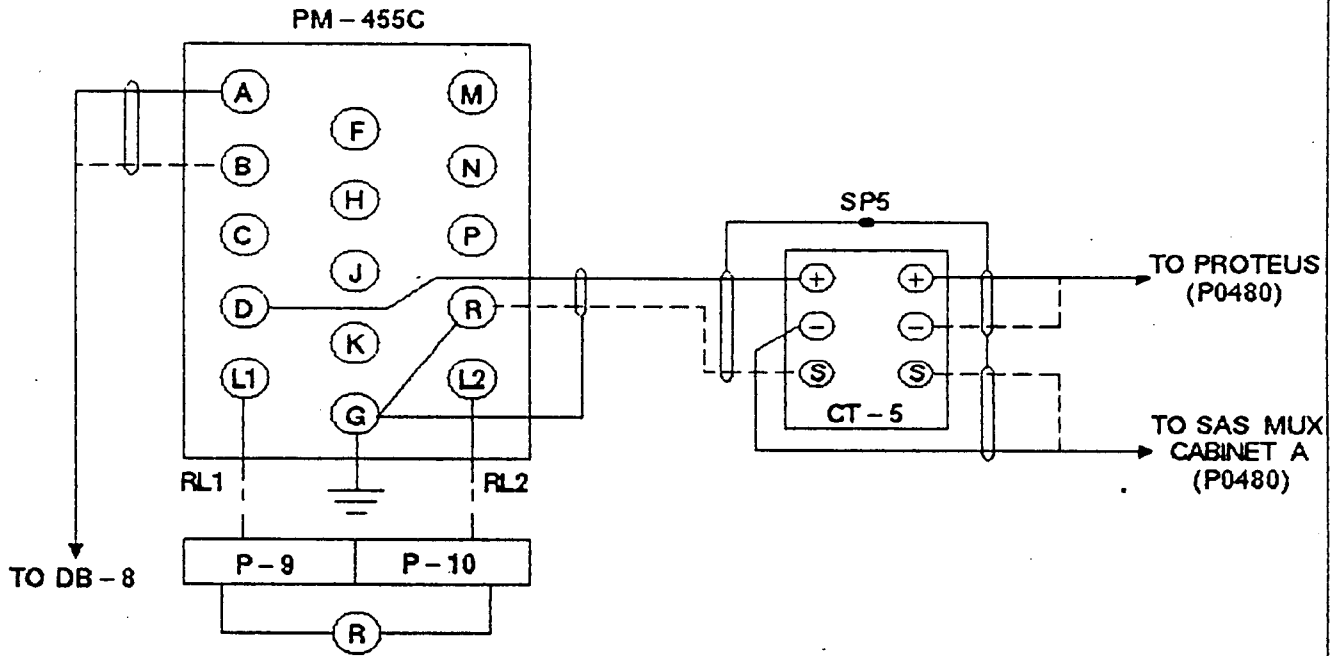
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
OVER PRESS SYSTEM PRESS (PT-443)		C&I	SKETCH NO. SAS-39
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TJ</i> DATE 8/13/87	
CHECKED BY: <i>King Look</i>		ENG. <i>VAS</i> DATE 8-13-87	

REVISION

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Issued for record.

DESIGN DETAIL



NOTE: 1. SAS SIGNAL DESTINATION: BTSCA 01R02, POINTS 23 (POS.), 24 (NEG.), AND 25 (SHIELD).

REF. DWG.: A225406, A225314  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG.	
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE		C&I SKETCH
PRESSURIZER 1 PRESS NR (P-455)	S	C&I	SKETCH NO. SAS-40	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 3/19/87		REV. 0 SH. 1 OF 2
CHECKED BY: <i>King Lake</i>		ENG. <i>VAD</i> DATE 3/17/87		

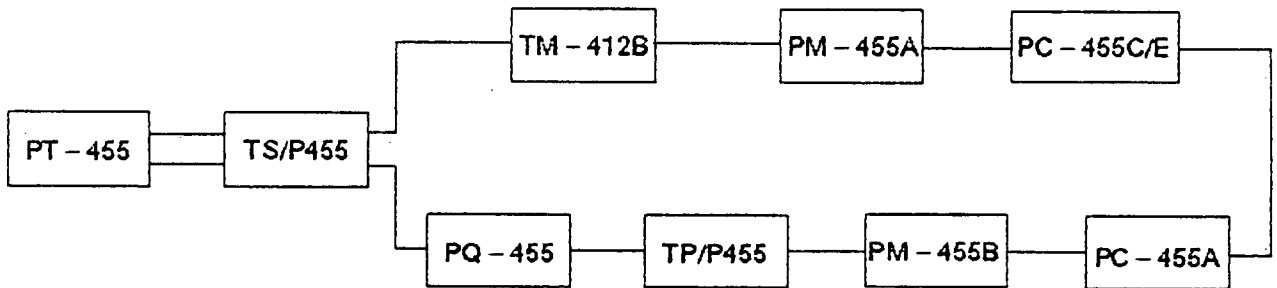
REVISION

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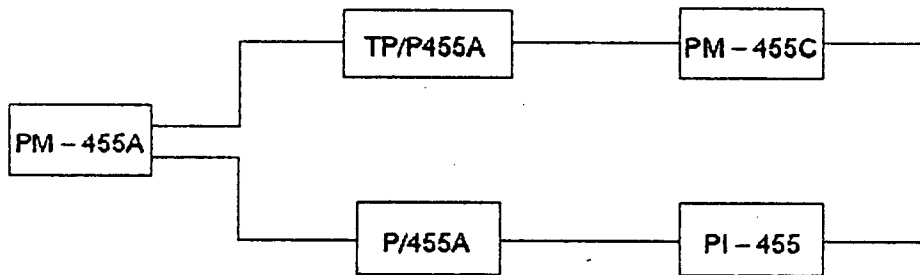
Issued for record.

# IMPEDANCE CALCULATION

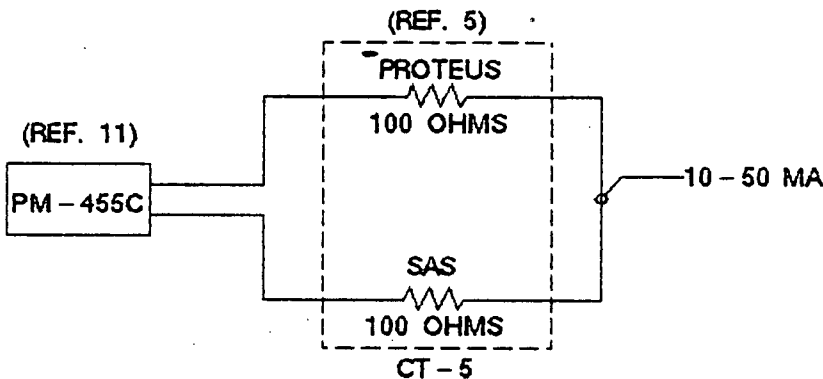
## PT-455 REACTOR PROTECTION CIRCUIT



## PM-455A REACTOR CONTROL CIRCUIT



## PM-455C CIRCUIT (Z EQUIV.)



TOTAL IMPEDANCE (OHMS) = 100 + 100 = 200

### ENGINEERING JUSTIFICATION:

THE PT-455 CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS SIGNAL CANNOT BE IMPLEMENTED HERE. PM-455A IS A FOXBORO 66BR-OH ISOLATOR, AND SERVES TO ISOLATE THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM. PM-455C (FOXBORO 66BR-OH) SERVES AS A CURRENT REPEATER IN THIS CIRCUIT, AND CAN DRIVE A LOAD UP TO A 660 OHMS. THE SAS SIGNAL CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (200 OHMS), FALLS WITHIN THE LOAD LIMIT (660 OHMS).

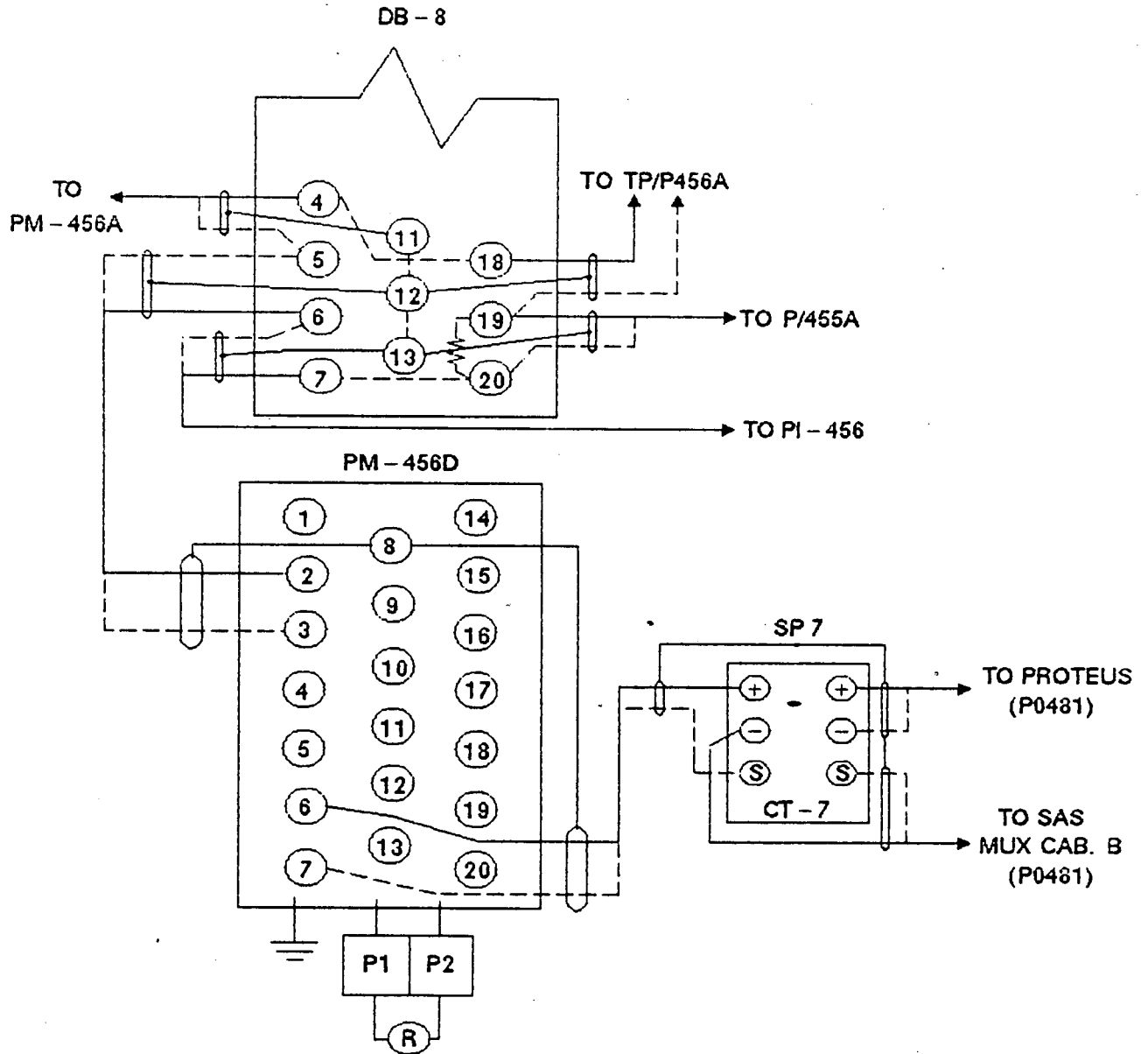
STATION: INDIAN POINT 2 TITLE: SAS COMPUTER INTERFACE PRESSURIZER 1 PRESS NR (P-455) SKETCHED BY: VICTOR S. D'AMORE CHECKED BY: <i>King</i>	A P P R V E D	MECH. PROGRAM ENG. <i>N/A</i> DATE C&I ENG. <i>TM</i> DATE 3/19/87 ENG. <i>VAD</i> DATE 3/17/87	<b>CON EDISON</b> ENG. <b>C&amp;I SKETCH</b> SKETCH NO. SAS-40 REV. 0 SH. 2 OF 2
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REVISION

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issued for record.

1  
Incorporated UDC FEI-860033 Revision 1.

DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R06, POINTS 2 (POS.), 3 (NEG.), AND 4 (SHIELD).

REF. DWGS.: A225406, A225334  
REF. SKETCH: SAS - REF

REF. UDC: FEI-860033 REV. 1

STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
PRESSURIZER 2 PRESS NR (PT - 456)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 4/20/87	
CHECKED BY: <i>King Luch</i>		ENG. <i>VAD</i> DATE 3/23/87	SKETCH NO. SAS-41 REV. 1 SH. 1 OF 2

REVISION

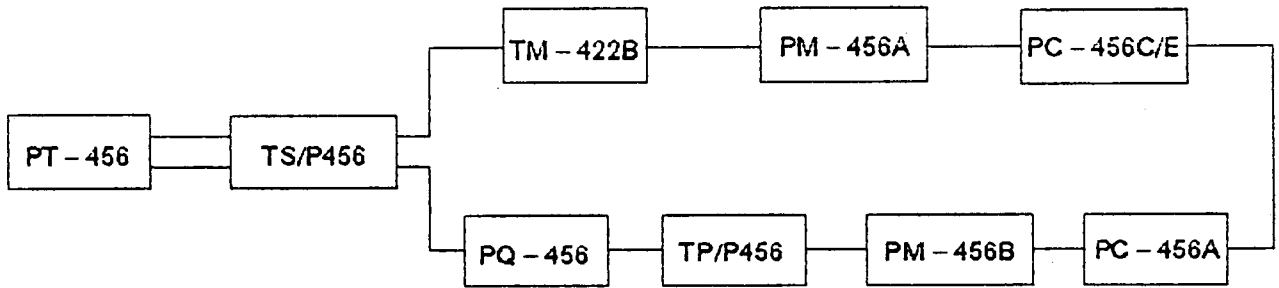
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Issued for record.

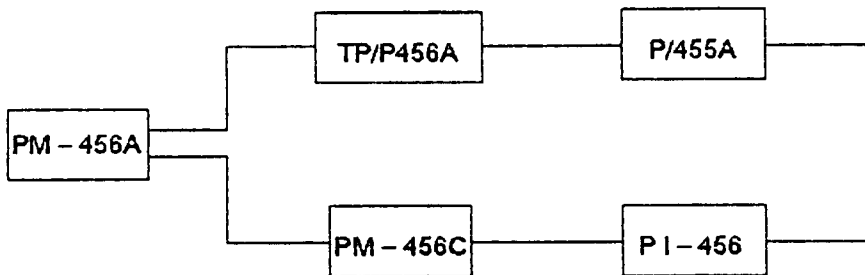
Incorporated  
UDC FE-320033  
Revision 1.

# IMPEDANCE CALCULATION

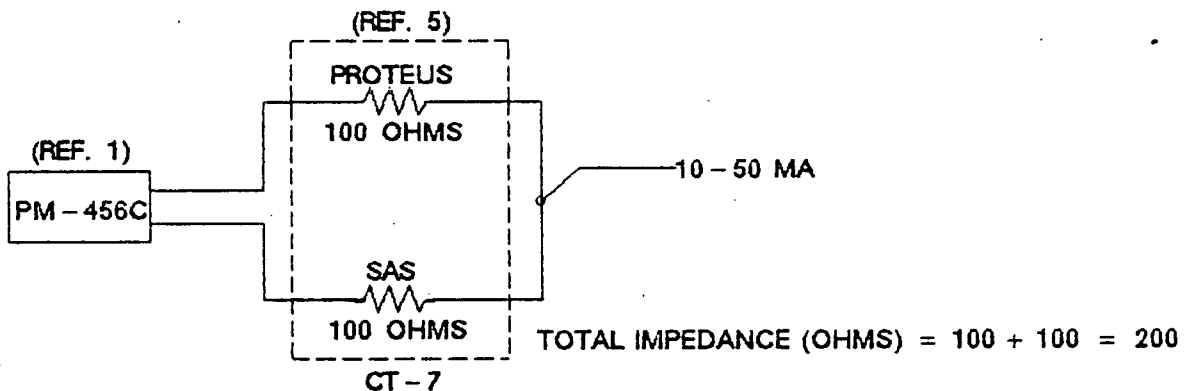
## PT-456 REACTOR PROTECTION CIRCUIT



## PM-456A REACTOR CONTROL CIRCUIT



## PM-456C CIRCUIT (Z EQUIV.)



### ENGINEERING JUSTIFICATION:

THE PT-456 CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. PM-456A IS A FOXBORO 66BR-OH ISOLATOR, AND SERVES TO ISOLATE THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM. PM-456C SERVES AS A CURRENT REPEATER IN THIS CIRCUIT, AND CAN DRIVE A LOAD UP TO 660 OHMS. THE SAS SIGNAL CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (200 OHMS), FALLS WITHIN THE LOAD LIMIT (660 OHMS).

STATION: INDIAN POINT 2  
 TITLE: SAS COMPUTER INTERFACE  
 PRESSURIZER 2 PRESS NR (PT-456)  
 SKETCHED BY: VICTOR S. D'AMORE  
 CHECKED BY: *King Lock*

A P P R V L S  
 MECH. PROGRAM  
 ENG. *N/A* DATE  
 C&I  
 ENG. *TM* DATE *4/2/87*  
 ENG. *VAD* DATE *3/23/87*

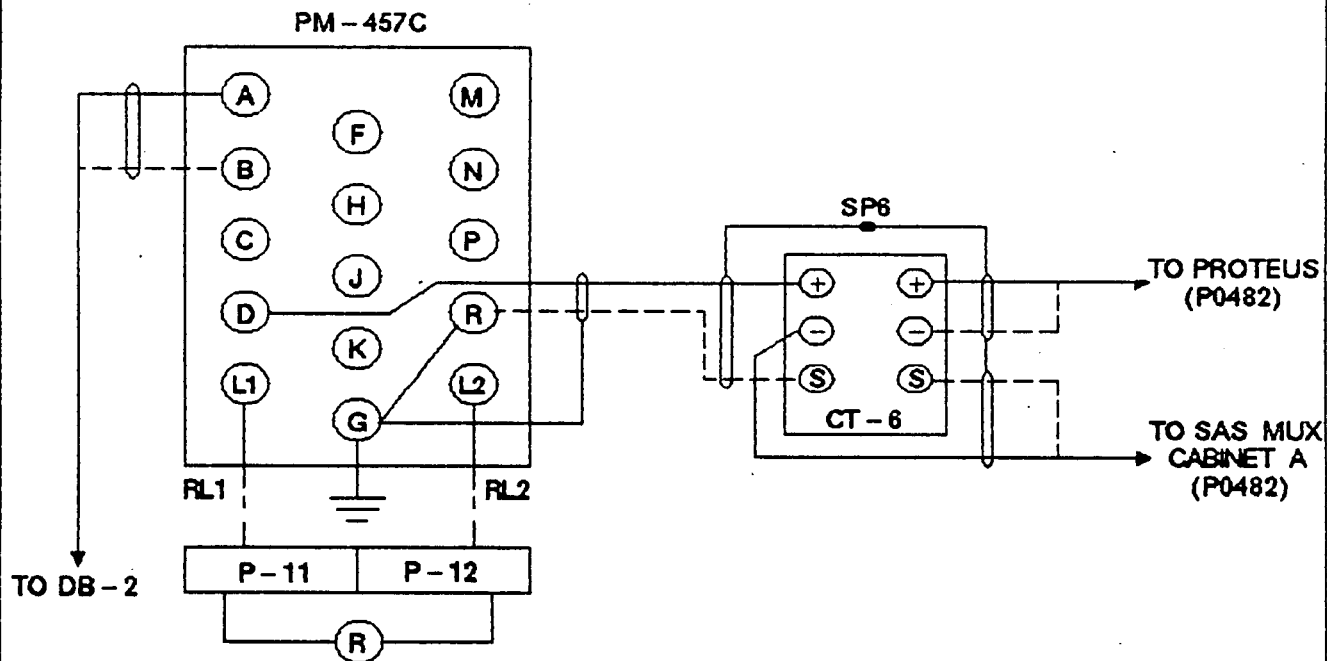
**CON EDISON ENG.**  
**C&I SKETCH**  
 SKETCH NO. SAS-41  
 REV. 1 SH. 2 OF 2

REVISION

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Issued for record.

DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R11, POINTS 6 (POS.), 7 (NEG.), AND 8 (SHIELD).

REF. DWG.: A225406, A225404, A225354  
 REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG.</b> C&I SKETCH SKETCH NO. SAS - 42 REV. 0 SH. 1 OF 2
TITLE: SAS COMPUTER INTERFACE		ENG. <i>NA</i> DATE	
PRESSURIZER 3 PRESS NR (P-457)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>11/23/86</i>	
CHECKED BY: <i>King Jack</i>		ENG. <i>VAD</i> DATE <i>12/29/86</i>	

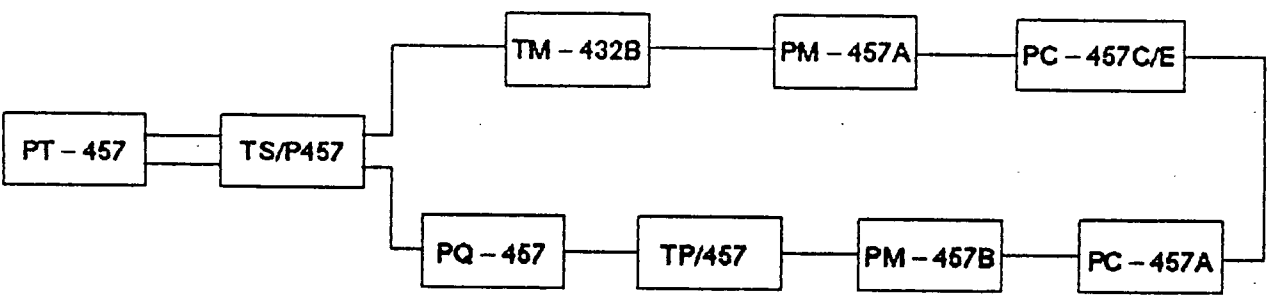


REVISION

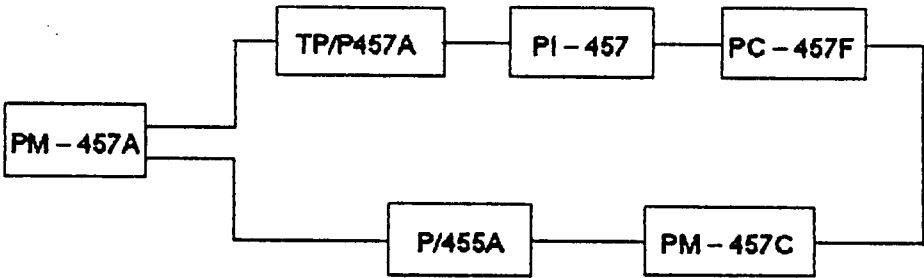
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Issued for record.

**IMPEDANCE CALCULATION**

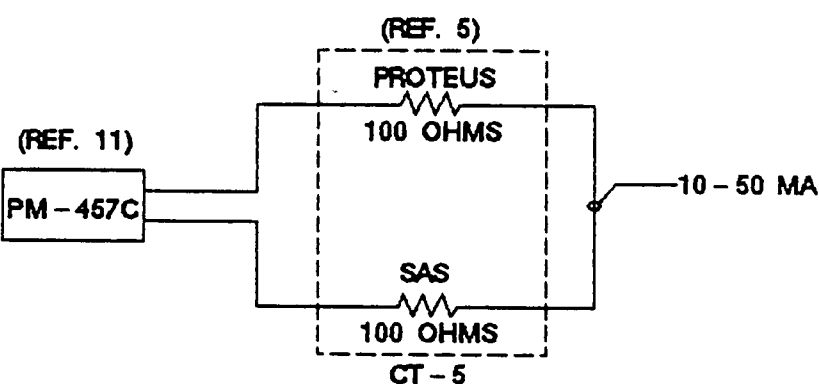
PT-457 REACTOR PROTECTION CIRCUIT



PM-457A REACTOR CONTROL CIRCUIT



PM-457C CIRCUIT (Z EQUIV.)



TOTAL IMPEDANCE (OHMS) = 100 + 100 = 200

ENGINEERING JUSTIFICATION:

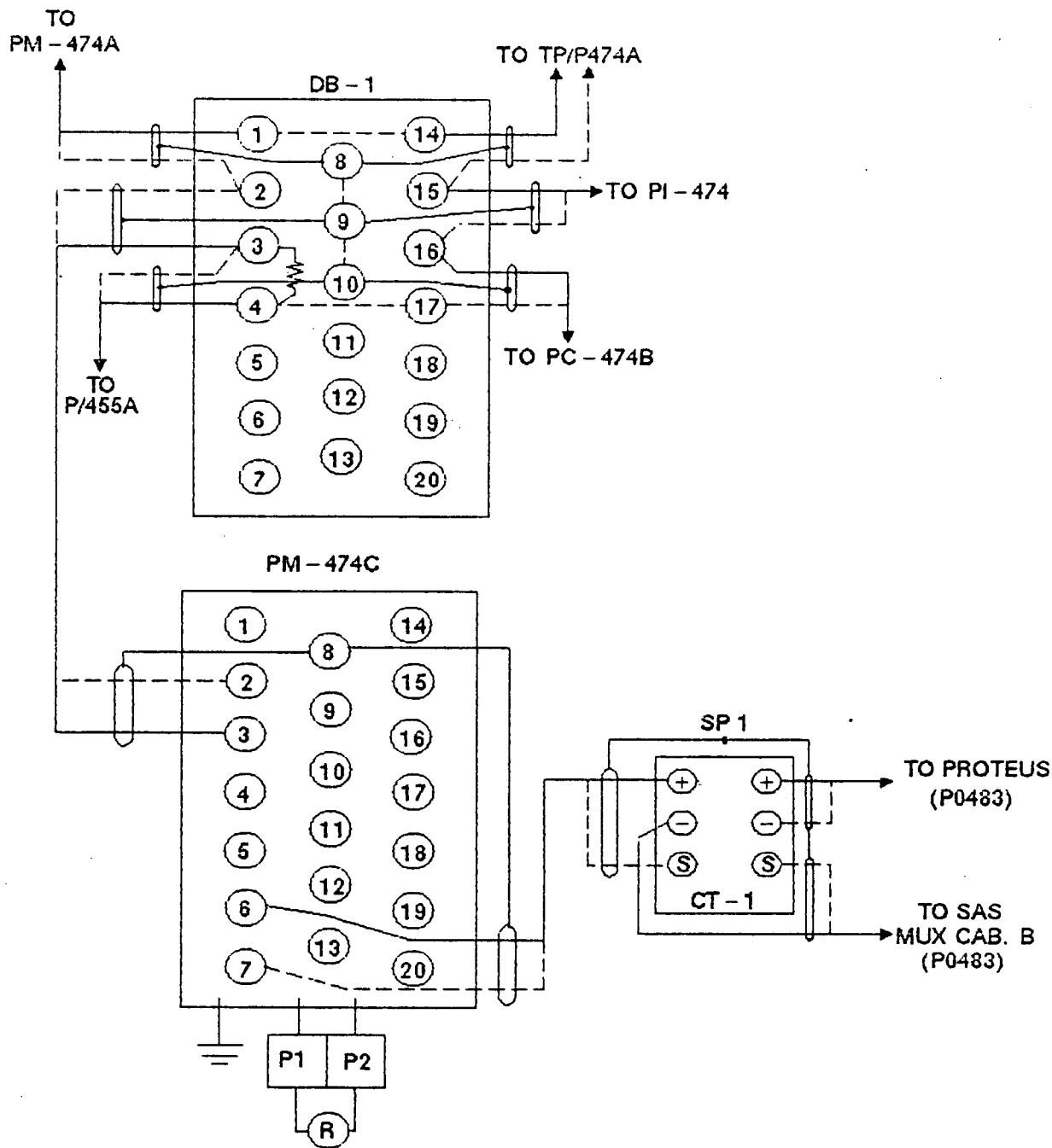
THE PT-457 CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS SIGNAL CANNOT BE IMPLEMENTED HERE. PM-457A IS A FOXBORO 66BR-OH ISOLATOR, AND SERVES TO ISOLATE THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM. PM-457C (FOXBORO 66BR-OH) SERVES AS A CURRENT REPEATER IN THIS CIRCUIT, AND CAN DRIVE A LOAD UP TO A 660 OHMS. THE SAS SIGNAL CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (200 OHMS), FALLS WITHIN THE LOAD LIMIT (660 OHMS).

STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	<b>CON EDISON ENG.</b> C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
PRESSURIZER 3 PRESS NR (P-457)		C&I	SKETCH NO. SAS-42 REV. 0 SH. 2 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>12/23/86</i>	
CHECKED BY: <i>King Jock</i>		ENG. <i>VAD</i> DATE <i>12/23/86</i>	

REVISION

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 Incorporated  
 UDC FEI-866033  
 Revision 1.

DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R05, POINTS 14 (POS.), 15 (NEG.), AND 16 (SHIELD).

REF. DWGS.: A225404, A225369  
 REF. SKETCH: SAS - REF

REF. UDC: FEI-860033 REV. 1

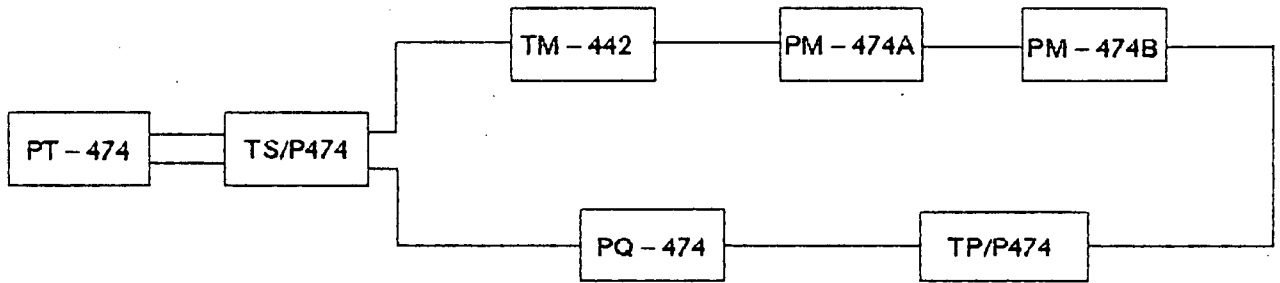
STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
PRESSURIZER 4 PRESS NR (P-474)		ENG. <i>TM</i> DATE <i>4/20/87</i>	SKETCH NO. SAS-43
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>VAD</i> DATE <i>4-20-87</i>	REV. 1 SH. 1 OF 2
CHECKED BY: <i>King Lake</i>			

REVISION

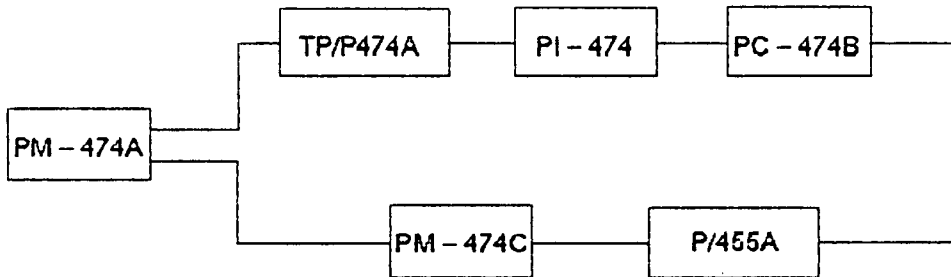
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 Issued for record.  
 Incorporated  
 UDC FEI-660033  
 Revision 1.

**IMPEDANCE CALCULATION**

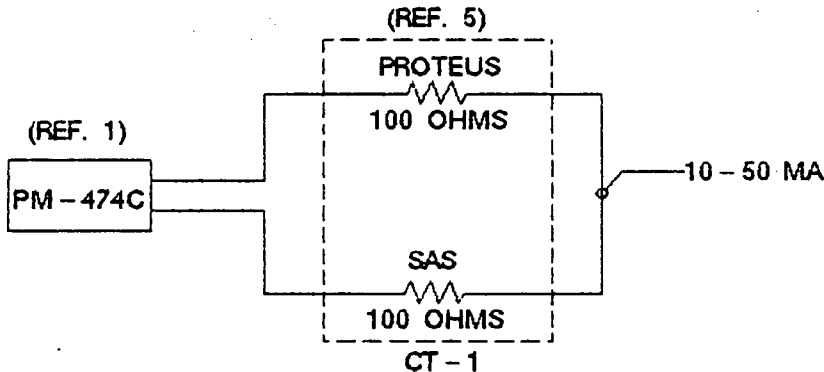
PT-474 REACTOR PROTECTION CIRCUIT



PM-474A REACTOR CONTROL CIRCUIT



PM-474C CIRCUIT (Z EQUIV.)



TOTAL IMPEDANCE (OHMS) = 100 + 100 = 200

ENGINEERING JUSTIFICATION:

THE PT-474 CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS SIGNAL CANNOT BE IMPLEMENTED HERE. PM-474A IS A FOXBORO 66BR-OH ISOLATOR, AND SERVES TO ISOLATE THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM. PM-474C (FOXBORO 66BT-OH) SERVES AS A CURRENT REPEATER IN THIS CIRCUIT, AND CAN DRIVE A LOAD UP TO A 660 OHMS. THE SAS SIGNAL CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (200 OHMS), FALLS WITHIN THE LOAD LIMIT (660 OHMS).

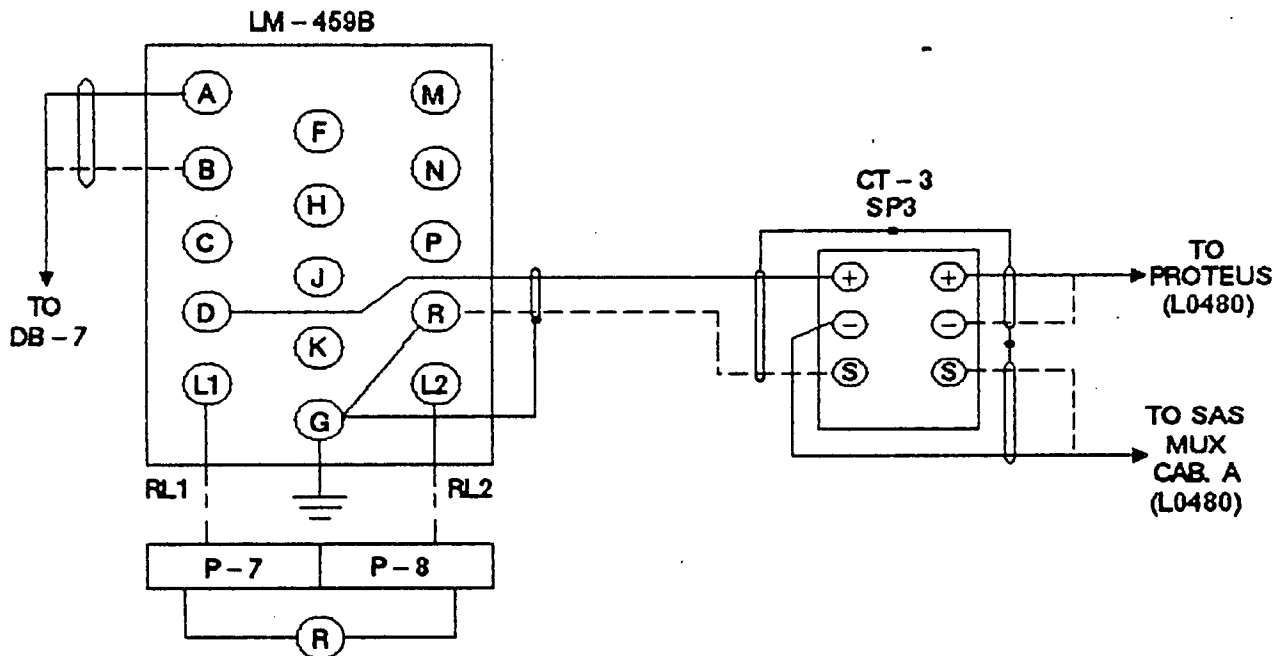
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON</b> <b>EDISON ENG.</b> <b>C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
PRESSURIZER 4 PRESS NR (P-474)		C&I	SKETCH NO. SAS-43 REV. 1 SH. 2 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>4/20/87</i>	
CHECKED BY: <i>King Loh</i>		ENG. <i>V.A.V.</i> DATE <i>4-20-87</i>	

REVISION

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Issued for record.

DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R05, POINTS 23 (POS.), 24 (NEG), AND 25 (SHIELD).

REF. DWGS.: A225406, A225314  
REF. SKETCH SAS - REF

STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	CON EDISON ENG.. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>n/a</i> DATE	
PRESSURIZER LVL 1 (L-459)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>4/17/87</i>	
CHECKED BY: <i>King Lake</i>		ENG. <i>VAD</i> DATE <i>4-17-87</i>	SKETCH NO. SAS-44 REV. 0 SH. 1 OF 2

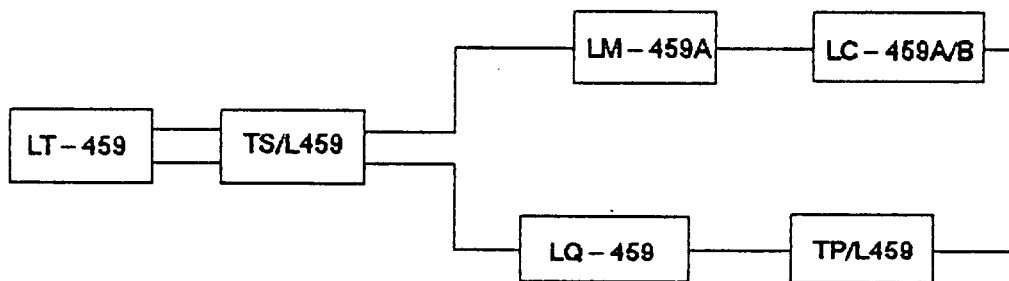
REVISION

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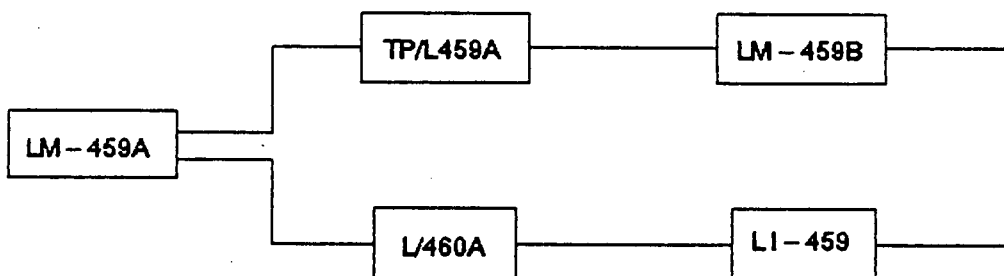
Issued for record.

# IMPEDANCE CALCULATION

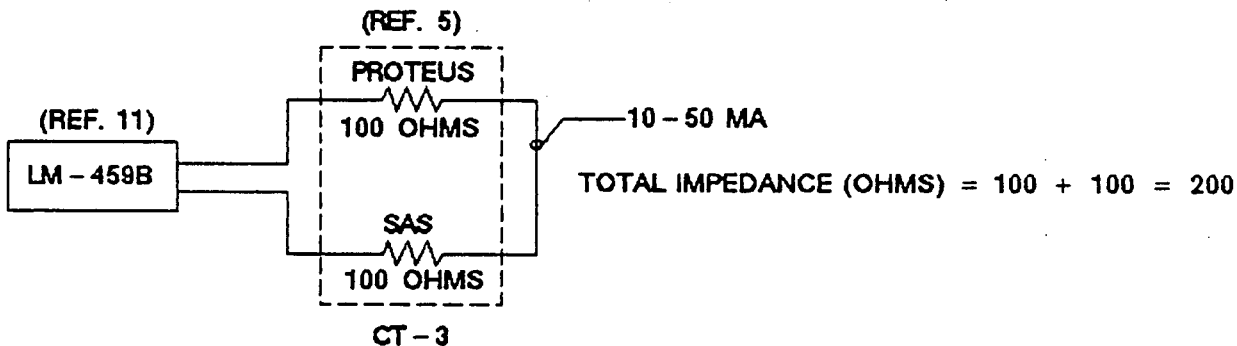
## LT-459 REACTOR PROTECTION SYSTEM CIRCUIT



## LM-459A REACTOR CONTROL SYSTEM CIRCUIT



## LM-459B CIRCUIT (Z EQUIV.)



### ENGINEERING JUSTIFICATION:

THE LT-459 PRIMARY LOOP IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT SIGNAL CANNOT BE IMPLEMENTED HERE. LM-459A (FOXBORO 66BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM. LM-459B (FOXBORO 66BR-OH) SERVES AS A CURRENT REPEATER IN THIS LOOP, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (200 OHMS) FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

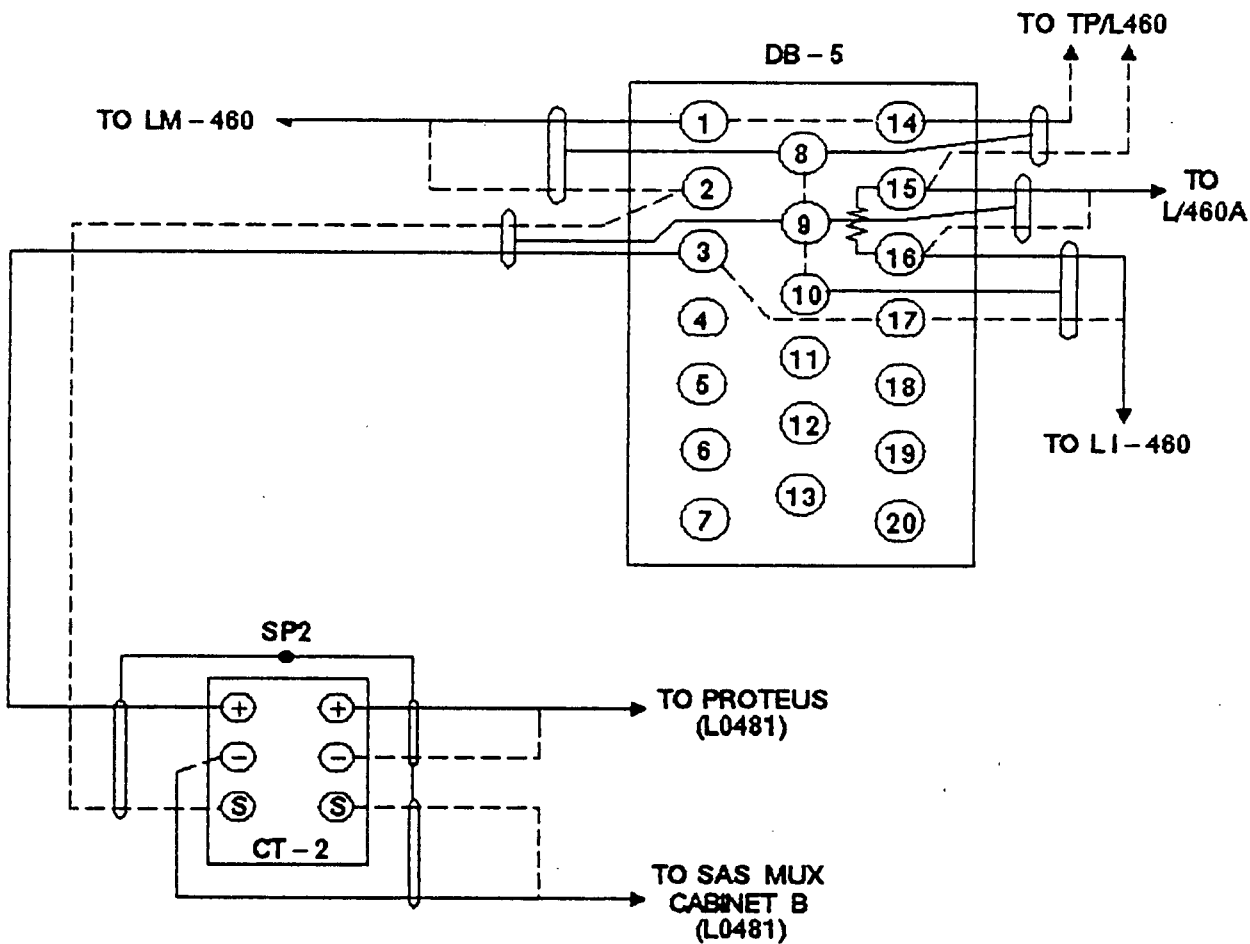
STATION: INDIAN POINT 2	A P P R V E S	MECH. PROGRAM ENG. <i>N/A</i> DATE	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE PRESSURIZER LVL 1 (L-459)		C&I ENG. <i>TM</i> DATE <i>4/17/87</i>	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>VAS</i> DATE <i>4-17-87</i>	SKETCH NO. SAS-44
CHECKED BY: <i>King Fush</i>			REV. 0 SH. 2 OF 2

REVISION

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Issued for record.

**DESIGN DETAIL**



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R06, POINTS 6 (POS.), 7 (NEG.), AND 8 (SHIELD).

REF. DWGS.: A225405, A225334  
 REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	CON EDISON ENG.- C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. N/A DATE	
PRESSURIZER LVL 2 (L-460)		ENG. TM DATE 4/17/87	
SKETCHED BY: VICTOR S. D'AMORE		ENG. VAS DATE 4-17-87	
CHECKED BY: <i>King Cook</i>			SKETCH NO. SAS-45 REV. 0 SH. 1 OF 2

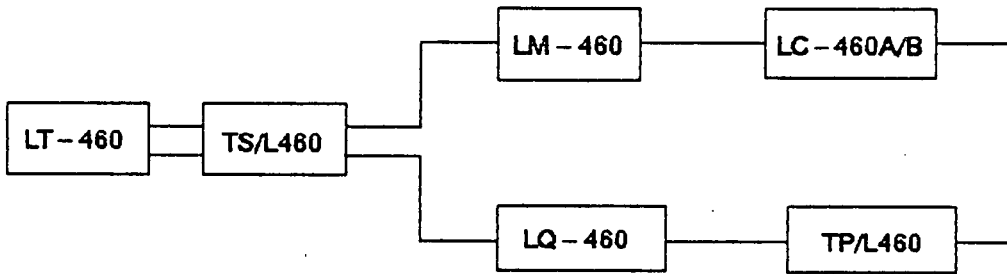
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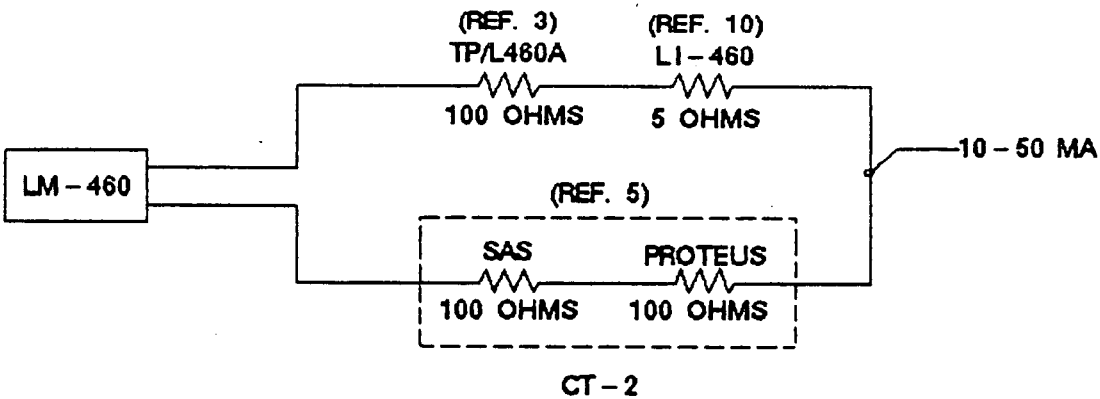
Issued for record.

**IMPEDANCE CALCULATION**

LT-460 REACTOR PROTECTION SYSTEM CIRCUIT



LM-460 REACTOR CONTROL SYSTEM CIRCUIT (Z EQUIV.)



TOTAL IMPEDANCE (OHMS) = 100 + 5 + 100 + 100 = 305

**ENGINEERING JUSTIFICATION:**

THE LT-460 PRIMARY LOOP IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS SIGNAL CANNOT BE IMPLEMENTED HERE. LM-460 (FOXBORO 66BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (305 OHMS) FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

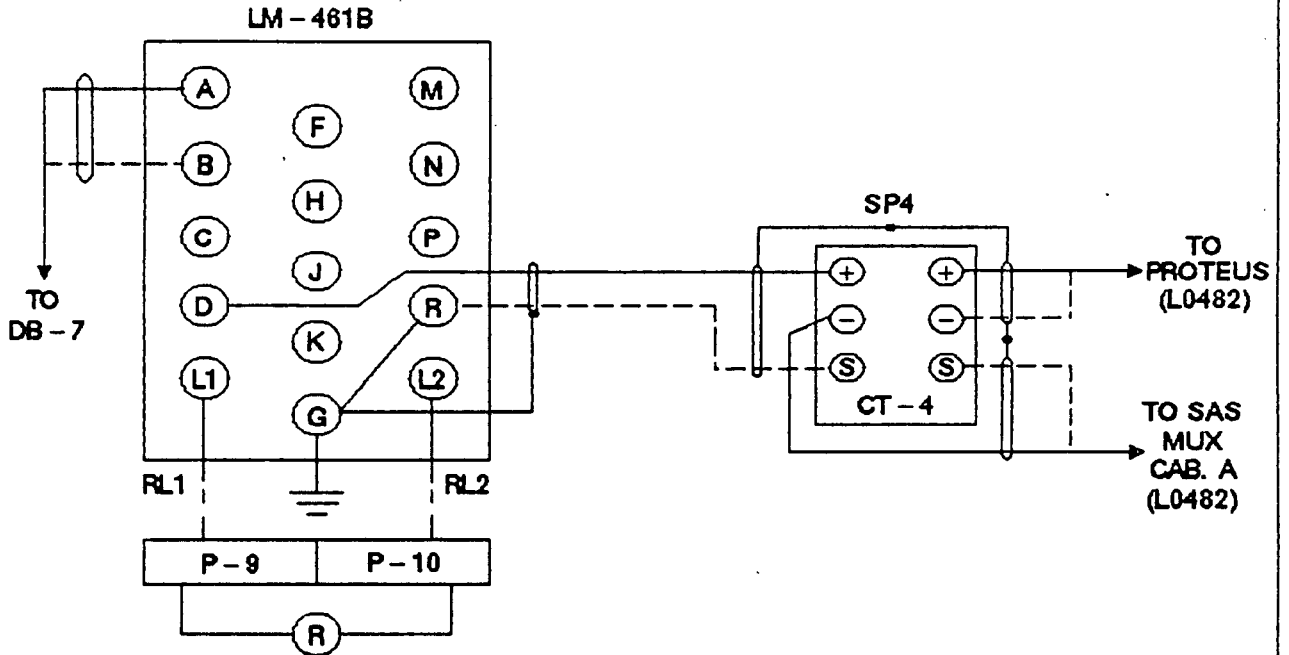
STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	CON EDISON ENG.- C&I SKETCH
TITLE SAS COMPUTER INTERFACE		ENG. N/A DATE	
PRESSURIZER LVL 2 (L-460)		C&I	DATE 4/17/87
SKETCHED BY: VICTOR S. D'AMORE		ENG. TM DATE 4-17-87	SKETCH NO. SAS-45
CHECKED BY: <i>King Lock</i>		ENG. VAS DATE 4-17-87	REV. 0 SH. 2 OF 2

REVISION

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DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R13, POINTS 2 (POS.), 3 (NEG.), AND 4 (SHIELD).

REF. DWGS.: A225406, A225354  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG.</b> <b>C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
PRESSURIZER LVL 3 (L-461)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>4/17/87</i>	
CHECKED BY: <i>King Look</i>	ENG. <i>VLL</i> DATE <i>4-17-87</i>	SKETCH NO. SAS - 48	REV. 0 SH. 1 OF 2



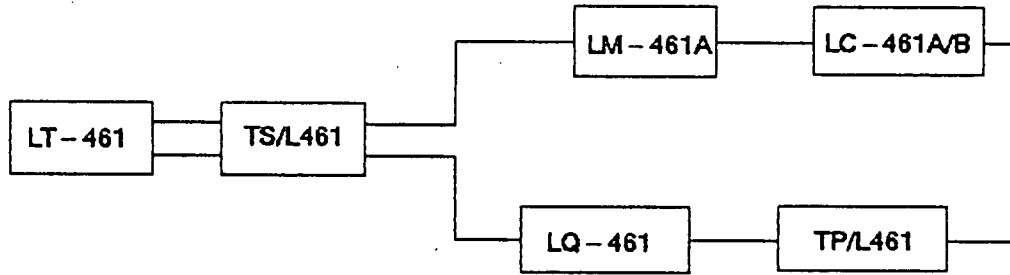
REVISION

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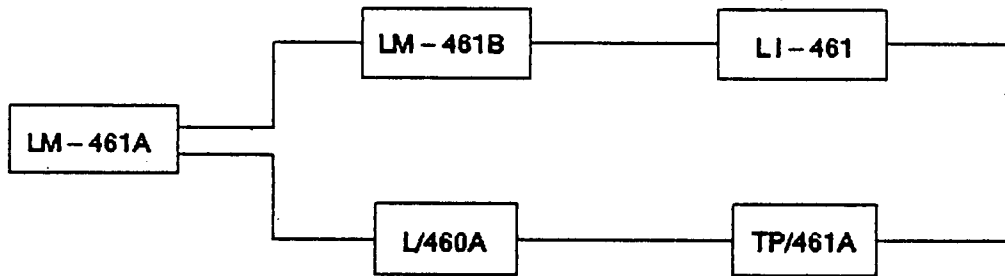
Issued for record.

# IMPEDANCE CALCULATION

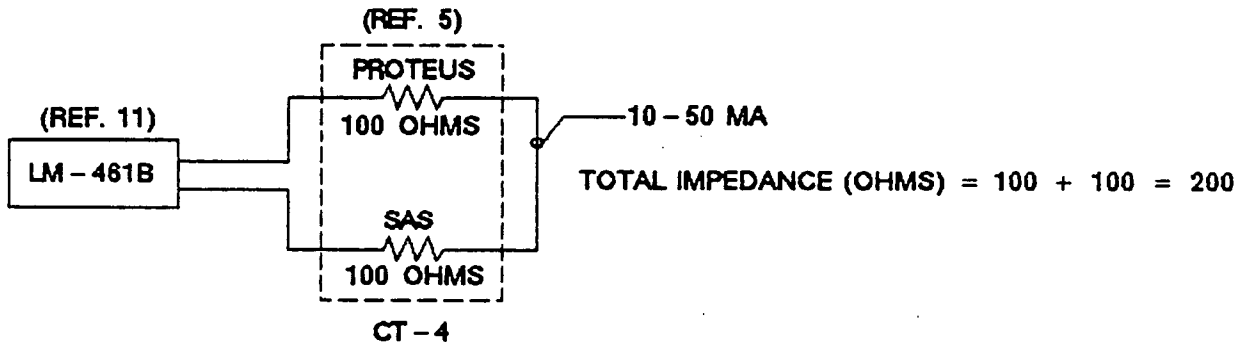
## LT-461 REACTOR PROTECTION SYSTEM CIRCUIT



## LM-461A REACTOR CONTROL SYSTEM CIRCUIT



## LM-461B CIRCUIT (Z EQUIV.)



### ENGINEERING JUSTIFICATION:

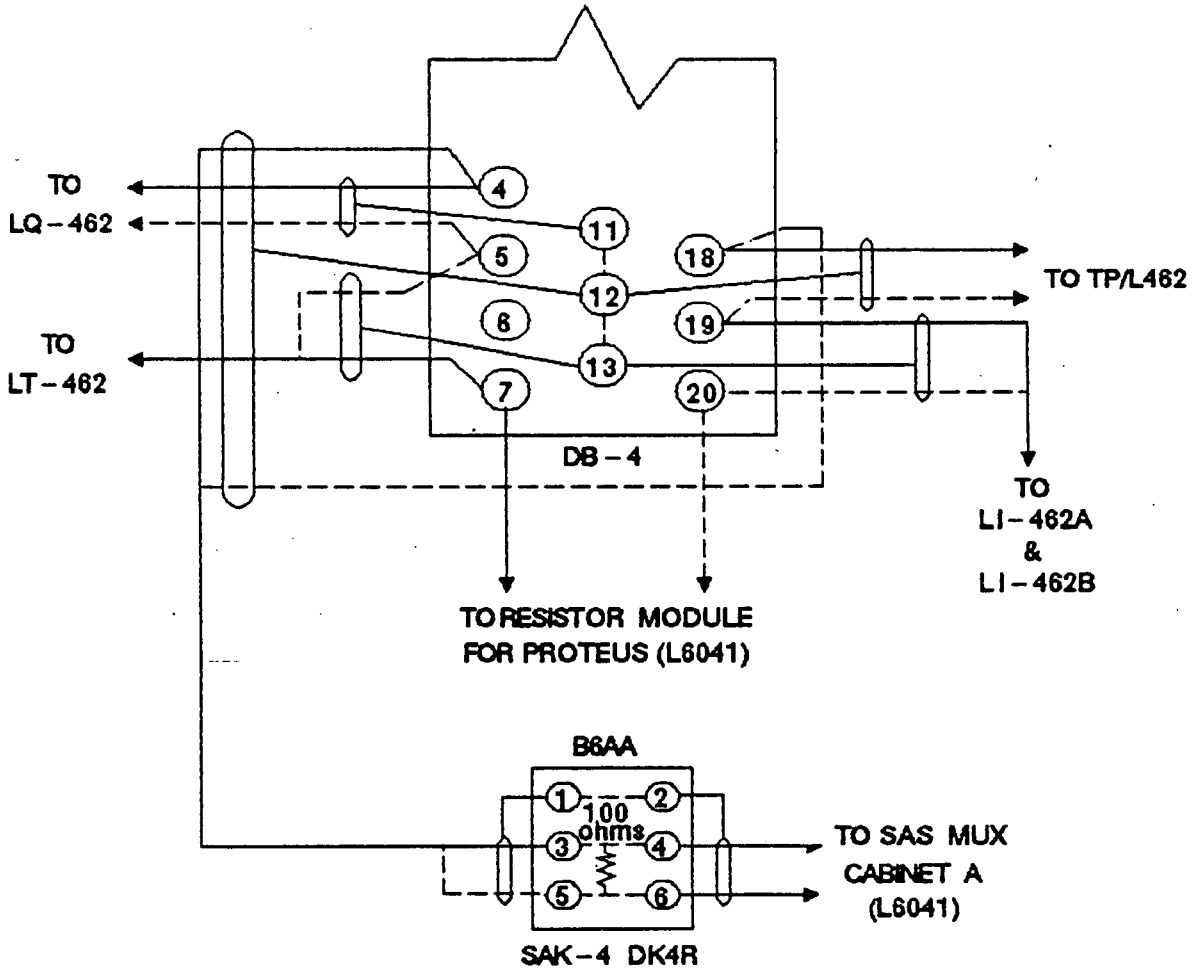
THE LT-461 PRIMARY LOOP IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT SIGNAL CANNOT BE IMPLEMENTED HERE. LM-461A (FOXBORO 86BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM. LM-461B (FOXBORO 86BR-OH) SERVES AS A CURRENT REPEATER IN THIS LOOP, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (200 OHMS) FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

STATION: INDIAN POINT 2	A P P R V E S	MECH. PROGRAM	<b>CON EDISON ENG.- C&amp;J SKETCH</b>	
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE		
PRESSURIZER LVL 3 (L-461)		C&J	ENG. <i>TM</i> DATE <i>4/17/87</i>	SKETCH NO. SAS-46 REV. 0 SH. 2 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>VAS</i> DATE <i>4-17-87</i>		
CHECKED BY: <i>King Loh</i>				

REVISION

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record.

DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R16, POINTS 19 (POS.), 20 (NEG.), AND 21 (SHIELD).

REF. DWG.: A225404  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG.
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
PRESSURIZER LVL COLD WR (LT-462)	VLS	C&I	SKETCH NO. SAS-47 REV. 0 SH. 1 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 4/20/87	
CHECKED BY: <i>King Fook</i>		ENG. <i>VAD</i> DATE 4.20.87	

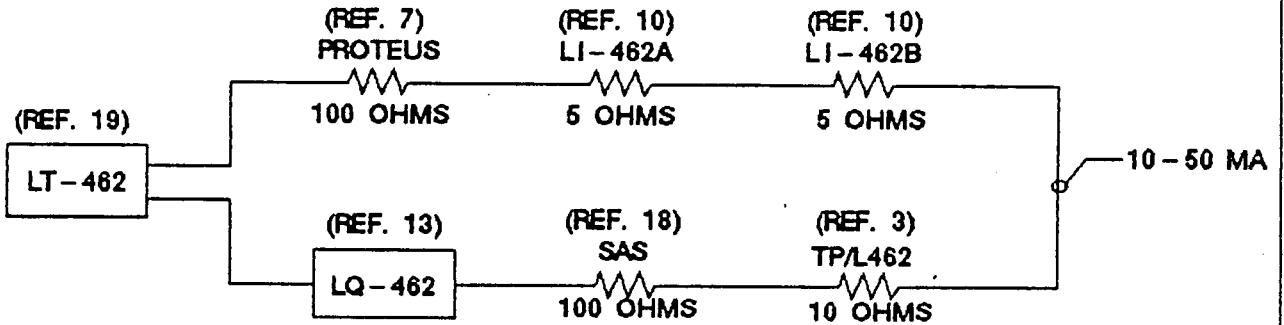
REVISION

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**IMPEDANCE CALCULATION**

LT-462 REACTOR CONTROL CIRCUIT (Z EQUIV.)



TOTAL IMPEDANCE (OHMS) = 100 + 5 + 5 + 10 + 100 = 220

ENGINEERING JUSTIFICATION:

LT-462 IS PART OF THE REACTOR CONTROL SYSTEM, THEREFORE, THE SAS INPUT CAN BE IMPLEMENTED HERE. LT-462 IS A 10-50 MA TRANSMITTER (FOXBORO 613HM), WITH AN OUTPUT LOAD OF 600 OHMS (+10, -20 PERCENT). LQ-462 (FOXBORO 610A) IS A 10-50 MA (80 VDC NOMINAL) POWER SUPPLY, WITH AN OUTPUT LOAD RESISTANCE OF 600 OHMS. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (220 OHMS) FALLS WITHIN THE LOAD LIMIT (600 OHMS).

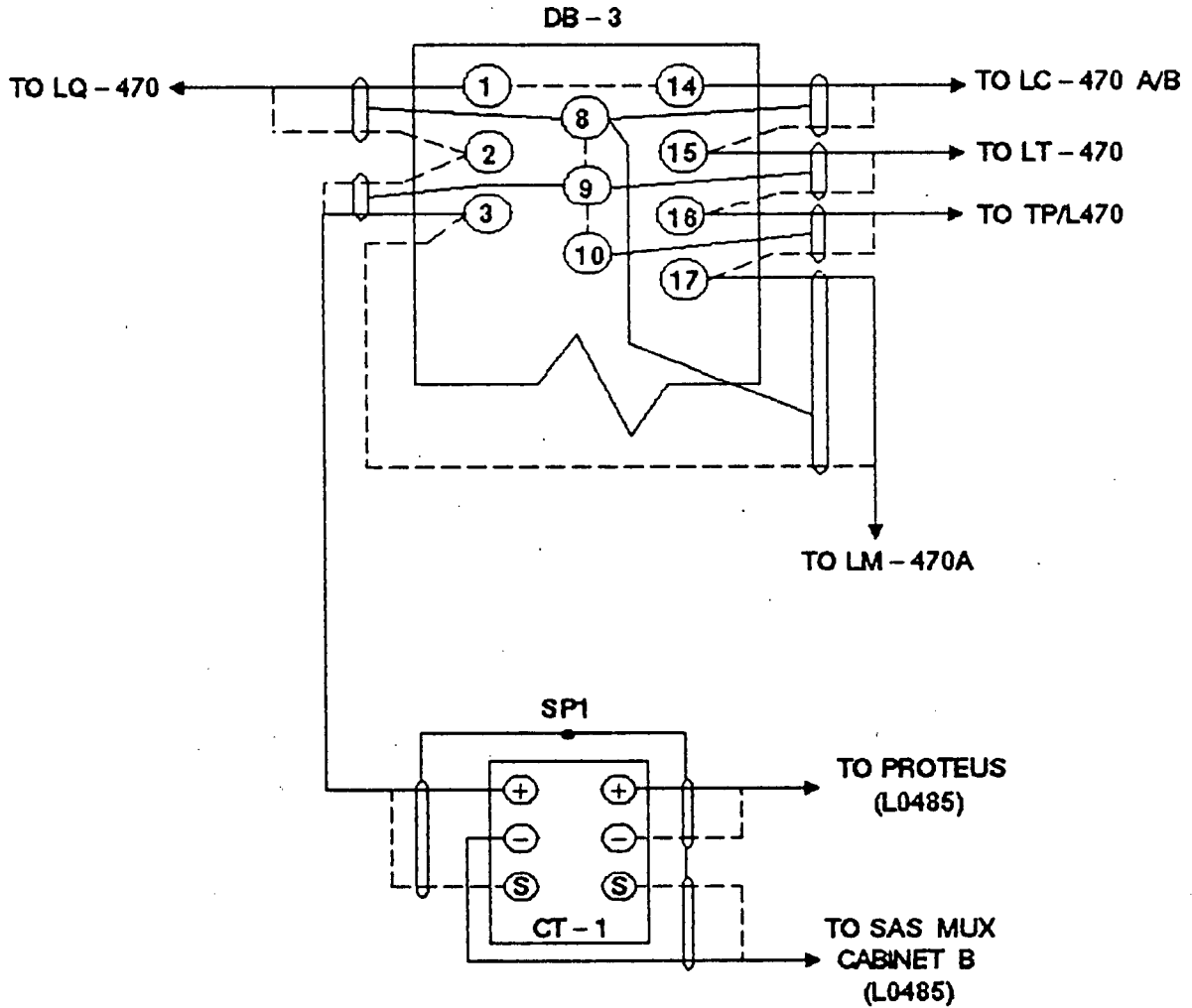
STATION: INDIAN POINT 2	A P P R O V E S	MECH. PROGRAM	CON EDISON ENG.- C&I SKETCH
TITLE SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
PRESSURIZER LVL COLD WR (LT-462)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>4/20/87</i>	
CHECKED BY: <i>Kevin Zook</i>		ENG. <i>V.A.D.</i> DATE <i>4-20-87</i>	SKETCH NO. SAS-47 REV. 0 SH. 2 OF 2

REVISION

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Issued for record.

**DESIGN DETAIL**



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R09, POINTS 2 (POS.), 3 (NEG.), AND 4 (SHIELD).

REF. DWG.: A225435  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG, C&amp;J SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
PRESSURIZER RELIEF TANK LEVEL (LT-470)		C&J ENG. <i>TM</i> DATE <i>3/17/87</i>	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>VAS</i> DATE <i>3/17/87</i>	
CHECKED BY: <i>King Fode</i>			SKETCH NO. SAS-48 REV. 0 SH. 1 OF 2

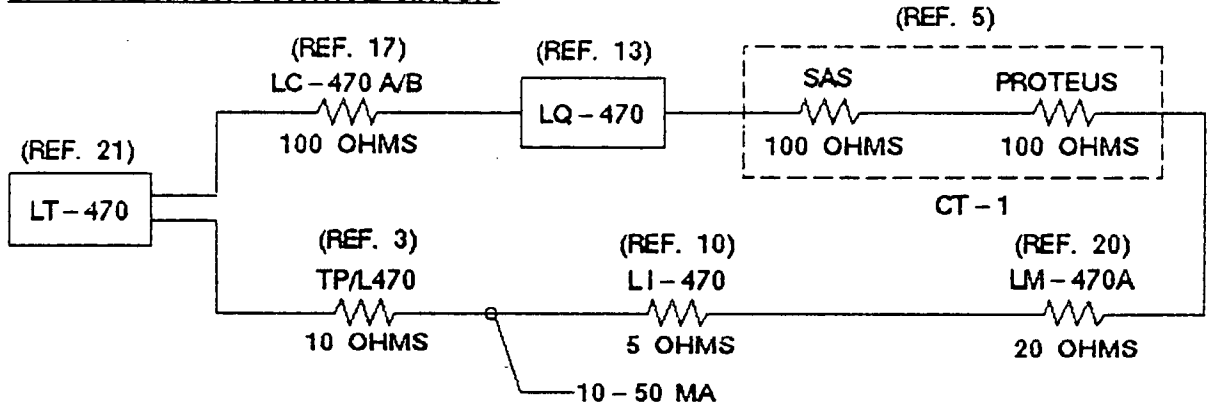
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# IMPEDANCE CALCULATION

## LT-470 REACTOR CONTROL CIRCUIT



TOTAL IMPEDANCE (OHMS) = 10 + 5 + 20 + 100 + 100 + 100 = 335

### ENGINEERING JUSTIFICATION:

LT-470 IS PART OF THE REACTOR CONTROL SYSTEM, THEREFORE, THE SAS INPUT CAN BE IMPLEMENTED HERE. LT-470 IS A FOXBORO N-E13DM TRANSMITTER, PROVIDING A 10-50 MA OUTPUT INTO A 950 OHM LOAD (APPROXIMATE, 80 VDC POWER SUPPLY CONSIDERED). LQ-470 IS A FOXBORO 610A POWER SUPPLY, PROVIDING A 10-50 MA OUTPUT (80 VDC NOMINAL), INTO A 600 OHM LOAD (+10 - 20 PERCENT). THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (335 OHMS), FALLS WITHIN THE LOAD LIMIT (600 OHMS).

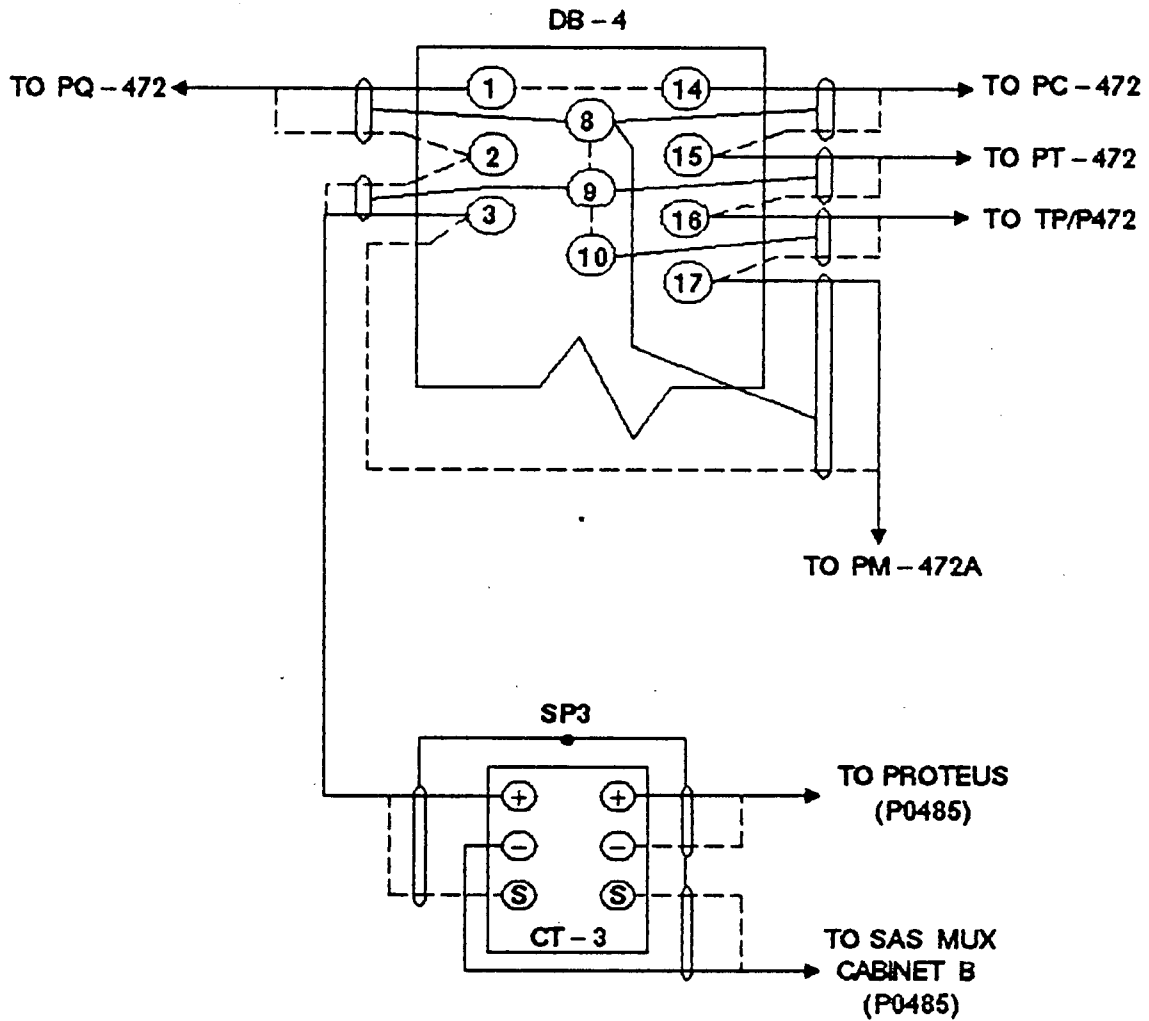
STATION: INDIAN POINT 2 TITLE: SAS COMPUTER INTERFACE PRESSURIZER RELIEF TANK LEVEL (LT-470) SKETCHED BY: VICTOR S. D'AMORE CHECKED BY: <i>King Cook</i>	A P P R O V E S	MECH. PROGRAM ENG. <i>N/A</i> DATE C&I ENG. <i>TM</i> DATE 3/17/87 ENG. <i>VLD</i> DATE 3/17/87	<b>CON EDISON ENG. C&amp;I SKETCH</b>  SKETCH NO. SAS-48 REV. 0 SH. 2 OF 2
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# DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R01, POINTS 14 (POS.), 15 (NEG.), AND 16 (SHIELD).

REF. DWG.: A225436  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
PRESSURIZER RELIEF TANK PRESS (PT-472)		ENG. <i>T M</i> DATE <i>4/20/87</i>	SKETCH NO. SAS-49 REV. 0 SH. 1 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>VAD</i> DATE <i>3/17/87</i>	
CHECKED BY: <i>King Losh</i>			

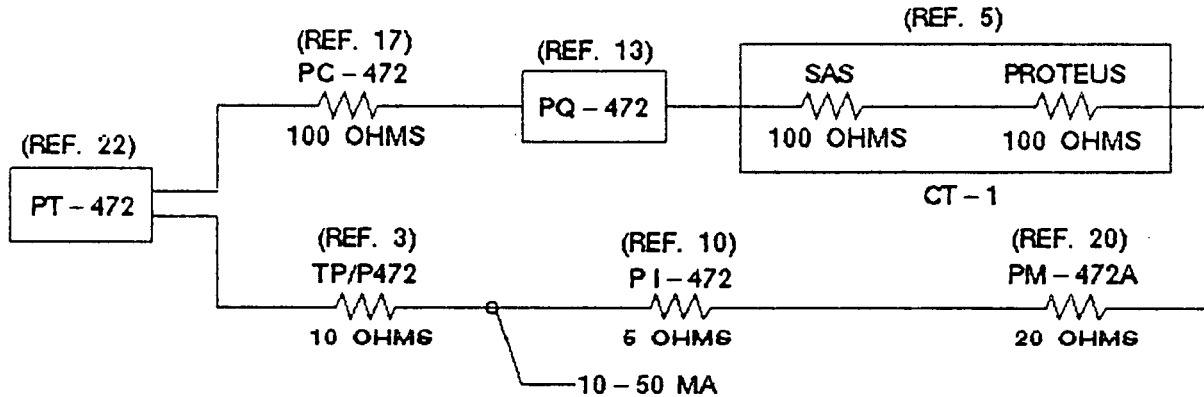
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# IMPEDANCE CALCULATION

## PT-472 REACTOR CONTROL CIRCUIT



TOTAL IMPEDANCE (OHMS) = 10 + 5 + 20 + 100 + 100 + 100 = 335

**ENGINEERING JUSTIFICATION:**

PT-472 IS PART OF THE REACTOR CONTROL SYSTEM, THEREFORE, THE SAS INPUT CAN BE IMPLEMENTED HERE. PT-472 IS A FOXBORO 611GM TRANSMITTER, PROVIDING A 10-50 MA OUTPUT INTO A 600 OHM LOAD (+10 -20 PERCENT). PQ-472 IS A FOXBORO 610A POWER SUPPLY, PROVIDING A 10-50 MA OUTPUT (80 VDC NOMINAL), INTO A 600 OHM LOAD (+10 -20 PERCENT). THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (335 OHMS), FALLS WITHIN THE LOAD LIMIT (600 OHMS).

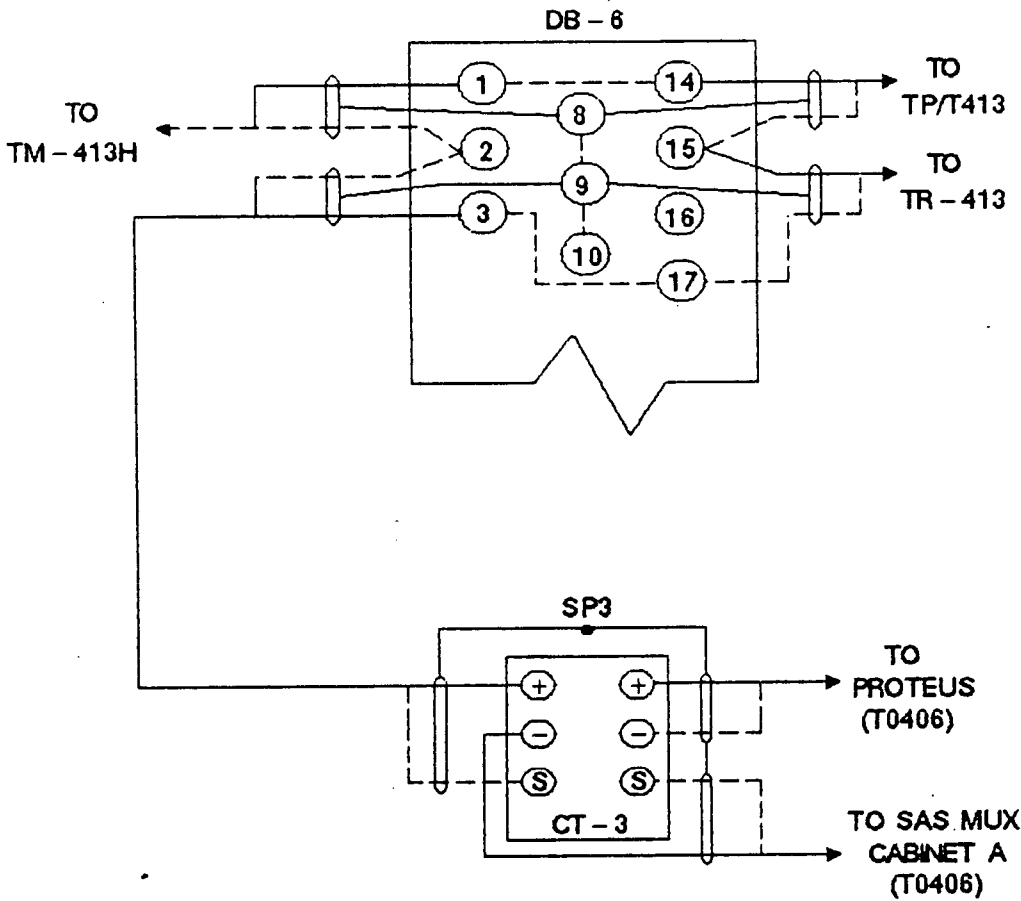
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON</b>
TITLE: SAS COMPUTER INTERFACE	APPROVALS	ENG. <i>N/A</i> DATE	<b>EDISON</b> ENG. -
PRESSURIZER RELIEF TANK PRESS (PT-472)		C&J	<b>C&amp;I SKETCH</b>
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>3/17/87</i>	SKETCH NO. SAS-49
CHECKED BY: <i>King Look</i>		ENG. <i>VAD</i> DATE <i>3/17/87</i>	REV. 0 SH. 2 OF 2

REVISION

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DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R10, POINTS 14 (POS.), 15 (NEG.), AND 16 (SHIELD).

REF. DWG.: A225429, A208356  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2  
TITLE: SAS COMPUTER INTERFACE  
LOOP 1 COLD LEG TEMP WR (TE - 413B)  
SKETCHED BY: VICTOR S. D'AMORE  
CHECKED BY: *King Josh*

MECH. PROGRAM  
ENG. *N/A* DATE  
C&J  
ENG. *TM* DATE *3/17/97*  
ENG. *VAD* DATE *3/17/87*

**CON EDISON ENG.**  
**C&J SKETCH**  
SKETCH NO. SAS - 50  
REV. 0 SH. 1 OF 2



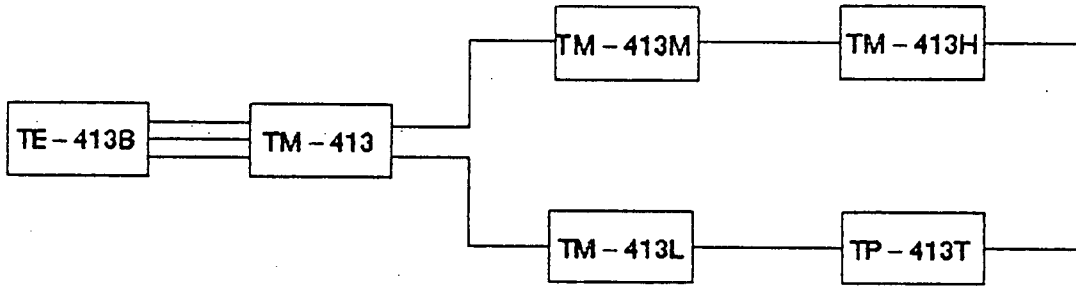
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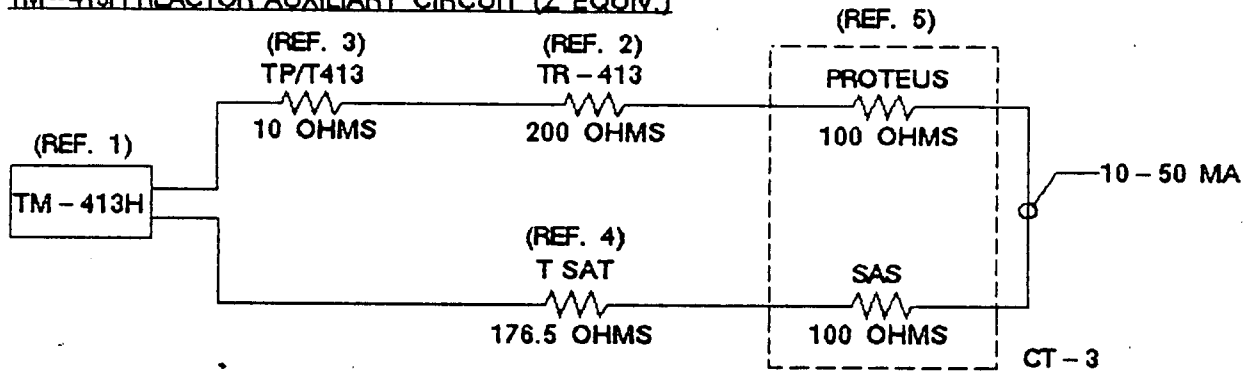
Issued for record.

**IMPEDANCE CALCULATION**

TE-413B RCS OVERPRESSURIZATION CIRCUIT



TM-413H REACTOR AUXILIARY CIRCUIT (Z EQUIV.)



TOTAL IMPEDANCE (OHMS) = 10 + 200 + 100 + 100 + 176.5 = 586.5

ENGINEERING JUSTIFICATION:

TE-413B IS PART OF THE RCS OVERPRESSURIZATION CIRCUIT, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. TM-413H (FOXBORO 66BT-OH) ISOLATES THE RCS OVERPRESSURIZATION SYSTEM FROM THE REACTOR AUXILIARY SYSTEM, AND CAN DRIVE A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (586.5 OHMS) FALLS WITHIN THE LOAD LIMIT (660 OHMS).

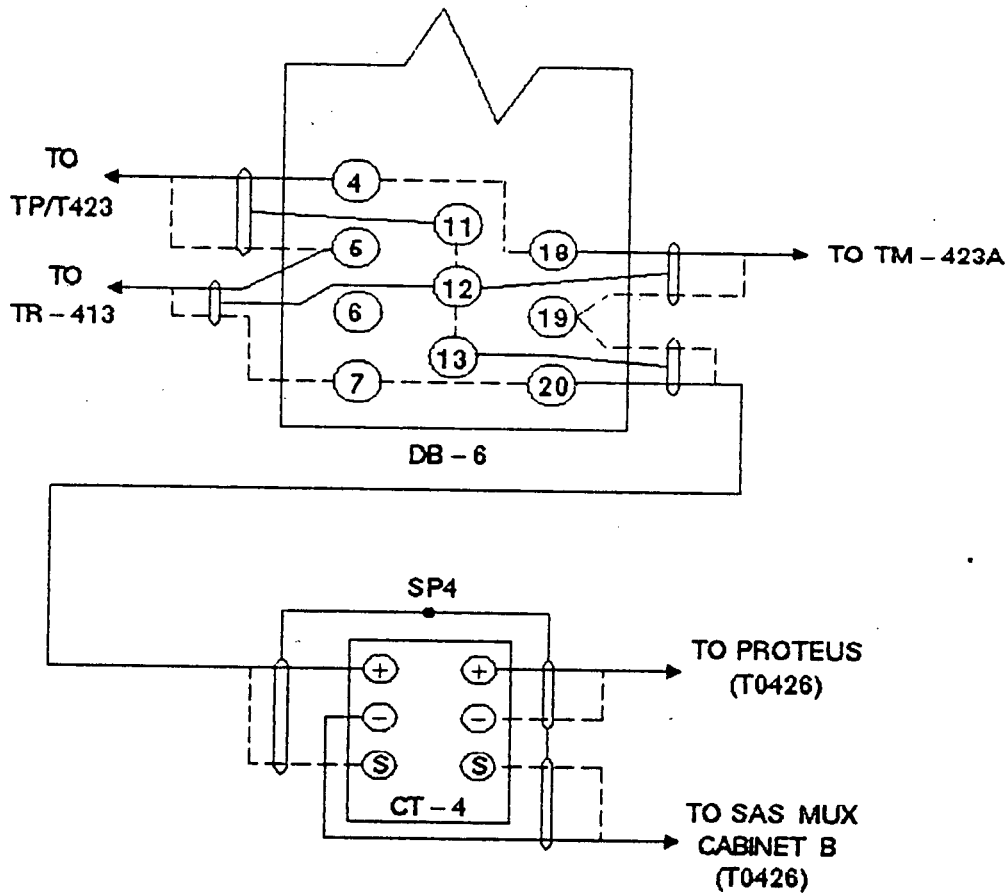
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
LOOP 1 COLD LEG TEMP WR (TE-413B)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>3/17/87</i>	
CHECKED BY: <i>King Loh</i>		ENG. <i>VA</i> DATE <i>3/17/87</i>	SKETCH NO. SAS-50 REV. 0 SH. 2 OF 2

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# DESIGN DETAIL



NOTE SAS SIGNAL DESTINATION: BTSCA 01R02, POINTS 14 (POS.), 15 (NEG.), AND 16 (SHIELD)

REF. DWG.: A225429, A225432  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG. - C&I SKETCH
TITLE SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
LOOP 2 COLD TEMP WR (TE - 423)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>4/17/87</i>	
CHECKED BY: <i>King Look</i>		ENG. <i>VAS</i> DATE <i>4-17-87</i>	SKETCH NO. SAS - 51 REV. 0 SH. 1 OF 2

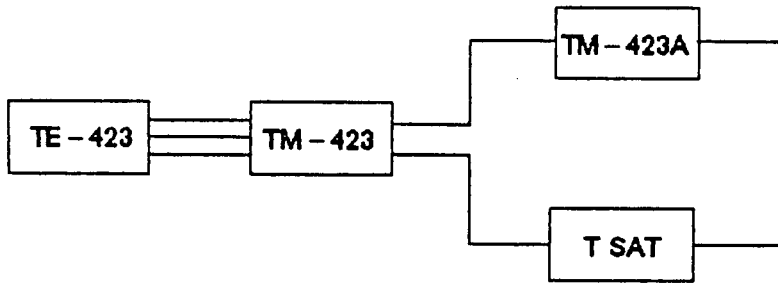
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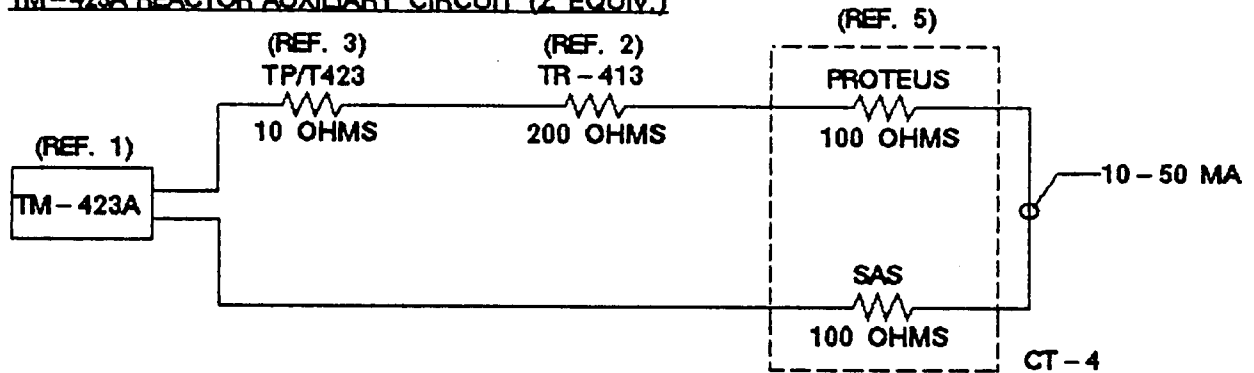
Issued for record.

# IMPEDANCE CALCULATION

## TE-423 REACTOR AUXILIARY CIRCUIT



## TM-423A REACTOR AUXILIARY CIRCUIT (Z EQUIV.)



TOTAL IMPEDANCE (OHMS) = 10 + 200 + 100 + 100 = 410

### ENGINEERING JUSTIFICATION:

THE TE-423 REACTOR AUXILIARY CIRCUIT CONTAINS A ISOLATOR TM-423A (FOXBORO 66BT - OH), WHICH PROVIDES A 10 - 50 MA OUTPUT INTO 660 OHMS. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (410 OHMS), FALLS WITHIN THE LOAD LIMIT (660 OHMS).

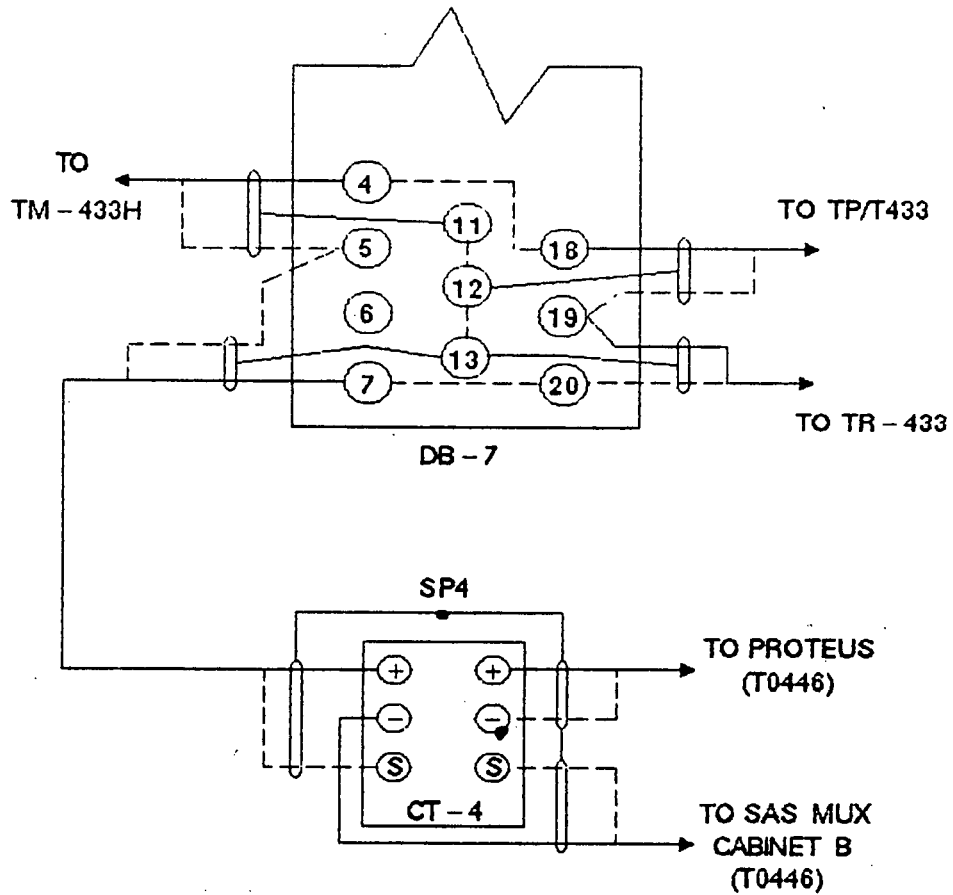
STATION: INDIAN POINT 2	A MECH. PROGRAM	<b>CON EDISON</b> ENG. C&I SKETCH SKETCH NO. SAS-51 REV. 0 SH. 2 OF 2
TITLE: SAS COMPUTER INTERFACE	ENG. <i>N/A</i> DATE	
LOOP 2 COLD LEG TEMP WR (TE-423)	C&I	
SKETCHED BY: VICTOR S. D'AMORE	ENG. <i>TM</i> DATE <i>4/17/87</i>	
CHECKED BY: <i>King Toole</i>	ENG. <i>VAS</i> DATE <i>4-17-87</i>	

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DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R03, POINTS 2 (POS.), 3 (NEG.), AND 4 (SHIELD)

REF. DWG.: A225429, A208355  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	A P P R V E D	MECH. PROGRAM	<b>CON</b> <b>EDISON</b> ENG.	
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE		<b>C&amp;I</b> SKETCH
LOOP 3 COLD TEMP WR (TE - 433B)		C&I	ENG. <i>TM</i> DATE <i>12/23/86</i>	SKETCH NO. SAS - 52 REV. 0 SH. 1 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>VAD</i> DATE <i>12/23/86</i>		
CHECKED BY: <i>King Luch</i>				

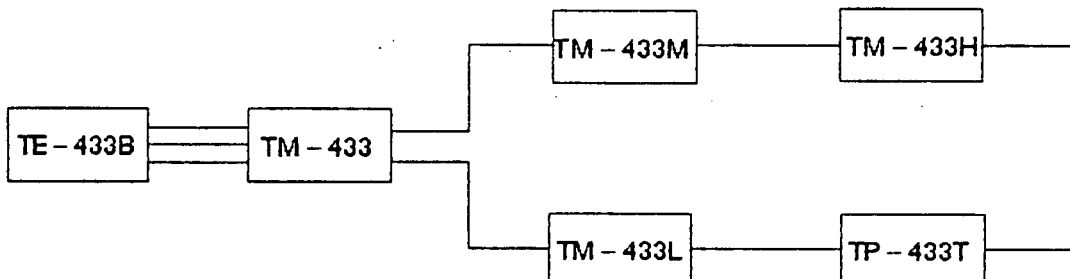
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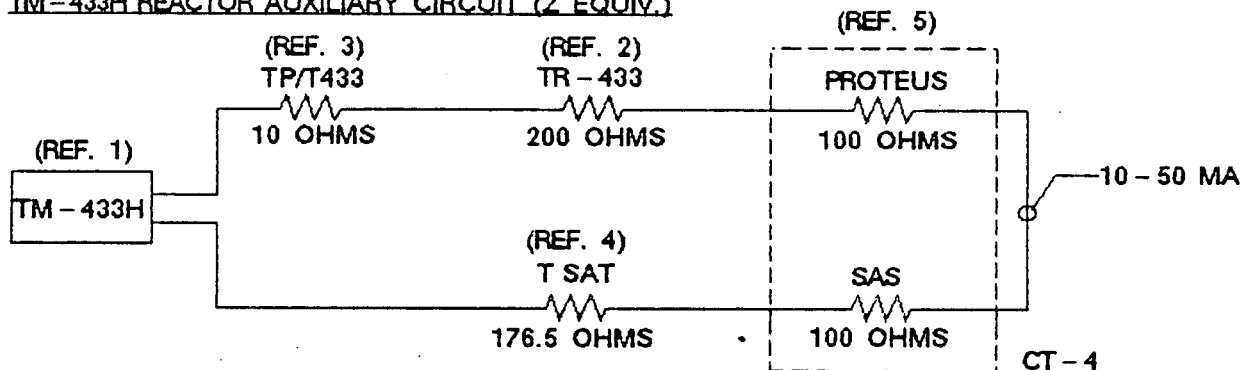
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**IMPEDANCE CALCULATION**

TE - 433B RCS OVERPRESSURIZATION CIRCUIT



TM - 433H REACTOR AUXILIARY CIRCUIT (Z EQUIV.)



TOTAL IMPEDANCE (OHMS) = 10 + 200 + 100 + 100 + 176.5 = 586.5

ENGINEERING JUSTIFICATION:

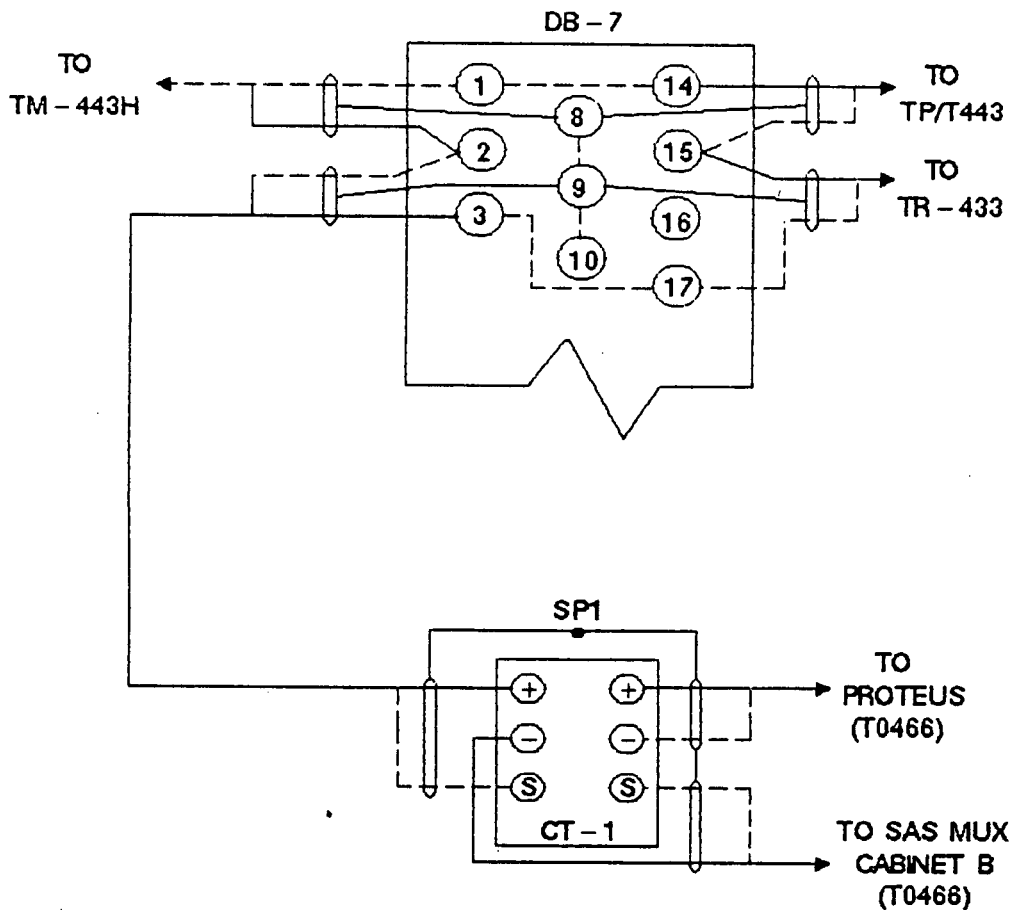
TE-433B IS PART OF THE RCS OVERPRESSURIZATION CIRCUIT, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. TM-433H (FOXBORO 66BT - OH) ISOLATES THE RCS OVERPRESSURIZATION SYSTEM FROM THE REACTOR AUXILIARY SYSTEM, AND CAN DRIVE A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (586.5 OHMS) FALLS WITHIN THE LOAD LIMIT (660 OHMS).

STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. N/A DATE	
LOOP 3 COLD LEG TEMP WR (TE - 433B)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. TM DATE 12/23/86	
CHECKED BY: <i>King Lock</i>		ENG. VAD DATE 12/23/86	
		SKETCH NO. SAS - 52	
		REV. SH. 2 OF 2	

REVISION

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**DESIGN DETAIL**



NOTE: SAS SIGNAL DESTINATION:: BTSCA 01R04, POINTS 2 (POS.), 3 (NEG.), 4 (SHIELD).

REF. DWG.: A225429, A208357  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	A P P R O V E S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
LOOP 4 COLD LEG TEMP WR (TE - 443B)		C&I	SKETCH NO. SAS - 53 REV. 0 SH. 1 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>3/17/87</i>	
CHECKED BY: <i>Kevin Fode</i>		ENG. <i>VAD</i> DATE <i>3/17/87</i>	

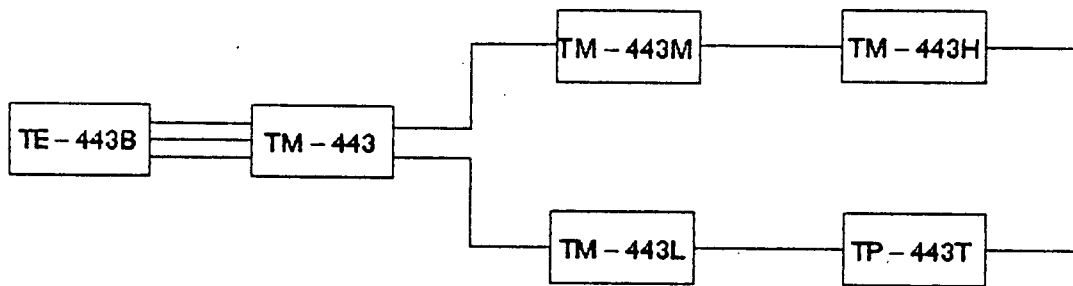
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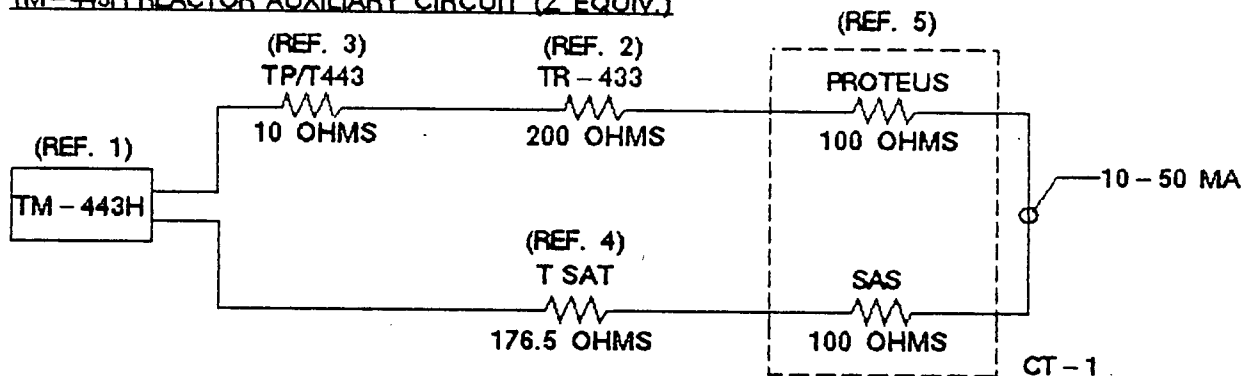
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# IMPEDANCE CALCULATION

## TE-443B RCS OVERPRESSURIZATION CIRCUIT



## TM-443H REACTOR AUXILIARY CIRCUIT (Z EQUIV.)



TOTAL IMPEDANCE (OHMS) = 10 + 200 + 100 + 100 + 176.5 = 586.5

### ENGINEERING JUSTIFICATION:

TE-443B IS PART OF THE RCS OVERPRESSURIZATION CIRCUIT, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. TM-443H (FOXBORO 66BT-OH) ISOLATES THE RCS OVERPRESSURIZATION SYSTEM FROM THE REACTOR AUXILIARY SYSTEM, AND CAN DRIVE A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (586.5 OHMS) FALLS WITHIN THE LOAD LIMIT (660 OHMS).

STATION: INDIAN POINT 2	A P P R V E S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
LOOP 4 COLD LEG TEMP WR (TE-443B)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>3/17/87</i>	
CHECKED BY: <i>King Losh</i>		ENG. <i>VAD</i> DATE <i>3/17/87</i>	
			SKETCH NO. SAS-53 REV. SH. 2 OF 2

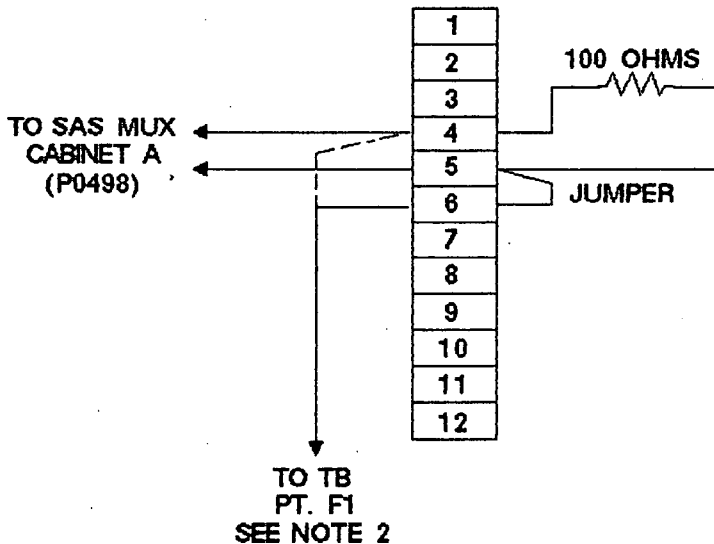
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FEI-860020  
Revision 1.

**DESIGN DETAIL**

12 POINT STATES CO.  
TERMINAL BLOCK CAT NO. 2WM25006



- NOTE: 1. SAS SIGNAL DESTINATION: BTSCA 01R10, POINTS 19 (POS.), 20 (NEG.), AND 21 (SHIELD).  
2. DISCONNECT WIRE (DASHED LINE) FROM POINT 4 AND CONNECT TO POINT 6.

REF. DWGS.: CON ED A225364  
REF. SKETCH: SAS - REF  
REF. UDC: 860020 REV. 1

STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. N/A DATE	
RCS PRESSURE (P-402)		C&I	SKETCH NO. SAS-54 REV. 1 SH. 1 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. TM DATE 10/22/87	
CHECKED BY: <i>2 mo</i>		ENG. VAS DATE 10/22/87	

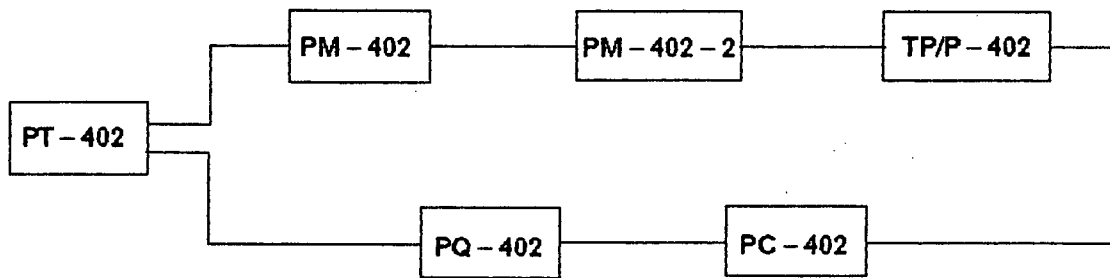


REVISION

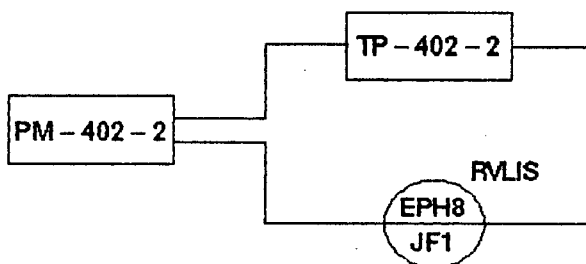
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Issued for record.  
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Incorporated FEI-880020 Revision 1.

**IMPEDANCE CALCULATION**

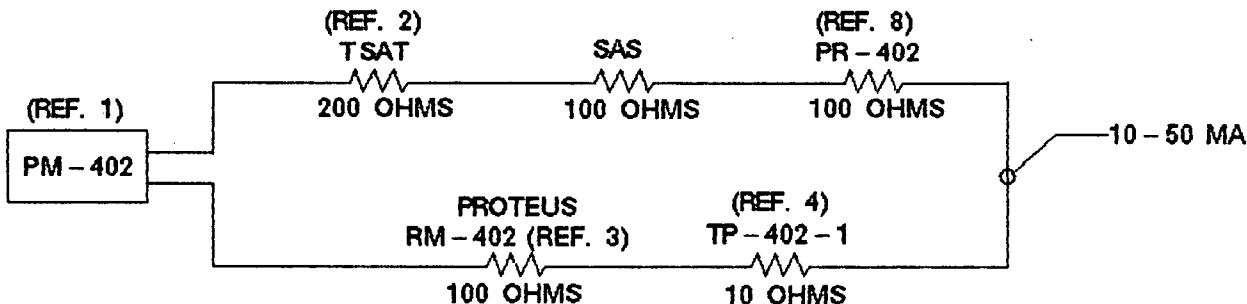
PT-402 CIRCUIT



PM-402-2 CIRCUIT



PM-402 CIRCUIT (Z EQUIV.)



TOTAL IMPEDANCE (OHMS) = 200 + 100 + 100 + 10 + 100 = 510

ENGINEERING JUSTIFICATION:

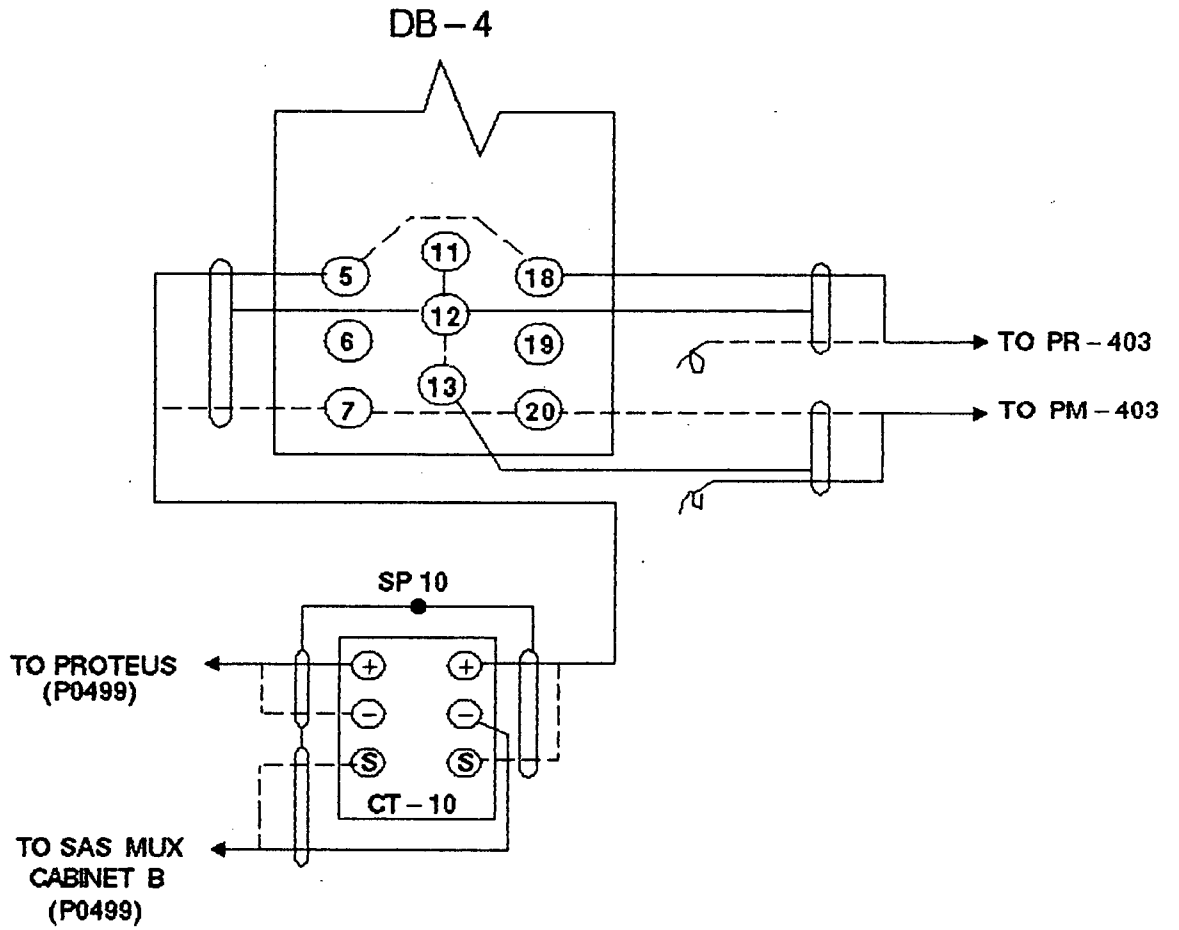
CIRCUIT PT-402 IS A CLASS A/CLASS 1E LOOP, THEREFORE, THE SAS INPUT SIGNAL CANNOT BE IMPLEMENTED HERE. CIRCUIT PM-402-2 IS USED TO DRIVE THE CLASS A/CLASS 1E REACTOR VESSEL LEVEL INSTRUMENTATION SYSTEM, AND ALSO CANNOT BE USED. CIRCUIT PM-402 IS A CLASS A/CLASS 1E LOOP, AND CAN BE UTILIZED TO OBTAIN THE SAS INPUT. PM-402 (FOXBORO 66BT-OH) CAN DRIVE A LOAD UP TO 660 OHMS. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF A 100 OHM RESISTOR FOR THE SAS INPUT, THE TOTAL IMPEDANCE WILL BE 510 OHMS. THIS IMPEDANCE FALLS WITHIN THE LIMITS OF PM-402, THEREFORE, THE SAS INPUT CAN BE IMPLEMENTED HERE.

STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
RCS PRESSURE (P-402)		ENG. <i>TM</i> DATE <i>10/22/87</i>	SKETCH NO. SAS-54
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>VAS</i> DATE <i>10/22/87</i>	REV. 1 SH. 2 OF 2
CHECKED BY: <i>RMCV</i>			

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**DESIGN DETAIL**



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R02, POINTS 10 (POS.), 11 (NEG.), AND 12 (SHIELD).

REF. DWGS.: A225430

REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
RCS PRESSURE (P-403)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>10/22/87</i>	
CHECKED BY: <i>LMCJ</i>	ENG. <i>VAD</i> DATE <i>10/22/87</i>	SKETCH NO. SAS-55	REV. 0 SH. 1 OF 2

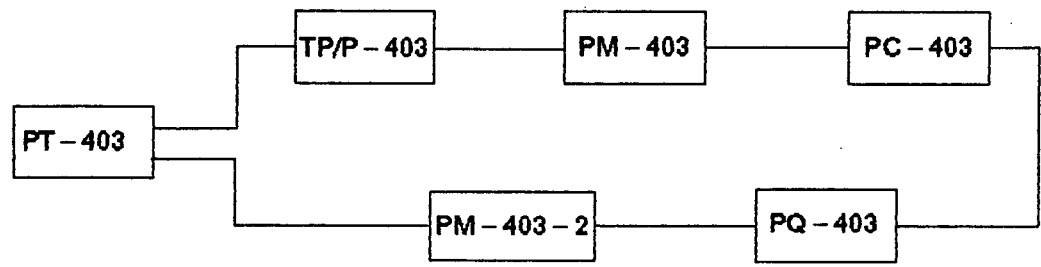
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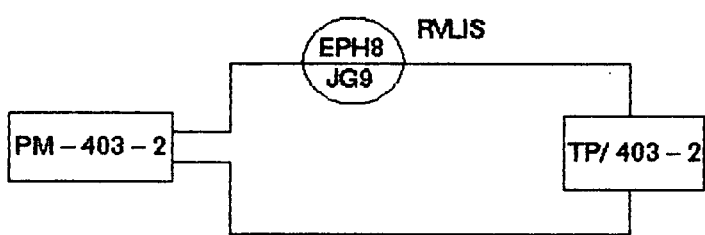
Issued for record.

**IMPEDANCE CALCULATION**

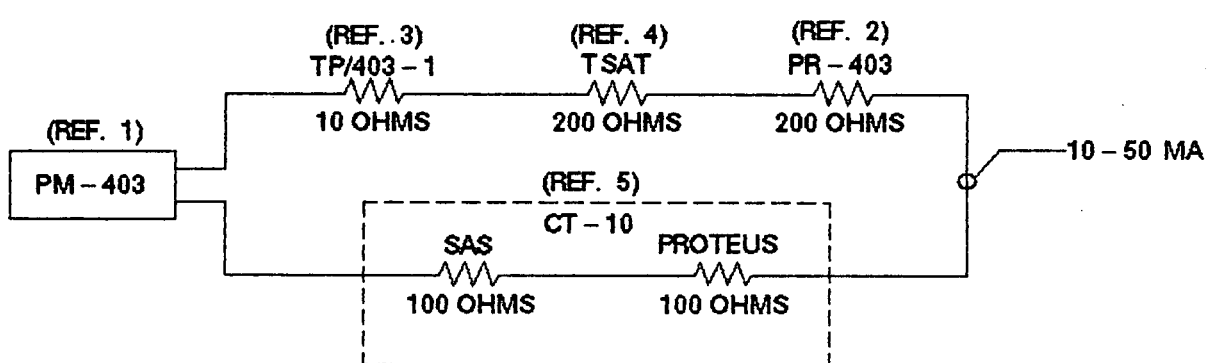
PT-403 CIRCUIT



PM-403-2 CIRCUIT



PM-403 CIRCUIT (Z EQUIV.)



TOTAL IMPEDANCE (OHMS) = 10 + 200 + 200 + 100 + 100 = 610

ENGINEERING JUSTIFICATION:

CIRCUIT PT-403 IS A CLASS A/CLASS 1E LOOP, THEREFORE, THE SAS INPUT SIGNAL CANNOT BE IMPLEMENTED HERE. CIRCUIT PM-403-2 IS USED TO DRIVE THE CLASS A/CLASS 1E REACTOR VESSEL LEVEL INSTRUMENTATION SYSTEM, AND ALSO CAN NOT BE USED. CIRCUIT PM-403 IS A CLASS A/NON CLASS 1E LOOP, AND CAN BE UTILIZED TO OBTAIN THE SAS INPUT. PM-403 (FOXBORO 66BT-OH), CAN DRIVE A LOAD UP TO 660 OHMS. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF A 100 OHM RESISTOR FOR THE SAS INPUT, THE TOTAL IMPEDANCE WILL BE 610 OHMS. THIS IMPEDANCE FALLS WITHIN THE LIMITS OF PM-403, THEREFORE, THE SAS INPUT SIGNAL CAN BE IMPLEMENTED HERE.

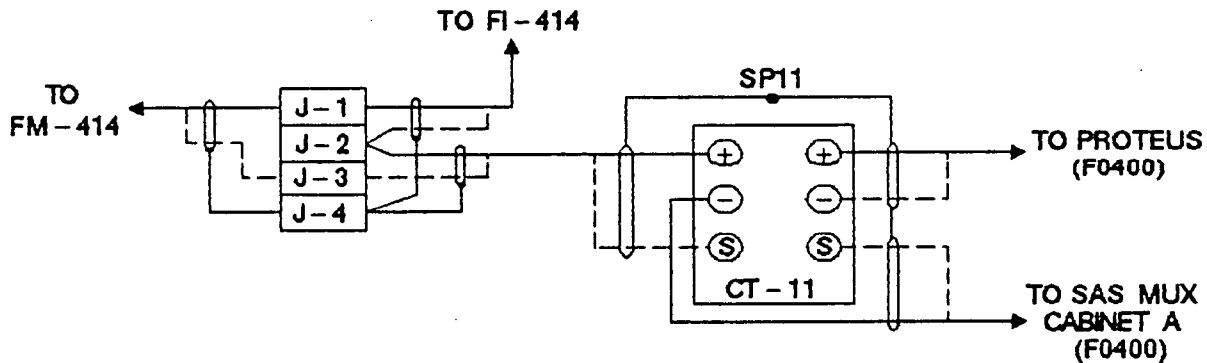
STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. N/A DATE	
RCS PRESSURE (P-403)		C&I	SKETCH NO. SAS-55 REV. 0 SH. 2 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. TM DATE 10/22/87	
CHECKED BY: <i>RMV</i>		ENG. VA DATE 10/22/87	

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DESIGN DETAIL



NOTE : SAS SIGNAL DESTINATION : BTSCA 01R03, POINTS 6 (POS.), 7 (NEG.), AND 8 (SHIELD).

REF. DWGS.: A225431, A225328  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
REACTOR COOLANT FLOW 21 (F-414)		ENG. <i>TM</i> DATE <i>12/23/86</i>	SKETCH NO. SAS - 56 REV. 0 SH. 1 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>VAD</i> DATE <i>12/23/86</i>	
CHECKED BY: <i>King Loeb</i>			

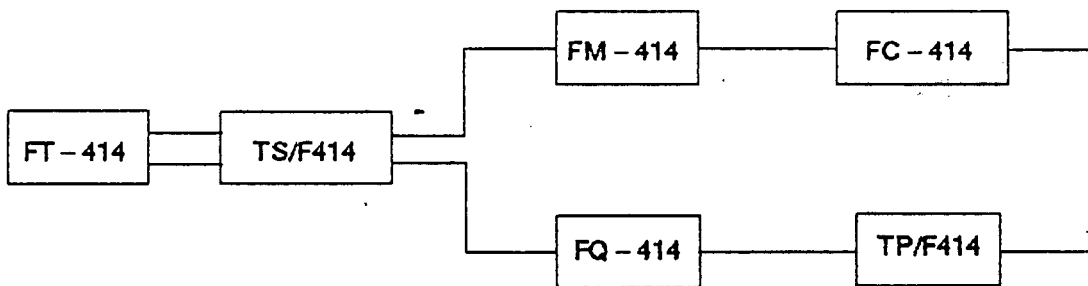
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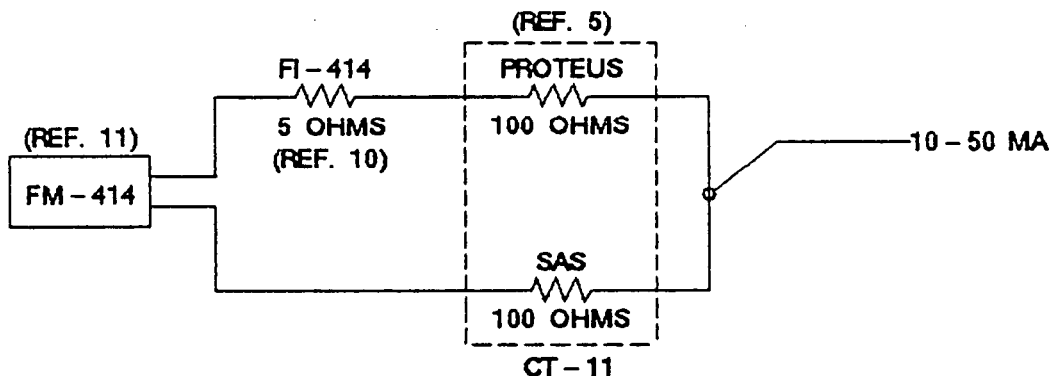
Issued for record.

IMPEDANCE CALCULATION

FT-414 REACTOR PROTECTION CIRCUIT



FM-414 REACTOR CONTROL CIRCUIT



TOTAL IMPEDANCE (OHMS) = 100 + 100 + 5 = 205

ENGINEERING JUSTIFICATION:

THE FT-414 CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS SIGNAL CANNOT BE IMPLEMENTED HERE. FM-414 (FOXBORO 66BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (205 OHMS) FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

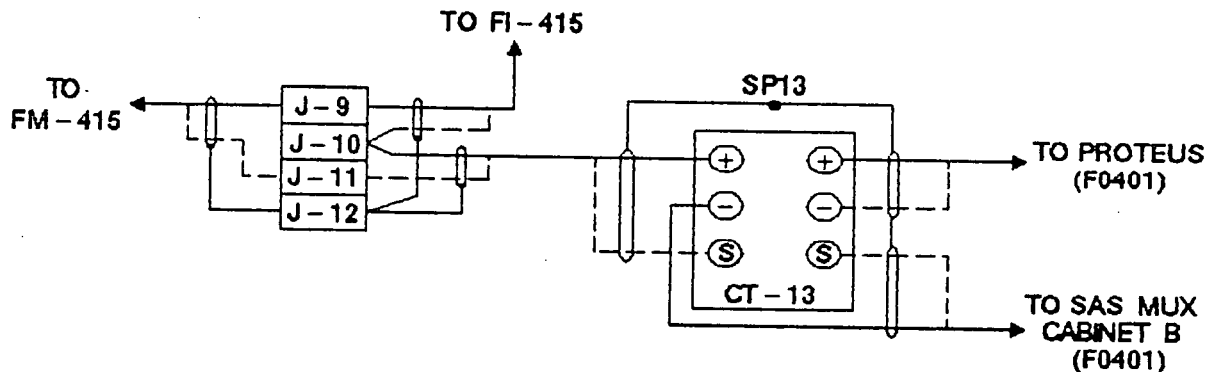
STATION: INDIAN POINT 2	A P P R V E D	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
REACTOR COOLANT FLOW 21 (F-414)		C&I	SKETCH NO. SAS-56 REV. 0 SH. 2 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>12/23/80</i>	
CHECKED BY: <i>King L...</i>		ENG. <i>VAD</i> DATE <i>12/23/80</i>	

REVISION

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DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R02, POINTS 23 (POS.), 24 (NEG.), AND 25 (SHIELD).

REF. DWGS.: A225431, A225348  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b> SKETCH NO. SAS-57 REV. 0 SH. 1 OF 2
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
REACTOR COOLANT FLOW 21 (F-415)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>12/23/86</i>	
CHECKED BY: <i>King Cook</i>		ENG. <i>VAD</i> DATE <i>12/23/86</i>	

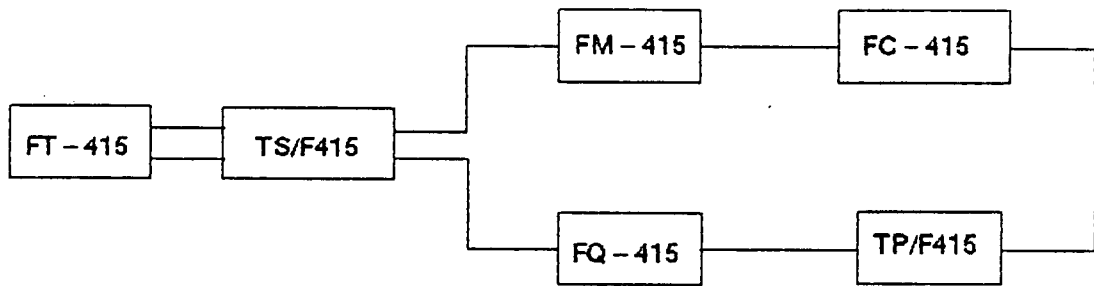
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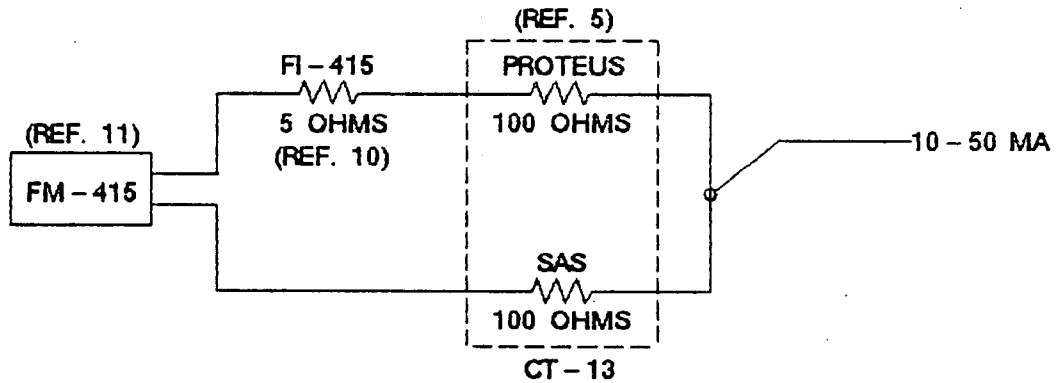
Issued for record.

**IMPEDANCE CALCULATION**

FT-415 REACTOR PROTECTION CIRCUIT



FM-415 REACTOR CONTROL CIRCUIT



TOTAL IMPEDANCE (OHMS) = 100 + 100 + 5 = 205

ENGINEERING JUSTIFICATION:

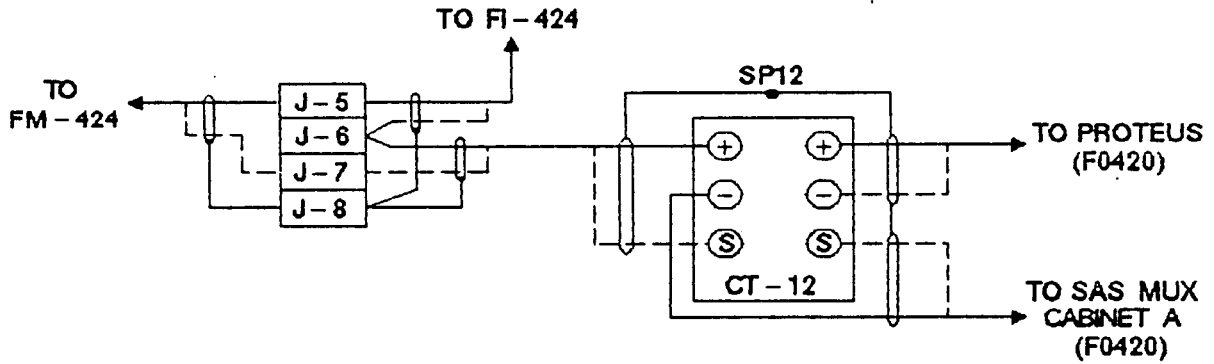
THE FT-415 CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS SIGNAL CANNOT BE IMPLEMENTED HERE. FM-415 (FOXBORO 66BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (205 OHMS) FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
REACTOR COOLANT FLOW 21 (F-415)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>12/23/86</i>	
CHECKED BY: <i>Ky Tooh</i>		ENG. <i>VAD</i> DATE <i>12/23/86</i>	SKETCH NO. SAS-57 REV. 0 SH. 2 OF 2

REVISION

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DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R04, POINTS 6 (POS.), 7 (NEG.), AND 8 (SHIELD).

REF. DWGS.: A225431, A225328  
 REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON</b> <b>EDISON</b> ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
REACTOR COOLANT FLOW 22 (F-424)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>12/23/86</i>	
CHECKED BY: <i>King Toole</i>		ENG. <i>VAD</i> DATE <i>12/23/86</i>	SKETCH NO. SAS - 58 REV. 0 SH. 1 OF 2

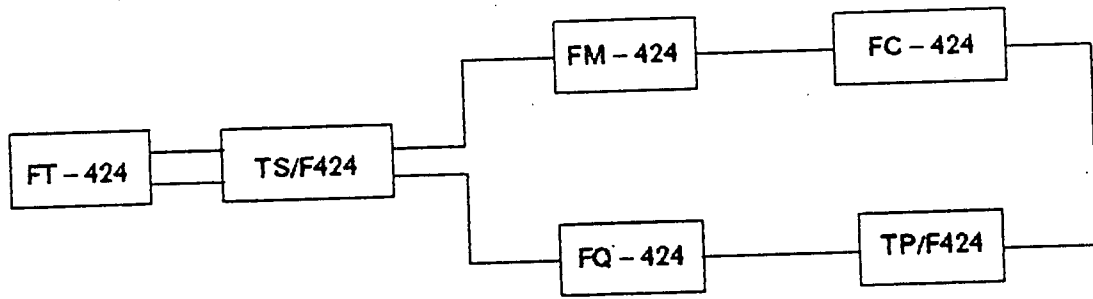


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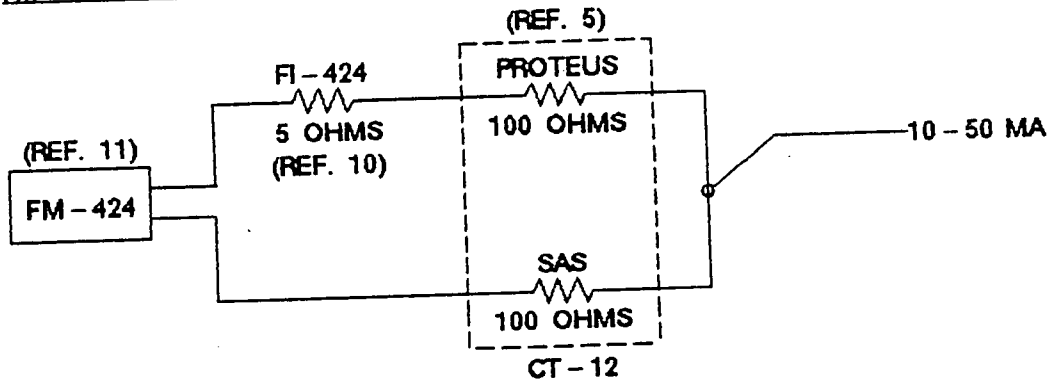
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IMPEDANCE CALCULATION

FT-424 REACTOR PROTECTION CIRCUIT



FM-424 REACTOR CONTROL CIRCUIT



TOTAL IMPEDANCE (OHMS) = 100 + 100 + 5 = 205

ENGINEERING JUSTIFICATION:

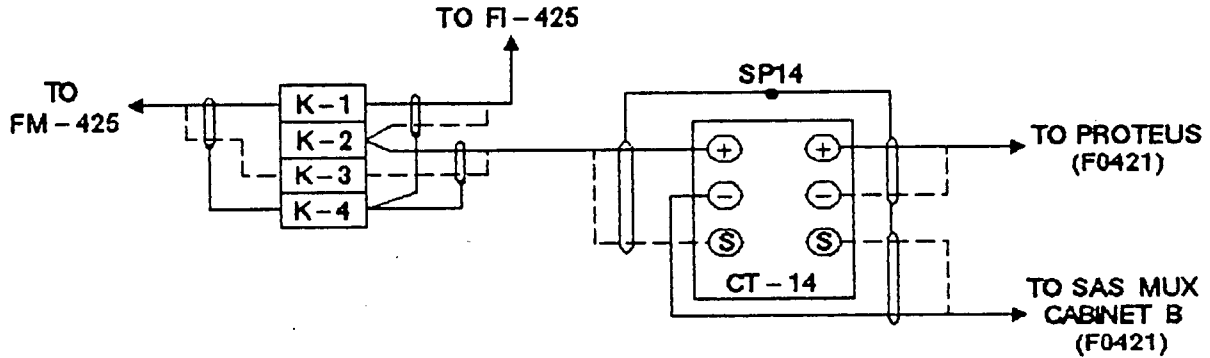
THE FT-424 CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS SIGNAL CANNOT BE IMPLEMENTED HERE. FM-424 (FOXBORO 66BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (205 OHMS) FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

STATION: INDIAN POINT 2	A P P R O V E S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
REACTOR COOLANT FLOW 22 (F-424)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>12/23/86</i>	
CHECKED BY: <i>Rory Fick</i>		ENG. <i>VAD</i> DATE <i>12/23/86</i>	SKETCH NO. SAS-58 REV. 0 SH. 2 OF 2

REVISION

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DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION : BTSCA 01R03, POINTS 6 (POS.), 7 (NEG.), AND 8 (SHIELD).

REF. DWGS.: A225431, A225348  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG.
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
REACTOR COOLANT FLOW 22 (F-425)		ENG. <i>TM</i> DATE <i>12/23/86</i>	SKETCH NO. SAS-59
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>VAD</i> DATE <i>12/23/86</i>	REV. 0 SH. 1 OF 2
CHECKED BY: <i>King Loh</i>			

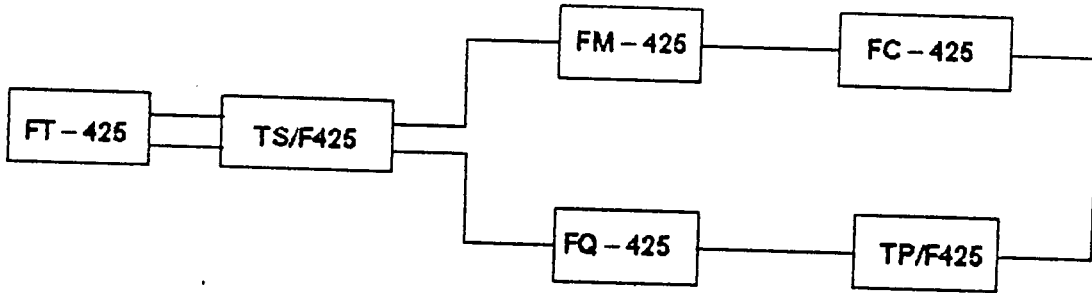
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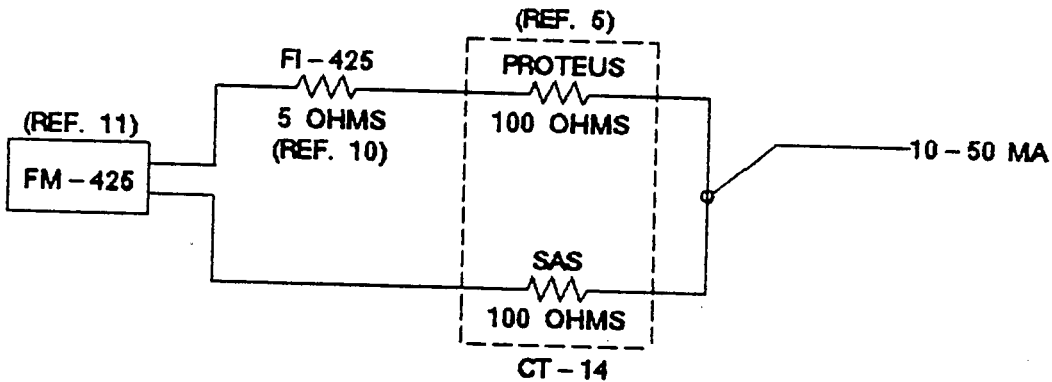
Issued for record.

# IMPEDANCE CALCULATION

## FT-425 REACTOR PROTECTION CIRCUIT



## FM-425 REACTOR CONTROL CIRCUIT



TOTAL IMPEDANCE (OHMS) = 100 + 100 + 5 = 205

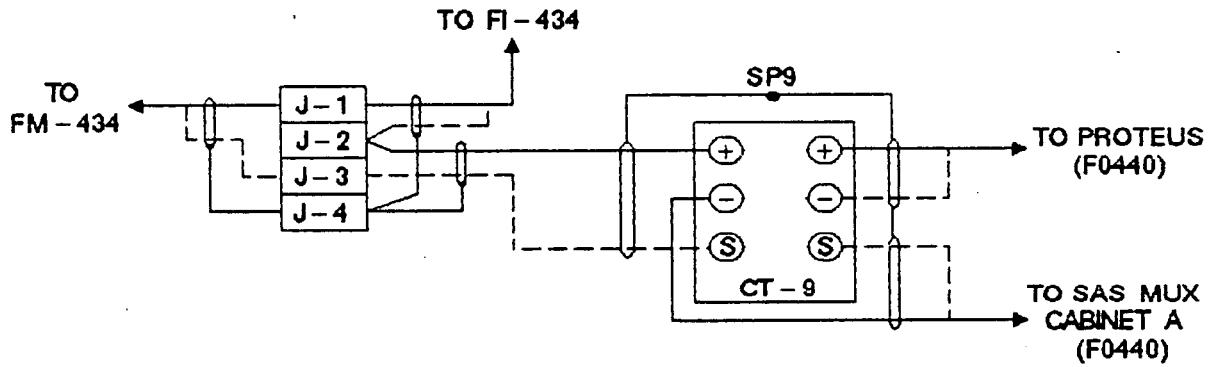
### ENGINEERING JUSTIFICATION:

THE FT-425 CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS SIGNAL CANNOT BE IMPLEMENTED HERE. FM-425 (FOXBORO 68 BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (205 OHMS) FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

STATION: INDIAN POINT 2 TITLE: SAS COMPUTER INTERFACE REACTOR COOLANT FLOW 22 (F-425) SKETCHED BY: VICTOR S. D'AMORE CHECKED BY: <i>King Jack</i>	A P P R O V E S	MECH. PROGRAM ENG. N/A DATE C&J ENG. TM DATE 12/23/86 ENG. VAD DATE 12/23/86	<b>CON EDISON ENG. C&amp;J SKETCH</b>  SKETCH NO. SAS-59 REV. 0 SH. 2 OF 2
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REVISION  
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**DESIGN DETAIL**



NOTE : SAS SIGNAL DESTINATION : BTSCA 01R02, POINTS 23 (POS.), 24 (NEG.), AND 25 (SHIELD).

REF. DWGS.: A225436, A225328  
 REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
REACTOR COOLANT FLOW 23 (F-434)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>12/23/86</i>	
CHECKED BY: <i>King Tech</i>		ENG. <i>VAD</i> DATE <i>12/23/86</i>	SKETCH NO. SAS - 60 REV. 0 SH. 1 OF 2

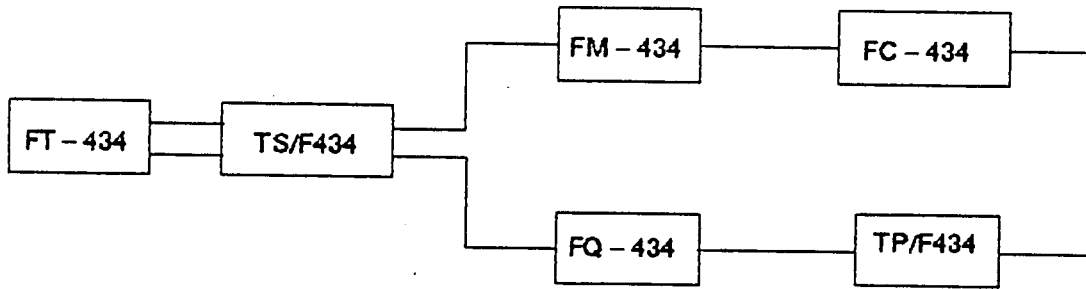
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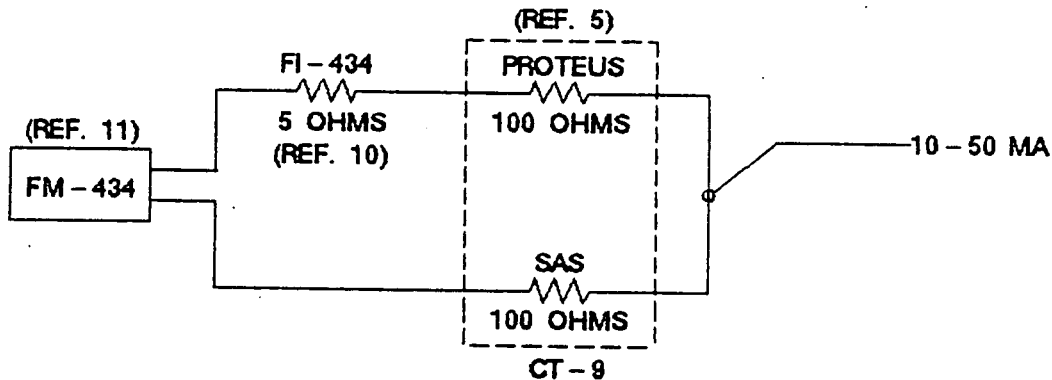
Issued for record.

# IMPEDANCE CALCULATION

## FT-434 REACTOR PROTECTION CIRCUIT



## FM-434 REACTOR CONTROL CIRCUIT



TOTAL IMPEDANCE (OHMS) = 100 + 100 + 5 = 205

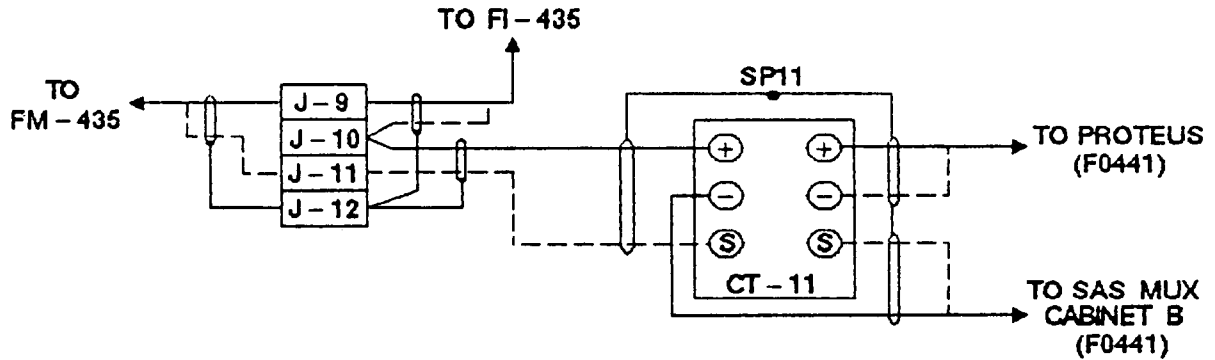
### ENGINEERING JUSTIFICATION:

THE FT-434 CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS SIGNAL CANNOT BE IMPLEMENTED HERE. FM-434 (FOXBORO 66BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (205 OHMS) FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

STATION: INDIAN POINT 2	A P P R V E L S	MECH. PROGRAM	CON
TITLE: SAS COMPUTER INTERFACE		ENG. N/A DATE	EDISON ENG.
REACTOR COOLANT FLOW 23 (F-434)		C&I	C&I SKETCH
SKETCHED BY: VICTOR S. D'AMORE		ENG. TM DATE 12/23/86	SKETCH NO. SAS-60
CHECKED BY: <i>King Loh</i>	ENG. VAD DATE 12/23/86	REV. 0 SH. 2 OF 2	

REVISION  
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DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION : BTSCA 01R01, POINTS 19 (POS.), 20 (NEG.), AND 21 (SHIELD).

REF. DWGS.: A225436, A225348  
REF. SKETCH: SAS - REF

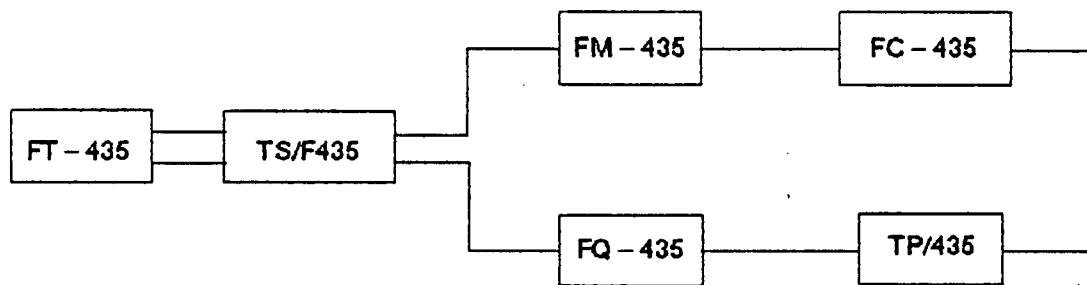
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
REACTOR COOLANT FLOW 23 (F-435)		ENG. <i>TM</i> DATE <i>12/23/80</i>	SKETCH NO. SAS-61 REV. 0 SH. 1 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>VLD</i> DATE <i>12/23/80</i>	
CHECKED BY: <i>King Lock</i>			

REVISION

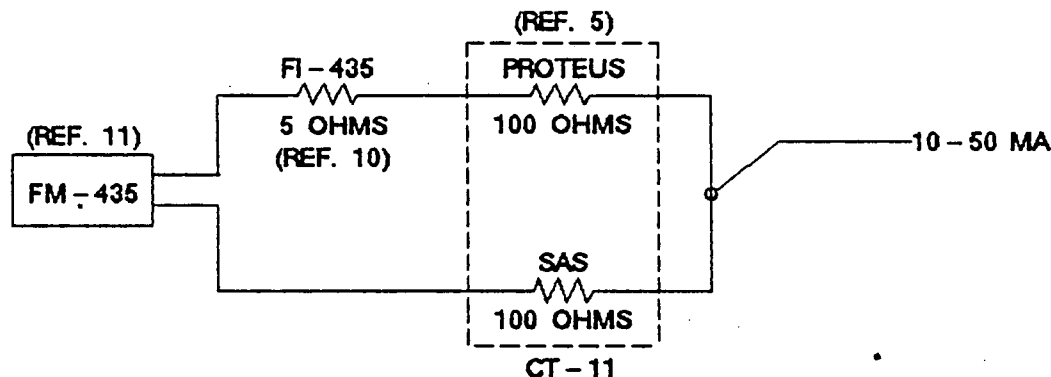
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Issued for record.

**IMPEDANCE CALCULATION**

FT-435 REACTOR PROTECTION CIRCUIT



FM-435 REACTOR CONTROL CIRCUIT



TOTAL IMPEDANCE (OHMS) = 100 + 100 + 5 = 205

ENGINEERING JUSTIFICATION:

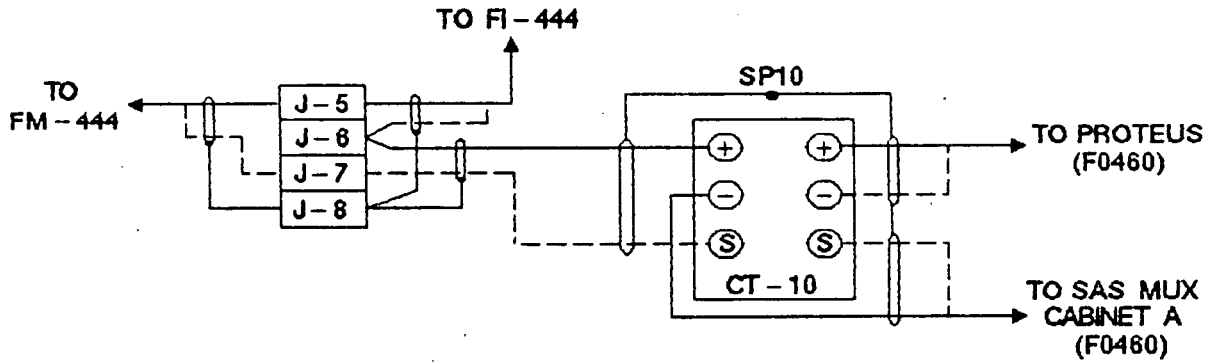
THE FT-435 CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS SIGNAL CANNOT BE IMPLEMENTED HERE. FM-435 (FOXBORO 66BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (205 OHMS) FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

STATION: INDIAN POINT 2	A P P R O V E S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>n/a</i> DATE	
REACTOR COOLANT FLOW 23 (F-435)		ENG. <i>T.M</i> DATE <i>12/23/86</i>	SKETCH NO. SAS-61
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>VAS</i> DATE <i>12/23/86</i>	REV. 0 SH. 2 OF 2
CHECKED BY: <i>King John</i>			

REVISION

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DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R010, POINTS 10 (POS.), 11 (NEG.), AND 12 (SHIELD).

REF. DWGS.: A225436, A225328  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON</b> <b>EDISON</b> ENG.
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
REACTOR COOLANT FLOW 24 (F-444)		ENG. <i>TM</i> DATE <i>12/23/86</i>	SKETCH NO. SAS - 62 REV. 0 SH. 1 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>VAD</i> DATE <i>12/23/86</i>	
CHECKED BY: <i>King Leck</i>			



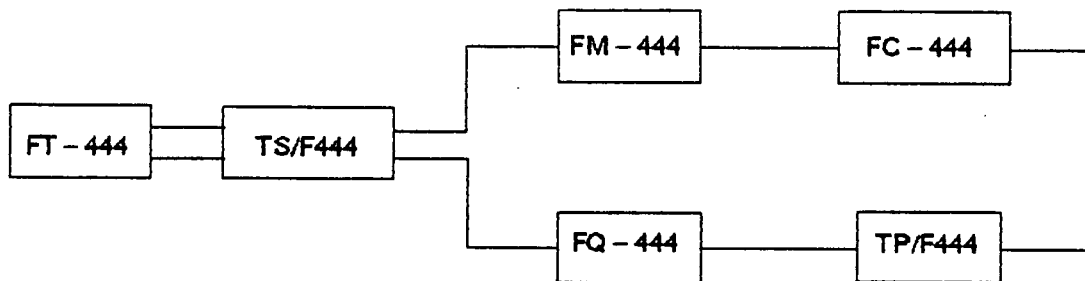
REVISION

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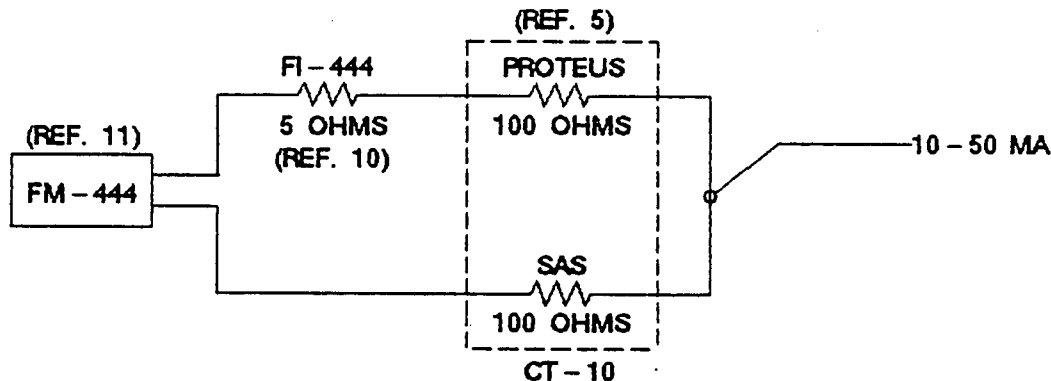
Issued for record.

**IMPEDANCE CALCULATION**

FT-444 REACTOR PROTECTION CIRCUIT



FM-444 REACTOR CONTROL CIRCUIT



TOTAL IMPEDANCE (OHMS) = 100 + 100 + 5 = 205

ENGINEERING JUSTIFICATION:

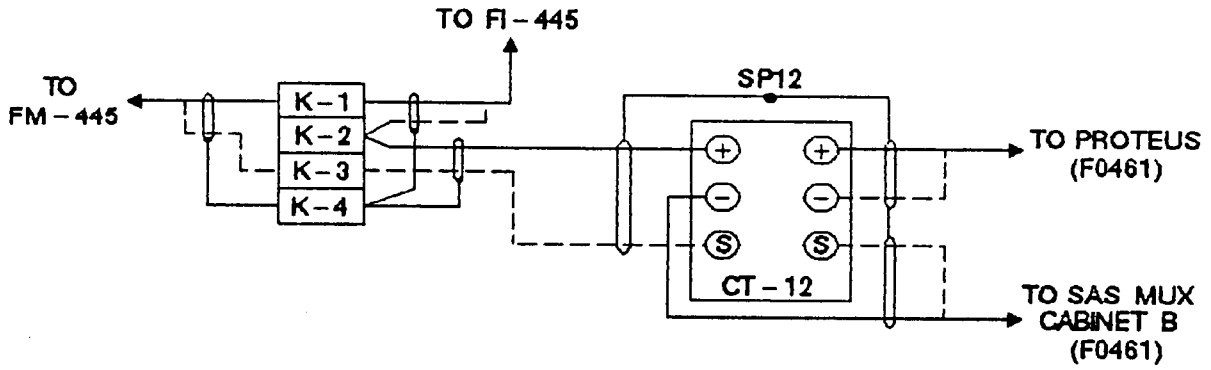
THE FT-444 CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS SIGNAL CANNOT BE IMPLEMENTED HERE. FM-444 (FOXBORO 66BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (205 OHMS) FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

STATION: INDIAN POINT 2	A P P R O V E S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. N/A DATE	
REACTOR COOLANT FLOW 24 (F-444)		ENG. TM DATE 12/23/86	SKETCH NO. SAS-62 REV. 0 SH. 2 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. VAS DATE 12/23/86	
CHECKED BY: <i>King Toth</i>			

REVISION

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Issued for record.

DESIGN DETAIL



NOTE : SAS SIGNAL DESTINATION : BTSCA 01R02, POINTS 2 (POS.), 3 (NEG.), AND 4 (SHIELD)

REF. DWGS.: A225436, A225348  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG.</b> <b>C&amp;J SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
REACTOR COOLANT FLOW 24 (F-445)		C&J	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>12/23/86</i>	
CHECKED BY: <i>King Loch</i>		ENG. <i>VAD</i> DATE <i>12/23/86</i>	SKETCH NO. SAS - 63 REV. 0 SH. 1 OF 2

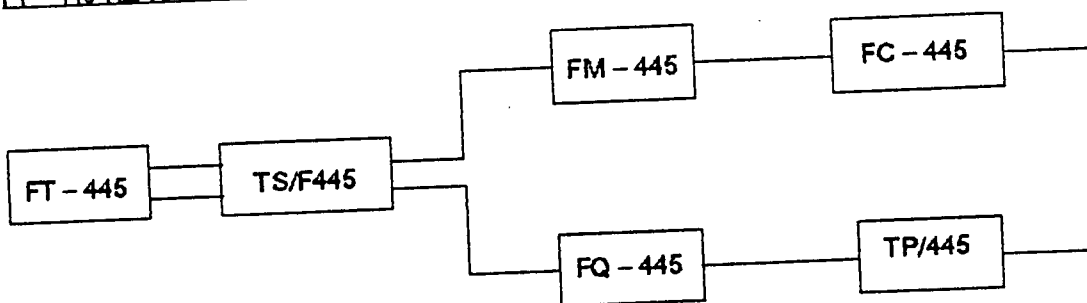
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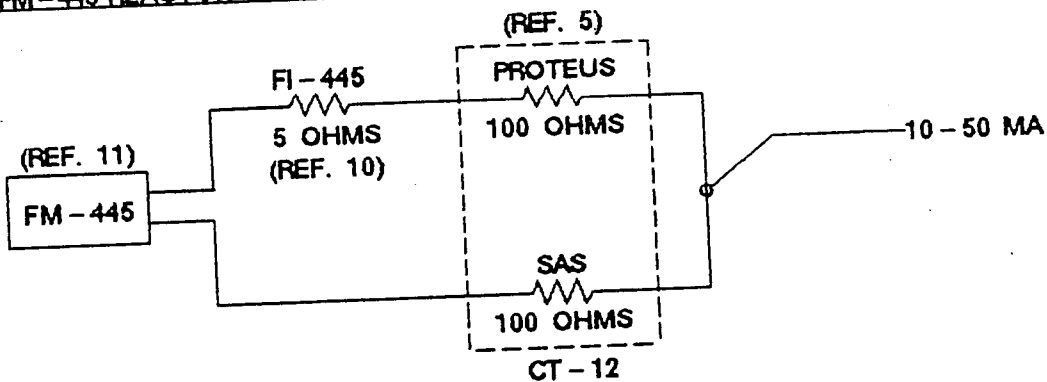
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# IMPEDANCE CALCULATION

## FT-445 REACTOR PROTECTION CIRCUIT



## FM-445 REACTOR CONTROL CIRCUIT



$$\text{TOTAL IMPEDANCE (OHMS)} = 100 + 100 + 5 = 205$$

### ENGINEERING JUSTIFICATION:

THE FT-445 CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS SIGNAL CANNOT BE IMPLEMENTED HERE. FM-445 (FOXBORO 66BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (205 OHMS) FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

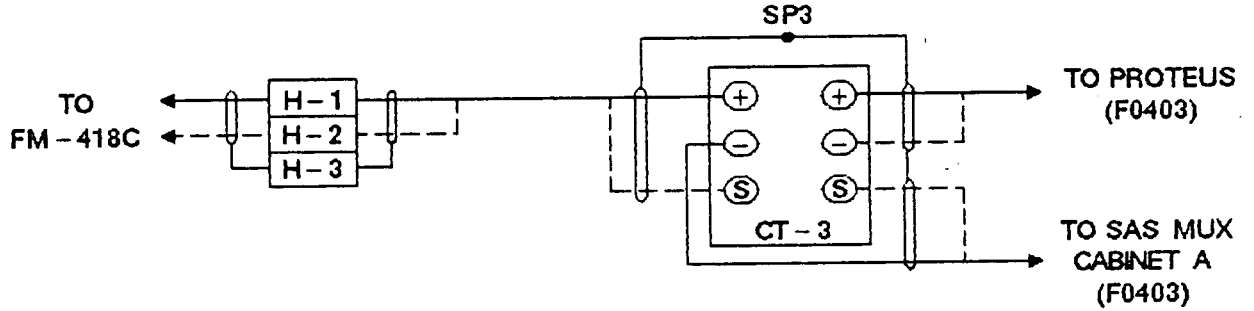
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. N/A DATE	
REACTOR COOLANT FLOW 24 (F-445)	S	C&I	SKETCH NO. SAS-63 REV. 0 SH. 2 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. TM DATE 12/23/86	
CHECKED BY:		ENG. VAD DATE 12/23/86	

REVISION

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Issued for record.

DESIGN DETAIL



NOTE : SAS DESTINATION : BTSCA 01R07, POINTS 2 (POS.), 3 (NEG.) AND 4 (SHIELD).

REF. DWGS.: A225379, A225318  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG.</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN A FW IN 1 FLOW (FT-418A)		C&I	SKETCH NO. SAS-64 REV. 0 SH. 1 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 12/23/86	
CHECKED BY: <i>King Lock</i>		ENG. <i>VAD</i> DATE 12/23/86	

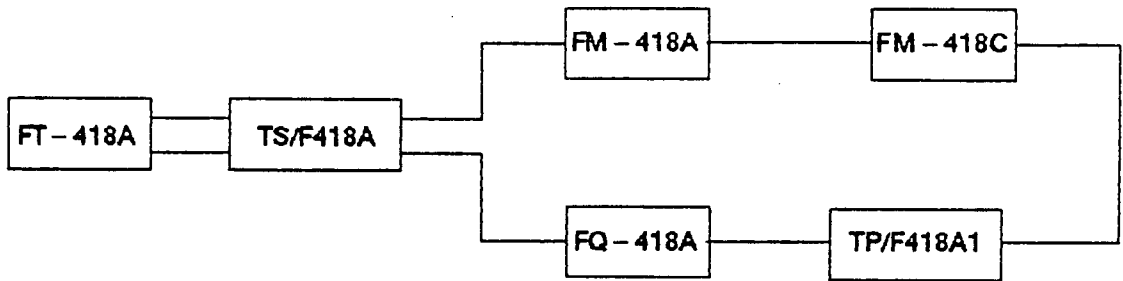
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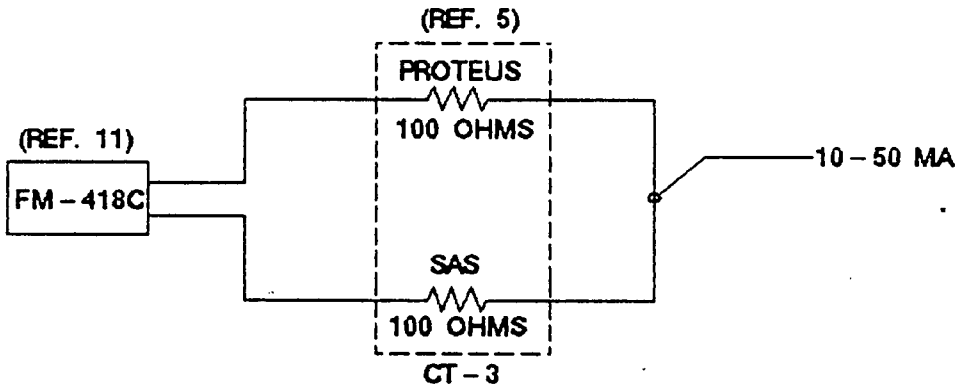
Issued for record.

# IMPEDANCE CALCULATION

## FT-418A REACTOR PROTECTION CIRCUIT



## FM-418C REACTOR CONTROL CIRCUIT



TOTAL IMPEDANCE (OHMS) = 100 + 100 = 200

### ENGINEERING JUSTIFICATION:

THE FT-418A CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. FM-418C (FOXBORO 68BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (200 OHMS), FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

STATION: INDIAN POINT 2  
 TITLE: SAS COMPUTER INTERFACE  
 STM GEN A FW IN 1 FLOW (FT-418A)  
 SKETCHED BY: VICTOR S. D'AMORE  
 CHECKED BY: *King Loh*

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S  
 MECH. PROGRAM  
 ENG. *N/A* DATE  
 C&I  
 ENG. *TM* DATE *12/23/86*  
 ENG. *VAD* DATE *12/23/86*

**CON  
EDISON ENG.  
C&I SKETCH**

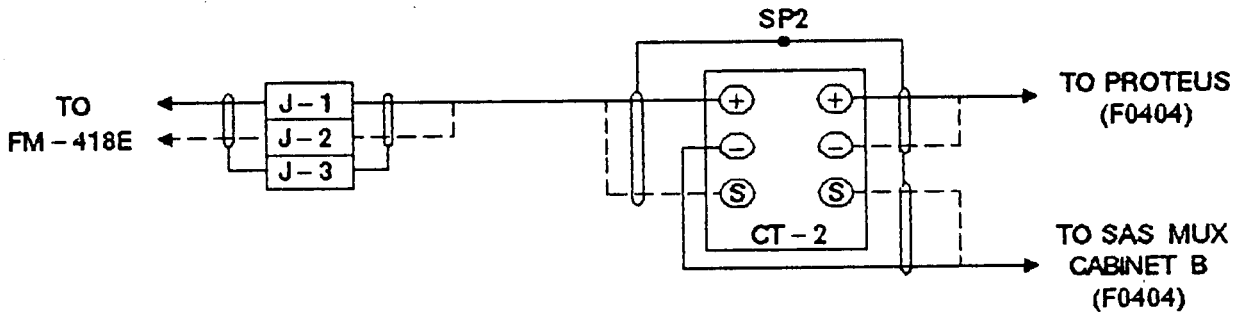
SKETCH NO. SAS-64  
 REV. 0 SH. 2 OF 2

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Issued for record.

DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R08, POINTS 2 (POS.), 3 (NEG.), AND 4 (SHIELD).

REF. DWGS.: A225379, A225338  
 REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	A P P R V E S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN A FW IN 2 FLOW (FT-418B)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>4/23/86</i>	
CHECKED BY: <i>King John</i>		ENG. <i>VAD</i> DATE <i>12/23/86</i>	SKETCH NO. SAS - 65 REV. 0 SH. 1 OF 2

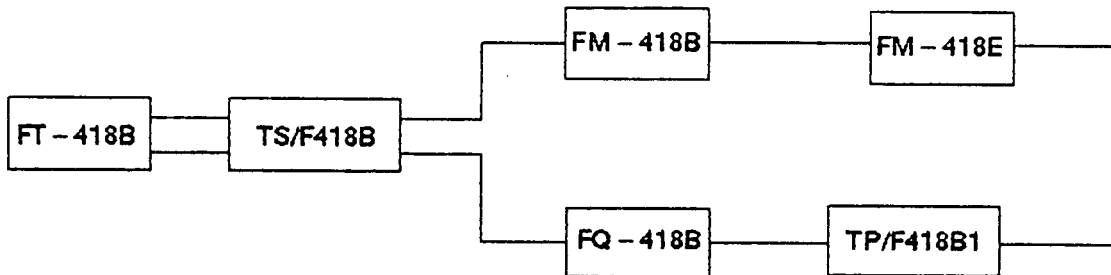
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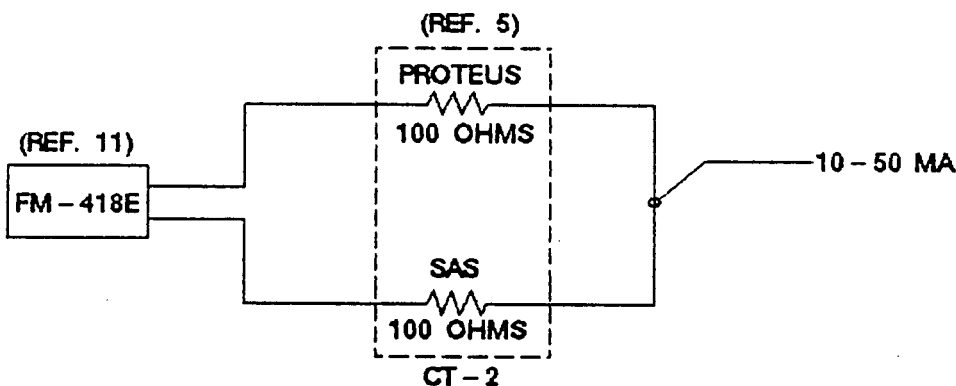
Issued for record.

# IMPEDANCE CALCULATION

## FT-418B REACTOR PROTECTION CIRCUIT



## FM-418E REACTOR CONTROL CIRCUIT



TOTAL IMPEDANCE (OHMS) = 100 + 100 = 200

### ENGINEERING JUSTIFICATION:

THE FT-418B CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. FM-418E (FOXBORO 66BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (200 OHMS), FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

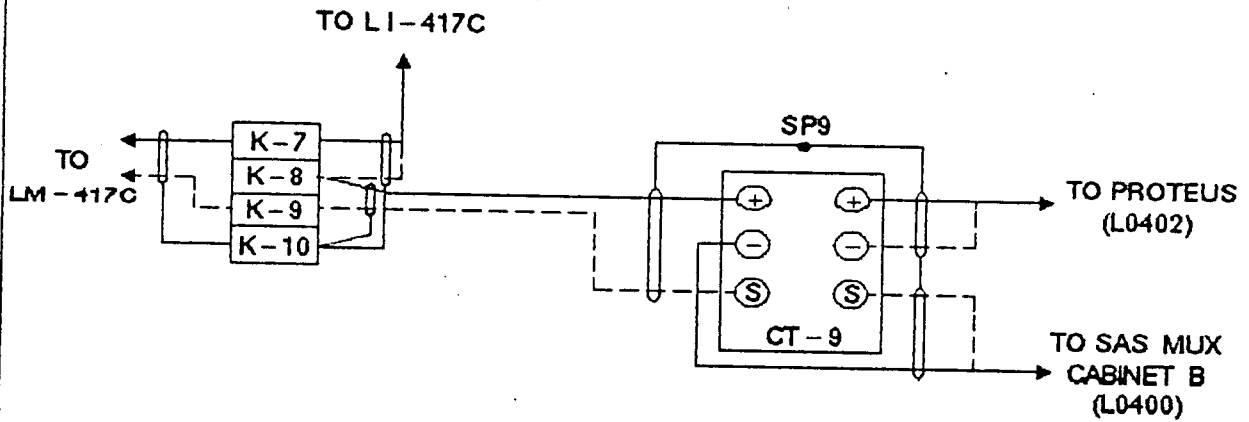
STATION: INDIAN POINT 2	A P P R V E S	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN A FW IN 2 FLOW (FT-418B)		C&I	SKETCH NO. SAS-65 REV. 0 SH. 2 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>2/23/86</i>	
CHECKED BY: <i>King Loh</i>		ENG. <i>VAD</i> DATE <i>12/23/86</i>	

REVISION

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Issued for record.

DESIGN DETAIL



- NOTE: 1. SAS SIGNAL DESTINATION: BTSCA 01R02, POINTS 27 (POS.), 28 (NEG.), AND 29 (SHIELD).  
 2. COMPUTER ADDRESS FOR SAS WILL BE CHANGED FROM L0400 TO L0402, PENDING IMPLEMENTATION OF REFERENCE MEMO ON DRAWING A225392.

REF. DWGS.: A225392, A225349  
 REF. SKETCH: SAS - REF  
 REF. MEMO: CON - ED MEMO (MSSRS B. LEE AND F. HOFFMAN) DATED 10/16/86

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG. C&J SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. N/A DATE	
STM GEN A NAR RNG 3 LVL (LT-417C)		C&J	
SKETCHED BY: VICTOR S. D'AMORE		ENG. TM DATE 12/23/86	
CHECKED BY: <i>King Zook</i>		ENG. VAD DATE 12/23/86	SKETCH NO. SAS-66 REV. 0 SH. 1 OF 2



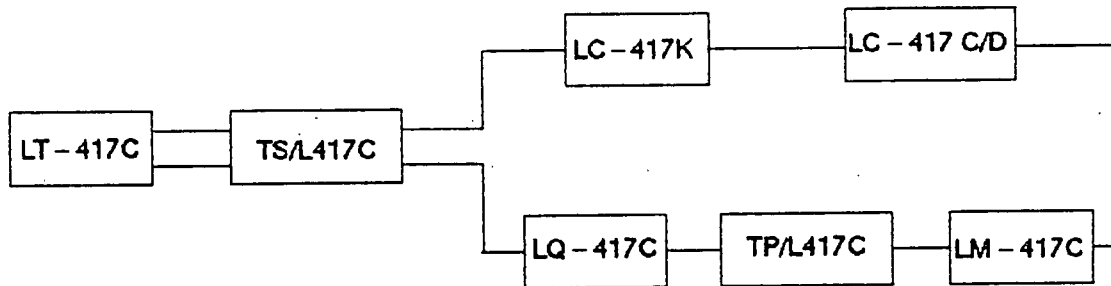
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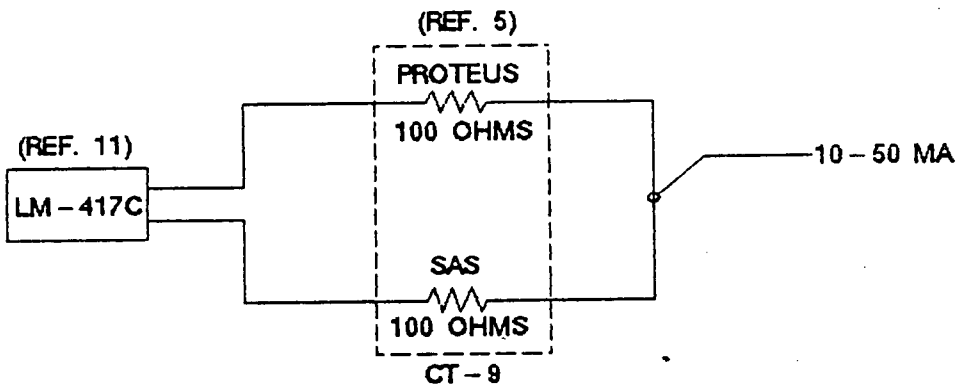
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**IMPEDANCE CALCULATION**

LT-417C REACTOR PROTECTION CIRCUIT



LM-417C REACTOR CONTROL CIRCUIT



TOTAL IMPEDANCE (OHMS) = 100 + 100 = 200

ENGINEERING JUSTIFICATION:

THE LT-417C CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. LM-417C (FOXBORO 68BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (200 OHMS), FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

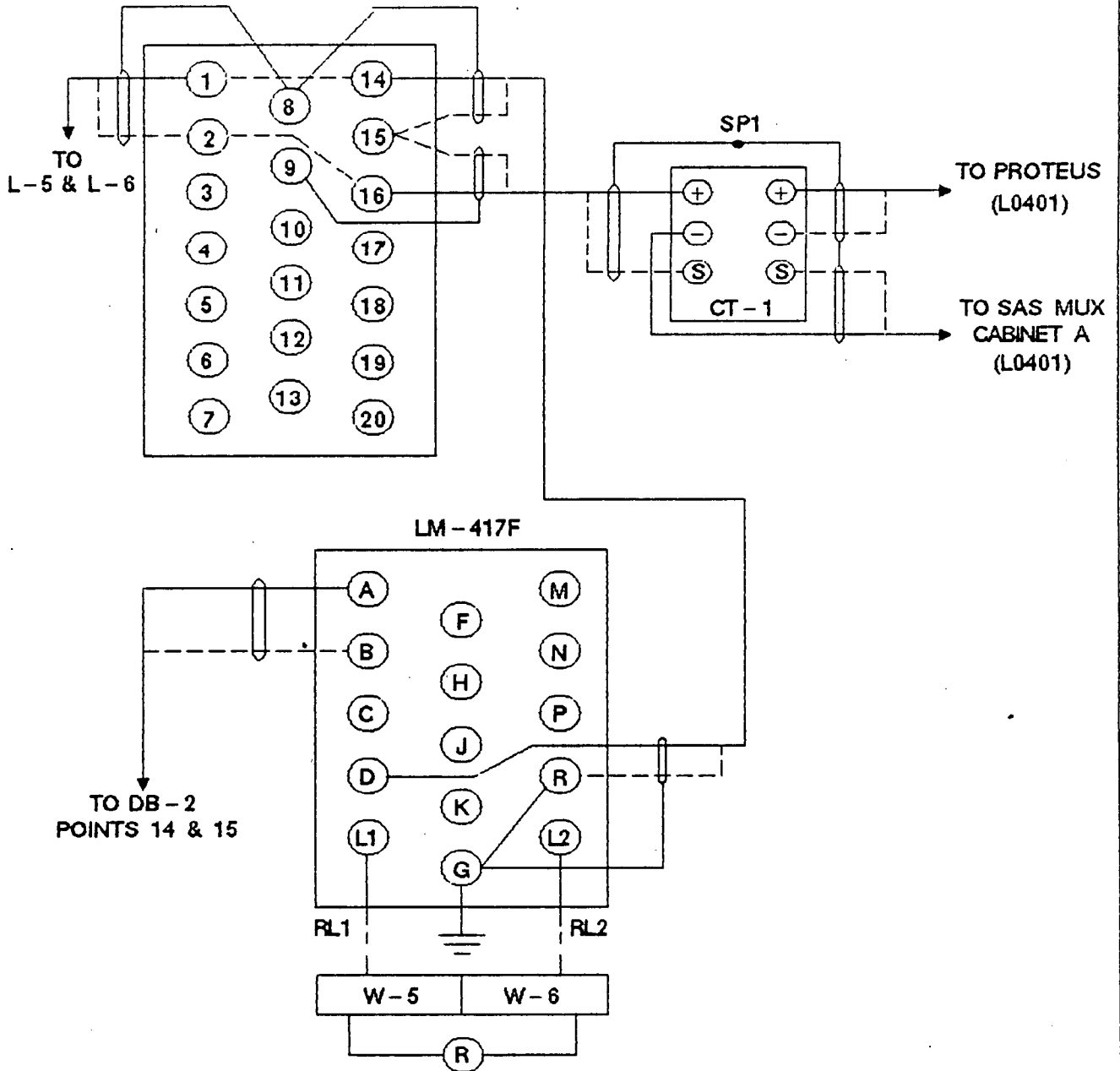
STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN A NAR RNG 3 LVL (LT-417C)		C&I	SKETCH NO. SAS-66 REV. 0 SH. 2 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>12/23/80</i>	
CHECKED BY: <i>King Look</i>		ENG. <i>VAD</i> DATE <i>12/23/80</i>	

REVISION

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Issued for record.

**DESIGN DETAIL**

(SEE NOTE 2)



NOTE :

1. SAS SIGNAL DESTINATION: BTSCA 01R05, POINTS 19 (POS.), 20 (NEG.), AND 21 (SHIELD).
2. DISTRIBUTION BLOCK IS DESIGNATED FOR LABELING.

REF. DWGS.: A225389, A225358

REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN A NAR RNG 2 LVL (LT-417B)		C&I	SKETCH NO. SAS - 67
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>1/23/86</i>	
CHECKED BY: <i>King Lock</i>		ENG. <i>VAS</i> DATE <i>12/23/86</i>	

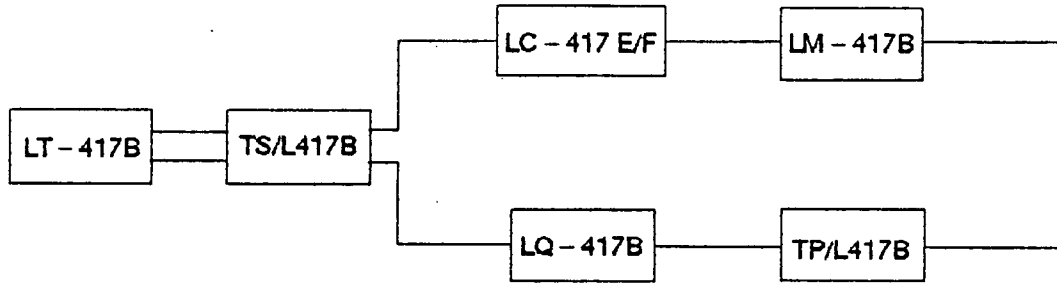
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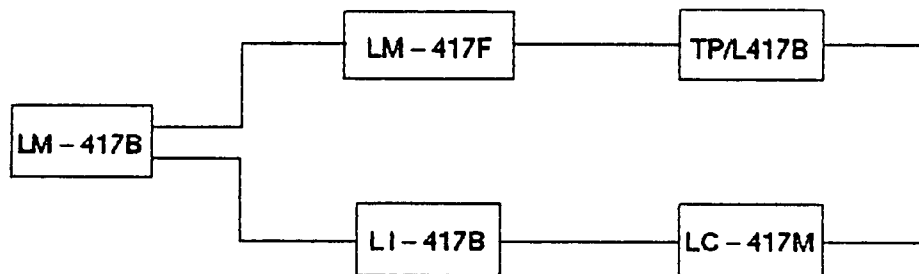
Issued for record.

# IMPEDANCE CALCULATION

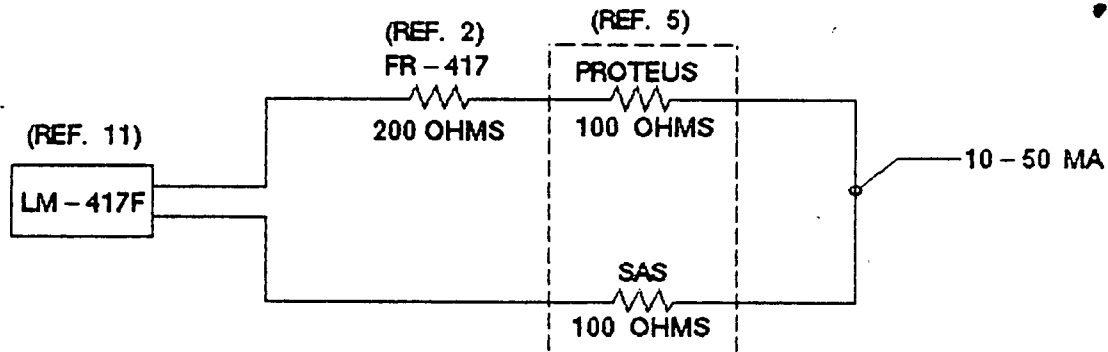
## LT-417B REACTOR PROTECTION CIRCUIT



## LM-417B REACTOR CONTROL CIRCUIT



## LM-417F CIRCUIT (Z EQUIV.)



TOTAL IMPEDANCE (OHMS) = 200 + 100 + 100 = 400

### ENGINEERING JUSTIFICATION:

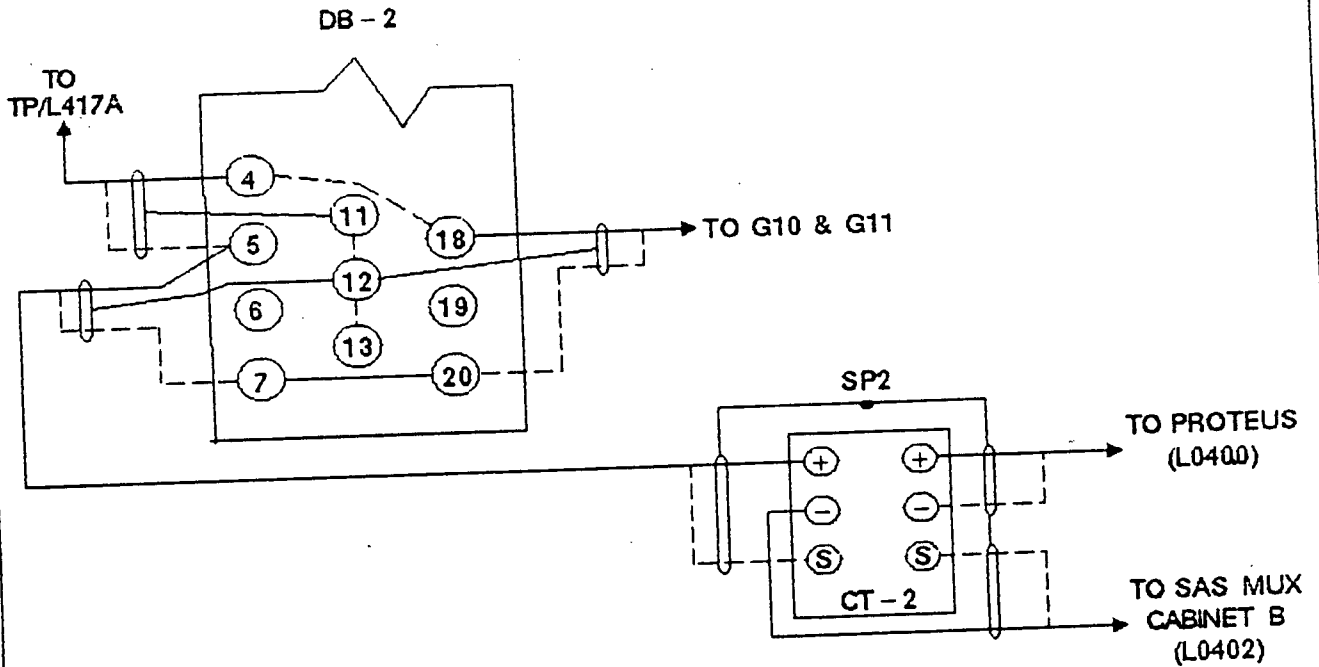
THE LT-417B CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS SIGNAL CANNOT BE IMPLEMENTED HERE. LM-417B IS A FOXBORO 66BR-OH ISOLATOR, AND SERVES TO ISOLATE THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM. LM-417F (FOXBORO 66BR-OH) SERVES AS A CURRENT REPEATER IN THIS CIRCUIT, AND CAN DRIVE A LOAD UP TO A 660 OHMS. THE SAS SIGNAL CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (400 OHMS), FALLS WITHIN THE LOAD LIMIT (660 OHMS).

STATION: INDIAN POINT 2	A P P R V E S	MECH. PROGRAM	<b>CON EDISON ENG.</b> C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN A NAR RNG 2 LVL (LT-417B)		ENG. <i>TM</i> DATE <i>12/23/86</i>	SKETCH NO. SAS-67 REV. 0 SH. 2 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>VAS</i> DATE <i>12/23/86</i>	
CHECKED BY: <i>King Lock</i>			

REVISION

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Issued for record.

DESIGN DETAIL



- NOTE: 1. SAS SIGNAL DESTINATION: BTSCA 01R04, POINTS 27 (POS.), 28 (NEG), AND 29 (SHIELD).  
 2. COMPUTER ADDRESS FOR SAS WILL BE CHANGED FROM L0402 TO L0400, PENDING IMPLEMENTATION OF REFERENCE MEMO ON DRAWING A225389.

REF. DWGS.: A225389, A225373  
 REF. SKETCH: SAS - REF.  
 REF. MEMO: CON - ED MEMO (MSSRS B. LEE AND F. HOFFMAN) DATED 10/16/86

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN A NAR RNG 1 LVL (LT-417A)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 3/17/87	
CHECKED BY: <i>King Lock</i>		ENG. <i>VAD</i> DATE 3/17/87	SKETCH NO. SAS-68
			REV. 0 SH. 1 OF 2

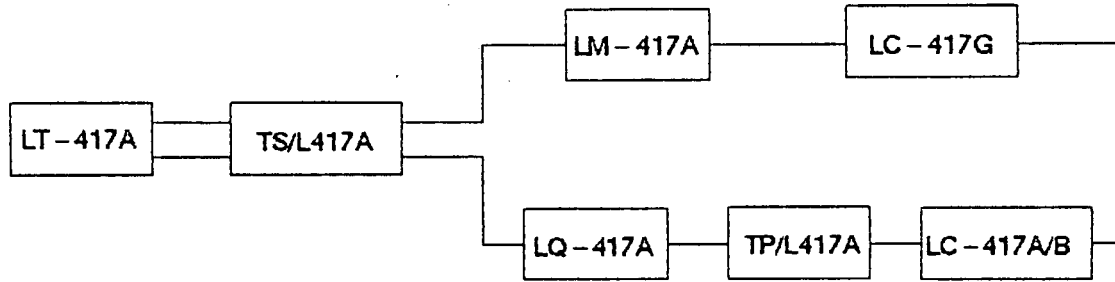
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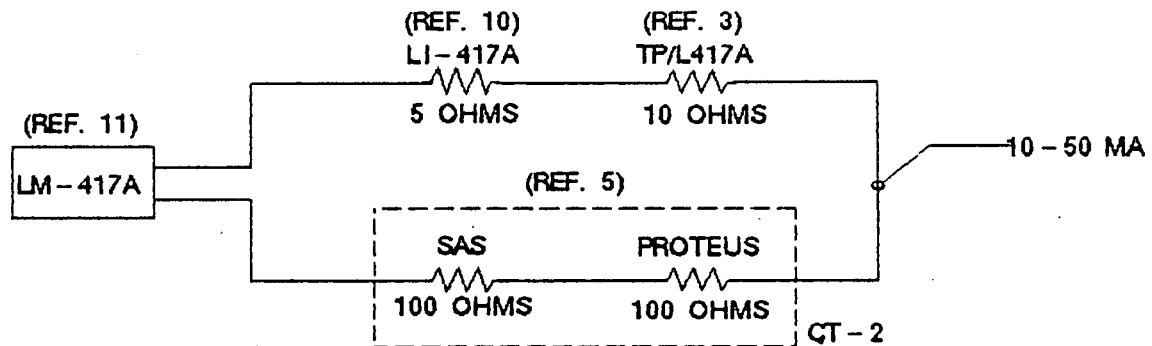
Issued for record.

**IMPEDANCE CALCULATION**

LT-417A REACTOR PROTECTION CIRCUIT



LM-417A REACTOR CONTROL CIRCUIT (Z EQUIV.)



TOTAL IMPEDANCE (OHMS) = 5 + 10 + 100 + 100 = 215

ENGINEERING JUSTIFICATION:

THE LT-417A CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. LM-417A (FOXBORO 66BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (215 OHMS), FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

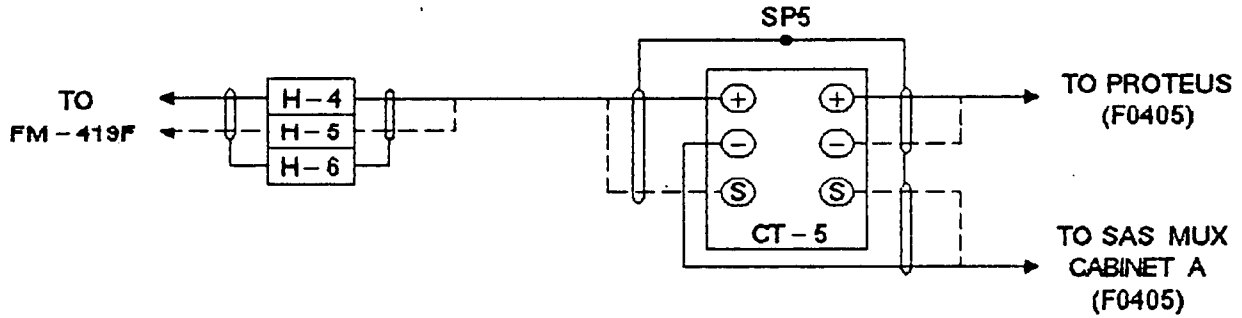
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. N/A DATE	
STM GEN A NAR RNG 1 LVL (LT-417A)	VLS	C&I	SKETCH NO. SAS-68 REV. 0 SH. 2 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. JM DATE 3/17/87	
CHECKED BY: King Loh		ENG. VAD DATE 3/17/87	

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Issued for record.

# DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R05, POINTS 10 (POS.), 11 (NEG.), AND 12 (SHIELD).

REF. DWGS.: A225379, A225318  
REF. SKETCH: SAS - REF

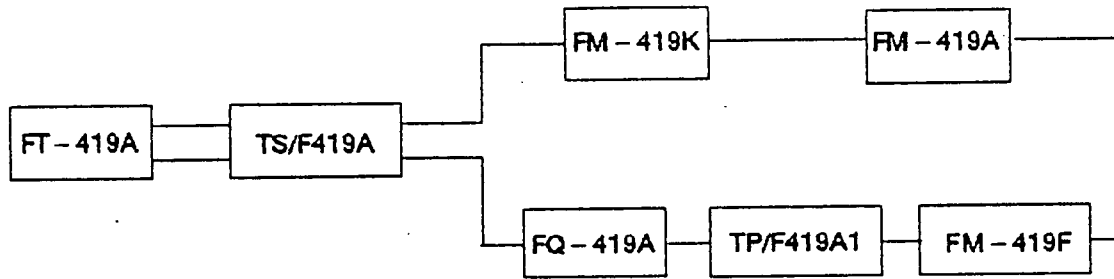
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON</b> ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN A STM OUT 1 FLOW (FT-419A)		C&I	SKETCH NO. SAS-69 REV. 0 SH. 1 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>12/23/86</i>	
CHECKED BY: <i>King Lock</i>	ENG. <i>VAD</i> DATE <i>12/23/86</i>		

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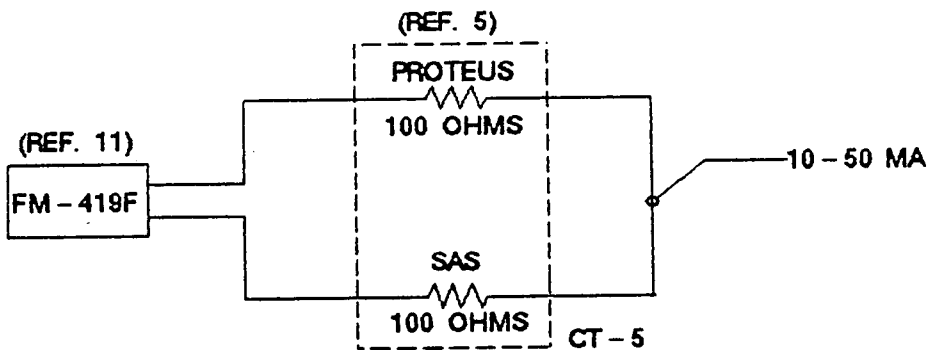
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Issued for record.

**IMPEDANCE CALCULATION**

FT-419A REACTOR PROTECTION CIRCUIT



FM-419F REACTOR CONTROL CIRCUIT



TOTAL IMPEDANCE (OHMS) = 100 + 100 = 200

**ENGINEERING JUSTIFICATION:**

THE FT-419A CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. FM-419F (FOXBORO 66BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (200 OHMS), FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

STATION: INDIAN POINT 2  
 TITLE: SAS COMPUTER INTERFACE  
 STM GEN A STM OUT 1 FLOW (FT-419A)  
 SKETCHED BY: VICTOR S. D'AMORE  
 CHECKED BY: *King Look*

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MECH. PROGRAM  
 ENG. *N/A* DATE  
 C&I  
 ENG. *TM* DATE *8/17/87*  
 ENG. *VAS* DATE *12/23/86*

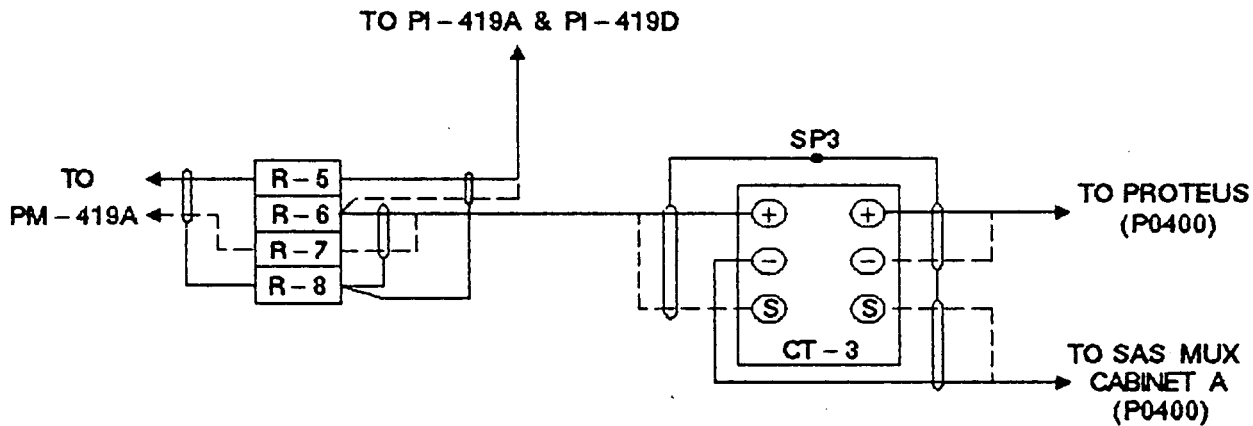
**CON EDISON** ENG. -  
**C&I SKETCH**  
 SKETCH NO. SAS-69  
 REV. 0 SH. 2 OF 2

REVISION

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Issued for record.

DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R05, POINTS 6 (POS.), 7 (NEG.), AND 8 (SHIELD).

REF. DWGS.: A225389, A225318  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON</b> <b>EDISON</b> ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>NA</i> DATE	
STM GEN A STM OUT 1 PRESS (PT-419A)		C&I	SKETCH NO. SAS-70 REV. 0 SH. 1 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>12/23/80</i>	
CHECKED BY: <i>King Jack</i>		ENG. <i>VAD</i> DATE <i>12/23/80</i>	



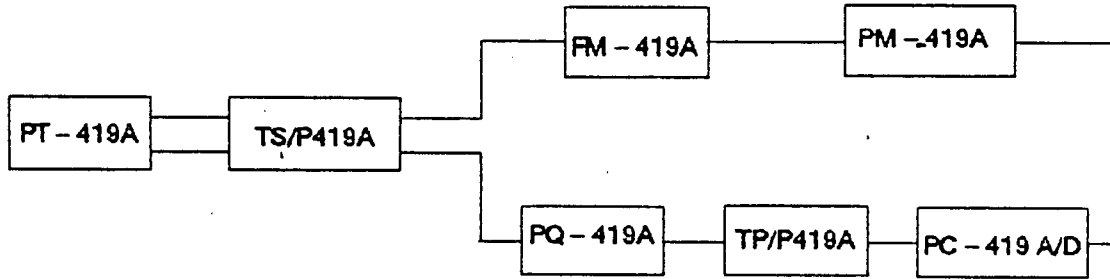
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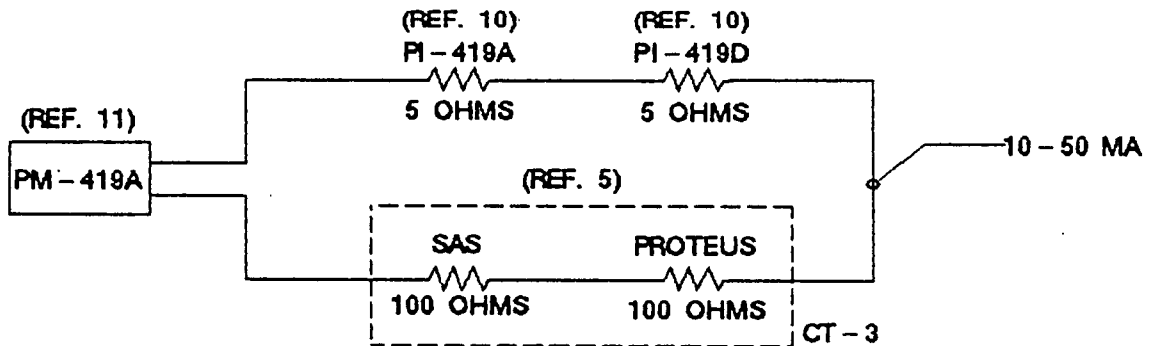
Issued for record.

**IMPEDANCE CALCULATION**

PT-419A REACTOR PROTECTION CIRCUIT



PM-419A REACTOR CONTROL CIRCUIT



TOTAL IMPEDANCE (OHMS) = 100 + 100 + 5 + 5 = 210

**ENGINEERING JUSTIFICATION:**

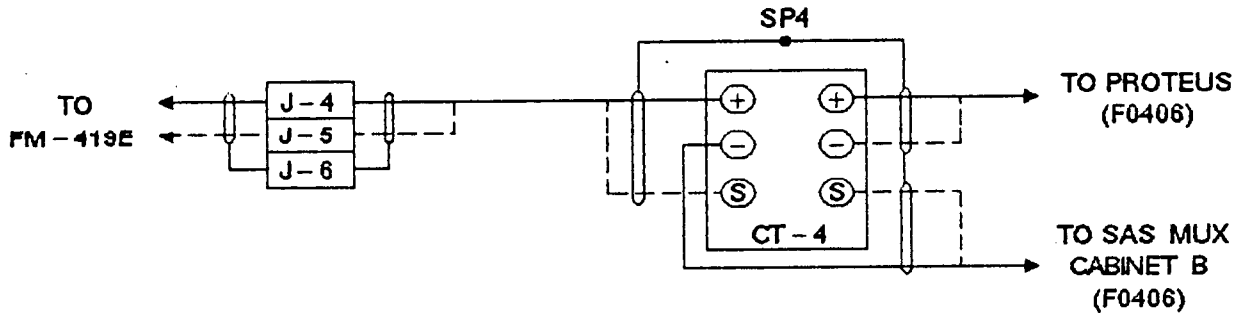
THE PT-419A CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. PM-419A (FOXBORO 66BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (210 OHMS), FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN A STM OUT 1 PRESS (PT-419A)		C&I	SKETCH NO. SAS-70 REV. 0 SH. 2 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 12/23/80	
CHECKED BY: <i>King Lock</i>		ENG. <i>VAD</i> DATE 12/23/80	

REVISION

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Issued for  
revised.

DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R09, POINTS 23 (POS.), 24 (NEG.), AND 25 (SHIELD).

REF. DWGS.: A225379, A225338  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON</b> <b>EDISON</b> ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN A STM OUT 2 FLOW (FT-419B)		C&I	SKETCH NO. SAS-71 REV. 0 SH. 1 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>12/23/86</i>	
CHECKED BY: <i>King Tooh</i>		ENG. <i>VAD</i> DATE <i>12/23/86</i>	

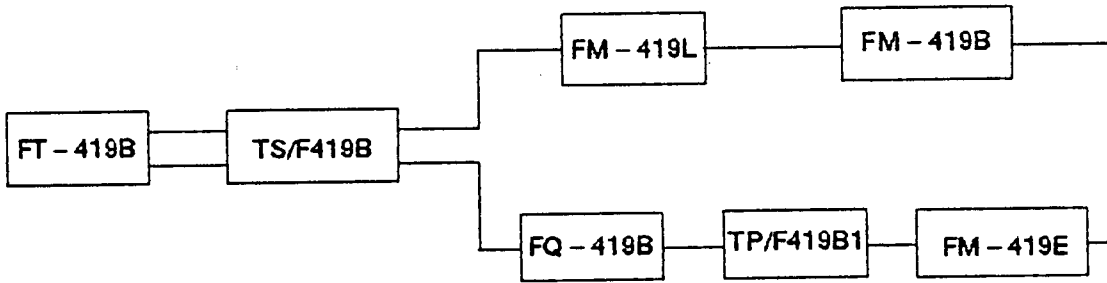
REVISION

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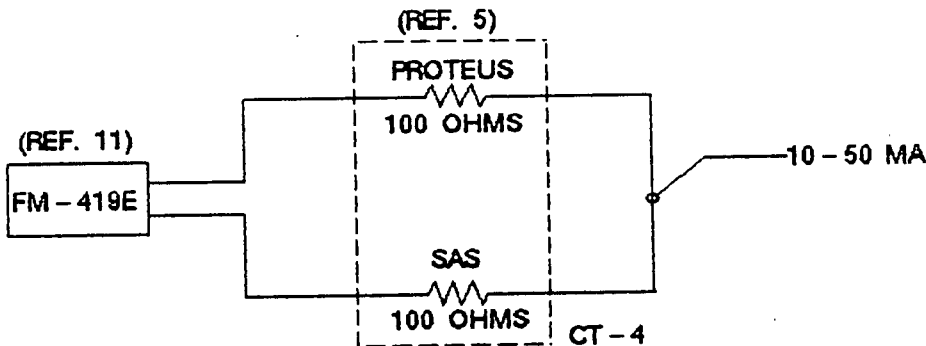
Issued for  
 [redacted]

**IMPEDANCE CALCULATION**

**FT-419B REACTOR PROTECTION CIRCUIT**



**FM-419E REACTOR CONTROL CIRCUIT**



TOTAL IMPEDANCE (OHMS) = 100 + 100 = 200

**ENGINEERING JUSTIFICATION:**

THE FT-419B CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. FM-419E (FOXBORO 66BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (200 OHMS), FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

STATION: INDIAN POINT 2
TITLE: SAS COMPUTER INTERFACE
STM GEN A STM OUT 2 FLOW (FT-419B)
SKETCHED BY: VICTOR S. D'AMORE
CHECKED BY: <i>King Lock</i>

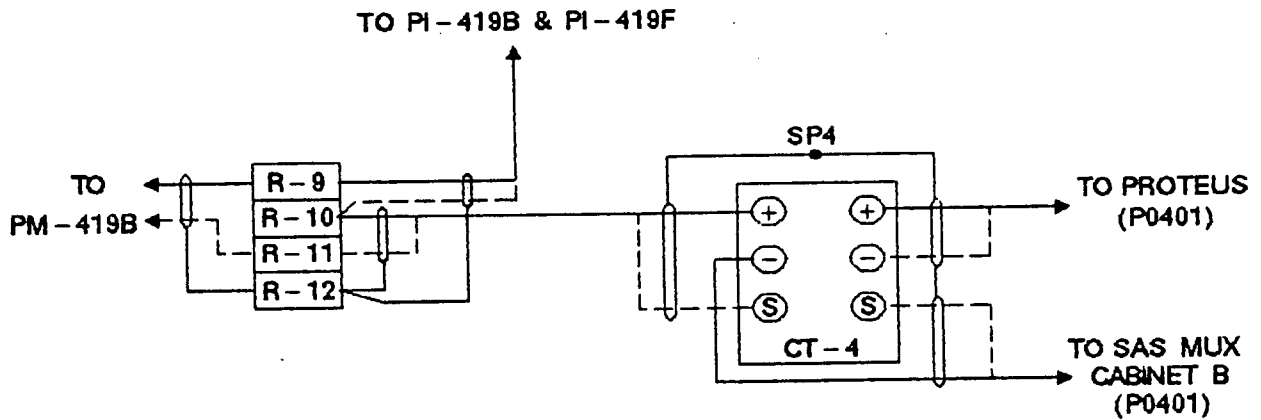
APPROVALS	MECH. PROGRAM
	ENG. <i>N/A</i> DATE
	C&I
	ENG. <i>TM</i> DATE <i>12/23/86</i>
	ENG. <i>VAD</i> DATE <i>12/23/86</i>

<b>CON EDISON ENG.</b>	
<b>C&amp;I SKETCH</b>	
SKETCH NO. SAS-71	REV. 0 SH. 2 OF 2

REVISION

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Issued for  
cord.

DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R04, POINTS 19 (POS.), 20 (NEG.), AND 21 (SHIELD).

REF. DWGS.: A225389, A225338  
REF. SKETCH: SAS - REF

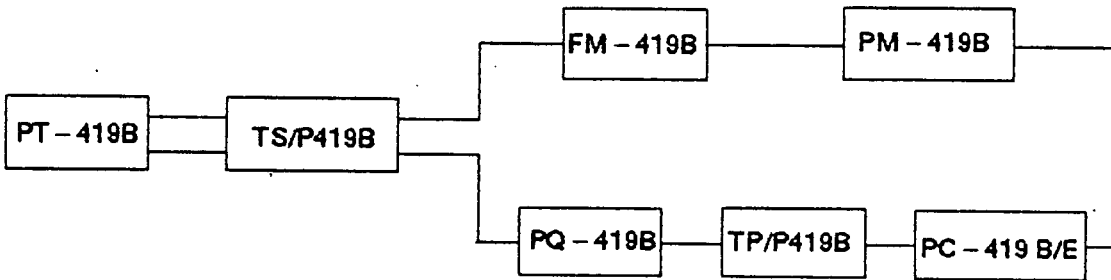
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN A STM OUT 2 PRESS (PT-419B)		C&J	<b>C&amp;J</b> SKETCH
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>12/23/86</i>	SKETCH NO. SAS-72
CHECKED BY: <i>King Lake</i>	ENG. <i>VAD</i> DATE <i>12/23/86</i>	REV. 0 SH. 1 OF 2	

REVISION

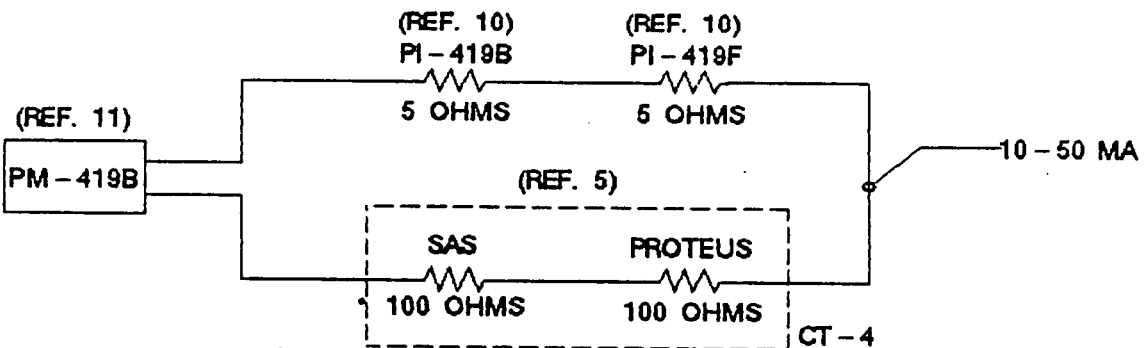
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Issued for record.

**IMPEDANCE CALCULATION**

PT-419B REACTOR PROTECTION CIRCUIT



PM-419B REACTOR CONTROL CIRCUIT



TOTAL IMPEDANCE (OHMS) = 100 + 100 + 5 + 5 = 210

ENGINEERING JUSTIFICATION:

THE PT-419B CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. PM-419B (FOXBORO 66BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (210 OHMS), FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660. OHMS).

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG. C&J SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN A STM OUT 2 PRESS (PT-419B)		C&J	SKETCH NO. SAS-72 REV. 0 SH. 2 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 1/23/86	
CHECKED BY: <i>King John</i>		ENG. <i>VAS</i> DATE 12/23/80	

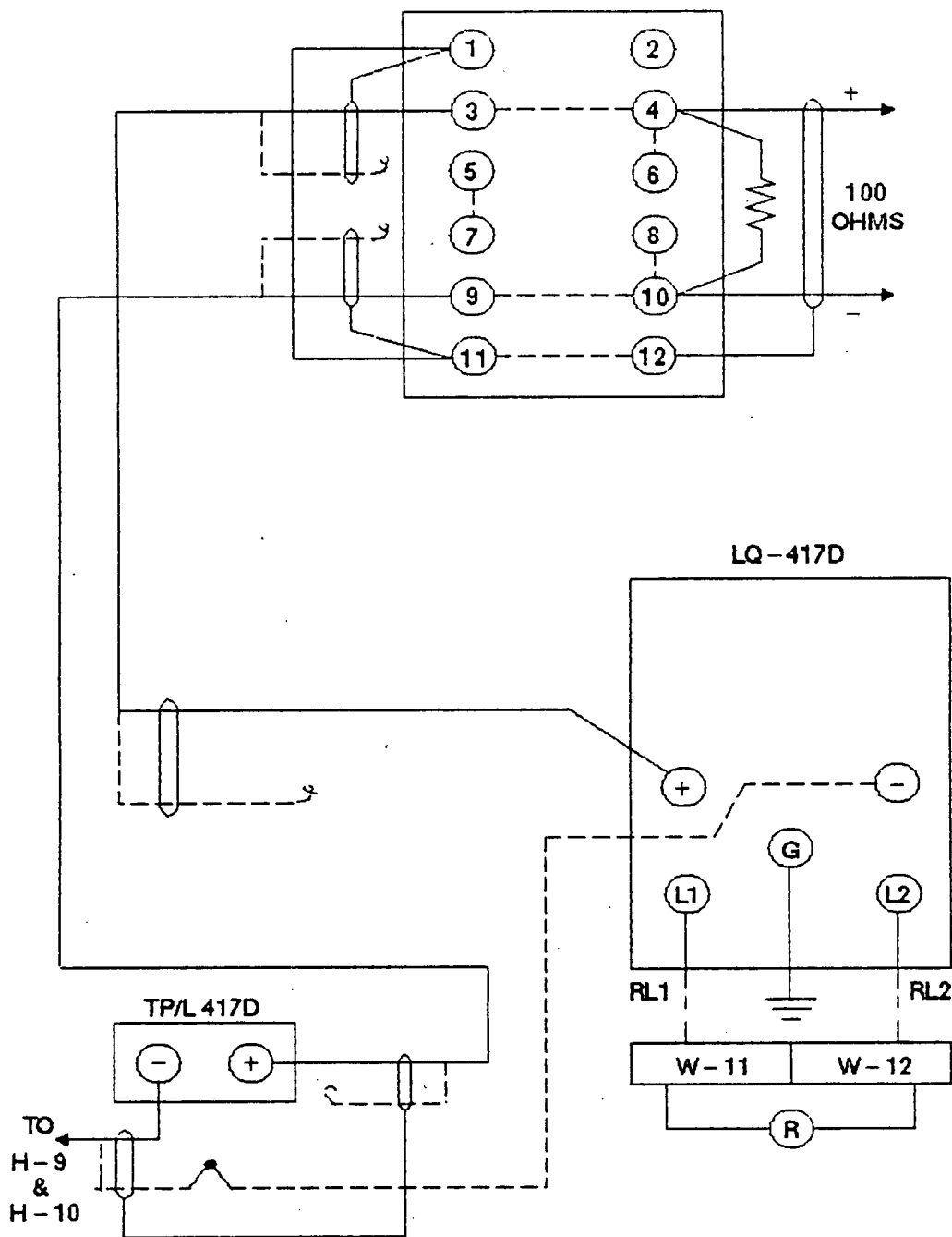
REVISION

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Issued for record.

**DESIGN DETAIL**

L-417D

SAKT - 2 B5AN



L0403  
TO SAS MUX  
CABINET A

NOTE: SAS SIGNAL DESTINATION: BTSCA 01R05, POINTS 14 (POS.), 15 (NEG.), AND 16 (SHIELD).

REF. DWG.: A225389  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2  
TITLE: SAS COMPUTER INTERFACE  
STM GEN A WIDE RNG LVL (LT - 417D)  
SKETCHED BY: VICTOR S. D'AMORE  
CHECKED BY: *King Lock*

A  
P  
P  
R  
V  
E  
D  
S  
MECH. PROGRAM  
ENG. *N/A* DATE  
C&J  
ENG. *TM* DATE *1/23/86*  
ENG. *V.A.D.* DATE *12/23/86*

**CON EDISON ENG.**  
**C&J SKETCH**  
SKETCH NO. SAS - 73  
REV. 0 SH. 1 OF 2

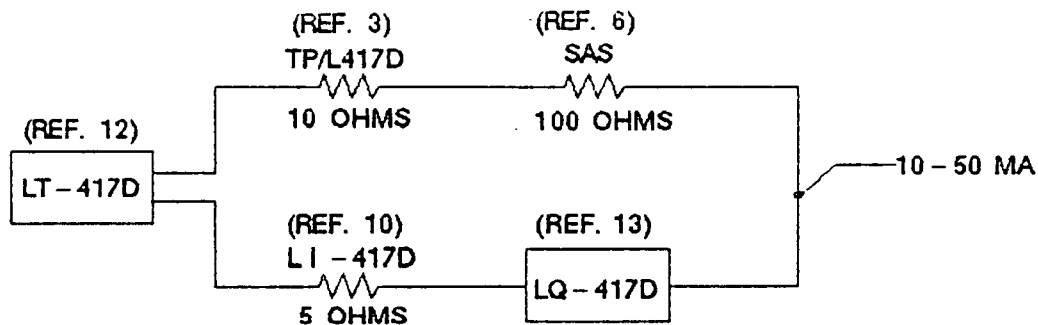
REVISION

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Issued for record.

IMPEDANCE CALCULATION

LT-417D REACTOR CONTROL CIRCUIT



TOTAL IMPEDANCE (OHMS) = 10 + 100 + 5 = 115

ENGINEERING JUSTIFICATION:

LT-417D IS PART OF THE REACTOR CONTROL SYSTEM, THEREFORE, THE SAS INPUT CAN BE IMPLEMENTED HERE. LT-417D IS A FOXBORO MODEL 613DM D/P CELL TRANSMITTER WHICH PROVIDES A 10-50 MA OUTPUT, WITH A 600 OHM LOAD (+10 - 20 PERCENT). LQ-417D IS A FOXBORO 610-AR POWER SUPPLY, AND PROVIDES A 10-50 MA OUTPUT WITH AN OUTPUT LOAD OF 600 OHMS (+10 - 20 PERCENT). THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (115 OHMS), FALLS WITHIN THE ALLOWABLE CIRCUIT LOAD LIMIT (600 OHMS).

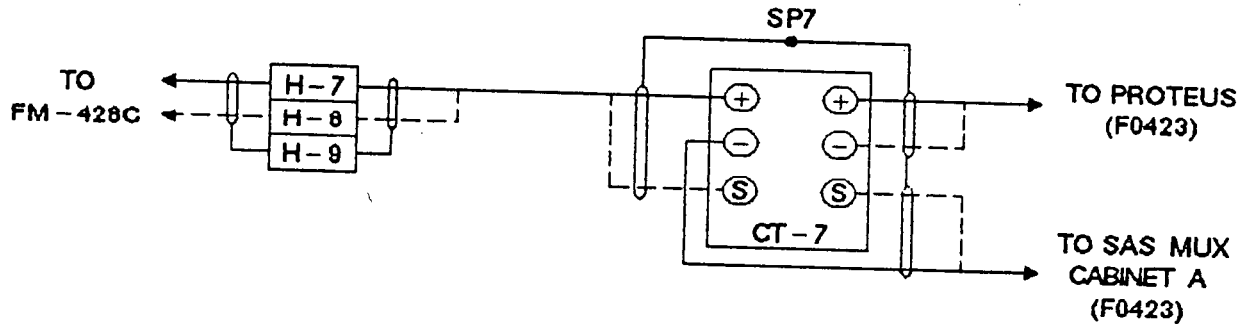
STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN A WIDE RNG LVL (LT-417D)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>12/23/86</i>	
CHECKED BY: <i>King John</i>		ENG. <i>VAD</i> DATE <i>12/23/86</i>	SKETCH NO. SAS-73 REV. SH. 2 OF 2

REVISION

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Issued for record.

DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R13, POINTS 14 (POS.), 15 (NEG.), AND 16 (SHIELD).

REF. DWGS.: A225379, A225319  
 REF. SKETCH: SAS - REF

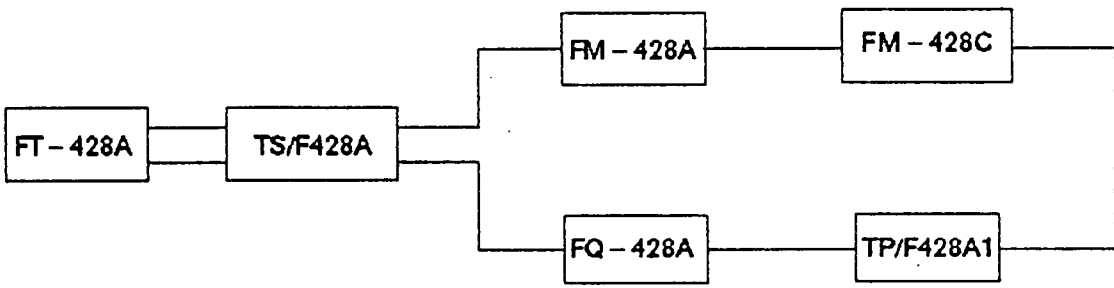
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN B FW IN 1 FLOW (FT-428A)		C&I	<b>C&amp;I</b> SKETCH
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>12/23/86</i>	SKETCH NO. SAS-74
CHECKED BY: <i>King Tooh</i>	ENG. <i>VAD</i> DATE <i>12/23/86</i>	REV. 0 SH. 1 OF 2	



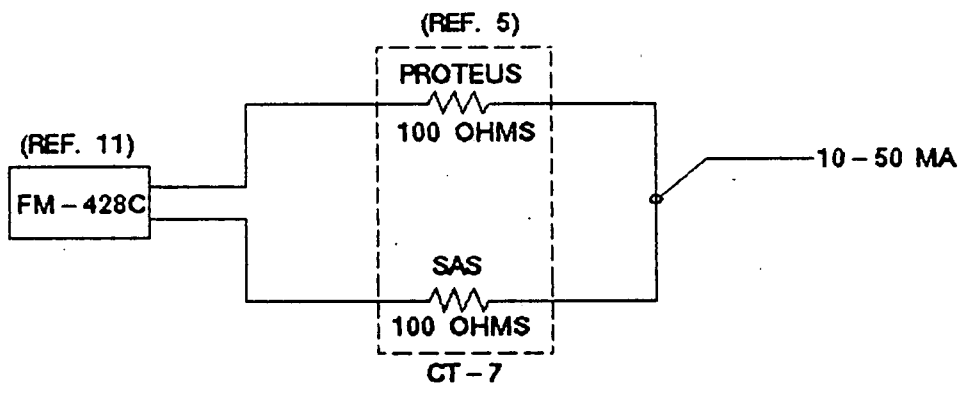
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Issued for record.

# IMPEDANCE CALCULATION

## FT-428A REACTOR PROTECTION CIRCUIT



## FM-428C REACTOR CONTROL CIRCUIT



TOTAL IMPEDANCE (OHMS) = 100 + 100 = 200

### ENGINEERING JUSTIFICATION:

THE FT-428A CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. FM-428C (FOXBORO 66BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (200 OHMS), FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

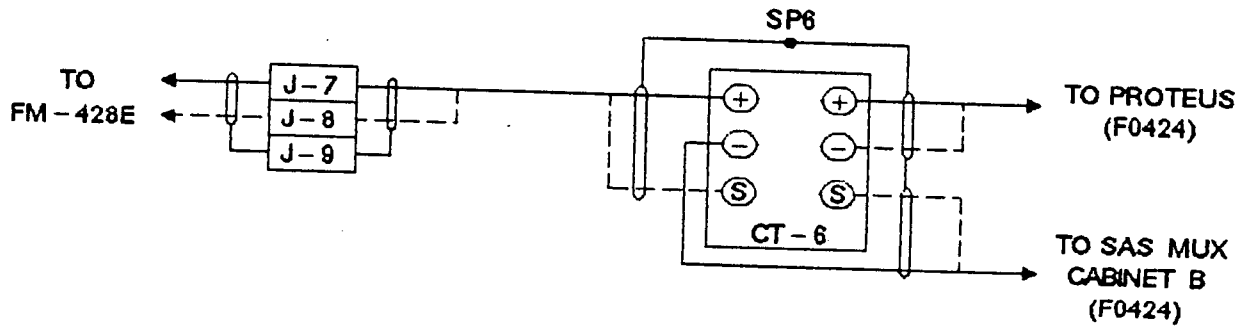
STATION: INDIAN POINT 2 TITLE: SAS COMPUTER INTERFACE STM GEN B FW IN 1 FLOW (FT-428A) SKETCHED BY: VICTOR S. D'AMORE CHECKED BY: <i>King Laska</i>	A P P R V E D	MECH. PROGRAM ENG. <i>N/A</i> DATE C&I ENG. <i>TM</i> DATE <i>12/23/86</i> ENG. <i>VAD</i> DATE <i>12/23/86</i>	<b>CON EDISON</b> ENG. <b>C&amp;I SKETCH</b> SKETCH NO. SAS-74 REV. 0 SH. 2 OF 2
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REVISION

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Issued for record.

DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R05, POINTS 19 (POS.), 20 (NEG.), AND 21 (SHIELD).

REF. DWGS.: A225379, A225343  
 REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN B FW IN 2 FLOW (FT-428B)		ENG. <i>TM</i> DATE <i>12/23/86</i>	SKETCH NO. SAS-75 REV. 0 SH. 1 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>VAD</i> DATE <i>12/23/86</i>	
CHECKED BY: <i>King Lock</i>			

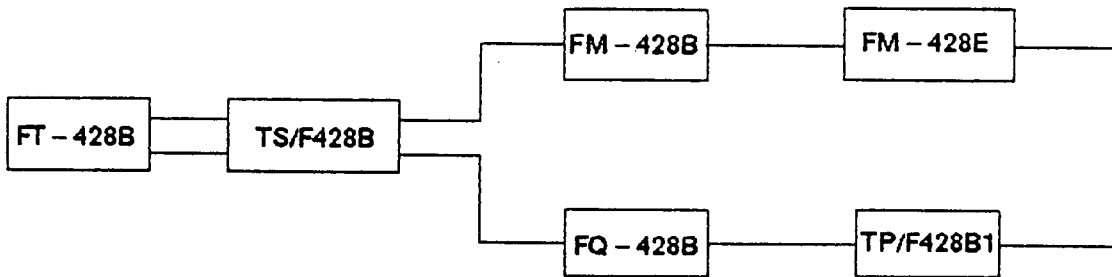
REVISION

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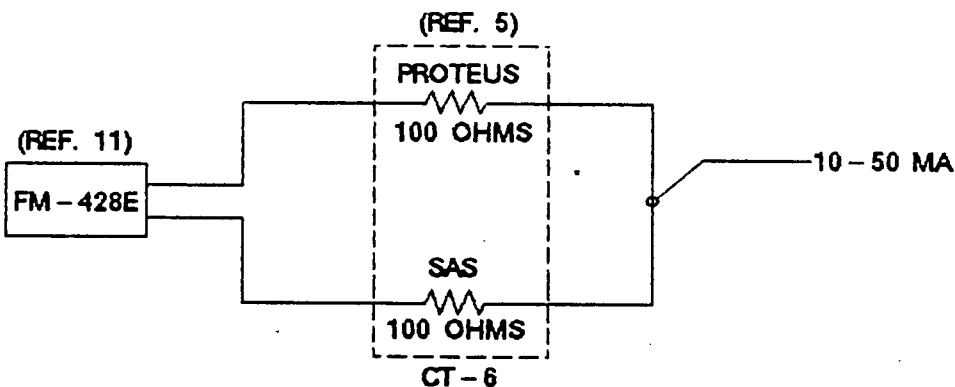
Issued for record.

**IMPEDANCE CALCULATION**

FT-428A REACTOR PROTECTION CIRCUIT



FM-428C REACTOR CONTROL CIRCUIT



TOTAL IMPEDANCE (OHMS) = 100 + 100 = 200

ENGINEERING JUSTIFICATION:

THE FT-428B CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. FM-428E (FOXBORO 66BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (200 OHMS), FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

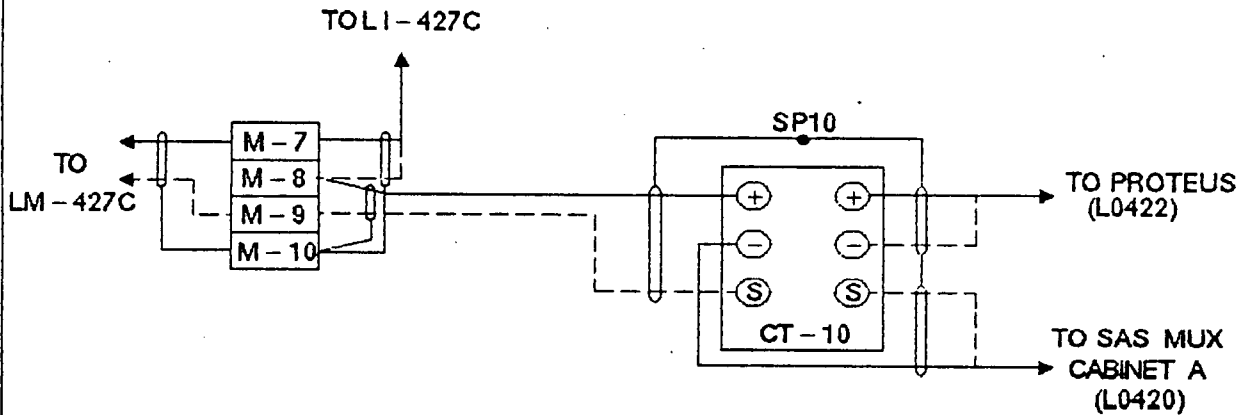
STATION: INDIAN POINT 2	A P P R O V E S	MECH. PROGRAM	CON EDISON ENG. C&J SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. N/A DATE	
STM GEN B FW IN 2 FLOW (FT-428B)		C&J	SKETCH NO. SAS-75 REV. 0 SH. 2 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. TM DATE 12/23/86	
CHECKED BY: <i>King Loch</i>		ENG. VAD DATE 12/23/86	

# DESIGN DETAIL

REVISION

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Issued for record.



**NOTE:**

1. SAS SIGNAL DESTINATION: BTSCA 01R06, POINTS 6 (POS.), 7 (NEG.), AND 8 (SHIELD).
2. COMPUTER ADDRESS FOR SAS WILL BE CHANGED FROM L0420 TO L0422, PENDING IMPLEMENTATION OF REFERENCE MEMO ON DWG. A225392.

REF. DWGS.: A225392, A225329

REF. SKETCH: SAS - REF

REF. MEMO: CON - ED MEMO (MSSRS. B. LEE AND F. HOFFMAN) DATED 10/16/86

STATION: INDIAN POINT 2	APP R V L S	MECH. PROGRAM	<b>CON</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	<b>EDISON</b> ENG.
STM GEN B NAR RNG 3 LVL (LT-427C)		C&I	<b>C&amp;I</b> SKETCH
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>12/23/86</i>	SKETCH NO. SAS-76
CHECKED BY: <i>King Loh</i>		ENG. <i>VAD</i> DATE <i>12/23/86</i>	REV. 0 SH. 1 OF 2

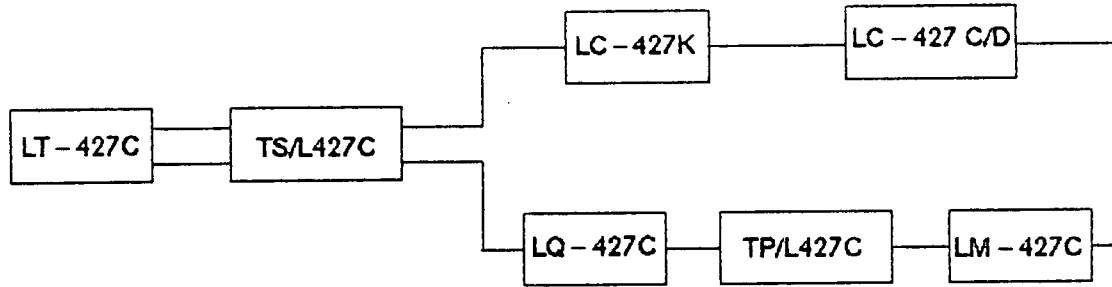
REVISION

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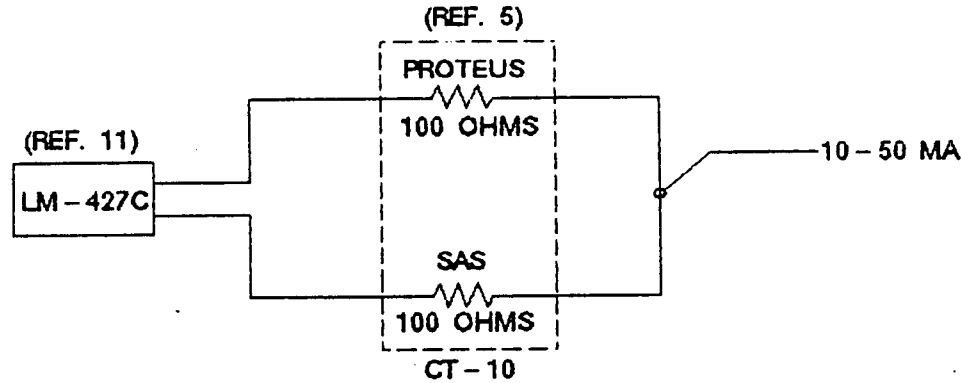
Issued for record.

# IMPEDANCE CALCULATION

## LT-427C REACTOR PROTECTION CIRCUIT



## LM-427C REACTOR CONTROL CIRCUIT



TOTAL IMPEDANCE (OHMS) = 100 + 100 = 200

### ENGINEERING JUSTIFICATION:

THE LT-427C CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. LM-427C (FOXBORO 66BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (200 OHMS), FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. N/A DATE	
STM GEN B NAR RNG 3 LVL (LT-427C)		C&I	SKETCH NO. SAS-76 REV. 0 SH. 2 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. TM DATE 12/23/86	
CHECKED BY: <i>King Lock</i>		ENG. VAD DATE 12/23/86	

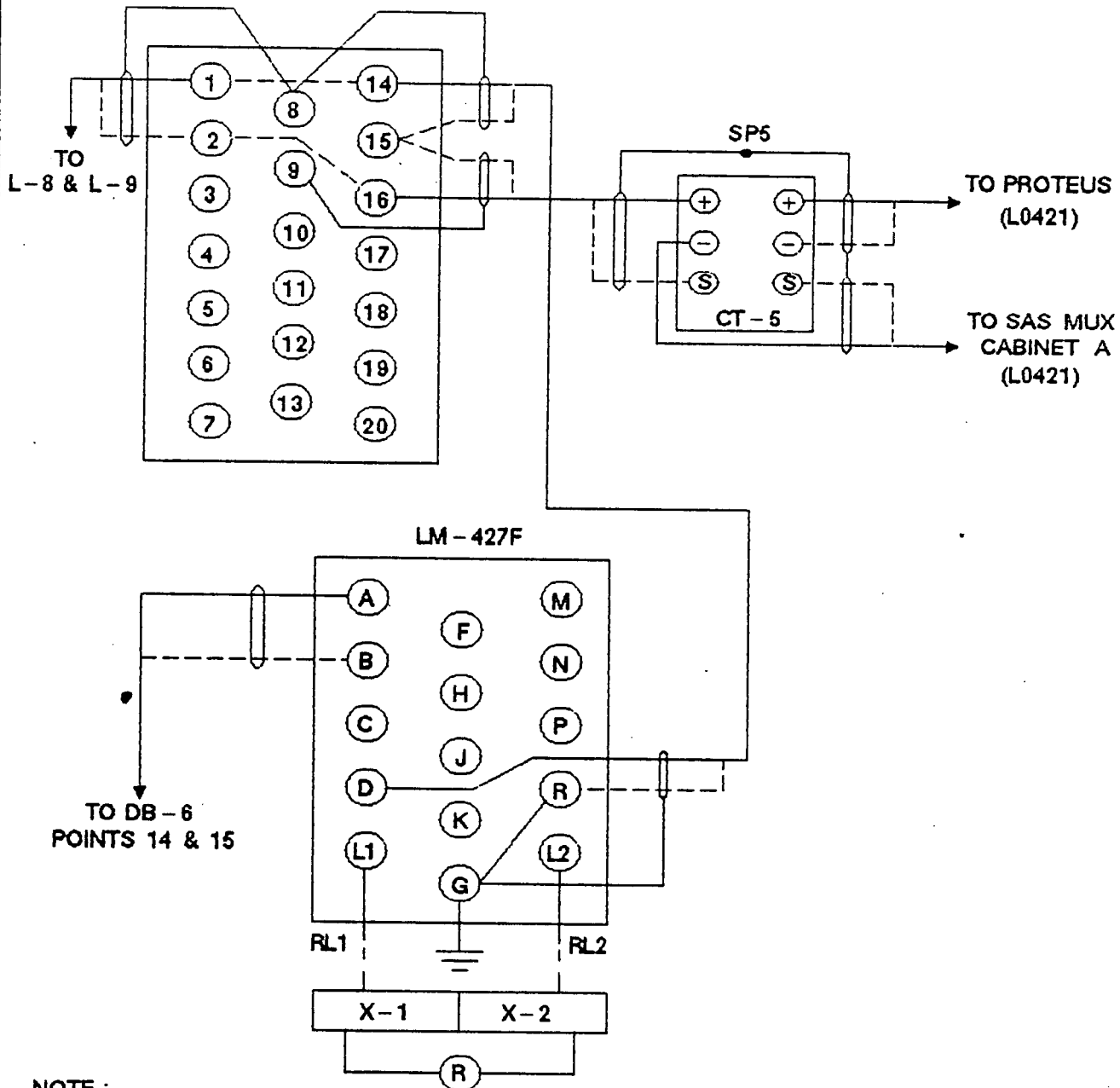
# DESIGN DETAIL

REVISION

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Issued for record.

( SEE NOTE 2 )



NOTE :

1. SAS SIGNAL DESTINATION: BTSCA 01R08, POINTS 6 (POS.), 7 (NEG.), AND 8 (SHIELD).
2. DISTRIBUTION BLOCK IS DESIGNATED FOR LABELING

REF. DWGS.: A225390, A225358

REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2 TITLE: SAS COMPUTER INTERFACE STM GEN B NAR RNG 2 LVL (LT-427B) SKETCHED BY: VICTOR S. D'AMORE CHECKED BY: <i>King Look</i>	A P P R V E D	MECH. PROGRAM ENG. <i>N/A</i> DATE C&J ENG. <i>TM</i> DATE <i>12/23/86</i> ENG. <i>VAD</i> DATE <i>12/23/86</i>	<b>CON EDISON ENG. C&amp;J SKETCH</b> SKETCH NO. SAS-77 REV. 0 SH. 1 OF 2
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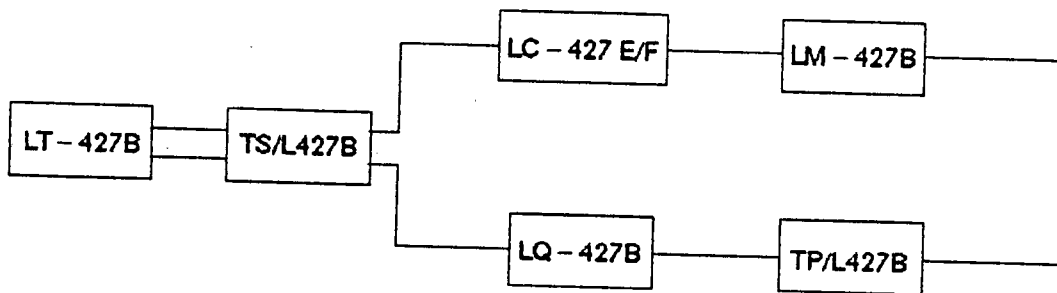
REVISION

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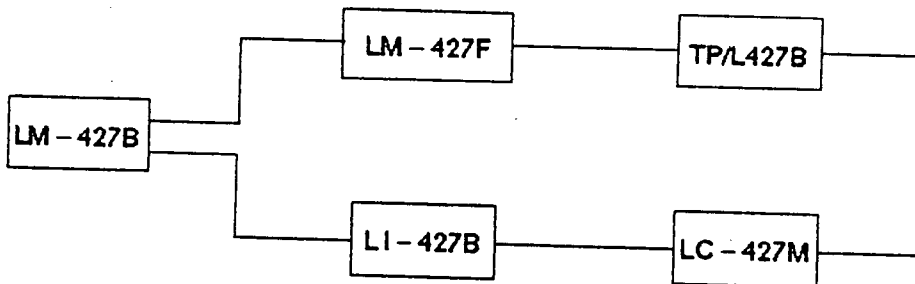
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# IMPEDANCE CALCULATION

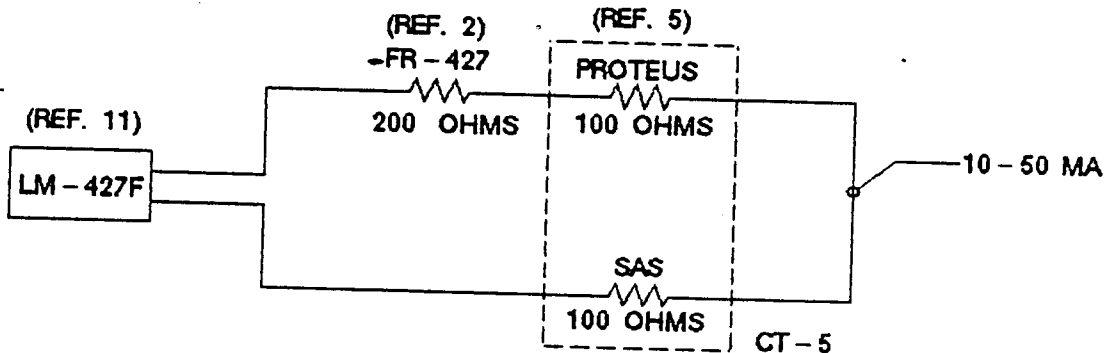
## LT-427B REACTOR PROTECTION CIRCUIT



## LM-427B REACTOR CONTROL CIRCUIT



## LM-427F CIRCUIT (Z EQUIV.)



TOTAL IMPEDANCE (OHMS)  $200 + 100 + 100 = 400$

### ENGINEERING JUSTIFICATION:

THE LT-427B CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS SIGNAL CANNOT BE IMPLEMENTED HERE. LM-427B IS A FOXBORO 66BR-OH ISOLATOR, AND SERVES TO ISOLATE THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM. LM-427F (FOXBORO 66BR-OH) SERVES AS A CURRENT REPEATER IN THIS CIRCUIT, AND CAN DRIVE A LOAD UP TO A 660 OHMS. THE SAS SIGNAL CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS). THE TOTAL IMPEDANCE (400 OHMS), FALLS WITHIN THE LOAD LIMIT (660 OHMS).

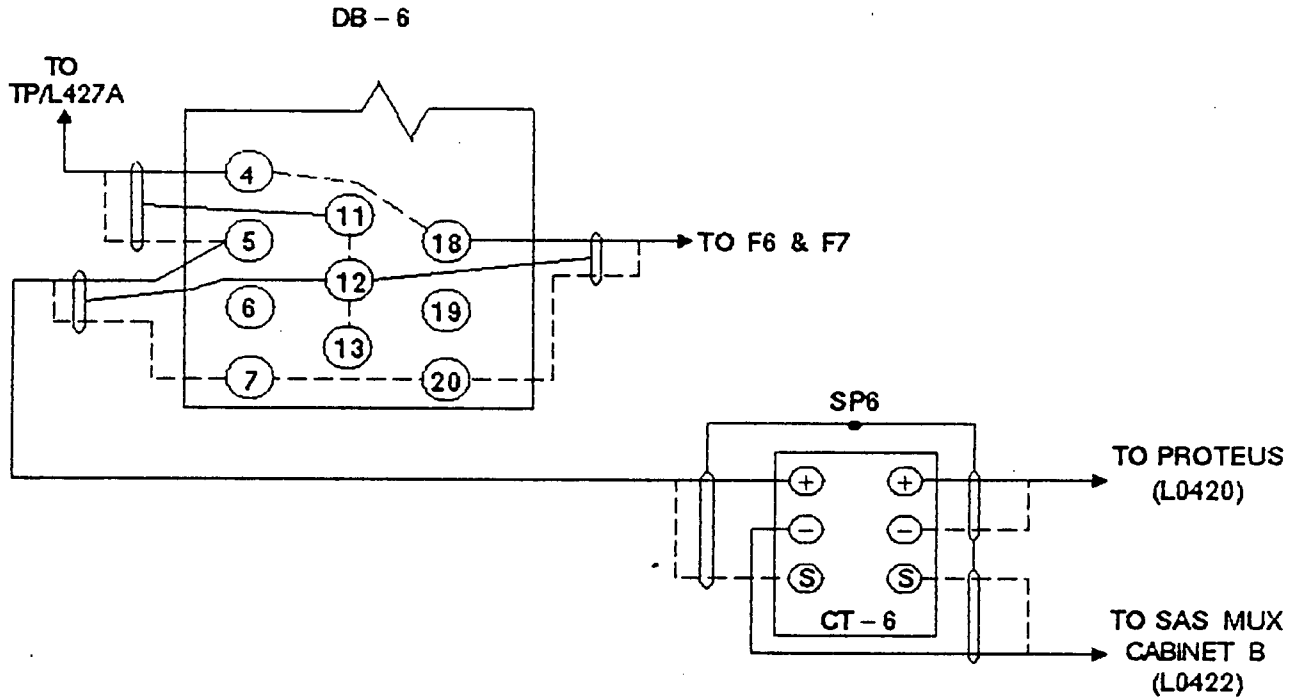
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TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN B NAR RNG 2 LVL (LT-427B)		C&J	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>12/23/86</i>	
CHECKED BY: <i>King Tooh</i>		ENG. <i>VLD</i> DATE <i>12/23/86</i>	SKETCH NO. SAS-77 REV. 0 SH. 2 OF 2

REVISION

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Issued for record.

DESIGN DETAIL



- NOTE: 1. SAS SIGNAL DESTINATION: BTSCA 01R05, POINTS 6 (POS.), 7 (NEG), AND 8 (SHIELD).  
 2. COMPUTER ADDRESS FOR SAS WILL BE CHANGED FROM L0422 TO L0420, PENDING IMPLEMENTATION OF REFERENCE MEMO ON DRAWING A225390.

REF. DWGS.: A225390, A225373

REF. SKETCH: SAS - REF.

REF. MEMO: CON - ED MEMO (MSSRS B. LEE AND F. HOFFMAN) DATED 10/16/86

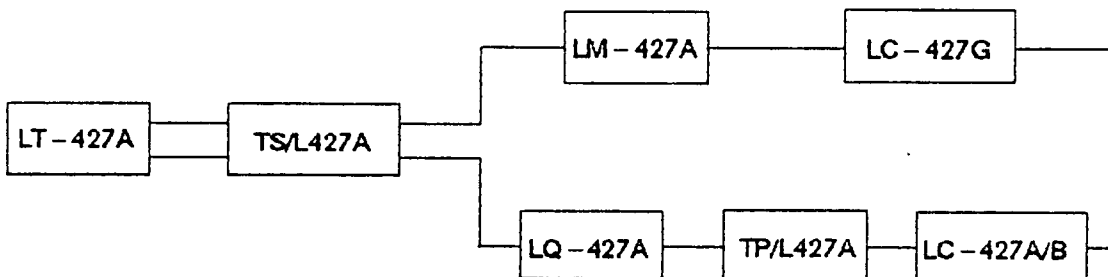
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN B NAR RNG 1 LVL (LT - 427A)		ENG. <i>TM</i> DATE 3/17/87	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>VAD</i> DATE 3/17/87	
CHECKED BY: <i>King Look</i>			SKETCH NO. SAS - 78 REV. 0 SH. 1 OF 2



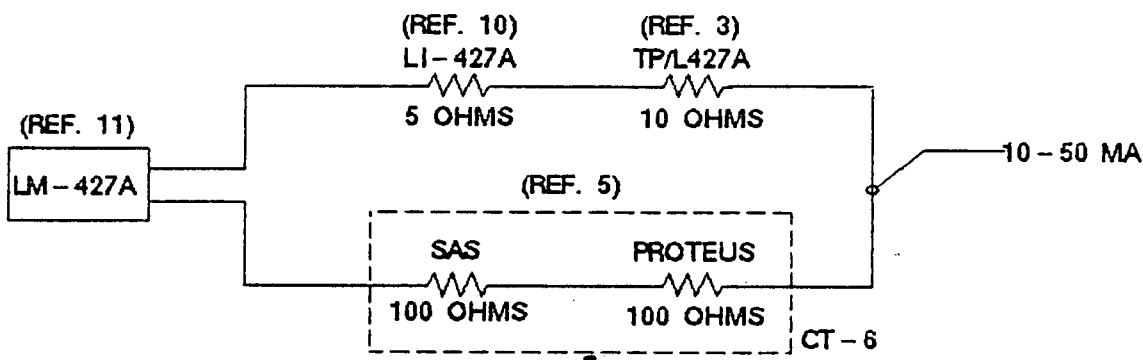
REVISION  
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Issued for record.

## IMPEDANCE CALCULATION

### LT-427A REACTOR PROTECTION CIRCUIT



### LM-427A REACTOR CONTROL CIRCUIT (Z EQUIV.)



TOTAL IMPEDANCE (OHMS) = 5 + 10 + 100 + 100 = 215

#### ENGINEERING JUSTIFICATION:

THE LT-427A CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. LM-427A (FOXBORO 66BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (215 OHMS), FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

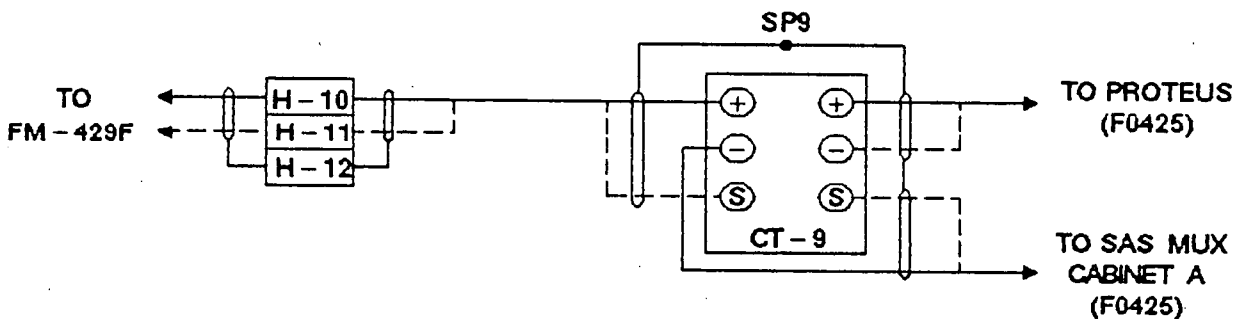
STATION: INDIAN POINT 2 TITLE: SAS COMPUTER INTERFACE STM GEN B NAR RNG 1 LVL (LT-427A) SKETCHED BY: VICTOR S. D'AMORE CHECKED BY: <i>King Lusk</i>	A P P R V E D	MECH. PROGRAM ENG. <i>N/A</i> DATE C&I ENG. <i>TM</i> DATE <i>3/17/87</i> ENG. <i>VLR</i> DATE <i>3/17/87</i>	<b>CON EDISON ENG. C&amp;I SKETCH</b>  SKETCH NO. SAS-78 REV. 0 SH. 2 OF 2
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REVISION

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Issued for record.

DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R06, POINTS 10 (POS.), 11 (NEG.), AND 12 (SHIELD).

REF. DWGS.: A225379, A225319  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN B STM OUT 1 FLOW (FT-429A)		C&I	SKETCH NO. SAS-79 REV. 0 SH. 1 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>12/23/86</i>	
CHECKED BY: <i>King Lock</i>		ENG. <i>VAD</i> DATE <i>12/23/86</i>	

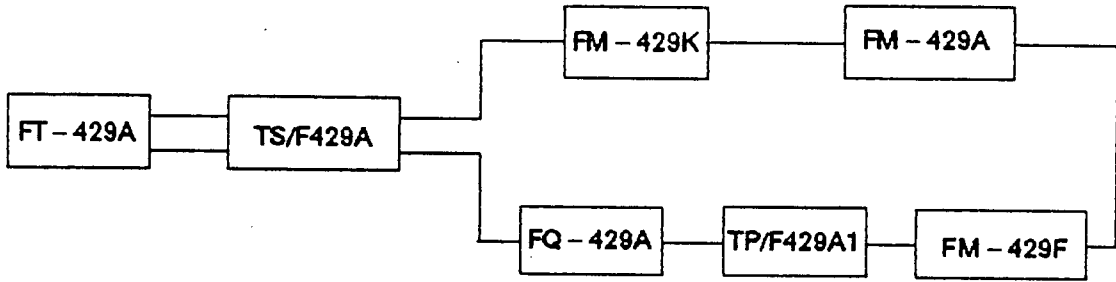
REVISION

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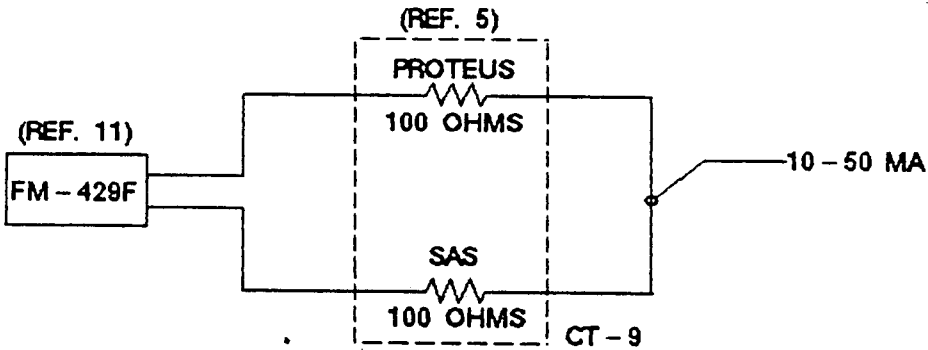
Issued for record.

# IMPEDANCE CALCULATION

## FT-429A REACTOR PROTECTION CIRCUIT



## FM-429F REACTOR CONTROL CIRCUIT



TOTAL IMPEDANCE (OHMS) = 100 + 100 = 200

### ENGINEERING JUSTIFICATION:

THE FT-429A CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. FM-429F (FOXBORO 86BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (200 OHMS), FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

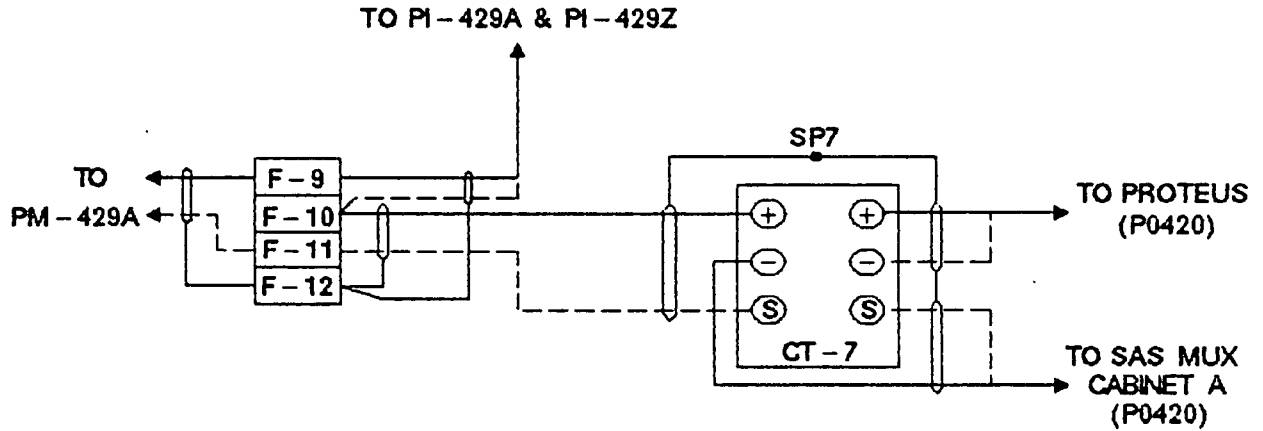
STATION: INDIAN POINT 2 TITLE: SAS COMPUTER INTERFACE STM GEN B STM OUT 1 FLOW (FT-429A) SKETCHED BY: VICTOR S. D'AMORE CHECKED BY: <i>King Tooh</i>	A P P R V E D	MECH. PROGRAM ENG. <i>N/A</i> DATE C&J ENG. <i>TM</i> DATE <i>12/23/86</i> ENG. <i>VAD</i> DATE <i>12/23/86</i>	CON EDISON ENG. C&J SKETCH SKETCH NO. SAS-79 REV. 0 SH. 2 OF 2
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REVISION

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Issued for record.

DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R06, POINTS 2 (POS.), 3 (NEG.), AND 4 (SHIELD).

REF. DWGS.: A225390, A225318  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON</b>	
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE		<b>EDISON</b> ENG.
STM GEN B STM OUT 1 PRESS (PT-429A)		C&I	<b>C&amp;I SKETCH</b>	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>12/23/86</i>	SKETCH NO. SAS - 80	
CHECKED BY: <i>King Looch</i>	ENG. <i>VSD</i> DATE <i>12/23/86</i>	REV. 0 SH. 1 OF 2		

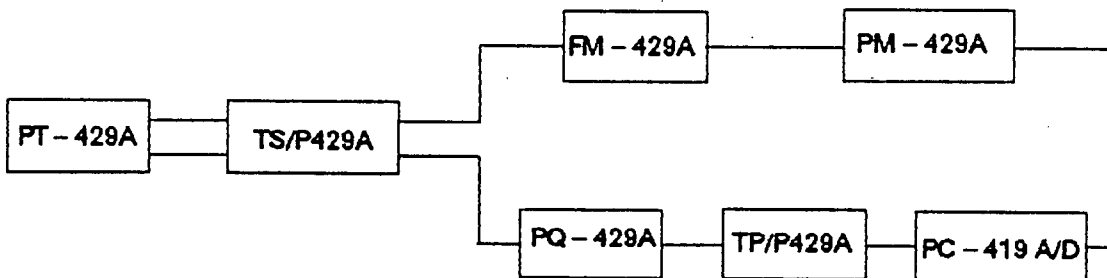
REVISION

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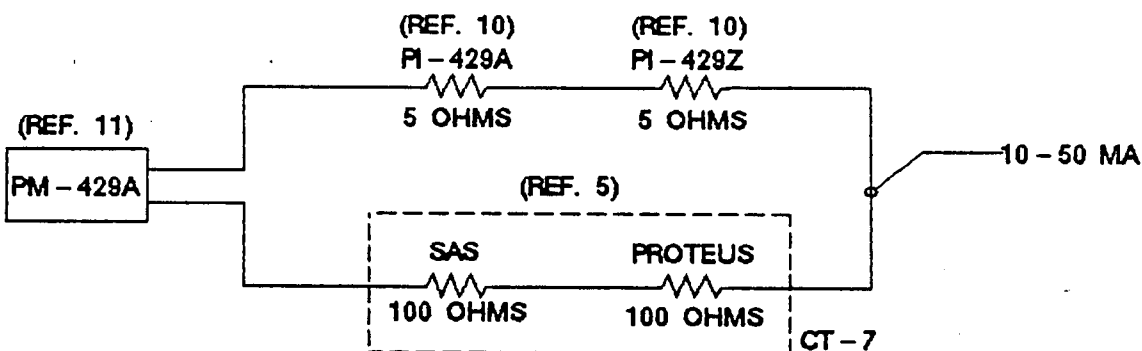
Issued for record.

# IMPEDANCE CALCULATION

## PT-429A REACTOR PROTECTION CIRCUIT



## PM-429A REACTOR CONTROL CIRCUIT



TOTAL IMPEDANCE (OHMS) =  $100 + 100 + 5 + 5 = 210$

### ENGINEERING JUSTIFICATION:

THE PT-429A CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. PM-429A (FOXBORO 66BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (210 OHMS), FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

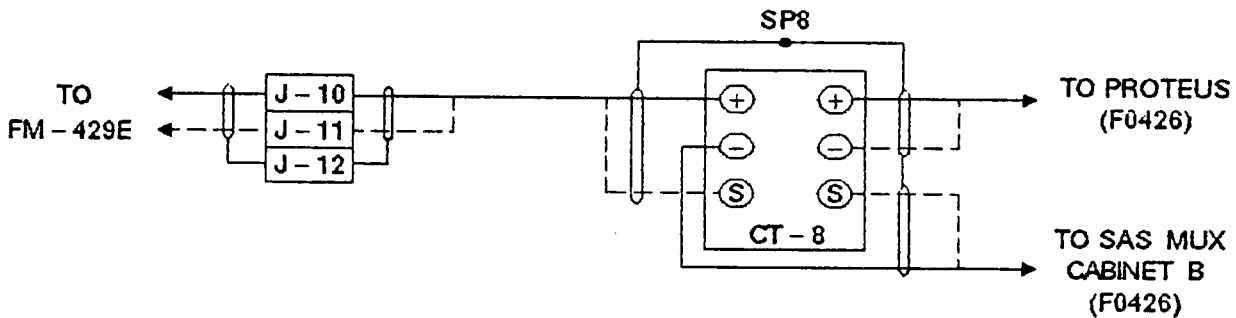
STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN B STM OUT 1 PRESS (PT-429A)		C&I	SKETCH NO. SAS-80 REV. 0 SH. 2 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 12/23/86	
CHECKED BY: <i>King Tooh</i>		ENG. <i>VAD</i> DATE 12/23/86	

REVISION

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Issued for record.

DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R05, POINTS 10 (POS.), 11 (NEG.), AND 12 (SHIELD).

REF. DWGS.: A225379, A225343  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2  
TITLE: SAS COMPUTER INTERFACE  
STM GEN B STM OUT 2 FLOW (FT-429B)  
SKETCHED BY: VICTOR S. D'AMORE  
CHECKED BY: *Ring Took*

APPROVALS

MECH. PROGRAM  
ENG. *N/A* DATE  
C&I  
ENG. *TM* DATE *12/23/86*  
ENG. *VAD* DATE *12/23/86*

**CON EDISON** ENG.  
C&I SKETCH  
SKETCH NO. SAS-81  
REV. 0 SH. 1 OF 2

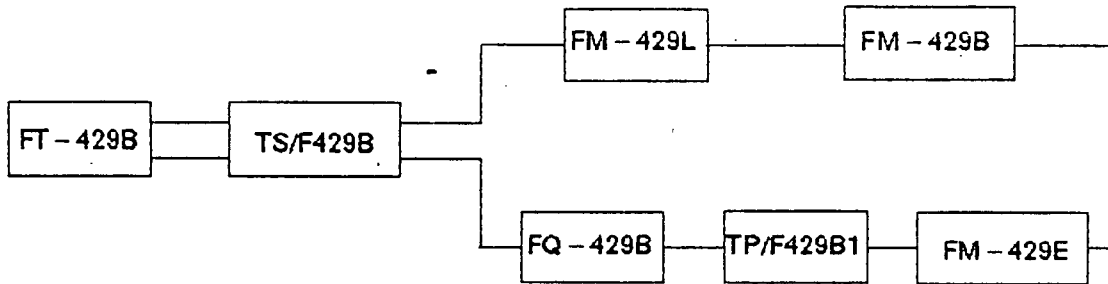
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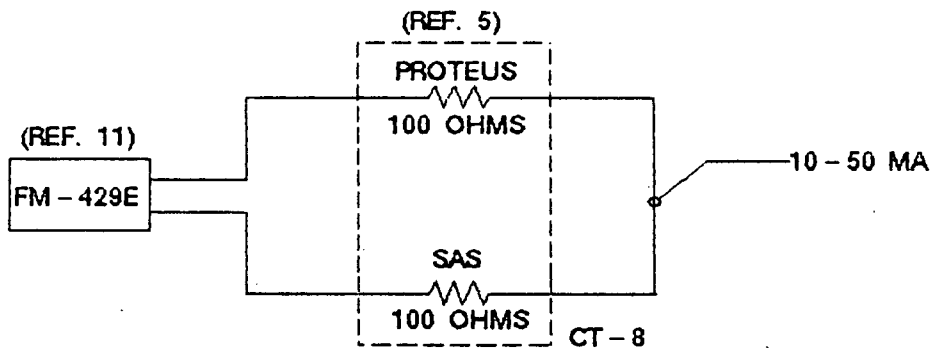
Issued for record.

# IMPEDANCE CALCULATION

## FT-429B REACTOR PROTECTION CIRCUIT



## FM-429E REACTOR CONTROL CIRCUIT



TOTAL IMPEDANCE (OHMS) = 100 + 100 = 200

### ENGINEERING JUSTIFICATION:

THE FT-429B CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. FM-429E (FOXBORO 66BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (200 OHMS), FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

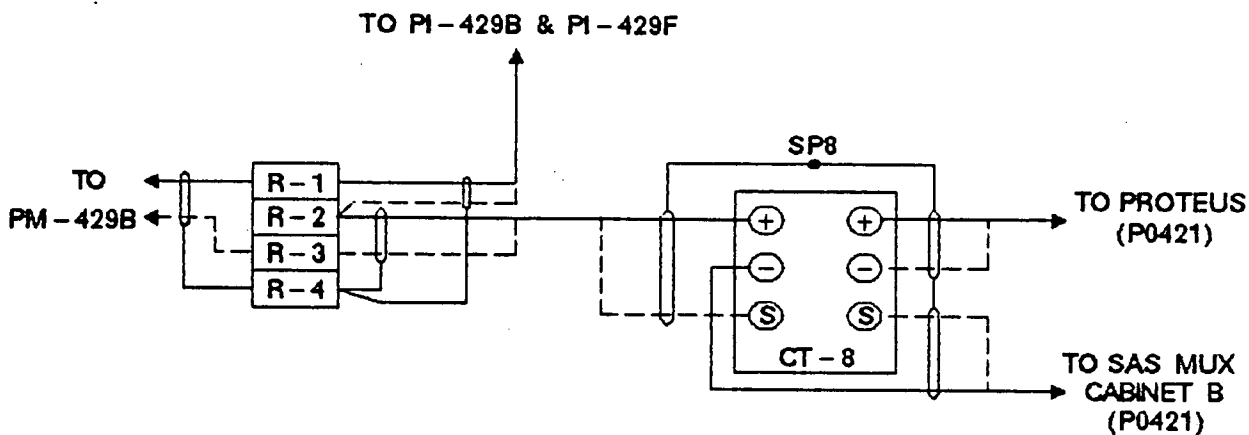
STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	<b>CON EDISON</b> ENG. - C&J SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN B STM OUT 2 FLOW (FT-429B)		C&J	SKETCH NO. SAS-81 REV. 0 SH. 2 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>12/23/86</i>	
CHECKED BY: <i>King Loh</i>		ENG. <i>VAD</i> DATE <i>12/23/86</i>	

REVISION

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Issued for record.

DESIGN DETAIL



NOTE : SAS SIGNAL DESTINATION : BTSCA 01R05, POINTS 2 (POS.), 3 (NEG.), AND 4 (SHIELD).

REF. DWGS.: A225390, A225343  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN B STM OUT 2 PRESS (PT-429B)		C&J	<b>C&amp;J</b> SKETCH
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>12/23/86</i>	
CHECKED BY: <i>King Loh</i>		ENG. <i>VAD</i> DATE <i>12/23/86</i>	REV. 0 SH. 1 OF 2



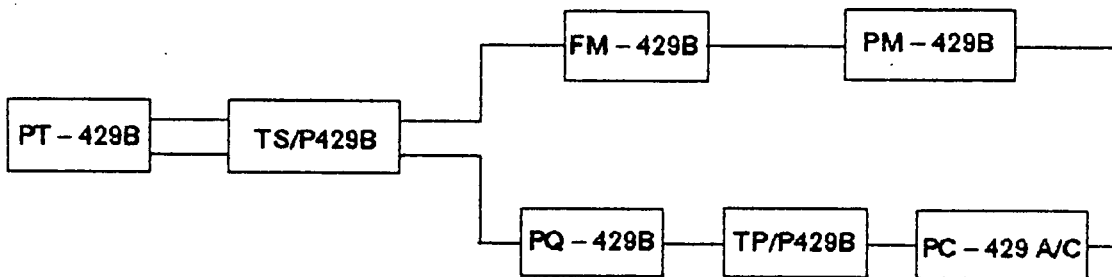
REVISION

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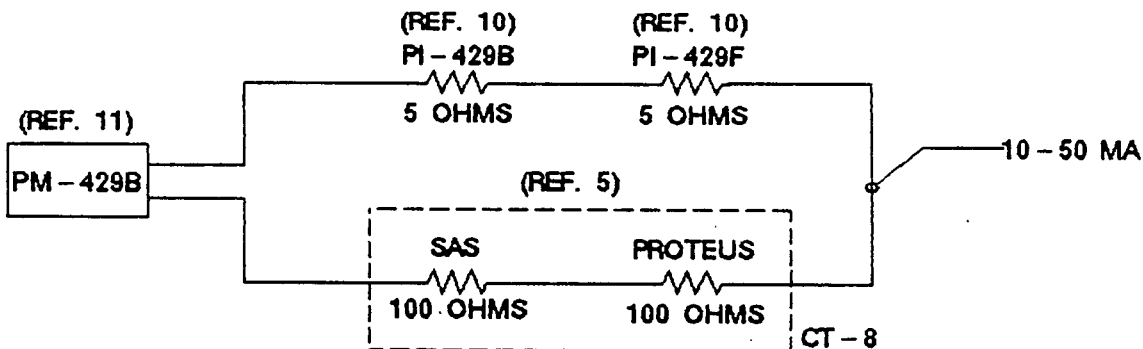
Issued for record.

# IMPEDANCE CALCULATION

## PT-429B REACTOR PROTECTION CIRCUIT



## PM-429B REACTOR CONTROL CIRCUIT



TOTAL IMPEDANCE (OHMS) = 100 + 100 + 5 + 5 = 210

### ENGINEERING JUSTIFICATION:

THE PT-429B CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. PM-429B (FOXBORO 86BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (210 OHMS), FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

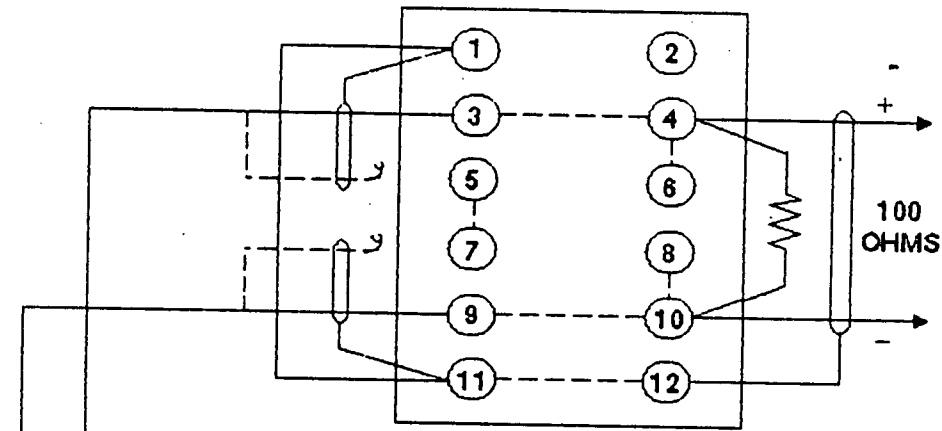
STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>	
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE		
STM GEN B STM OUT 2 PRESS (PT-429B)		C&I	ENG. <i>TM</i> DATE <i>12/23/86</i>	SKETCH NO. SAS-82
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>VAD</i> DATE <i>12/23/86</i>	REV. 0 SH. 2 OF 2	
CHECKED BY: <i>King Lock</i>				

REVISION

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issued for record.

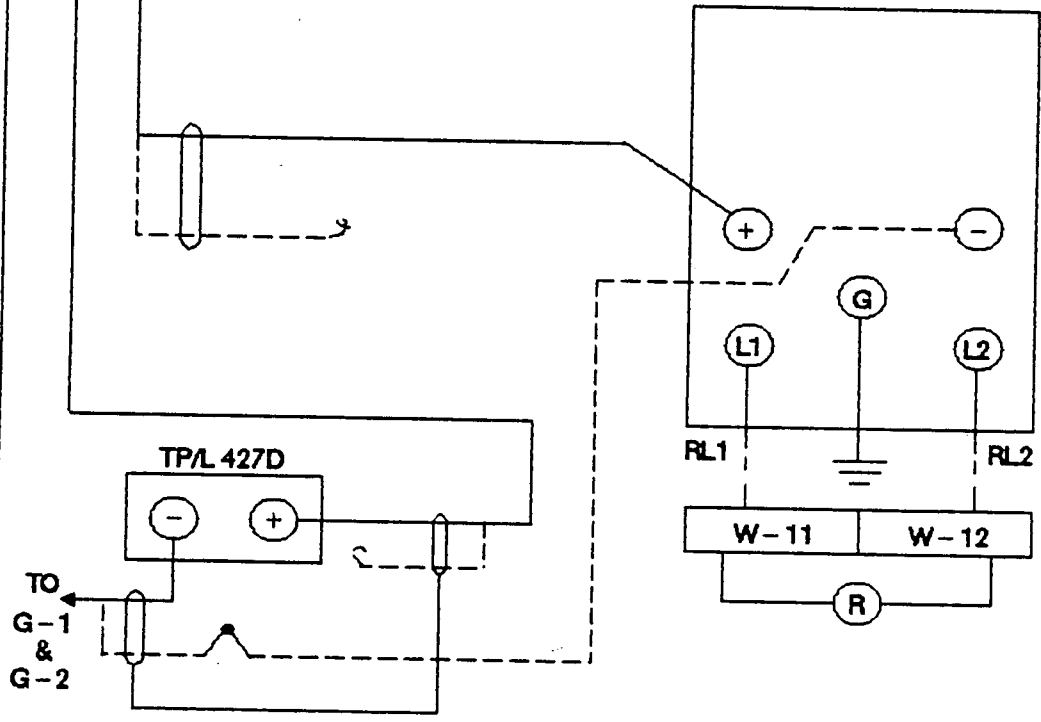
**DESIGN DETAIL**

L-427D  
SAKT-2 B5AP



L0423  
TO SAS MUX  
CABINET A

LQ-427D



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R08, POINTS 14 (POS.), 15 (NEG.), AND 16 (SHIELD).

REF. DWG.: A225389  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. N/A DATE	
STM GEN B WIDE RNG LVL (LT-427D)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. TM DATE 11/23/86	
CHECKED BY: <i>Kevin Foch</i>	ENG. VAS DATE 12/23/86	SKETCH NO. SAS-83	REV. 0 SH. 1 OF 2

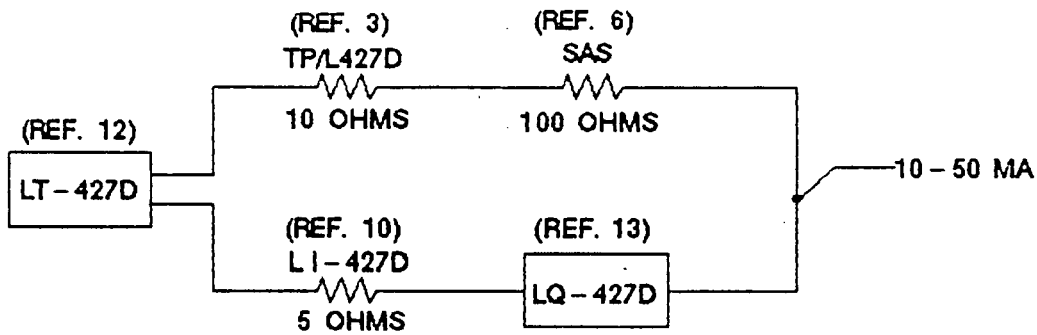
REVISION

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Issued for record.

**IMPEDANCE CALCULATION**

LT-427D REACTOR CONTROL CIRCUIT



TOTAL IMPEDANCE (OHMS) = 10 + 100 + 5 = 115

ENGINEERING JUSTIFICATION:

LT-427D IS PART OF THE REACTOR CONTROL SYSTEM, THEREFORE, THE SAS INPUT CAN BE IMPLEMENTED HERE. LT-427D IS A FOXBORO MODEL 613DM D/P CELL TRANSMITTER WHICH PROVIDES A 10-50 MA OUTPUT, WITH A 600 OHM LOAD (+10 -20 PERCENT). LQ-427D IS A FOXBORO 610-AR POWER SUPPLY, AND PROVIDES A 10-50 MA OUTPUT WITH AN OUTPUT LOAD OF 600 OHMS (+10 -20 PERCENT). THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (115 OHMS), FALLS WITHIN THE ALLOWABLE CIRCUIT LOAD LIMIT (600 OHMS).

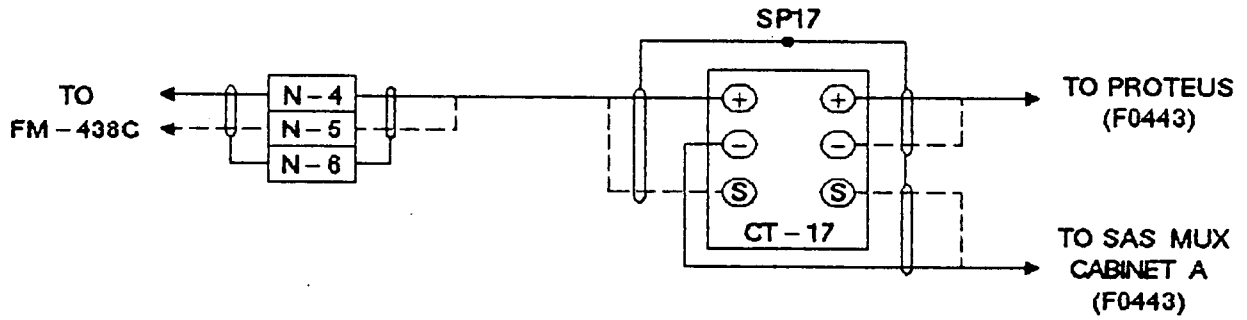
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG.
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN B WIDE RNG LVL (LT-427D)		C&I	SKETCH NO. SAS-83
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>1/23/86</i>	
CHECKED BY: <i>King Lake</i>		ENG. <i>VMS</i> DATE <i>12/23/80</i>	

REVISION

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Issued for record.

DESIGN DETAIL



NOTE : SAS SIGNAL DESTINATION : BTSCA 01R13, POINTS 10 (POS.), 11 (NEG.), AND 12 (SHIELD).

REF. DWGS.: A225395, A225323  
 REF. SKETCH: SAS - REF

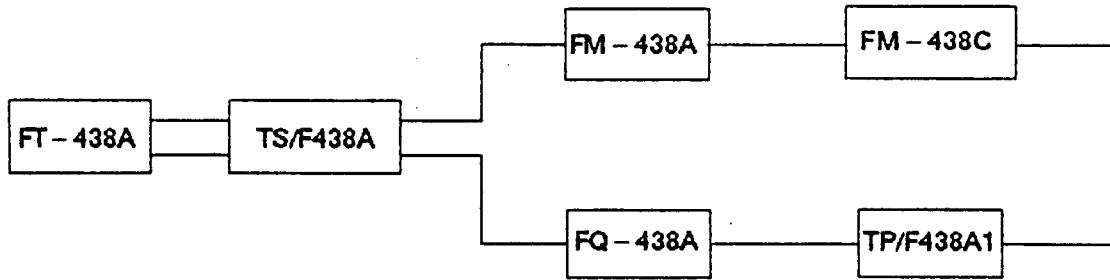
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN C FW IN 1 FLOW (FT - 438A)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>12/23/86</i>	
CHECKED BY: <i>Kevin Lohr</i>		ENG. <i>VAD</i> DATE <i>12/23/86</i>	
			SKETCH NO. SAS - 84 REV. 0 SH. 1 OF 2

REVISION

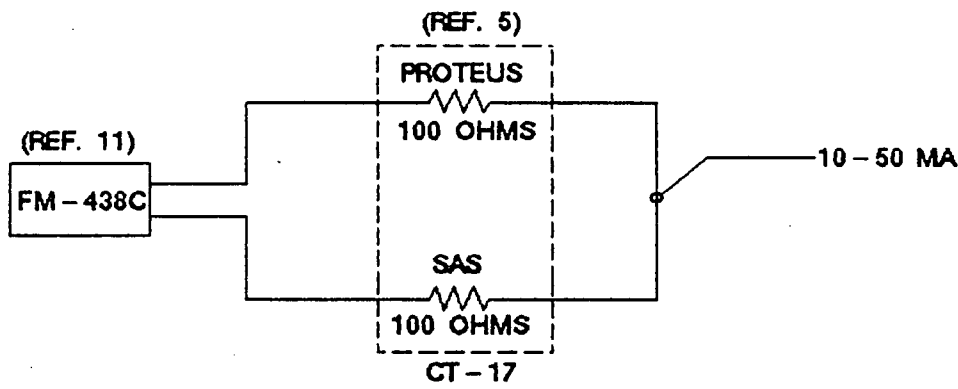
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Issued for record.

**IMPEDANCE CALCULATION**

**FT-428A REACTOR PROTECTION CIRCUIT**



**FM-428C REACTOR CONTROL CIRCUIT**



TOTAL IMPEDANCE (OHMS) = 100 + 100 = 200

**ENGINEERING JUSTIFICATION:**

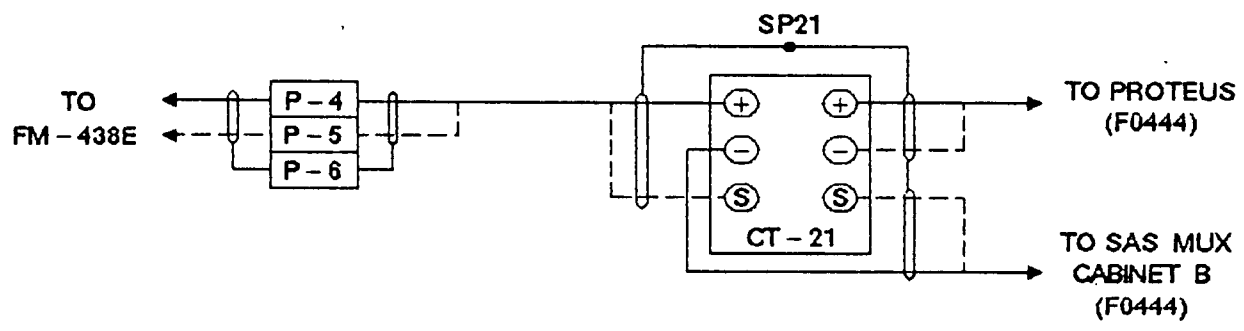
THE FT-438A CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. FM-438C (FOXBORO 66BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (200 OHMS), FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	CON EDISON ENG. C&J SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. N/A DATE	
STM GEN C FW IN 1 FLOW (FT-438A)		C&J	SKETCH NO. SAS-84 REV. 0 SH. 2 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. TM DATE 12/23/86	
CHECKED BY: <i>King Lock</i>		ENG. VAD DATE 12/23/86	

REVISION

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 Issued for  
 record.

DESIGN DETAIL



NOTE : SAS SIGNAL DESTINATION : BTSCA 01R06, POINTS 10 (POS.), 11 (NEG.), AND 12 (SHIELD).

REF. DWGS.: A225395, A225339  
 REF. SKETCH: SAS - REF

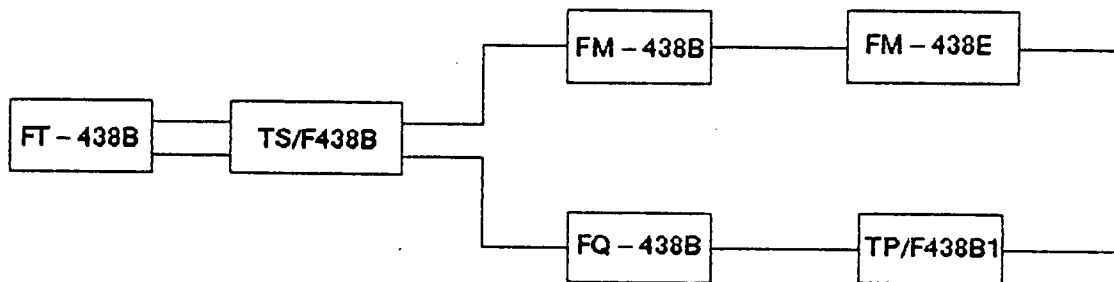
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG.</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN C FW IN 2 FLOW (FT - 438B)		C&I	SKETCH NO. SAS - 85 REV. 0 SH. 1 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>12/23/86</i>	
CHECKED BY: <i>Kerry Loh</i>		ENG. <i>VAD</i> DATE <i>12/23/86</i>	

REVISION

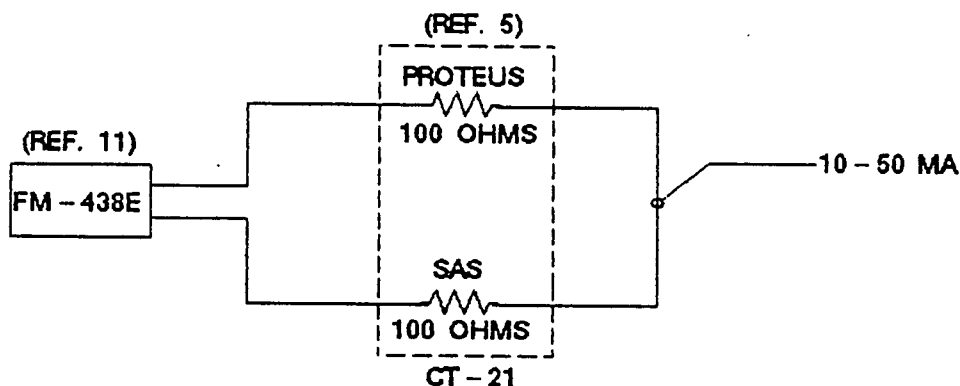
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Issued for record.

IMPEDANCE CALCULATION

FT-438B REACTOR PROTECTION CIRCUIT



FM-438E REACTOR CONTROL CIRCUIT



TOTAL IMPEDANCE (OHMS) = 100 + 100 = 200

ENGINEERING JUSTIFICATION:

THE FT-438B CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. FM-438E (FOXBORO 66BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (200 OHMS), FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

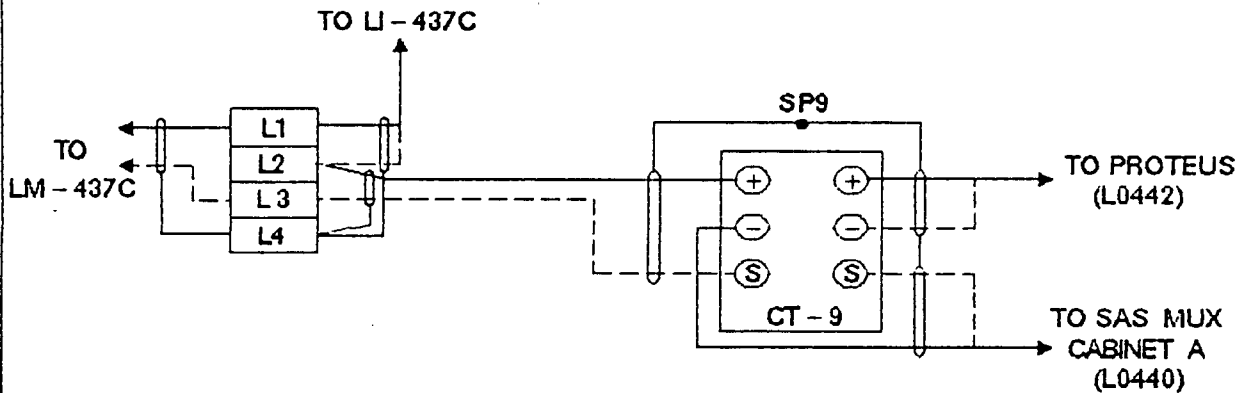
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN C FW IN 2 FLOW (FT-438B)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>12/23/86</i>	
CHECKED BY: <i>King Tooke</i>		ENG. <i>VAD</i> DATE <i>12/23/86</i>	SKETCH NO. SAS-85 REV. 0 SH. 2 OF 2

REVISION

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DESIGN DETAIL



NOTE :

1. SAS SIGNAL DESTINATION: BTSCA 01R03, POINTS 19 (POS.), 20 (NEG.), AND 21 (SHIELD).
2. COMPUTER ADDRESS FOR SAS WILL BE CHANGED FROM L0440 TO L0442 , PENDING IMPLEMENTATION OF REFERENCE MEMO ON DWG. A225382.

REF. DWGS.: A225382, A225329

REF. SKETCH: SAS - REF

REF. MEMO: CON - ED MEMO (MSSRS B. LEE AND F. HOFFMAN) DATED 10/16/86

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN C NAR RNG 3 LVL (LT - 437C)		C&I ENG. <i>TM</i> DATE <i>1/23/86</i>	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>VAD</i> DATE <i>12/23/86</i>	
CHECKED BY: <i>King Lock</i>			SKETCH NO. SAS - 86 REV. 0 SH. 1 OF 2



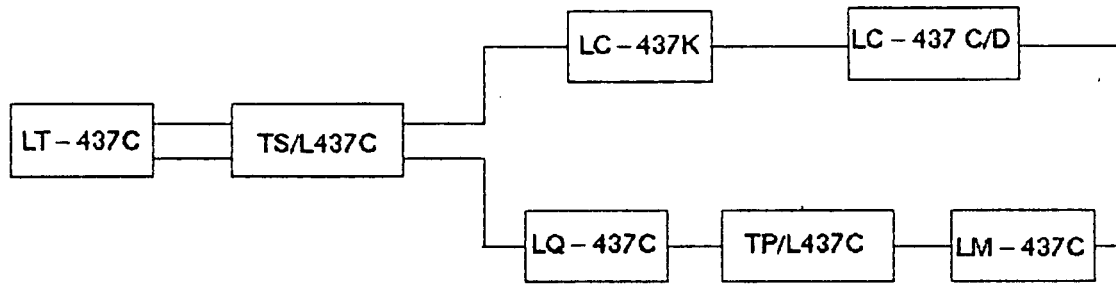
REVISION

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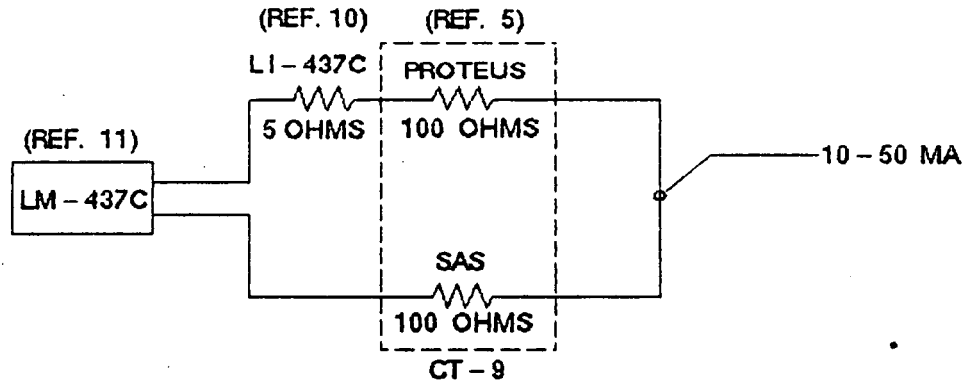
Issued for record.

# IMPEDANCE CALCULATION

## LT-437C REACTOR PROTECTION CIRCUIT



## LM-437C REACTOR CONTROL CIRCUIT



TOTAL IMPEDANCE (OHMS) = 100 + 100 + 5 = 205

### ENGINEERING JUSTIFICATION:

THE LT-437C CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. LM-437C (FOXBORO 68BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (205 OHMS), FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

STATION: INDIAN POINT 2 TITLE: SAS COMPUTER INTERFACE STM GEN C NAR RNG 3 LVL (LT-437C)	A P P R V E D	MECH. PROGRAM ENG. <i>N/A</i> DATE C&I ENG. <i>TM</i> DATE <i>12/23/86</i> ENG. <i>VAD</i> DATE <i>12/23/86</i>	CON EDISON ENG. C&I SKETCH
SKETCHED BY: VICTOR S. D'AMORE CHECKED BY: <i>King J...</i>		SKETCH NO. SAS-86 REV. 0 SH. 2 OF 2	

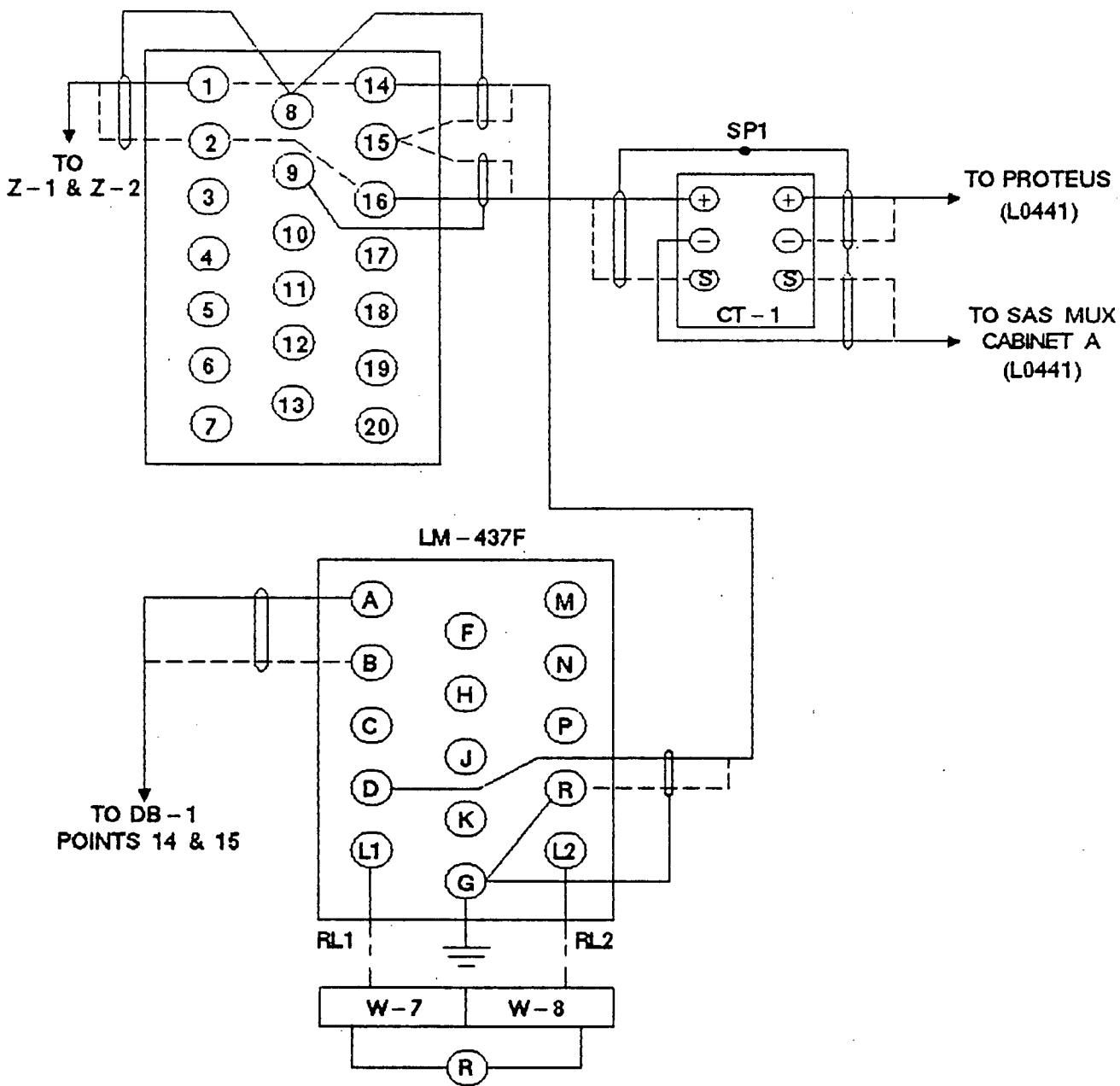
REVISION

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**DESIGN DETAIL**

(SEE NOTE 2)



- NOTE: 1. SAS SIGNAL DESTINATION: BTSCA 01R10, POINTS 27 (POS.), 28 (NEG.), AND 29 (SHIELD).  
 2. DISTRIBUTION BLOCK IS DESIGNATED FOR LABELING.

REF. DWGS.: A225384, A225358  
 REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG. C&J SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN C NAR RNG 2 LVL (LT-437B)	C&J	ENG. <i>TM</i> DATE <i>12/23/86</i>	SKETCH NO. SAS-87
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>VAD</i> DATE <i>12/23/86</i>	
CHECKED BY: <i>King Lock</i>			

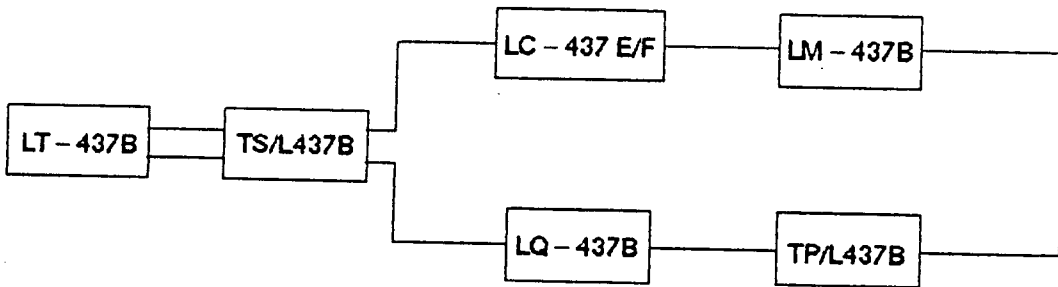
REVISION

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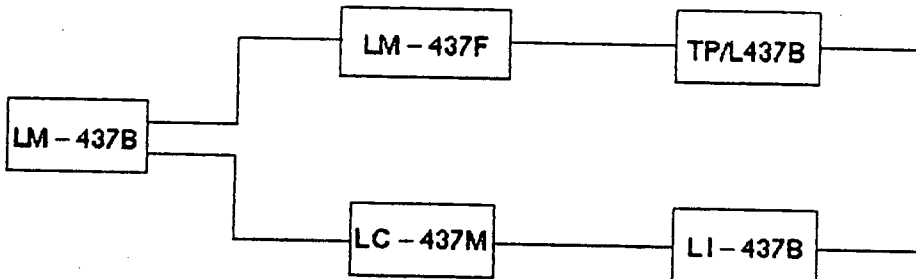
Issued for record.

# IMPEDANCE CALCULATION

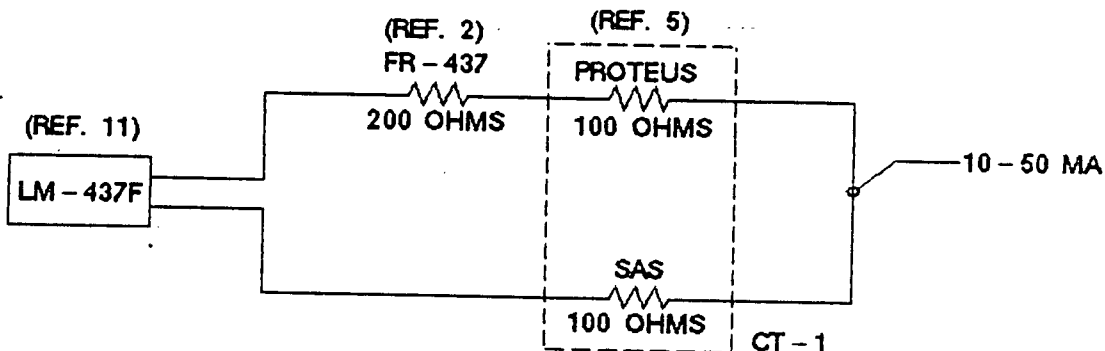
## LT-437B REACTOR PROTECTION CIRCUIT



## LM-437B REACTOR CONTROL CIRCUIT



## LM-437F CIRCUIT (Z EQUIV.)



TOTAL IMPEDANCE (OHMS)  $200 + 100 + 100 = 400$

### ENGINEERING JUSTIFICATION:

THE LT-437B CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS SIGNAL CANNOT BE IMPLEMENTED HERE. LM-437B IS A FOXBORO 66BR-OH ISOLATOR, AND SERVES TO ISOLATE THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM. LM-437F (FOXBORO 66BR-OH) SERVES AS A CURRENT REPEATER IN THIS CIRCUIT, AND CAN DRIVE A LOAD UP TO A 660 OHMS. THE SAS SIGNAL CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (400 OHMS), FALLS WITHIN THE LOAD (660 OHMS).

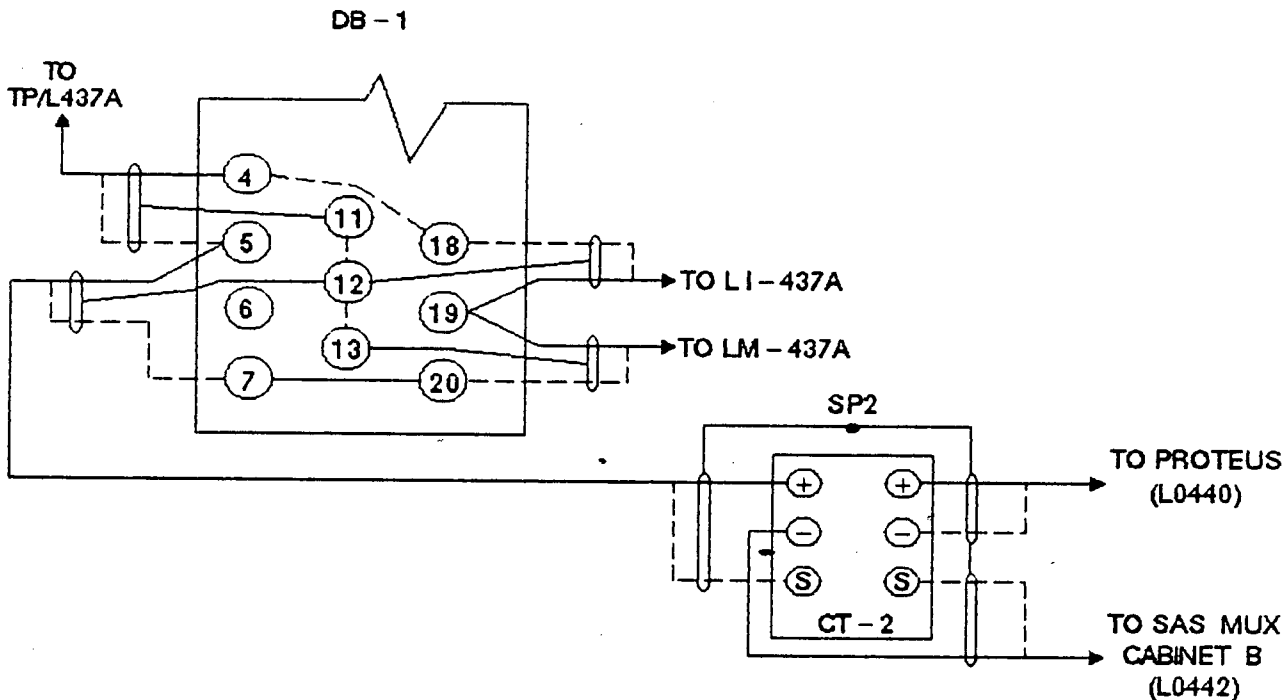
STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN C NAR RNG 2 LVL (LT-437B)		C&I	ENG. <i>TT</i> DATE <i>11/23/86</i>
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>VAD</i> DATE <i>12/23/86</i>	SKETCH NO. SAS-87
CHECKED BY: <i>King Fisher</i>			REV. 0 SH. 2 OF 2

REVISION

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DESIGN DETAIL



- NOTE: 1. SAS SIGNAL DESTINATION: BTSCA 01R09, POINTS 14 (POS.), 15 (NEG.), AND 16 (SHIELD).  
 2. COMPUTER ADDRESS FOR SAS WILL BE CHANGED FROM L0442 TO L0440, PENDING IMPLEMENTATION OF REFERENCE MEMO ON DWG A225384.

REF. DWGS.: A225384, A225374  
 REF. SKETCH: SAS - REF.  
 REF. MEMO: CON - ED MEMO (MSSRS B. LEE AND F. HOFFMAN) DATED 10/16/86

STATION: INDIAN POINT 2	A P P R V E D	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN C NAR RNG 1 LVL (LT - 437A)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 3/17/87	
CHECKED BY: <i>King John</i>		ENG. <i>VAD</i> DATE 3/17/87	SKETCH NO. SAS - 88 REV. 0 SH. 1 OF 2

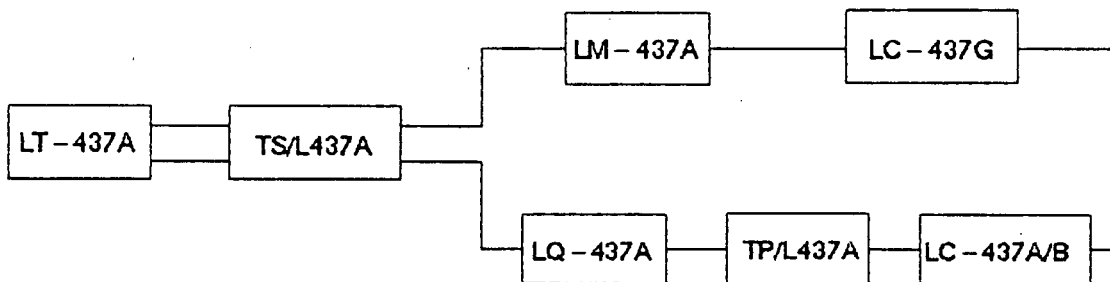
REVISION

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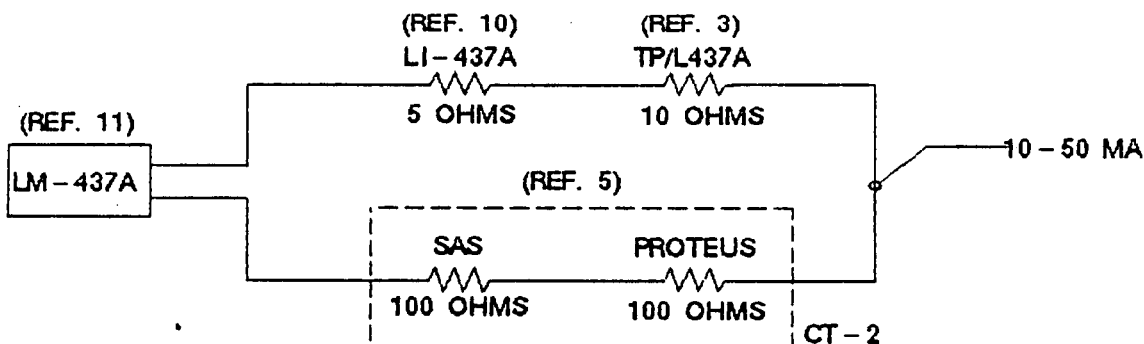
Issued for record.

# IMPEDANCE CALCULATION

## LT-437A REACTOR PROTECTION CIRCUIT



## LM-437A REACTOR CONTROL CIRCUIT (Z EQUIV.)



TOTAL IMPEDANCE (OHMS) = 5 + 10 + 100 + 100 = 215

### ENGINEERING JUSTIFICATION:

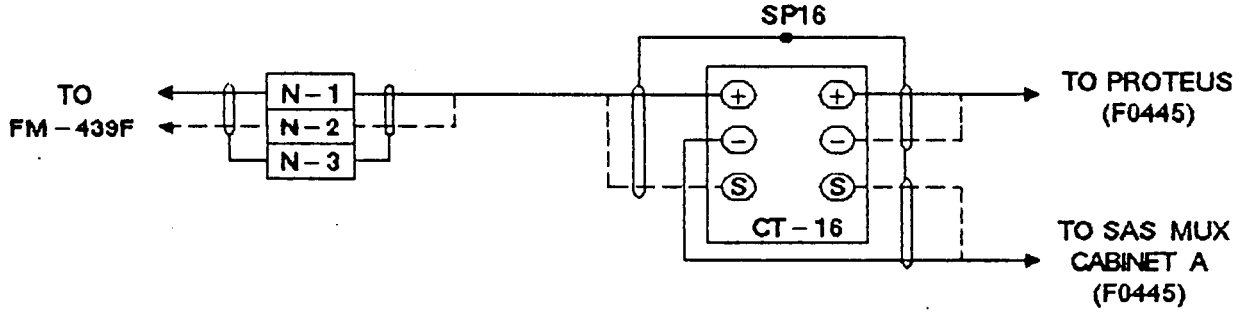
THE LT-437A CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. LM-437A (FOXBORO 66BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (215 OHMS), FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

STATION: INDIAN POINT 2 TITLE: SAS COMPUTER INTERFACE STM GEN C NAR RNG 1 LVL (LT-437A) SKETCHED BY: VICTOR S. D'AMORE CHECKED BY: <i>King Tooh</i>	A P P R V E S	MECH. PROGRAM ENG. <i>N/A</i> DATE C&I ENG. <i>TM</i> DATE <i>3/17/87</i> ENG. <i>V/S</i> DATE <i>3/17/87</i>	<b>CON EDISON ENG. C&amp;I SKETCH</b>  SKETCH NO. SAS-88 REV. 0 SH. 2 OF 2
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REVISION

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Issued for record.

DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R03, POINTS 23 (POS.), 24 (NEG.), AND 25 (SHIELD).

REF. DWGS.: A225395, A225323  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2  
TITLE: SAS COMPUTER INTERFACE  
STM GEN C STM OUT 1 FLOW (FT-439A)  
SKETCHED BY: VICTOR S. D'AMORE  
CHECKED BY: *King Lock*

APPROVALS

MECH. PROGRAM  
ENG. *N/A* DATE  
C&I  
ENG. *TM* DATE *12/23/86*  
ENG. *VAN* DATE *12/23/86*

**CON EDISON** ENG.  
C&I SKETCH  
SKETCH NO. SAS-89  
REV. 0 SH. 1 OF 2

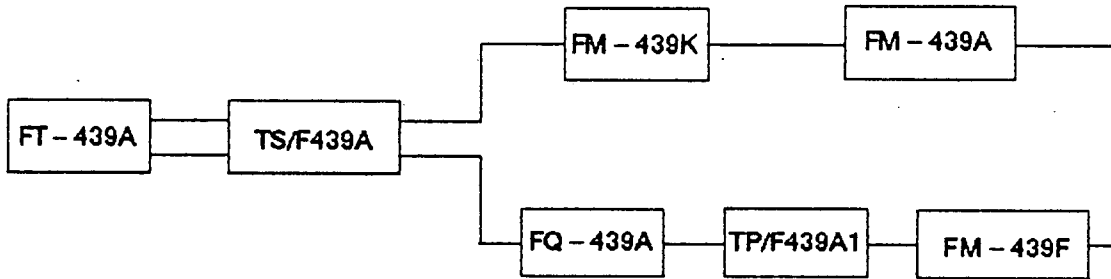
REVISION

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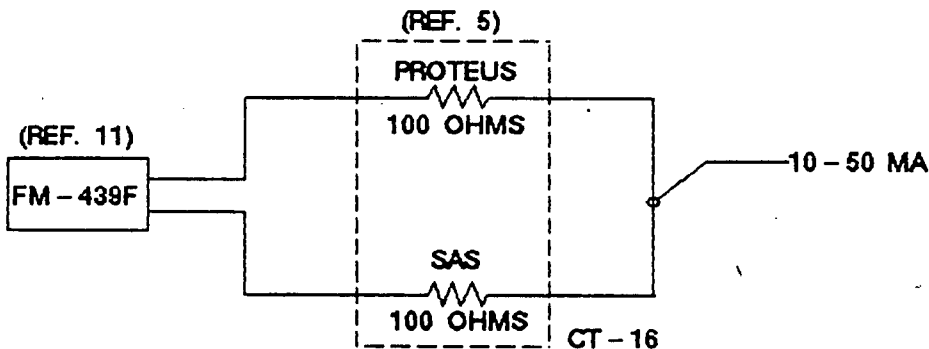
Issued for record.

**IMPEDANCE CALCULATION**

FT-439A REACTOR PROTECTION CIRCUIT



FM-439F REACTOR CONTROL CIRCUIT



TOTAL IMPEDANCE (OHMS) = 100 + 100 = 200

ENGINEERING JUSTIFICATION:

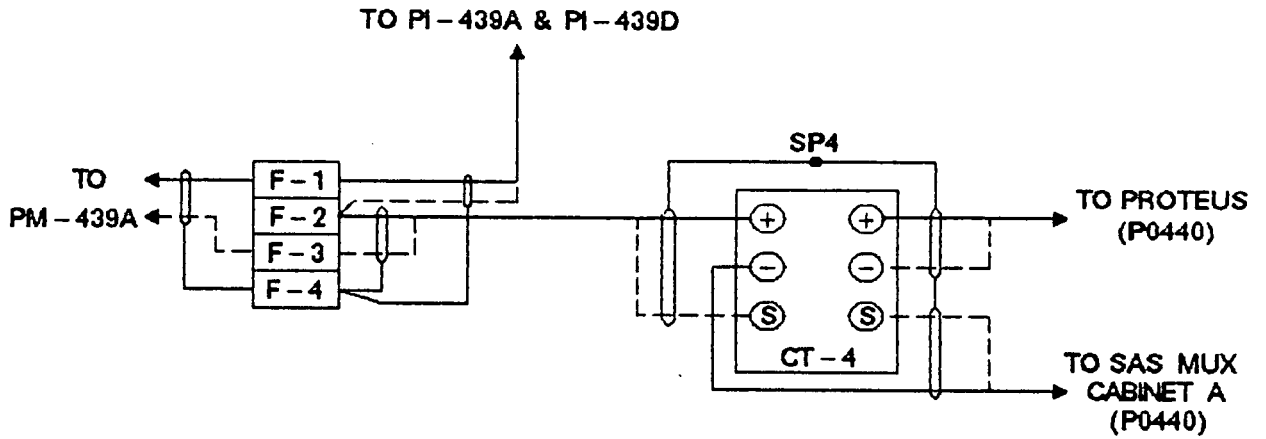
THE FT-439A CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. FM-439F (FOXBORO 86BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (200 OHMS), FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON</b> <b>EDISON</b> ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN C STM OUT 1 FLOW (FT-439A)		C&I	SKETCH NO. SAS-89 REV. 0 SH. 2 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 12/23/88	
CHECKED BY: <i>King Loh</i>		ENG. <i>VLD</i> DATE 12/23/88	

REVISION

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Issued for record.

DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R03, POINTS 14 (POS.), 15 (NEG.), AND 16 (SHIELD).

REF. DWGS.: A225384, A225323  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN C STM OUT 1 PRESS (PT - 439A)		C&I	<b>C&amp;I SKETCH</b>
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>12/23/86</i>	
CHECKED BY: <i>King Lock</i>		ENG. <i>VAD</i> DATE <i>12/23/86</i>	REV. 0 SH. 1 OF 2

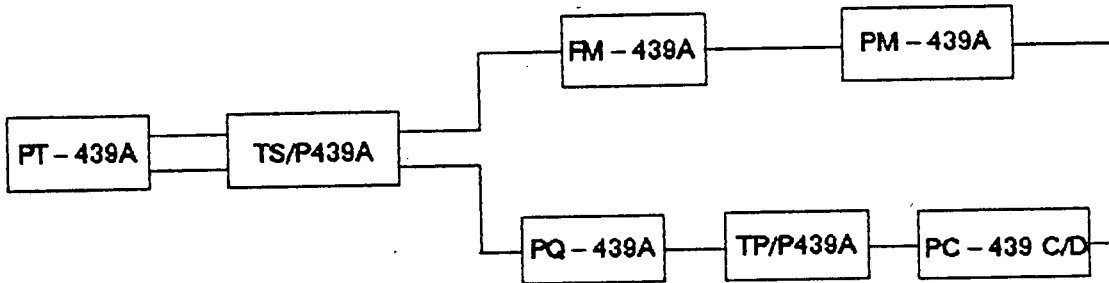


REVISION

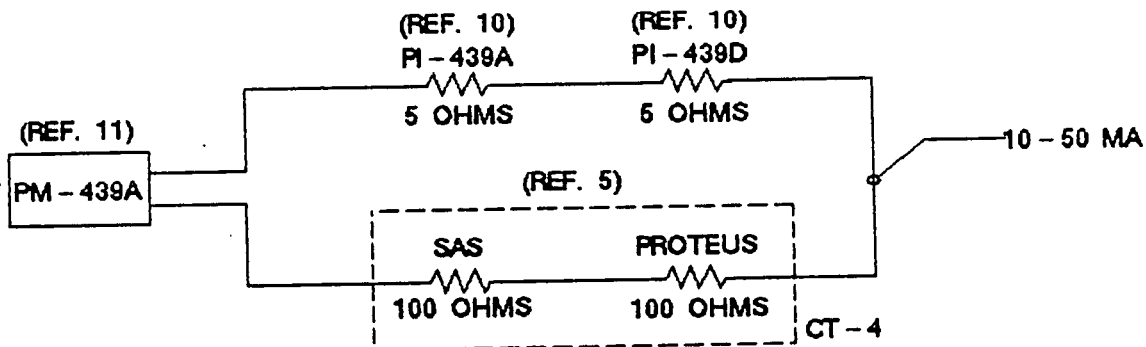
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Issued for

# IMPEDANCE CALCULATION

## PT-439A REACTOR PROTECTION CIRCUIT



## PM-439A REACTOR CONTROL CIRCUIT



TOTAL IMPEDANCE (OHMS) =  $100 + 100 + 5 + 5 = 210$

### ENGINEERING JUSTIFICATION:

THE PT-439A CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. PM-439A (FOXBORO 68BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (210 OHMS), FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

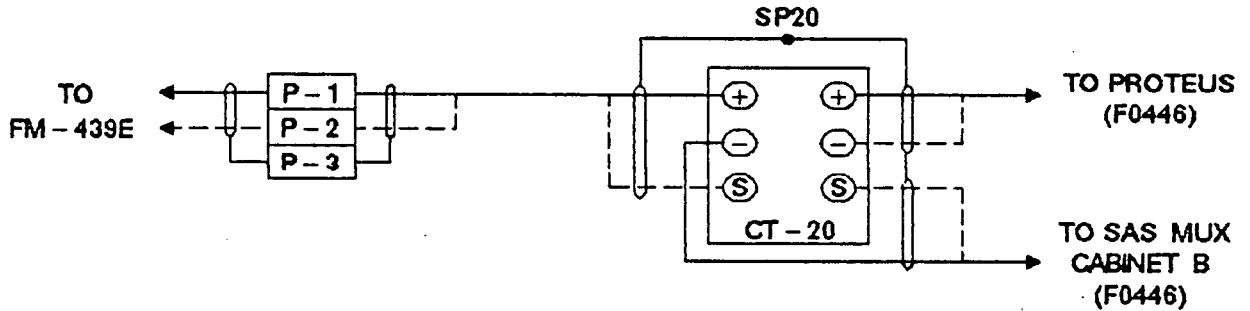
STATION: INDIAN POINT 2 TITLE: SAS COMPUTER INTERFACE STM GEN C STM OUT 1 PRESS (PT-439A) SKETCHED BY: VICTOR S. D'AMORE CHECKED BY:	A P P R V L S	MECH. PROGRAM ENG. <i>N/A</i> DATE C&I ENG. <i>TM</i> DATE 12/23/86 ENG. <i>VAD</i> DATE 12/23/86	CON EDISON ENG. C&I SKETCH	SKETCH NO. SAS-90 REV. 0 SH. 2 OF 2
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REVISION

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Issued for record.

DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R09, POINTS 19 (POS.), 20 (NEG.), AND 21 (SHIELD).

REF. DWGS.: A225395, A225339  
 REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN C STM OUT 2 FLOW (FT-439B)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>12/23/86</i>	
CHECKED BY: <i>King Tech</i>		ENG. <i>VAD</i> DATE <i>12/23/86</i>	SKETCH NO. SAS-91 REV. 0 SH. 1 OF 2

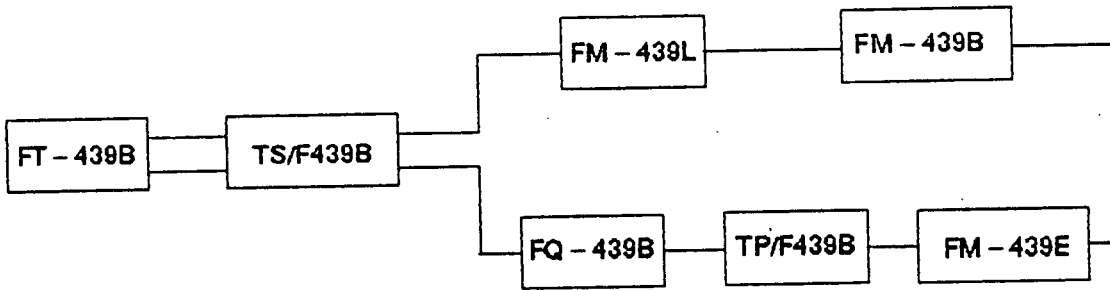
REVISION

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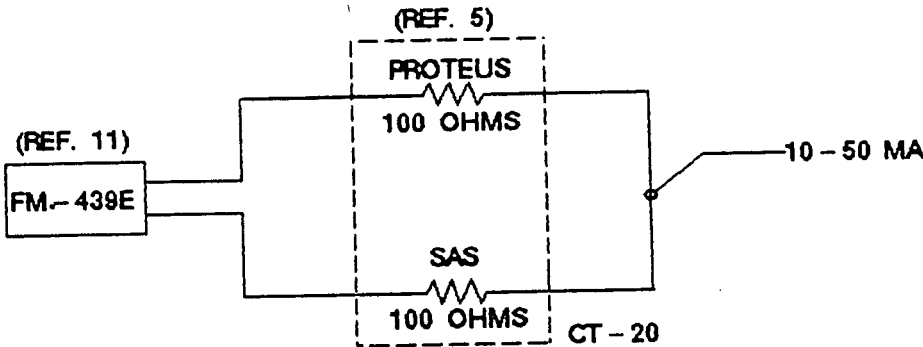
Issued for record.

# IMPEDANCE CALCULATION

## FT-439B REACTOR PROTECTION CIRCUIT



## FM-439E REACTOR CONTROL CIRCUIT



TOTAL IMPEDANCE (OHMS) = 100 + 100 = 200

### ENGINEERING JUSTIFICATION:

THE FT-439B CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. FM-439E (FOXBORO 86BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (200 OHMS), FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

STATION: INDIAN POINT 2  
 TITLE: SAS COMPUTER INTERFACE  
 STM GEN C STM OUT 2 FLOW (FT-439B)  
 SKETCHED BY: VICTOR S. D'AMORE  
 CHECKED BY: *King John*

APPROVALS  
 MECH. PROGRAM  
 ENG. *N/A* DATE  
 C&J  
 ENG. *TM* DATE *12/23/88*  
 ENG. *VAD* DATE *12/23/88*

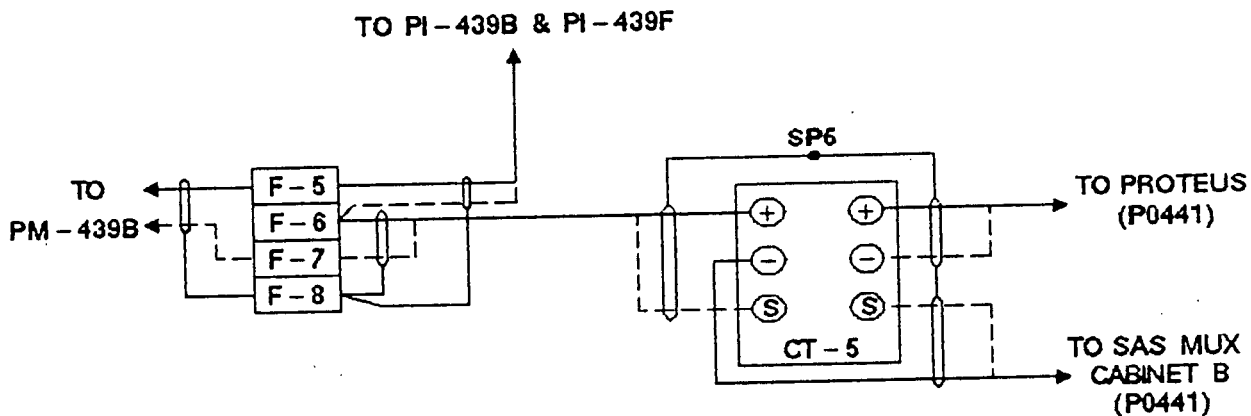
**CON EDISON ENG.**  
**C&I SKETCH**  
 SKETCH NO. SAS-91  
 REV. 0 SH. 2 OF 2

REVISION

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Issued for record.

DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R03, POINTS 19 (POS.), 20 (NEG.), AND 21 (SHIELD).

REF. DWGS.: A225384, A225338  
 REF. SKETCH: SAS - REF

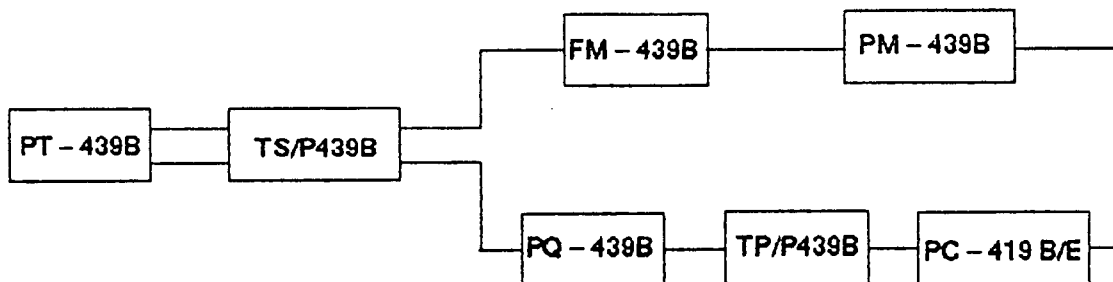
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG.</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN C STM OUT 2 PRESS (PT - 439B)		C&I	SKETCH NO. SAS - 92
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>12/23/80</i>	
CHECKED BY: <i>King Lock</i>		ENG. <i>VAD</i> DATE <i>12/23/80</i>	

REVISION

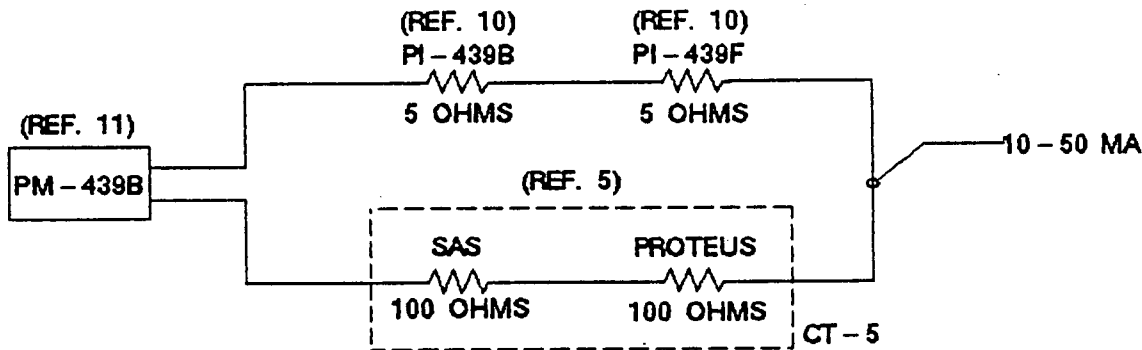
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Issued for record.

**IMPEDANCE CALCULATION**

PT-439B REACTOR PROTECTION CIRCUIT



PM-439B REACTOR CONTROL CIRCUIT



TOTAL IMPEDANCE (OHMS) = 100 + 100 + 5 + 5 = 210

ENGINEERING JUSTIFICATION:

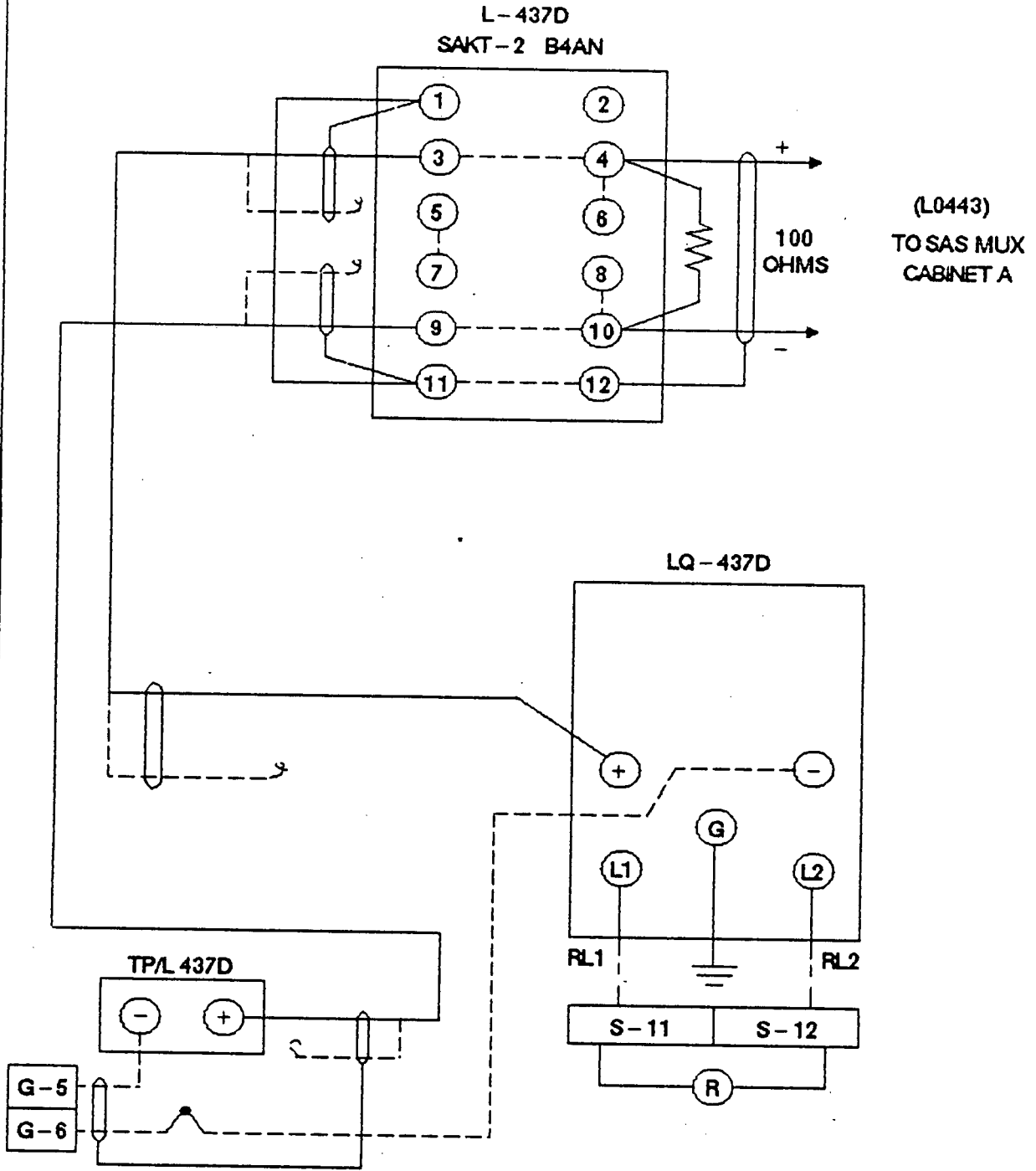
THE PT-439B CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. PM-439B (FOXBORO 66BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (210 OHMS), FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG.</b>	
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE		<b>C&amp;J SKETCH</b>
STM GEN C STM OUT 2 PRESS (PT-439B)		C&J	ENG. <i>TM</i> DATE <i>12/23/86</i>	SKETCH NO. SAS-92 REV. 0 SH. 2 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>VAD</i> DATE <i>12/23/86</i>		
CHECKED BY: <i>King Look</i>				

REVISION

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Issued for record.

DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R10, POINTS 23 (POS.), 24 (NEG.), AND 25 (SHIELD).

REF. DWG.: A225384  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG.</b> <b>C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN C WIDE RNG LVL (LT-437D)	C&I	ENG. <i>TM</i> DATE <i>12/23/86</i>	
SKETCHED BY: VICTOR S. D'AMORE	ENG. <i>VAD</i> DATE <i>12/23/86</i>	SKETCH NO. SAS-93	
CHECKED BY: <i>King Lock</i>		REV. 0. SH. 1 OF 2	

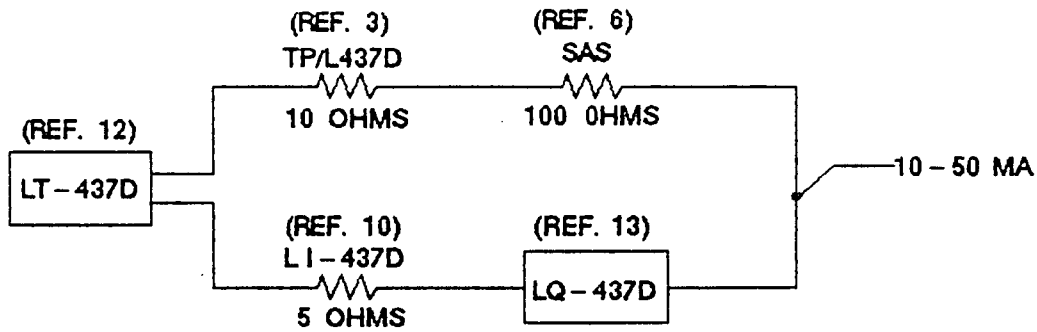
REVISION

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# IMPEDANCE CALCULATION

## LT-437D REACTOR CONTROL CIRCUIT



TOTAL IMPEDANCE (OHMS) = 10 + 100 + 5 = 115

ENGINEERING JUSTIFICATION:

LT-437D IS PART OF THE REACTOR CONTROL SYSTEM, THEREFORE, THE SAS INPUT CAN BE IMPLEMENTED HERE. LT-437D IS A FOXBORO MODEL 613 DM D/P CELL TRANSMITTER WHICH PROVIDES A 10-50 MA OUTPUT, WITH A 600 OHM LOAD (+10 - 20 PERCENT). LQ-437D IS A FOXBORO 610-AR POWER SUPPLY, AND PROVIDES A 10-50 MA OUTPUT WITH AN OUTPUT LOAD OF 600 OHMS (+10 - 20 PERCENT). THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (115 OHMS), FALLS WITHIN THE ALLOWABLE CIRCUIT LOAD LIMIT (600 OHMS).

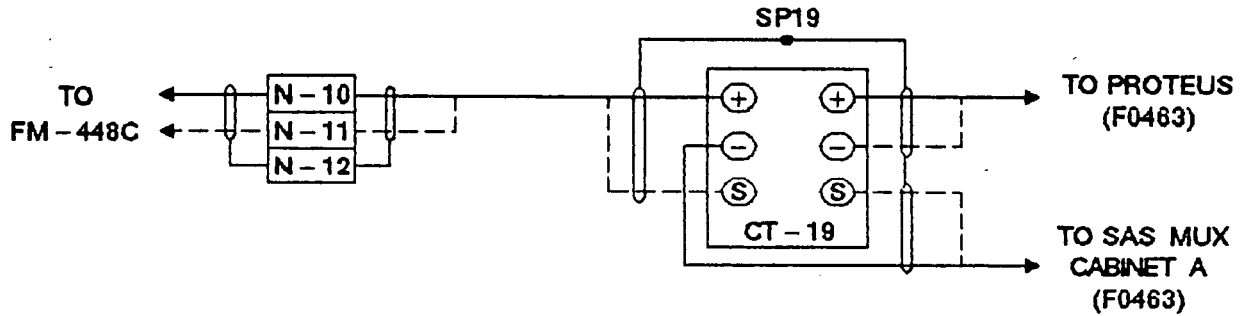
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG.</b> <b>C&amp;J SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN C WIDE RNG LVL (LT-437D)		C&J	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>12/23/80</i>	
CHECKED BY: <i>King Tech</i>		ENG. <i>VAD</i> DATE <i>12/23/80</i>	SKETCH NO. SAS-93 REV. 0 SH. 2 OF 2

REVISION

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Issued for record.

DESIGN DETAIL



NOTE : SAS SIGNAL DESTINATION : BTSCA 01R13, POINTS 6 (POS.), 7 (NEG.), AND 8 (SHIELD).

REF. DWGS.: A225395, A225324  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN D FW IN 1 FLOW (FT-448A)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>12/23/86</i>	
CHECKED BY: <i>King Lock</i>		ENG. <i>V.A.</i> DATE <i>12/23/86</i>	SKETCH NO. SAS-94 REV. 0 SH. 1 OF 2

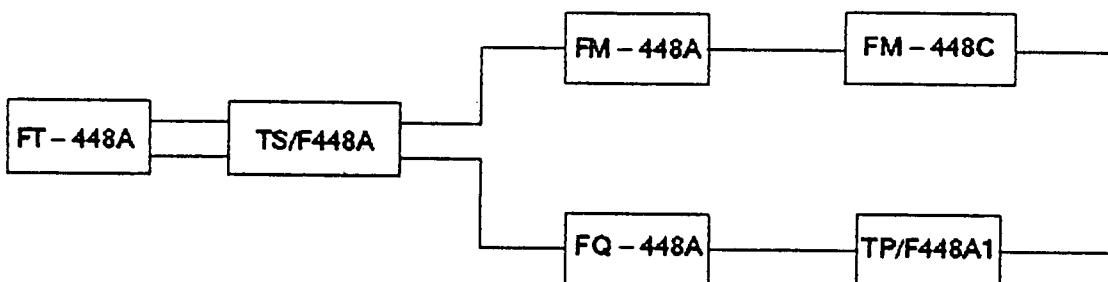


REVISION

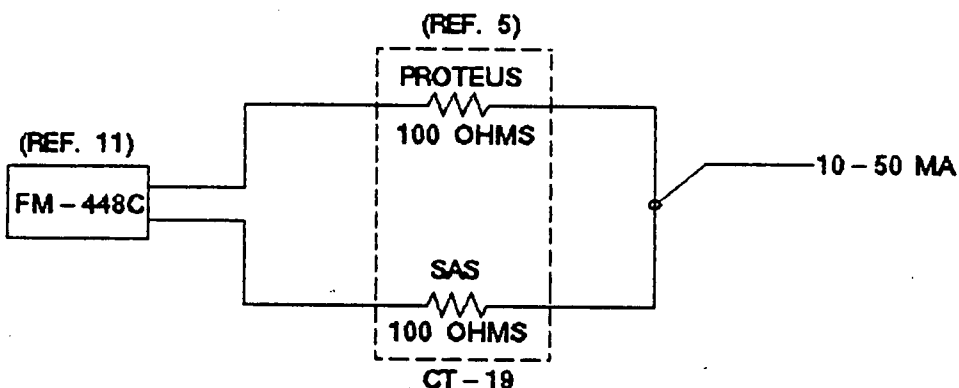
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Issued for record.

# IMPEDANCE CALCULATION

## FT-448A REACTOR PROTECTION CIRCUIT



## FM-448C REACTOR CONTROL CIRCUIT



TOTAL IMPEDANCE (OHMS) = 100 + 100 = 200

### ENGINEERING JUSTIFICATION:

THE FT-448A CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. FM-448C (FOXBORO 86BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (200 OHMS), FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

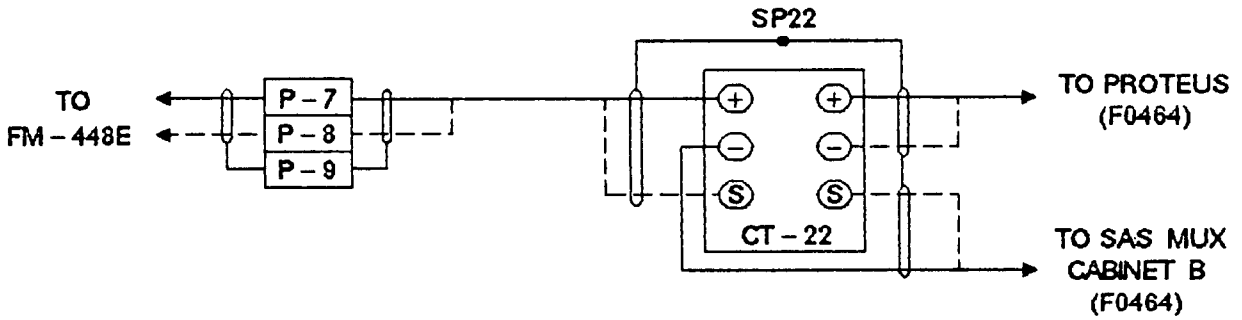
STATION: INDIAN POINT 2 TITLE: SAS COMPUTER INTERFACE STM GEN D FW IN 1 FLOW (FT-448A) SKETCHED BY: VICTOR S. D'AMORE CHECKED BY: <i>King Tooh</i>	A P P R V E D	MECH. PROGRAM ENG. <i>N/A</i> DATE C&I ENG. <i>TM</i> DATE <i>12/23/86</i> ENG. <i>V.A.D.</i> DATE <i>12/23/86</i>	CON EDISON ENG. C&I SKETCH SKETCH NO. SAS-94 REV. 0 SH. 2 OF 2
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REVISION

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Issued for record.

DESIGN DETAIL



NOTE : SAS SIGNAL DESTINATION : BTSCA 01R07, POINTS 2 (POS.), 3 (NEG.), AND 4 (SHIELD).

REF. DWGS.: A225395, A225344  
 REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2  
 TITLE: SAS COMPUTER INTERFACE  
 STM GEN D FW IN 2 FLOW (FT - 448B)  
 SKETCHED BY: VICTOR S. D'AMORE  
 CHECKED BY: *King Tooh*

APPROVALS

MECH. PROGRAM  
 ENG. *N/A* DATE  
 C&J  
 ENG. *TM* DATE *12/23/86*  
 ENG. *VAD* DATE *12/23/86*

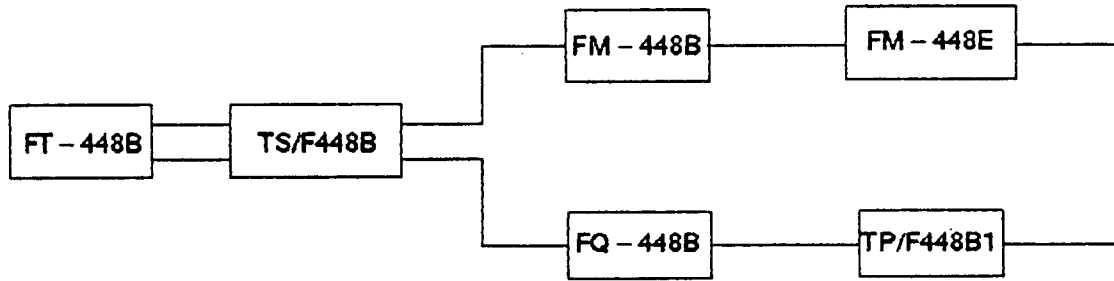
**CON EDISON ENG.**  
**C&J SKETCH**  
 SKETCH NO. SAS - 95  
 REV. 0 SH. 1 OF 2

REVISION

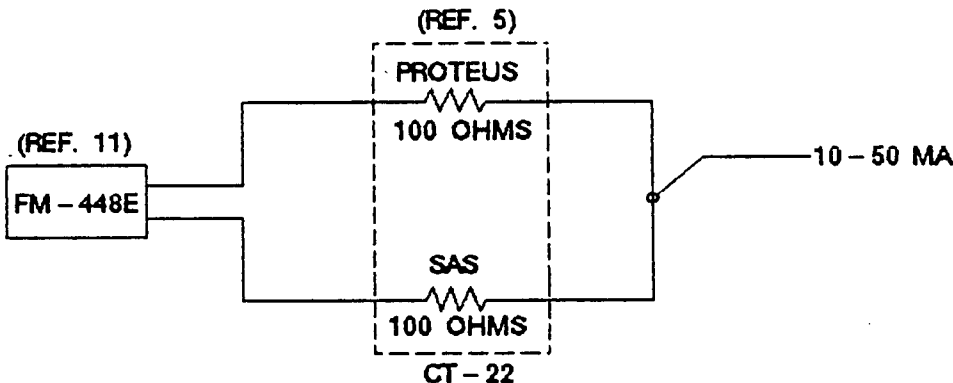
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Issued for  
Record.

## IMPEDANCE CALCULATION

### FT-448B REACTOR PROTECTION CIRCUIT



### FM-448E REACTOR CONTROL CIRCUIT



TOTAL IMPEDANCE (OHMS) = 100 + 100 = 200

#### ENGINEERING JUSTIFICATION:

THE FT-448B CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. FM-448E (FOXBORO 66BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (200 OHMS), FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

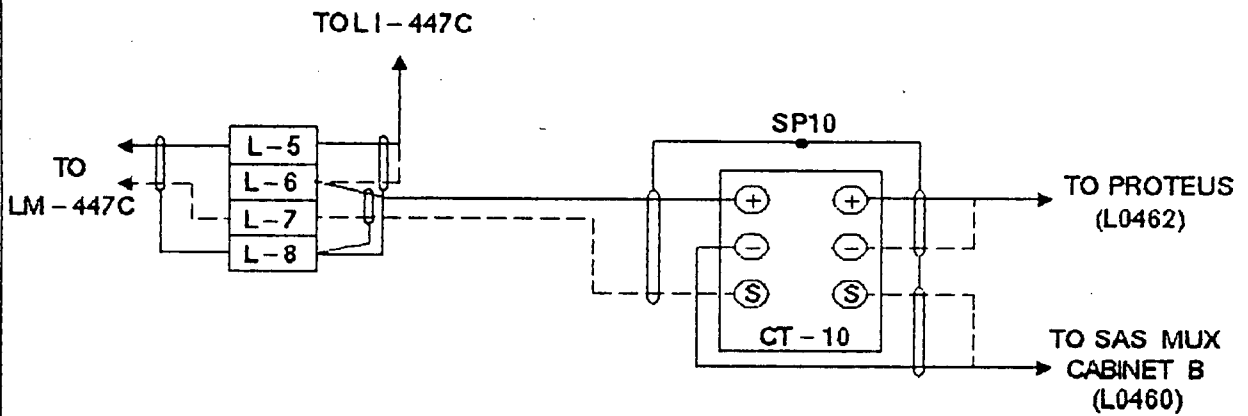
STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>W/A</i> DATE	
STM GEN D FW IN 2 FLOW (FT-448B)		C&I	SKETCH NO. SAS-95 REV. 0 SH. 2 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 12/23/86	
CHECKED BY: <i>King Lock</i>		ENG. <i>VLD</i> DATE 12/23/86	

REVISION

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DESIGN DETAIL



NOTE :

1. SAS SIGNAL DESTINATION: BTSCA 01R03, POINTS 23 (POS.), 24 (NEG.), AND 25 (SHIELD).
2. COMPUTER ADDRESS FOR SAS WILL BE CHANGED FROM L0460 TO L0462, PENDING IMPLEMENTATION OF REFERENCE MEMO ON A225382.

REF. DWGS.: A225382, A225349

REF. SKETCH: SAS - REF

REF. MEMO: CON - ED MEMO (MSSRS B. LEE AND F. HOFFMAN) DATED 10/16/86.

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN D NAR RNG 3 LVL (LT-447C)		ENG. <i>TM</i> DATE <i>4/23/86</i>	SKETCH NO. SAS-96
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>VAN</i> DATE <i>12/23/86</i>	REV. 0 SH. 1 OF 2
CHECKED BY: <i>King Luke</i>			

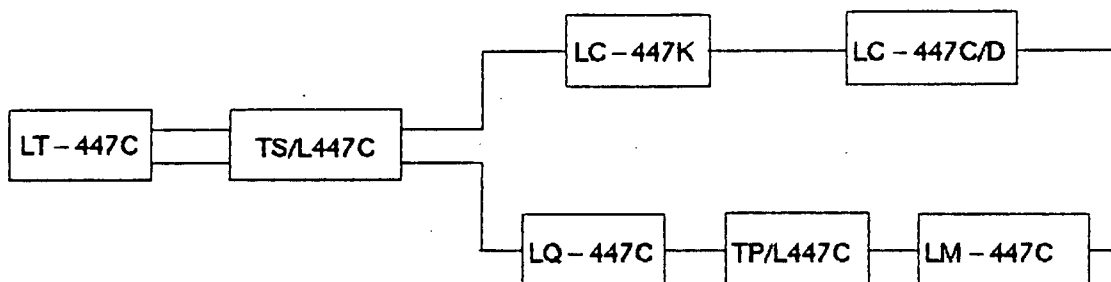
REVISION

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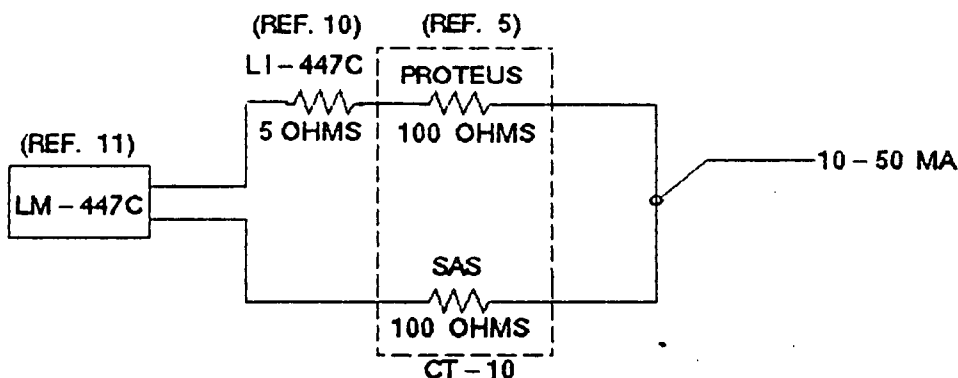
Issued for record.

# IMPEDANCE CALCULATION

## LT-447C REACTOR PROTECTION CIRCUIT



## LM-447C REACTOR CONTROL CIRCUIT



TOTAL IMPEDANCE (OHMS) = 100 + 100 + 5 = 205

### ENGINEERING JUSTIFICATION:

THE LT-447C CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. LM-447C (FOXBORO 66BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (205 OHMS), FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

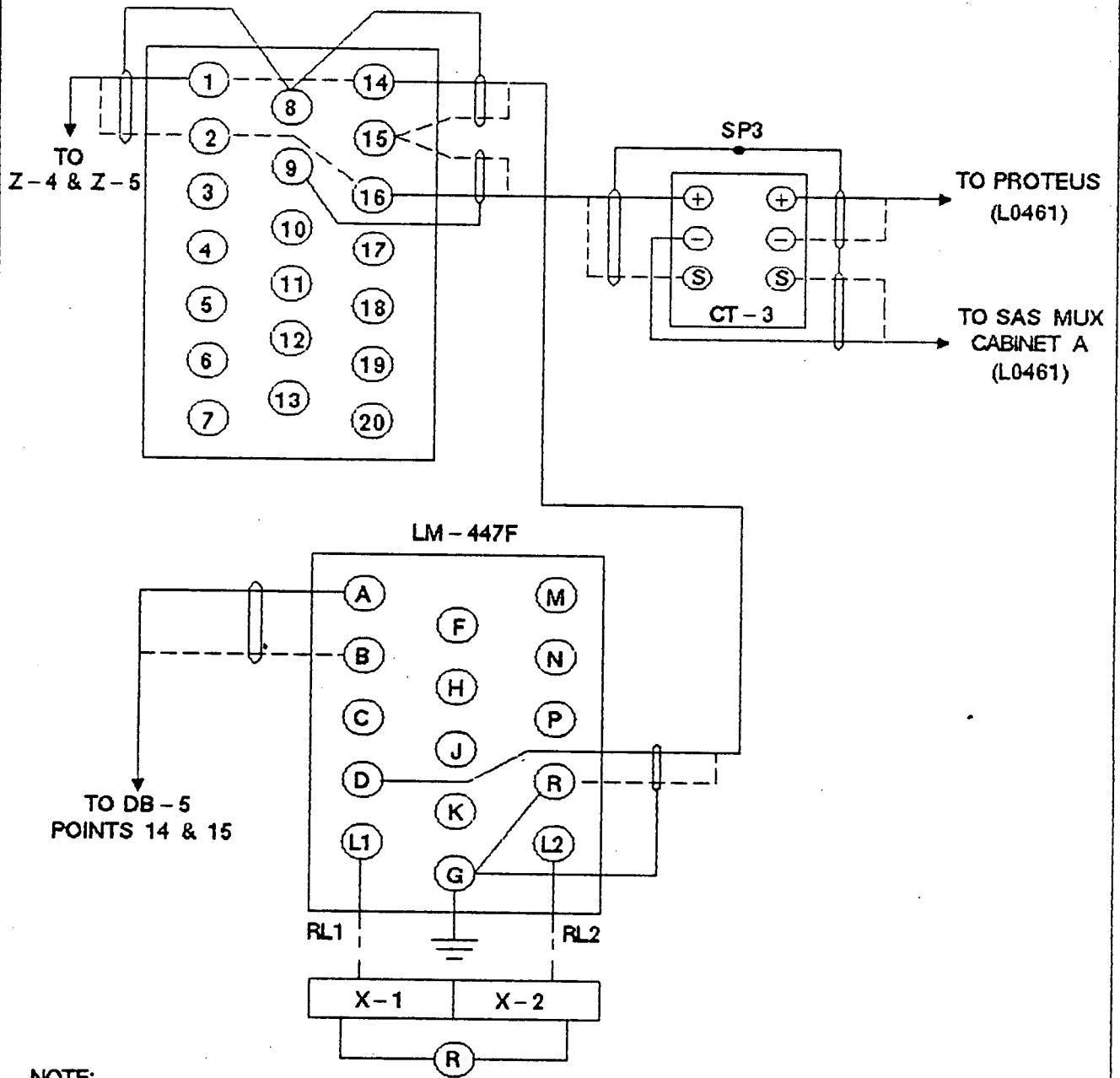
STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;J SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN D NAR RNG 3 LVL (LT-447C)		ENG. <i>TM</i> DATE <i>12/23/86</i>	SKETCH NO. SAS-96 REV. 0 SH. 2 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>VLD</i> DATE <i>12/23/86</i>	
CHECKED BY: <i>King Lock</i>			

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**DESIGN DETAIL**

(SEE NOTE 2)



**NOTE:**

1. SAS SIGNAL DESTINATION: BTSCA 01R11, POINTS 2 (POS.), 3 (NEG.), AND 4 (SHIELD).
2. DISTRIBUTION BLOCK IS DESIGNATED FOR LABELING.

REF. DWGS.: A225359, A225385, A225384  
REF. SKETCH: SAS - REF

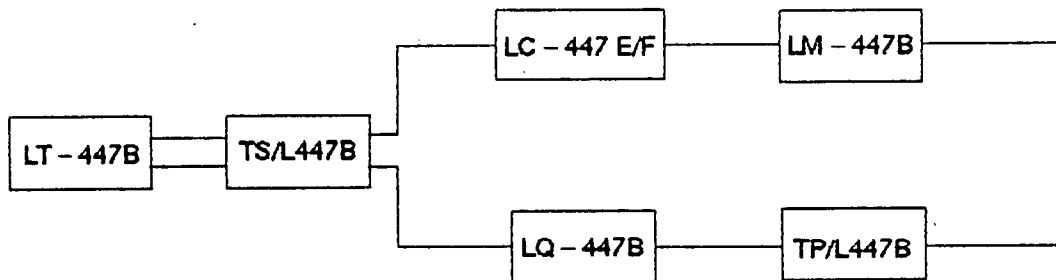
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN D NAR RNG 2 LVL (LT-447B)		ENG. <i>TM</i> DATE <i>12/23/86</i>	SKETCH NO. SAS-97 REV. 0 SH. 1 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>VAD</i> DATE <i>12/23/86</i>	
CHECKED BY: <i>King Looh</i>			

REVISION

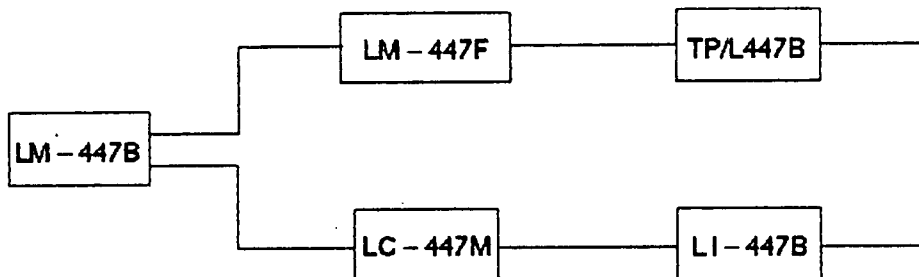
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Issued for record.

# IMPEDANCE CALCULATION

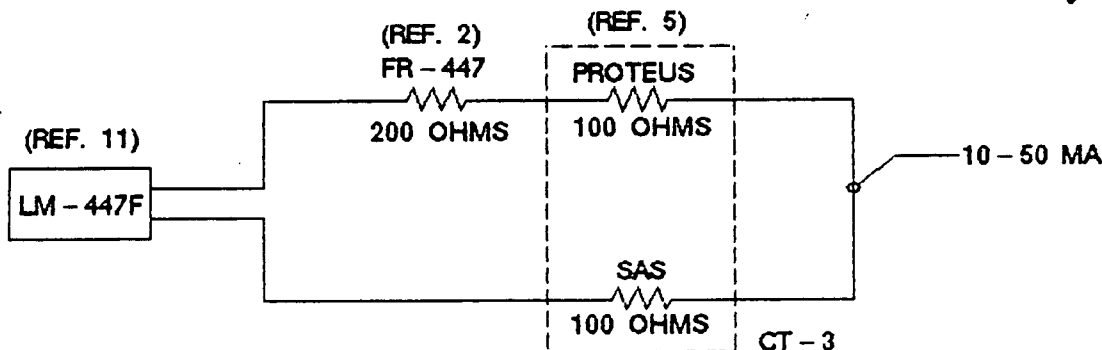
## LT-447B REACTOR PROTECTION CIRCUIT



## LM-447B REACTOR CONTROL CIRCUIT



## LM-447F CIRCUIT (Z EQUIV.)



TOTAL IMPEDANCE (OHMS) = 200 + 100 + 100 = 400

### ENGINEERING JUSTIFICATION:

THE LT-447B CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS SIGNAL CANNOT BE IMPLEMENTED HERE. LM-447B IS A FOXBORO 66BR-OH ISOLATOR, AND SERVES TO ISOLATE THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM. LM-447F (FOXBORO 66BR-OH) SERVES AS A CURRENT REPEATER IN THIS CIRCUIT, AND CAN DRIVE A LOAD UP TO A 660 OHMS. THE SAS SIGNAL CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (400 OHMS), FALLS WITHIN THE LOAD LIMIT (660 OHMS).

STATION: INDIAN POINT 2	A P P R V I S	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN D NAR RNG 2 LVL (LT-447B)		C&I	SKETCH NO. SAS-97
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>11/23/86</i>	
CHECKED BY: <i>Kerry Looke</i>		ENG. <i>V.A.L.</i> DATE <i>12/23/86</i>	

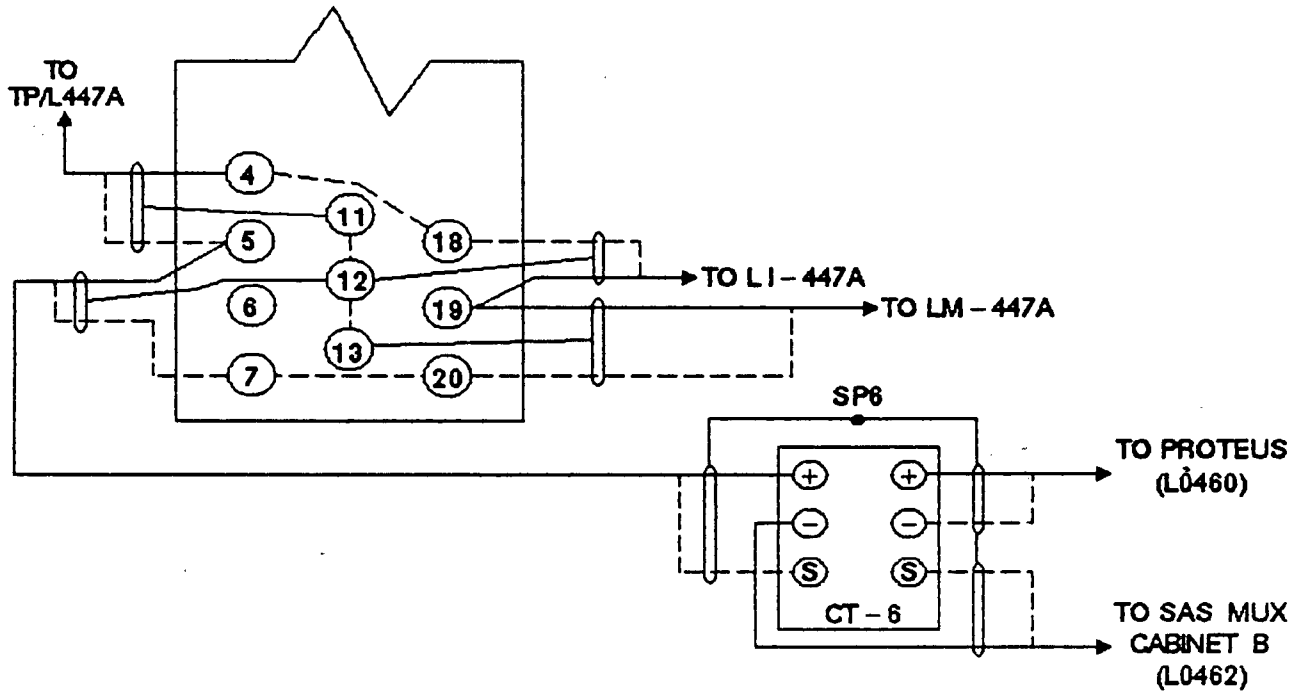
REVISION

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Issued for record.

DESIGN DETAIL

DB-5



- NOTE: 1. SAS SIGNAL DESTINATION: BTSCA 01R04, POINTS 14 (POS.), 15 (NEG), AND 16 (SHIELD).  
 2. COMPUTER ADDRESS FOR SAS WILL BE CHANGED FROM L0462 TO L0460, PENDING IMPLEMENTATION OF REFERENCE MEMO ON DRAWING A225385.

REF. DWGS.: A225385, A225374

REF. SKETCH: SAS - REF.

REF. MEMO: CON - ED MEMO (MSSRS B. LEE AND F. HOFFMAN) DATED 10/16/86

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN D NAR RNG 1 LVL (LT-447A)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 4/17/86	
CHECKED BY: <i>King Lock</i>		ENG. <i>V.A.S.</i> DATE 4-17-87	SKETCH NO. SAS - 98 REV. 0 SH. 1 OF 2

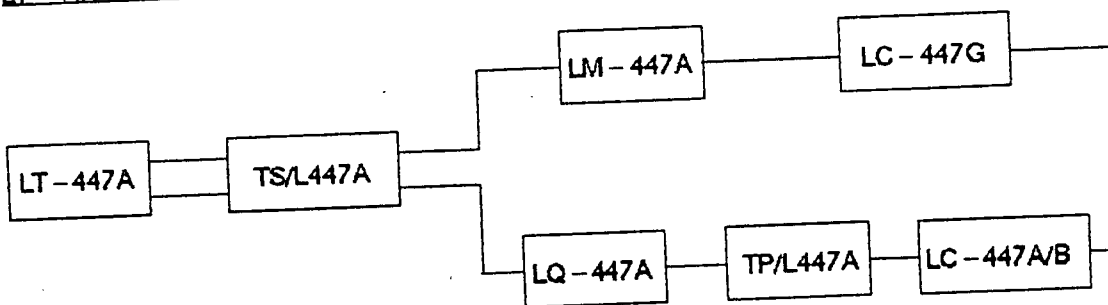


REVISION

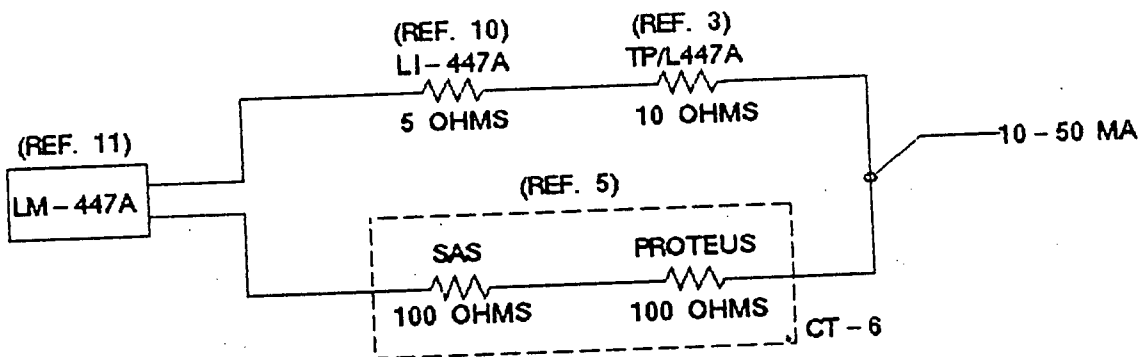
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# IMPEDANCE CALCULATION

## LT-447A REACTOR PROTECTION CIRCUIT



## LM-447A REACTOR CONTROL CIRCUIT (Z EQUIV.)



TOTAL IMPEDANCE (OHMS) = 5 + 10 + 100 + 100 + 215

### ENGINEERING JUSTIFICATION:

THE LT-447A CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. LM-447A (FOXBORO 66BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (215 OHMS), FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

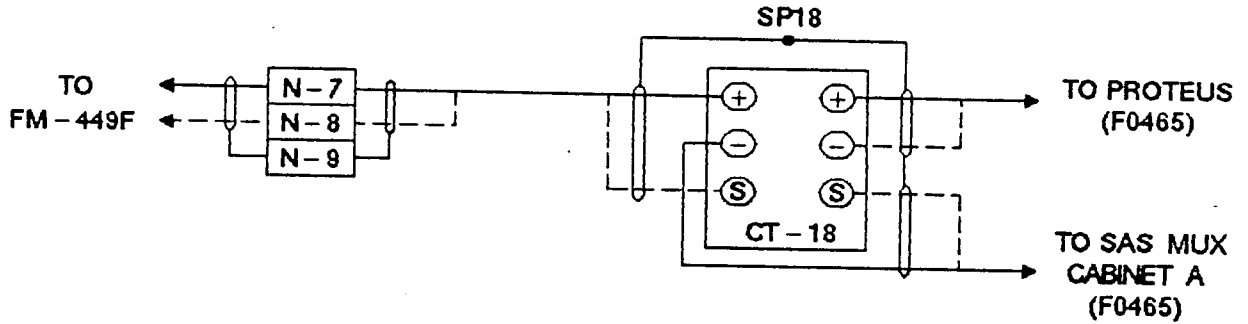
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>VA</i> DATE	
STM GEN D NAR RNG 1 LVL (LT-447A)	L	C&I	SKETCH NO. SAS-98 REV. 0 SH. 2 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>4/20/87</i>	
CHECKED BY: <i>King Loh</i>		ENG. <i>VA</i> DATE <i>4-17-87</i>	

REVISION

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DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R04, POINTS 19 (POS.), 20 (NEG.), AND 21 (SHIELD).

REF. DWGS.: A225395, A225324  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN D STM OUT 1 FLOW (FT-449A)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>12/23/86</i>	
CHECKED BY: <i>King Jack</i>		ENG. <i>VAD</i> DATE <i>12/23/86</i>	SKETCH NO. SAS-99 REV. 0 SH. 1 OF 2

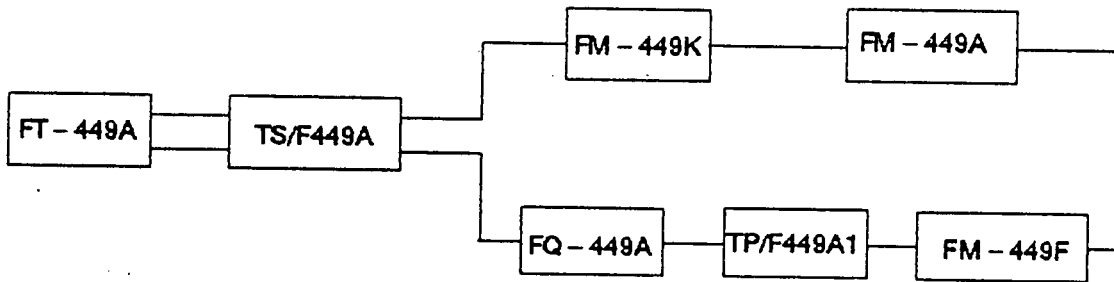
REVISION

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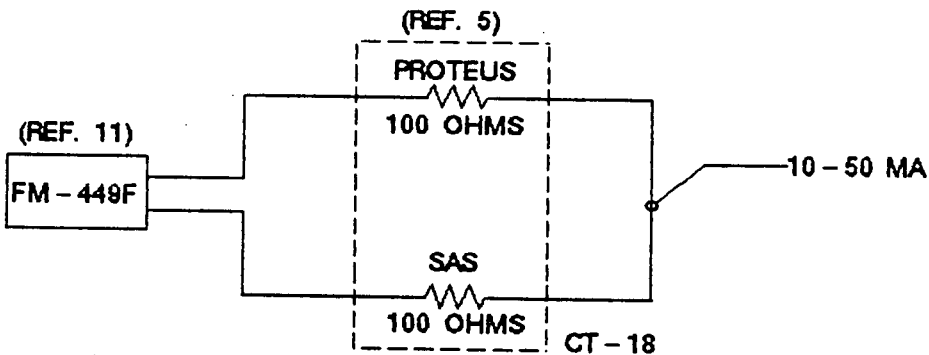
Issued for record.

# IMPEDANCE CALCULATION

## FT-449A REACTOR PROTECTION CIRCUIT



## FM-449F REACTOR CONTROL CIRCUIT



TOTAL IMPEDANCE (OHMS) = 100 + 100 = 200

### ENGINEERING JUSTIFICATION:

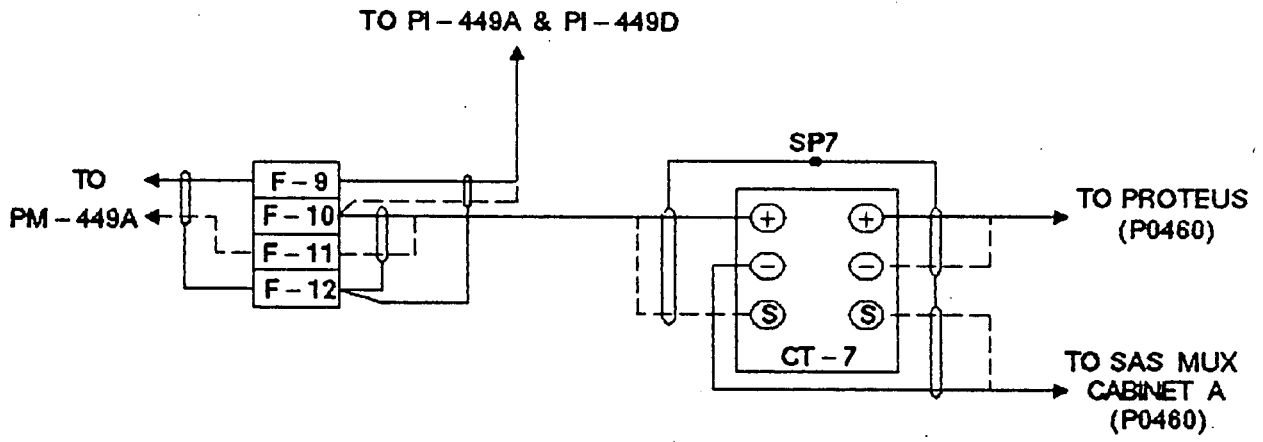
THE FT-449A CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. FM-449F (FOXBORO 66BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (200 OHMS), FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

STATION: INDIAN POINT 2 TITLE: SAS COMPUTER INTERFACE STM GEN D STM OUT 1 FLOW (FT-449A) SKETCHED BY: VICTOR S. D'AMORE CHECKED BY: <i>King Tooh</i>	A P P R V E D	MECH. PROGRAM ENG. N/A DATE C&J ENG. TM DATE 12/23/86 ENG. VAN DATE 12/23/86	<b>CON EDISON ENG. C&amp;J SKETCH</b>  SKETCH NO. SAS-99 REV. 0 SH. 2 OF 2
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 Issued for record.

DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R04, POINTS 14 (POS.), 15 (NEG.), AND 16 (SHIELD).

REF. DWGS.: A225385, A225323  
 REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN D STM OUT 1 PRESS (PT-449A)		C&I	<b>C&amp;I SKETCH</b>
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>12/23/86</i>	SKETCH NO. SAS - 100
CHECKED BY: <i>King Lock</i>		ENG. <i>VAD</i> DATE <i>12/23/86</i>	REV. 0 SH. 1 OF 2

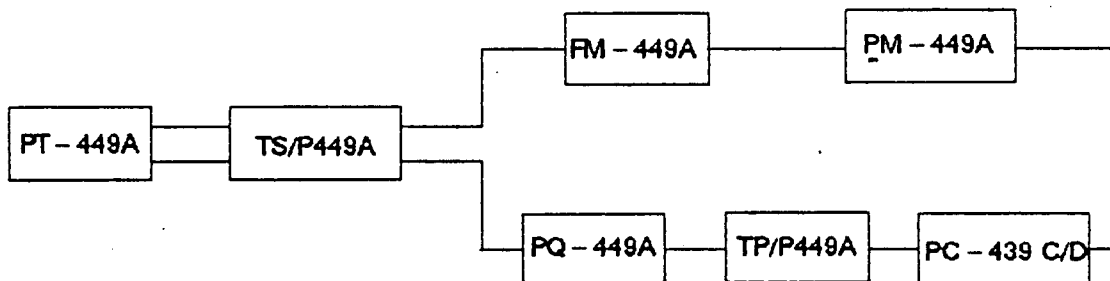
REVISION

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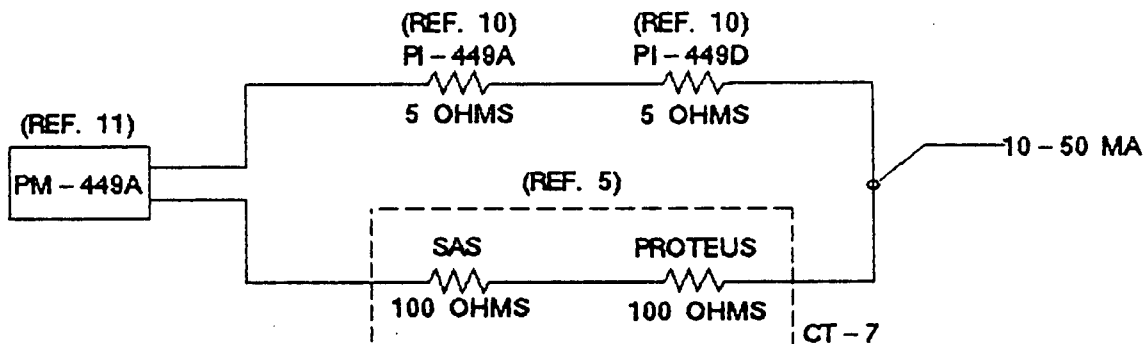
Issued for record.

**IMPEDANCE CALCULATION**

PT-449A REACTOR PROTECTION CIRCUIT



PM-449A REACTOR CONTROL CIRCUIT



TOTAL IMPEDANCE (OHMS) = 100 + 100 + 5 + 5 = 210

ENGINEERING JUSTIFICATION:

THE PT-449A CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. PM-449A (FOXBORO 66BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (210 OHMS), FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

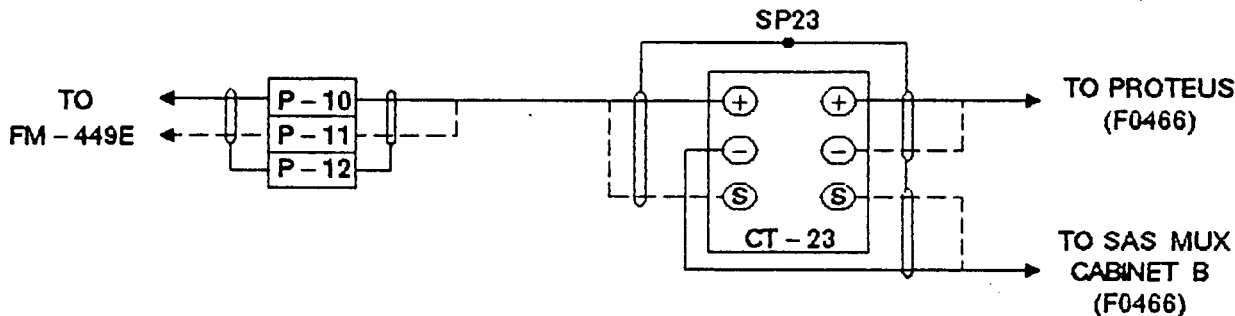
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN D STM OUT 1 PRESS (PT-449A)		C&I	SKETCH NO. SAS-100
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>12/23/86</i>	
CHECKED BY: <i>King Lake</i>		ENG. <i>VAD</i> DATE <i>12/23/86</i>	

REVISION

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Issued for record.

DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R04, POINTS 10 (POS.), 11 (NEG.), AND 12 (SHIELD).

REF. DWGS.: A225395, A225344  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN D STM OUT 2 FLOW (FT-449B)		C&I ENG. <i>TM</i> DATE <i>12/23/86</i>	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>VAD</i> DATE <i>12/23/86</i>	
CHECKED BY: <i>King Lach</i>			SKETCH NO. SAS-101 REV. 0 SH. 1 OF 2

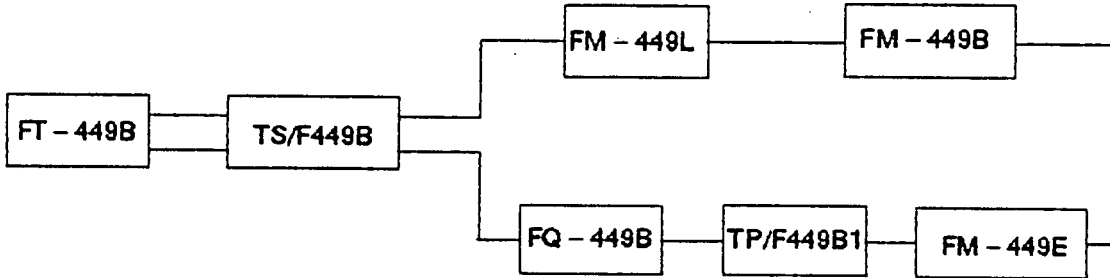
REVISION

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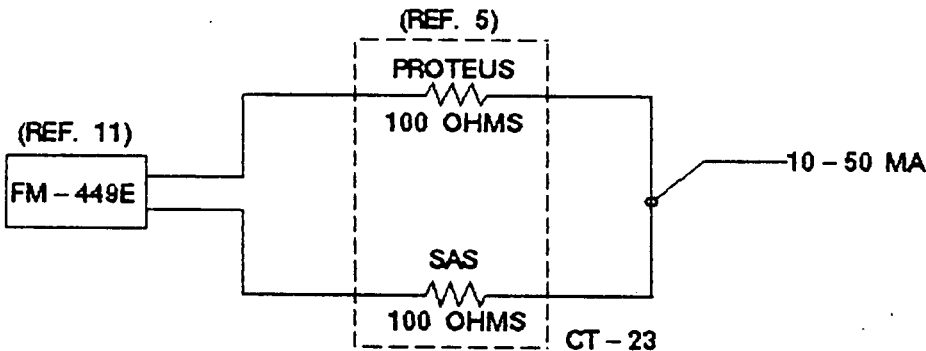
Issued for record.

# IMPEDANCE CALCULATION

## FT-449B REACTOR PROTECTION CIRCUIT



## FM-449E REACTOR CONTROL CIRCUIT



TOTAL IMPEDANCE (OHMS) = 100 + 100 = 200

### ENGINEERING JUSTIFICATION:

THE FT-449B CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. FM-449E (FOXBORO 86BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (200 OHMS), FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

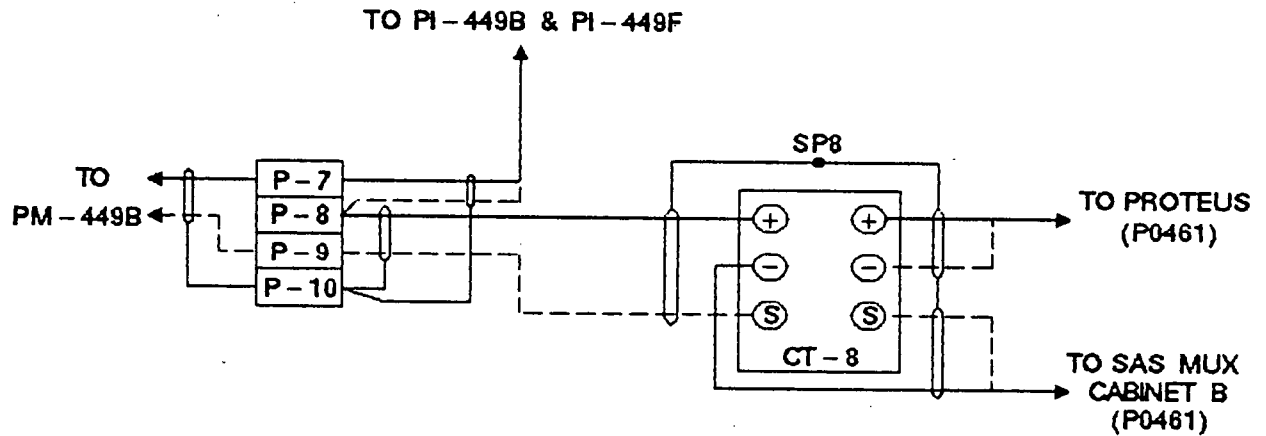
STATION: INDIAN POINT 2	A P P R O V E S	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;J SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN D STM OUT 2 FLOW (FT-449B)		C&J	SKETCH NO. SAS-101 REV. 0 SH. 2 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 12/23/86	
CHECKED BY: <i>King Jook</i>		ENG. <i>V.A.D.</i> DATE 12/23/86	

REVISION

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DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R04, POINTS 6 (POS.), 7 (NEG.), AND 8 (SHIELD).

REF. DWGS.: A225385, A225343  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN D STM OUT 2 PRESS (PT-449B)		C&J	<b>C&amp;J</b> SKETCH
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>12/23/86</i>	SKETCH NO. SAS-102
CHECKED BY: <i>King Look</i>	ENG. <i>VAD</i> DATE <i>12/23/86</i>	REV. 0 SH. 1 OF 2	

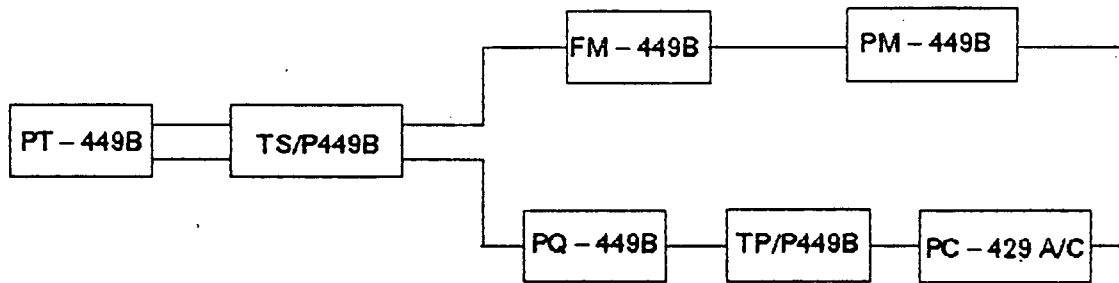


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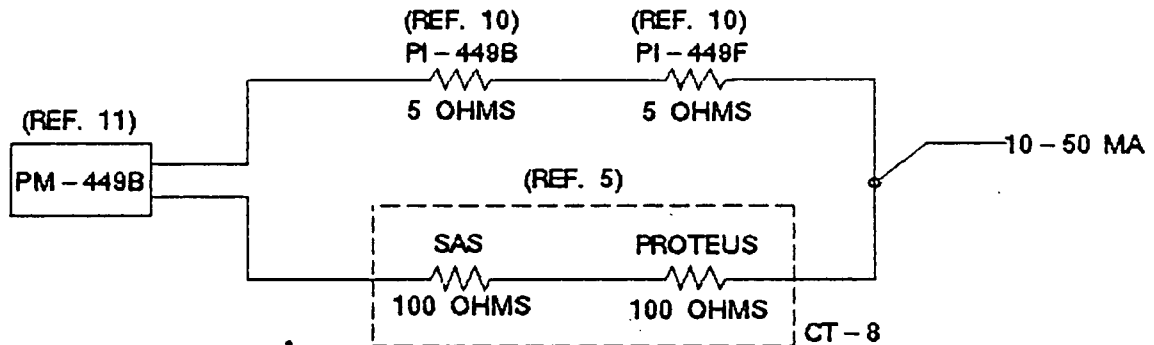
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Issued for record.

**IMPEDANCE CALCULATION**

PT-449B REACTOR PROTECTION CIRCUIT



PM-449B REACTOR CONTROL CIRCUIT



TOTAL IMPEDANCE (OHMS) = 100 + 100 + 5 + 5 = 210

ENGINEERING JUSTIFICATION:

THE PT-449B CIRCUIT IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. PM-449B (FOXBORO 66BR-OH) ISOLATES THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (210 OHMS), FALLS WITHIN THE ALLOWABLE LOAD LIMIT (660 OHMS).

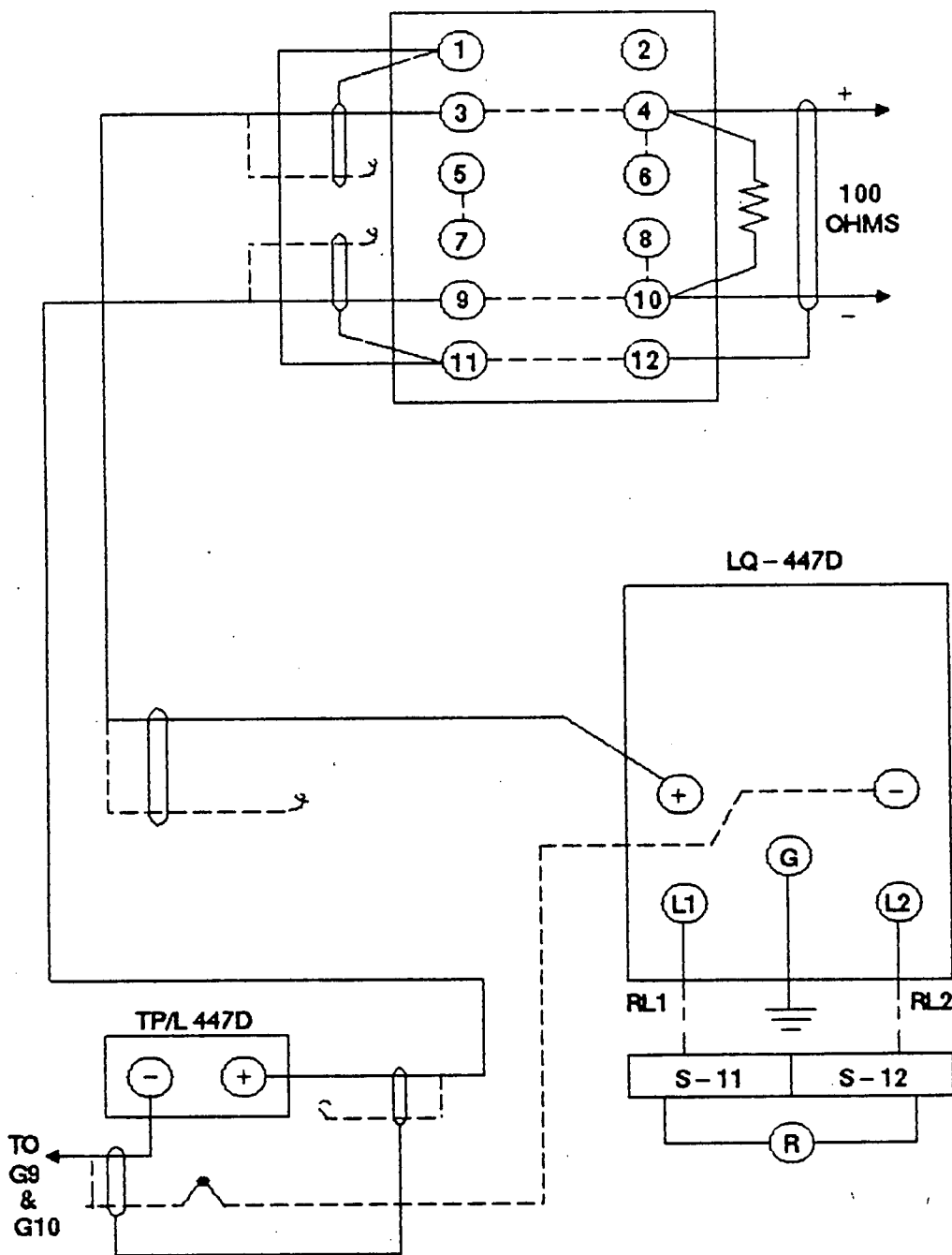
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON</b> <b>EDISON</b> ENG. C&J SKETCH	
TITLE SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE		
STM GEN D STM OUT 2 PRESS (PT-449B)		C&J	ENG. <i>TM</i> DATE <i>12/23/86</i>	SKETCH NO. SAS-102 REV. 0 SH. 2 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>VAD</i> DATE <i>12/23/86</i>		
CHECKED BY: <i>King Lock</i>				

REVISION

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**DESIGN DETAIL**

L-447D  
SAKT-2 B4AP



(L0463)  
TO SAS MUX  
CABINET A

NOTE: SAS SIGNAL DESTINATION: BTSCA 01R04, POINTS 23 (POS.), 24 (NEG.), AND 25 (SHIELD).

REF. DWG.: A225384  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG.
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN D WIDE RNG LVL (LT-447D)		C&I	SKETCH NO. SAS-103
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>12/23/86</i>	REV. 0 SH. 1 OF 2
CHECKED BY: <i>King Lock</i>		ENG. <i>VAD</i> DATE <i>12/23/86</i>	

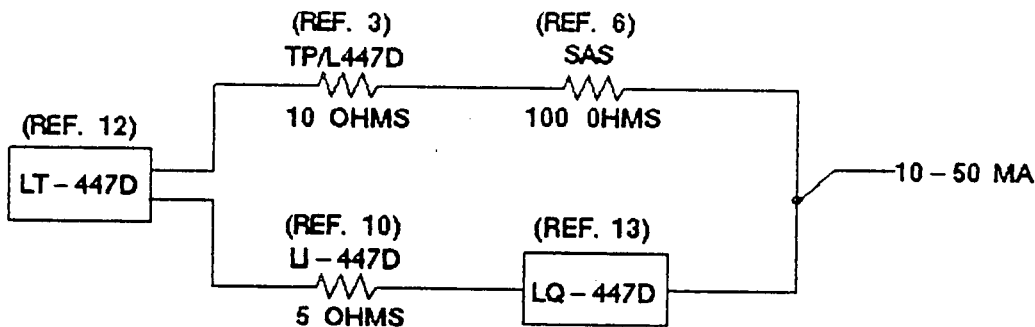
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# IMPEDANCE CALCULATION

## LT-447D REACTOR CONTROL CIRCUIT



TOTAL IMPEDANCE (OHMS) = 10 + 100 + 5 = 115

ENGINEERING JUSTIFICATION:

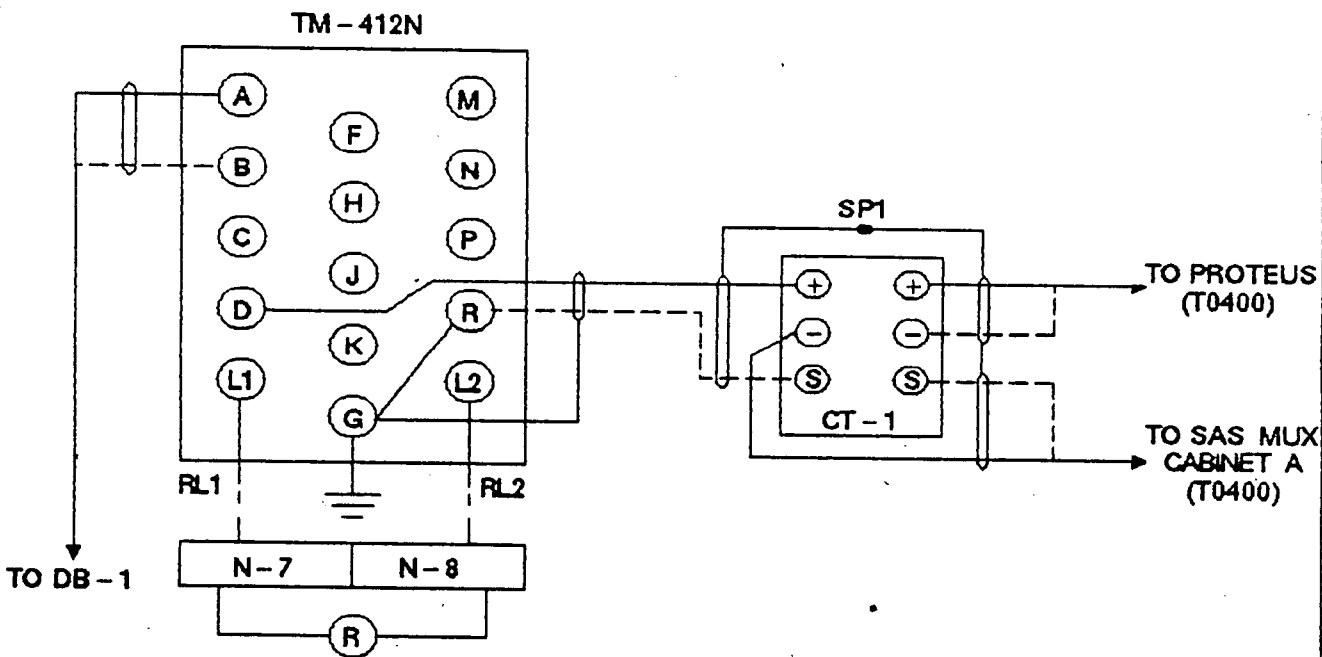
LT-447D IS PART OF THE REACTOR CONTROL SYSTEM, THEREFORE, THE SAS INPUT CAN BE IMPLEMENTED HERE. LT-447D IS A FOXBORO MODEL 613 DM D/P CELL TRANSMITTER WHICH PROVIDES A 10 - 50 MA OUTPUT, WITH A 600 OHM LOAD (+10 - 20 PERCENT). LQ-447D IS A FOXBORO 610-AR POWER SUPPLY, AND PROVIDES A 10 - 50 MA OUTPUT WITH AN OUTPUT LOAD OF 600 OHMS (+10 - 20 PERCENT). THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (115 OHMS), FALLS WITHIN THE ALLOWABLE CIRCUIT LOAD LIMIT (600 OHMS).

STATION: INDIAN POINT 2 TITLE: SAS COMPUTER INTERFACE STM GEN D WIDE RNG LVL (LT-447D) SKETCHED BY: VICTOR S. D'AMORE CHECKED BY: <i>King Lock</i>	A P P R O V E S	MECH. PROGRAM ENG. <i>N/A</i> DATE C&I ENG. <i>TM</i> DATE <i>12/23/80</i> ENG. <i>VAD</i> DATE <i>12/23/80</i>	<b>CON EDISON ENG. C&amp;I SKETCH</b>  SKETCH NO. SAS-103 REV. SH. 2 OF 2
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DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R15, POINTS 31 (POS.), 32 (NEG.), AND 33 (SHIELD).

REF. DWG. : A225399, A225313

REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2  
 TITLE: SAS COMPUTER INTERFACE  
 TAVG LOOP 21 (TM-412N)  
 SKETCHED BY: VICTOR S. D'AMORE  
 CHECKED BY: *King Lock*

A  
P  
P  
R  
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E  
D

MECH. PROGRAM  
 ENG. *N/A* DATE  
 C&I  
 ENG. *TM* DATE *12/23/86*  
 ENG. *VAD* DATE *12/23/86*

**CON EDISON ENG.**  
**C&I SKETCH**

SKETCH NO. SAS-104  
 REV. 0 SH. 1 OF 2

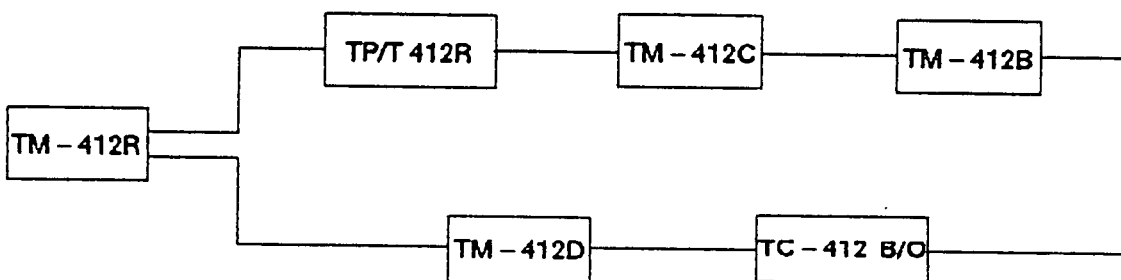
REVISION

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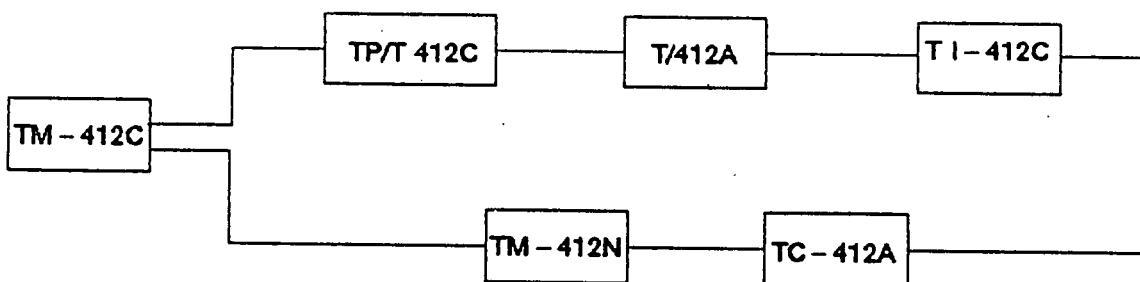
Issued for record.

# IMPEDANCE CALCULATION

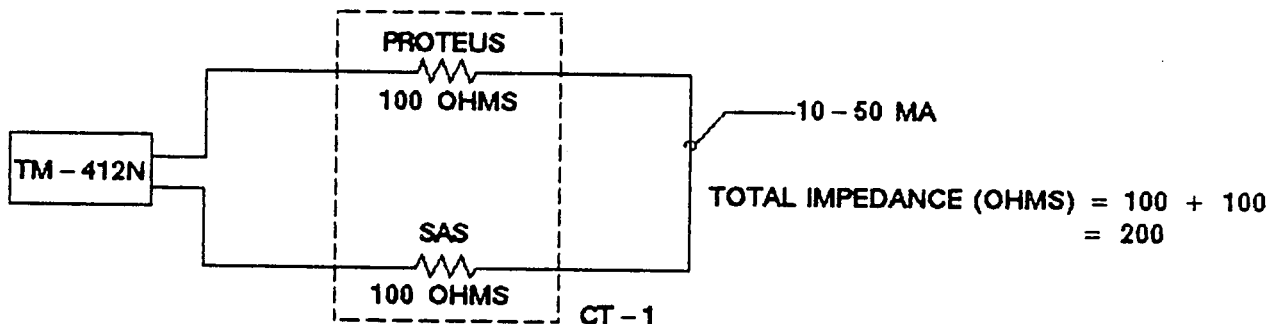
## TM-412R REACTOR PROTECTION CIRCUIT



## TM-412C REACTOR CONTROL CIRCUIT



## TM-412N CIRCUIT (Z EQUIV.)



### ENGINEERING JUSTIFICATION:

TM-412R (FOXBORO 66R E1) IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. TM-412C (FOXBORO 66BR-OH) SERVES TO ISOLATE THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM. TM-412N SERVES AS A CURRENT REPEATER IN THIS LOOP, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (200 OHMS), FALLS WITHIN THE LOAD LIMIT (660 OHMS).

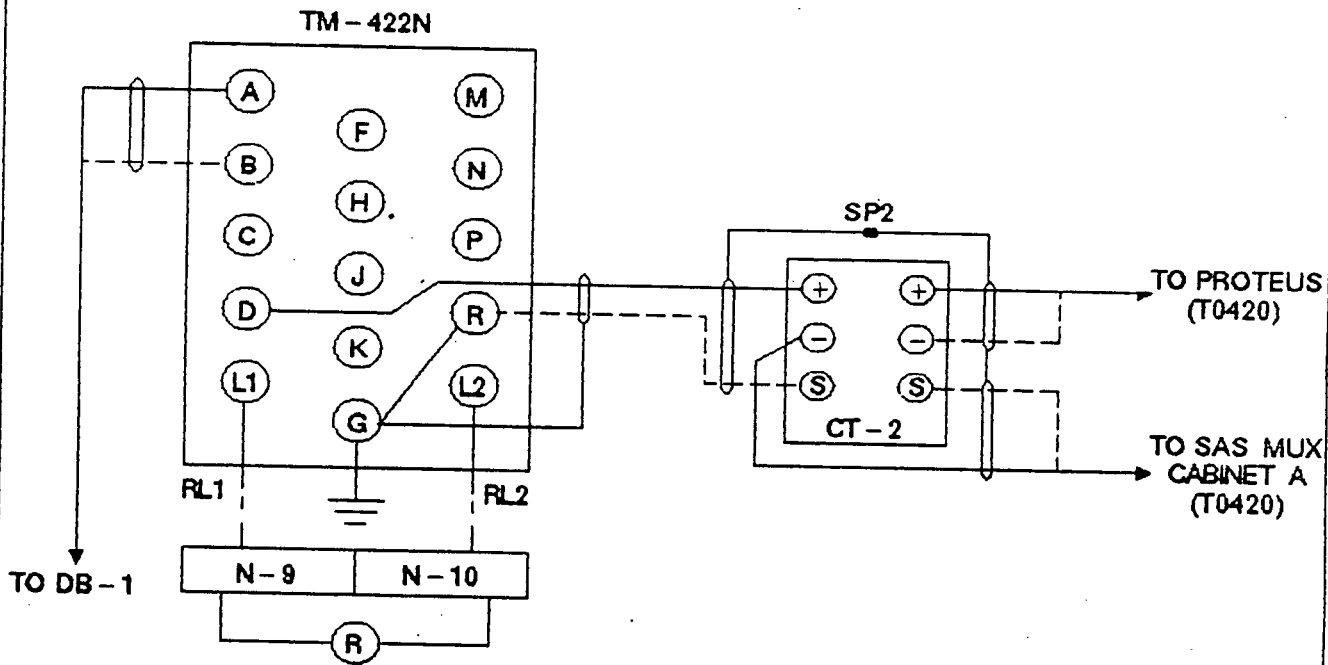
NOTE: TM-412N (FOXBORO 66 BR-OH).

STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>NA</i> DATE	
TAVG LOOP 21 (TM-412N)		ENG. <i>TM</i> DATE <i>12/23/86</i>	SKETCH NO. SAS-104
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>VAD</i> DATE <i>12/23/86</i>	REV. 0 SH. 2 OF 2
CHECKED BY: <i>King Loh</i>			

REVISION

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DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R16, POINTS 27 (POS.), 28 (NEG.), AND 29 (SHIELD).

REF. DWG. : A225399, A225333  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG.</b> <b>C&amp;J SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
TAVG LOOP 22 (TM-422N)		C&J	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>12/23/86</i>	SKETCH NO. SAS-105 REV. 0 SH. 1 OF 2
CHECKED BY: <i>King Locke</i>		ENG. <i>VAD</i> DATE <i>12/23/86</i>	

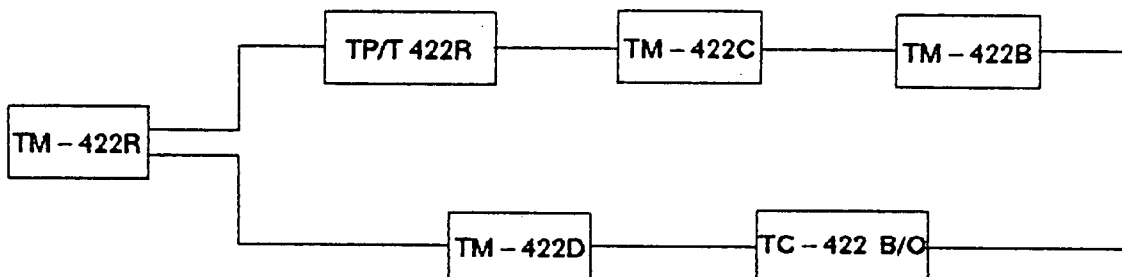
REVISION

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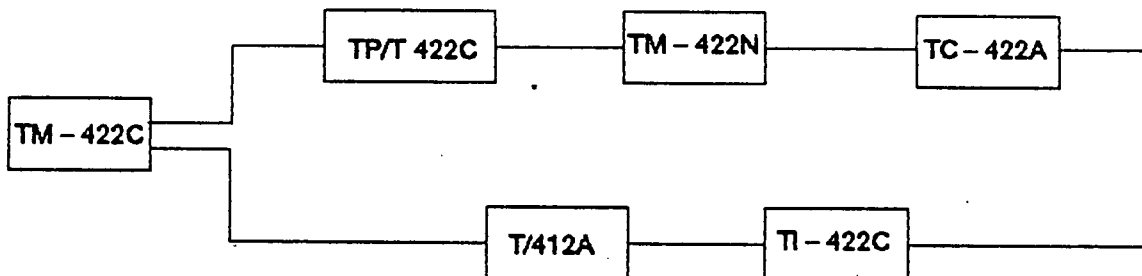
Issued for record.

# IMPEDANCE CALCULATION

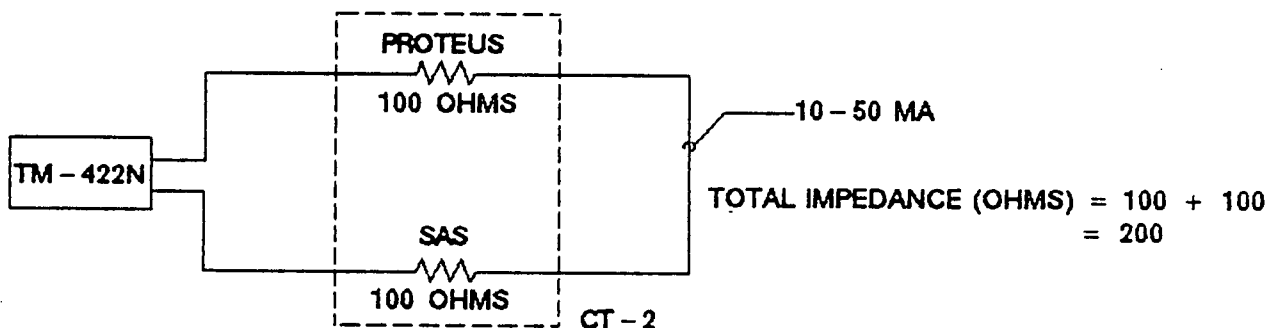
## TM-422R REACTOR PROTECTION CIRCUIT



## TM-422C REACTOR CONTROL CIRCUIT



## TM-422N CIRCUIT (Z EQUIV.)



### ENGINEERING JUSTIFICATION:

TM-422R (FOXBORO 66R E1) IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. TM-422C (FOXBORO 66BR-OH) SERVES TO ISOLATE THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM. TM-422N SERVES AS A CURRENT REPEATER IN THIS LOOP, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (200 OHMS), FALLS WITHIN THE LOAD LIMIT (660 OHMS).

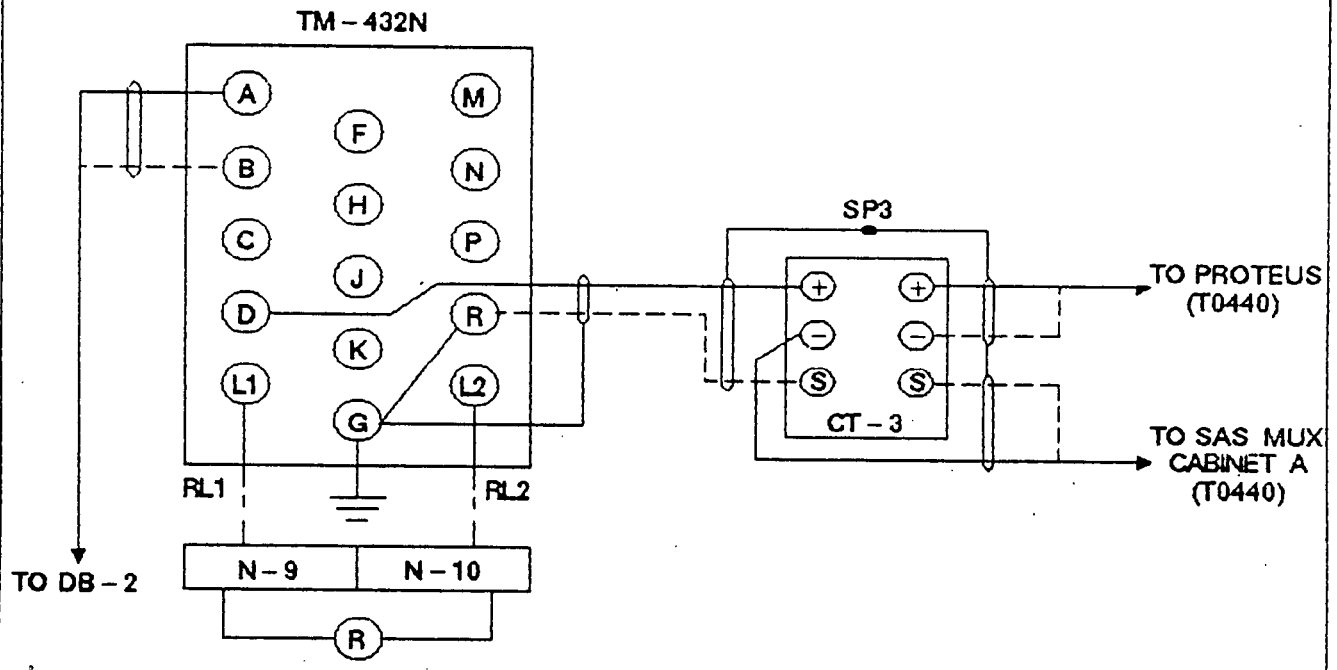
NOTE : TM-422N (FOXBORO 66 BR-OH)

STATION: INDIAN POINT 2	A P P R V E S	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
TAVG LOOP 22 (TM-422N)		ENG. <i>TM</i> DATE <i>4/23/86</i>	SKETCH NO. SAS-105 REV. 0 SH. 2 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>VMA</i> DATE <i>12/23/86</i>	
CHECKED BY: <i>King Look</i>			

REVISION

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DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R17, POINTS 2 (POS.), 3 (NEG.), AND 4 (SHIELD).

REF. DWG. : A225399, A225353  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	<b>CON EDISON</b> ENG. C&I SKETCH SKETCH NO. SAS-106 REV. 0 SH. 1 OF 2
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
TAVG LOOP 23 (TM-432N)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>12/23/86</i>	
CHECKED BY: <i>King Look</i>		ENG. <i>VAD</i> DATE <i>12/23/86</i>	



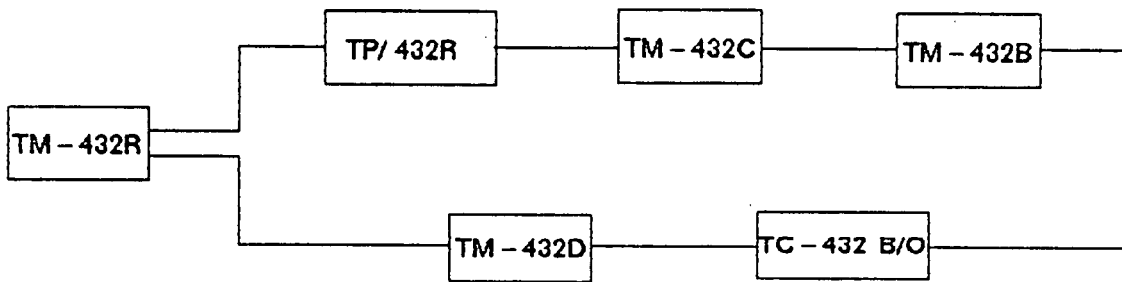
REVISION

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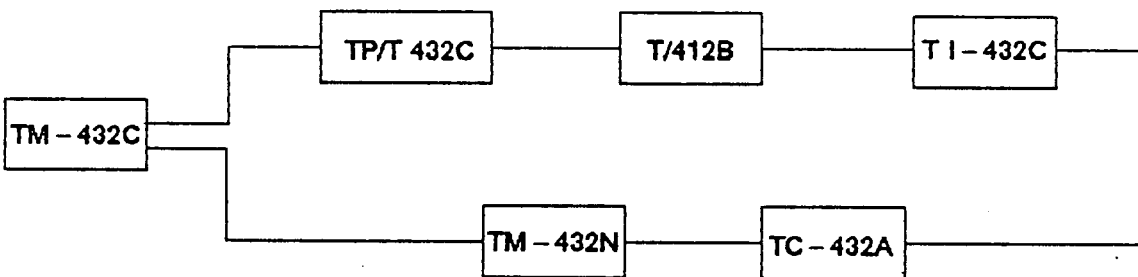
Issued for record.

# IMPEDANCE CALCULATION

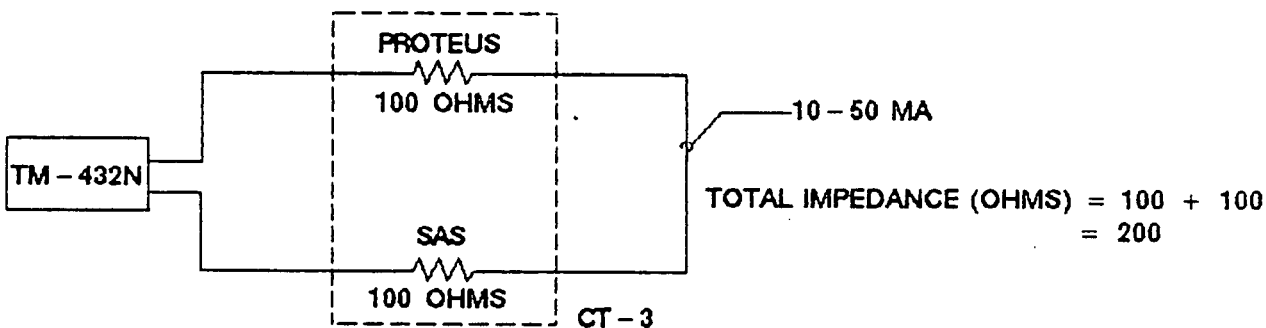
## TM-432R REACTOR PROTECTION CIRCUIT



## TM-432C REACTOR CONTROL CIRCUIT



## TM-432N CIRCUIT (Z EQUIV.)



### ENGINEERING JUSTIFICATION:

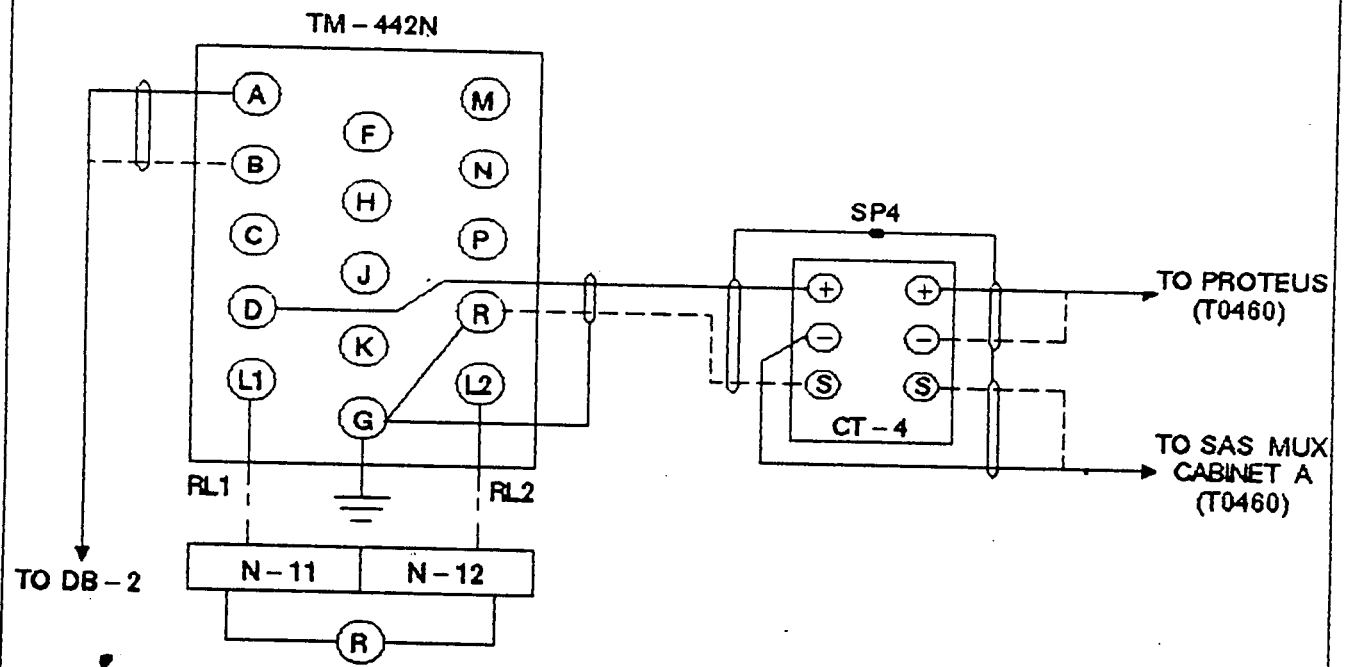
TM-432R (FOXBORO 66R E1) IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. TM-432C (FOXBORO 68BR-OH) SERVES TO ISOLATE THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM. TM-432N SERVES AS A CURRENT REPEATER IN THIS LOOP, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (200 OHMS), FALLS WITHIN THE LOAD LIMIT (660 OHMS).  
 NOTE : TM-432N (FOXBORO 66 BR-OH).

STATION: INDIAN POINT 2 TITLE: SAS COMPUTER INTERFACE TAGV LOOP 23 (TM-432N) SKETCHED BY: VICTOR S. D'AMORE CHECKED BY: <i>King Look</i>	A P P R V E D	MECH. PROGRAM ENG. <i>N/A</i> DATE C&J ENG. <i>TM</i> DATE <i>12/23/80</i> VAV ENG. <i>12/23/80</i> DATE	<b>CON EDISON ENG.</b> C&J SKETCH SKETCH NO. SAS-106 REV. 0 SH. 2 OF 2
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REVISION

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Issued for record.

DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R18, POINTS 2 (POS.), 3 (NEG.), AND 4 (SHIELD).

REF. DWG.: A225399, A225368  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
TAVG LOOP 24 (TM - 442N)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>12/23/86</i>	
CHECKED BY: <i>King John</i>	ENG. <i>VAS</i> DATE <i>12/23/86</i>	SKETCH NO. SAS - 107	REV. 0 SH. 1 OF 2

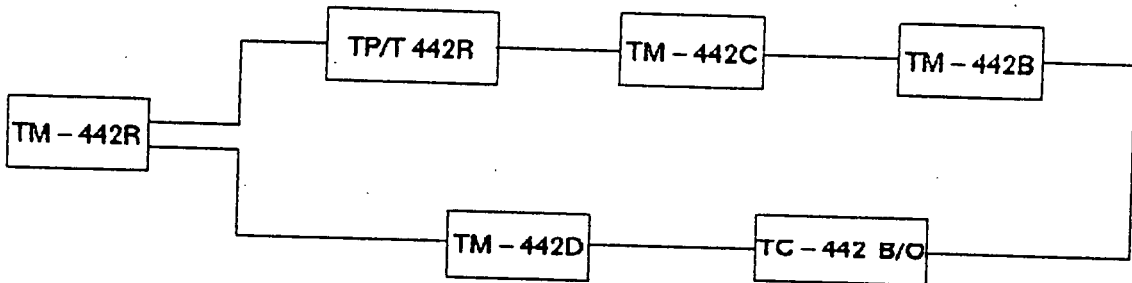
REVISION

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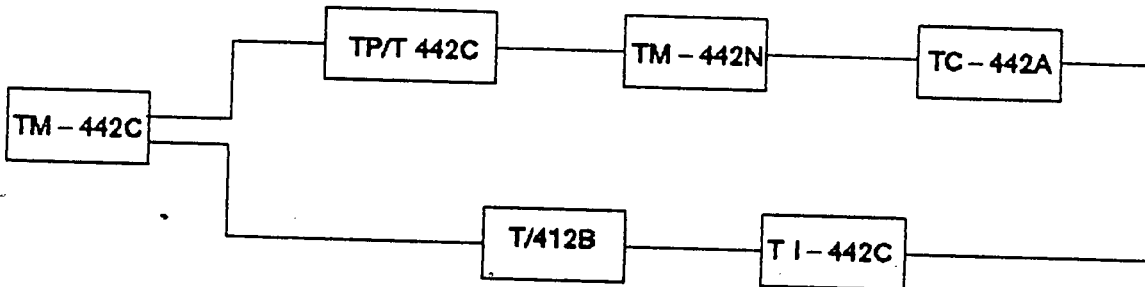
Issued for record.

# IMPEDANCE CALCULATION

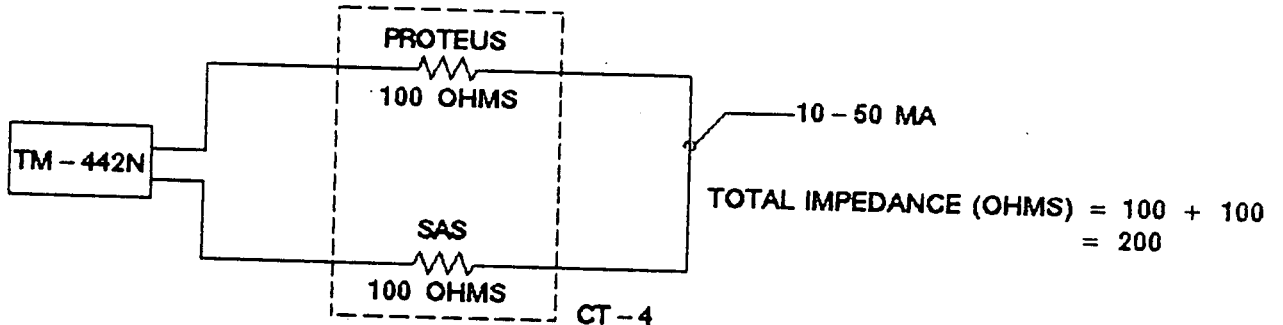
## TM-442R REACTOR PROTECTION CIRCUIT



## TM-442C REACTOR CONTROL CIRCUIT



## TM-442N CIRCUIT (Z EQUIV.)



### ENGINEERING JUSTIFICATION:

TM-442R (FOXBORO 66R E1) IS PART OF THE REACTOR PROTECTION SYSTEM, AND THE SAS INPUT CANNOT BE IMPLEMENTED HERE. TM-442C (FOXBORO 66BR-OH) SERVES TO ISOLATE THE REACTOR PROTECTION SYSTEM FROM THE REACTOR CONTROL SYSTEM. TM-442N SERVES AS A CURRENT REPEATER IN THIS LOOP, AND IS CAPABLE OF DRIVING A 660 OHM LOAD. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (200 OHMS), FALLS WITHIN THE LOAD LIMIT (660 OHMS).  
NOTE: TM-442N (FOXBORO 66 BR-OH)

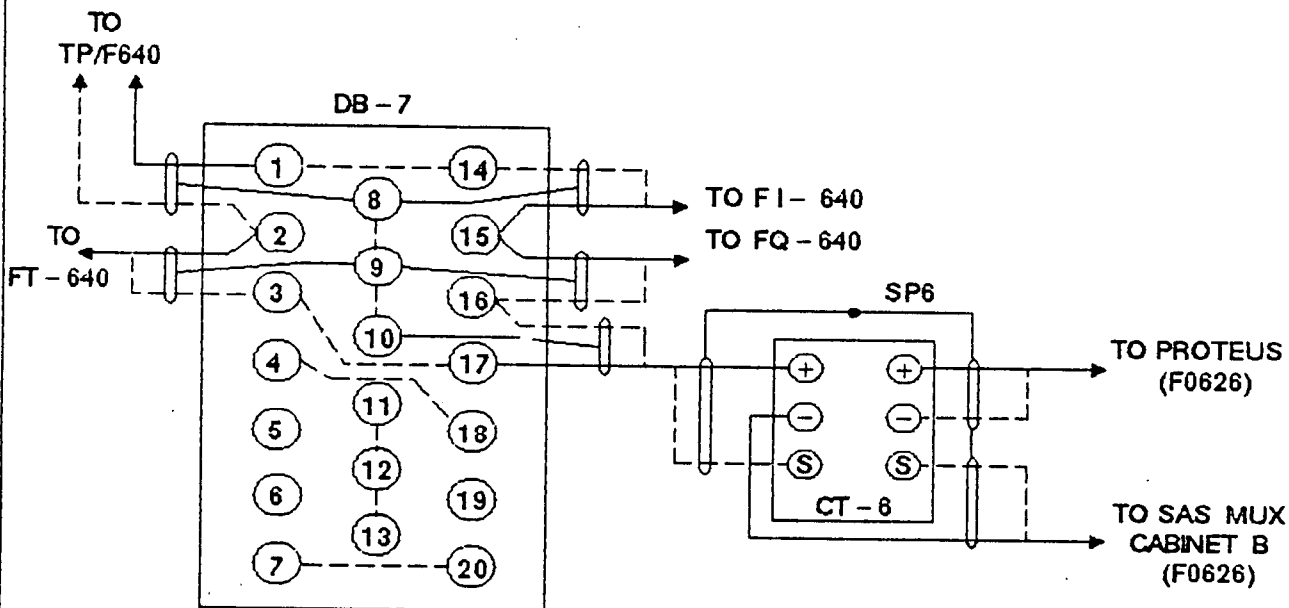
STATION: INDIAN POINT 2 TITLE: SAS COMPUTER INTERFACE TAVG LOOP 24 (TM-442N) SKETCHED BY: VICTOR S. D'AMORE CHECKED BY: <i>King Look</i>	APPR VLS MECH. PROGRAM ENG. <i>N/A</i> DATE C&I ENG. <i>TM</i> DATE <i>12/23/86</i> ENG. <i>VAD</i> DATE <i>12/23/86</i>	CON EDISON ENG. C&I SKETCH SKETCH NO. SAS-107 REV. 0 SH. 2 OF 2
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REVISION

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DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R01, POINTS 23 (POS.), 24 (NEG.), AND 25 (SHIELD).

REF. DWG.: A225436  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	<b>CON EDISON</b> ENG. <b>C&amp;I</b> SKETCH SKETCH NO. SAS-108 REV. 0 SH. 1 OF 2
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
RHR LOOP FLOW (FT-640)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>12/23/86</i>	
CHECKED BY: <i>King Cook</i>		ENG. <i>VAN</i> DATE <i>12/23/86</i>	

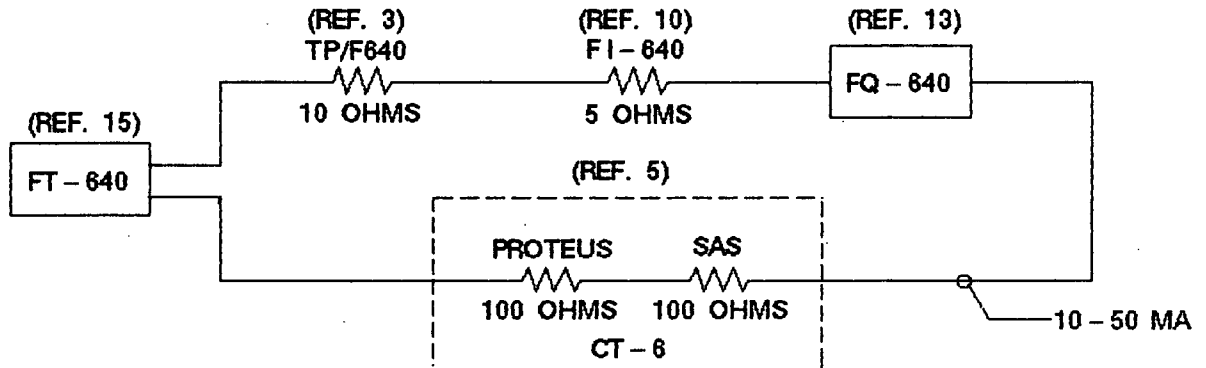
REVISION

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**IMPEDANCE CALCULATION**

**FT-640 REACTOR CONTROL CIRCUIT (Z EQUIV.)**



TOTAL IMPEDANCE (OHMS) = 10 + 5 + 100 + 100 = 215

**ENGINEERING JUSTIFICATION:**

THE FT-640 CIRCUIT IS PART OF THE REACTOR CONTROL SYSTEM, THEREFORE, THE SAS INPUT CAN BE IMPLEMENTED HERE. FQ-640 (FOXBORO 610 AR) PROVIDES A 10-50 MA OUTPUT AT 80 VDC NOMINAL, AND CAN DRIVE A LOAD OF 600 OHMS (+10% -20%). THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (215 OHMS), FALLS WITHIN THE LOAD LIMIT (600 OHMS, +10% -20%).

THE RHR LOOP FLOW CHANNEL IS A CATEGORY 2 CHANNEL. AN ISOLATOR WILL BE PROVIDED TO SEPARATE THE PROTEUS AND SAS COMPUTER INPUTS FROM THE CATEGORY 2 PORTION OF THE LOOP.

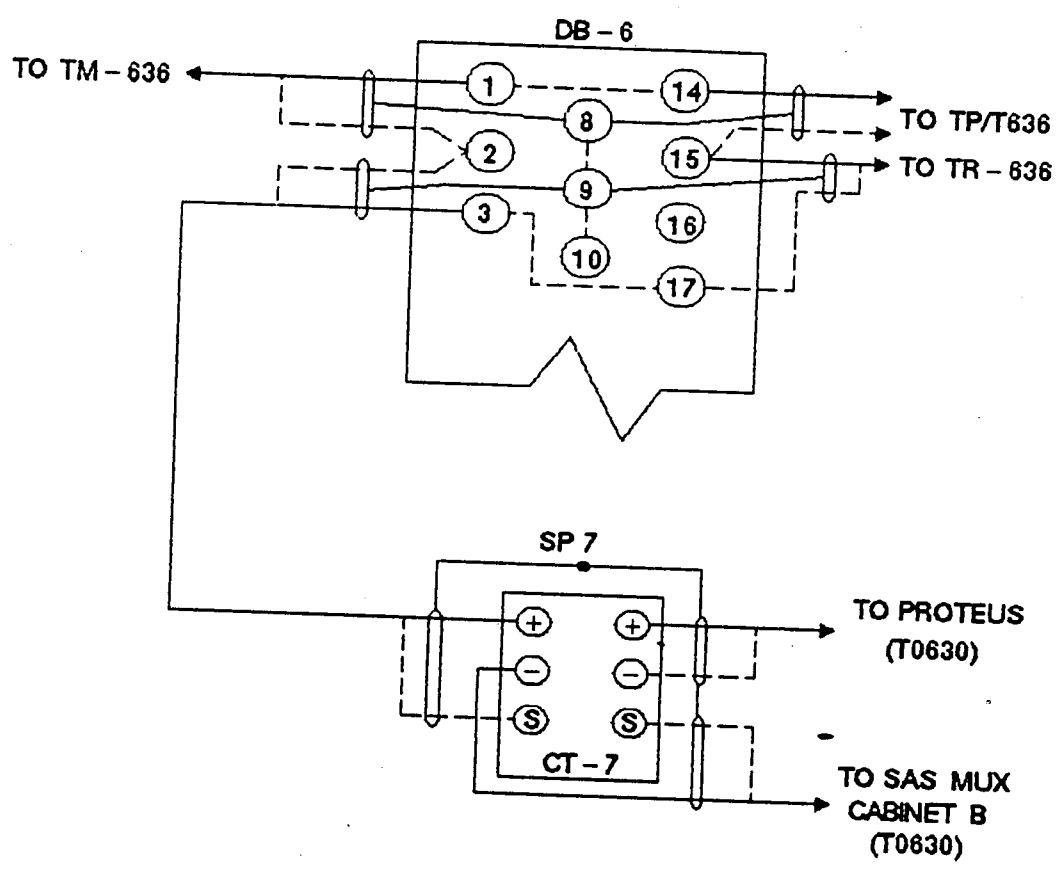
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG.</b> C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
RHR LOOP FLOW (FT-640)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>10/22/87</i>	
CHECKED BY: <i>Rmcv</i>		ENG. <i>VAD</i> DATE <i>10/22/87</i>	
		SKETCH NO. SAS-108 REV. 0 SH. 2 OF 2	

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DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R09, POINTS 6 (POS.), 7 (NEG.), AND 8 (SHIELD).

REF. DWG.: A225436  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. N/A DATE	
RESID HX IN LOOP HDR TEMP (TE - 636)	S	C&I	SKETCH NO. SAS - 109 REV. 0 SH. 1 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. TM DATE 12/23/86	
CHECKED BY: <i>King John</i>		ENG. VAD DATE 12/23/86	

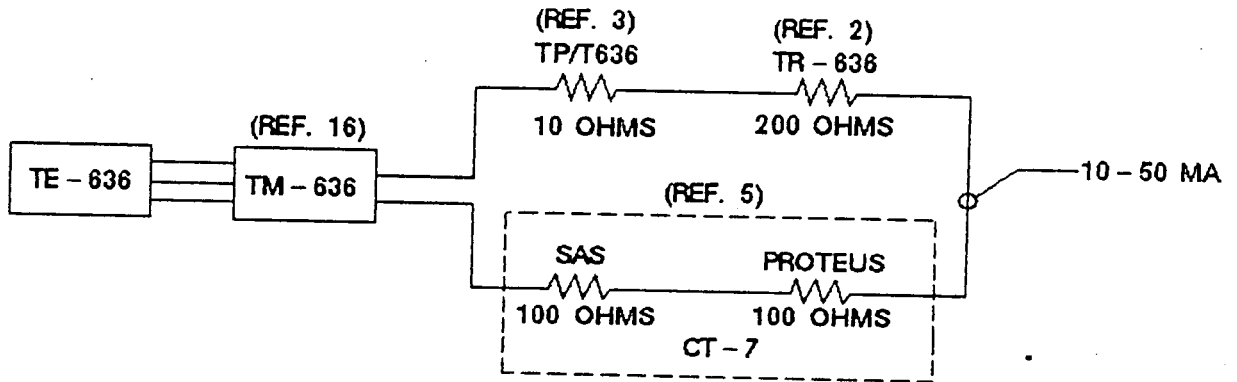
REVISION

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# IMPEDANCE CALCULATION

TE - 636 REACTOR CONTROL CIRCUIT (Z EQUIV)



TOTAL IMPEDANCE (OHMS) = 10 + 200 + 100 + 100 + = 410

ENGINEERING JUSTIFICATION:

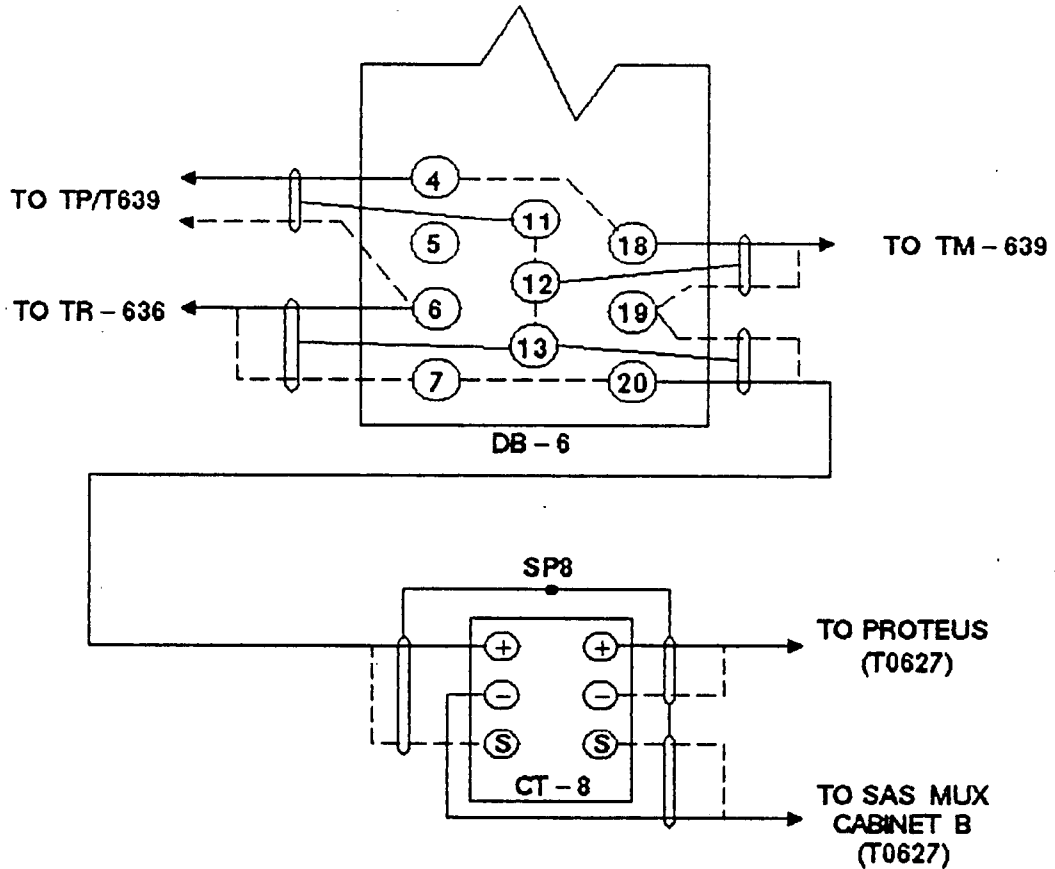
THE TE - 636 CIRCUIT IS PART OF THE REACTOR CONTROL SYSTEM. THEREFORE, THE SAS INPUT CAN BE IMPLEMENTED HERE. TM - 636 (FOXBORO 894AR R1 CONVERTER) HAS AN OUTPUT RATING OF 10 - 50 MA DC INTO 100 TO 700 OHMS. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (410 OHMS) FALLS WITHIN THE LOAD LIMIT (700 OHMS).

STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
RESID HX IN LOOP HDR TEMP (TE - 636)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 12/23/86	
CHECKED BY: <i>King Loh</i>	ENG. <i>VAD</i> DATE 12/23/86	SKETCH NO. SAS - 109 REV. 0 SH. 2 OF 2	

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**DESIGN DETAIL**



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R02, POINTS 6 (POS.), 7 (NEG.), AND 8 (SHIELD).

REF. DWG.: A225436  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;J SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
RESID HX OUT LOOP HDR TEMP (TE - 639)		C&J	SKETCH NO. SAS - 110 REV. 0 SH. 1 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>12/23/88</i>	
CHECKED BY: <i>King Lock</i>		ENG. <i>VAD</i> DATE <i>12/23/88</i>	

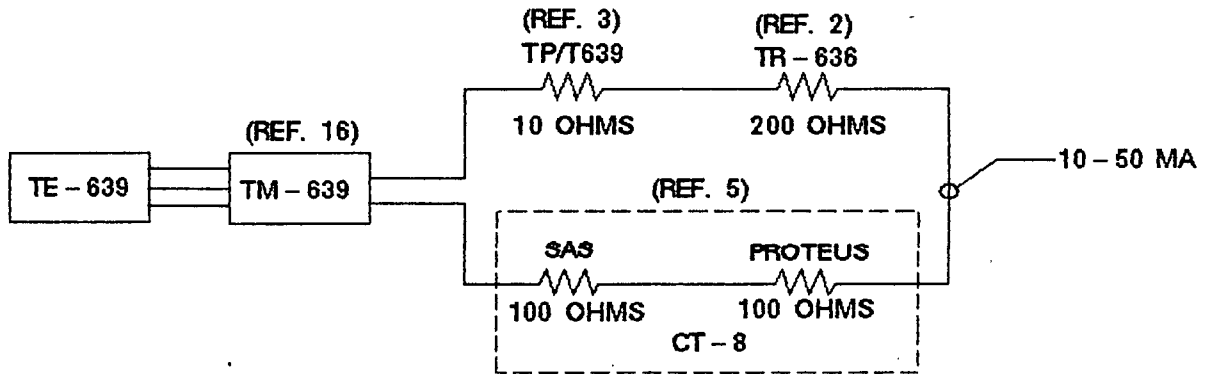


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**IMPEDANCE CALCULATION**

**TE-639 REACTOR CONTROL CIRCUIT (Z EQUIV)**



TOTAL IMPEDANCE (OHMS) = 10 + 200 + 100 + 100 = 410

**ENGINEERING JUSTIFICATION:**

THE TE-639 CIRCUIT IS PART OF THE REACTOR CONTROL SYSTEM. THEREFORE, THE SAS INPUT CAN BE IMPLEMENTED HERE. TM-639 (FOXBORO 694AR R/I CONVERTER) HAS AN OUTPUT RATING OF 10-50 MA DC INTO 100 TO 700 OHMS. THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (410 OHMS) FALLS WITHIN THE LOAD LIMIT (700 OHMS).

THE RESIDUAL HX OUT LOOP HDR TEMP IS A CATEGORY 2 CHANNEL. AN ISOLATOR WILL BE PROVIDED TO SEPARATE THE SAS AND PROTEUS COMPUTER INPUTS FROM THE CATEGORY 2 PORTION OF THE CHANNEL.

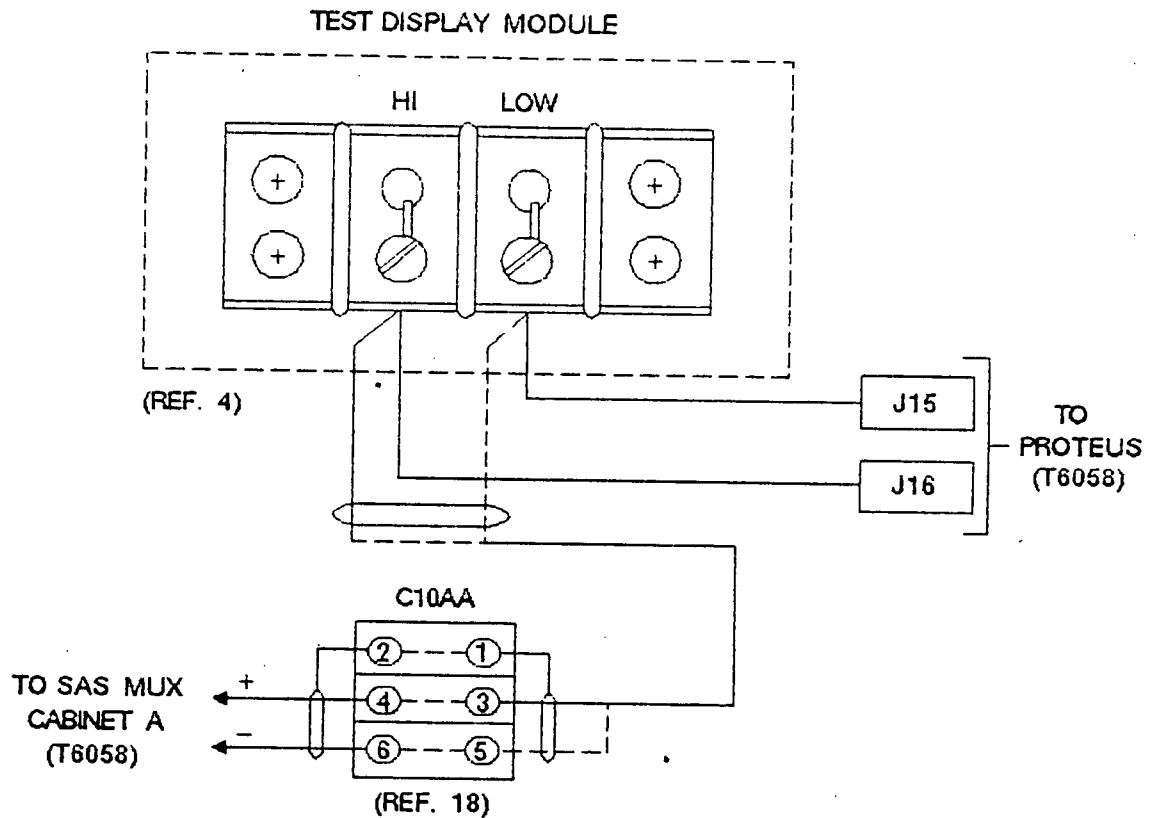
STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	<b>CON EDISON ENG.</b> C&I SKETCH SKETCH NO. SAS-110 REV. 0 SH. 2 OF 2
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
RESID HX OUT LOOP HDR TEMP (TE-639)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>10/22/87</i>	
CHECKED BY: <i>Rmcv</i>		ENG. <i>VAS</i> DATE <i>10/22/87</i>	

REVISION

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**DESIGN DETAIL**



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R08. POINTS 14 (POS.), 15 (NEG.), AND 16 (SHIELD).

ENGINEERING JUSTIFICATION:

THE TSAT METER AND ASSOCIATED INPUTS, ARE NON SAFETY RELATED. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED WITHOUT AN ISOLATION DEVICE. PAGE 16 OF THE BABCOCK & WILCOX TECH MANUAL (REF. 4), STATES THAT AN ANALOG OUTPUT ON THE BACK PANEL PROVIDES 2 - 10 VDC FOR TSAT MARGIN.

REF. DWG.: A208363  
REF. SKETCH: SAS - REF

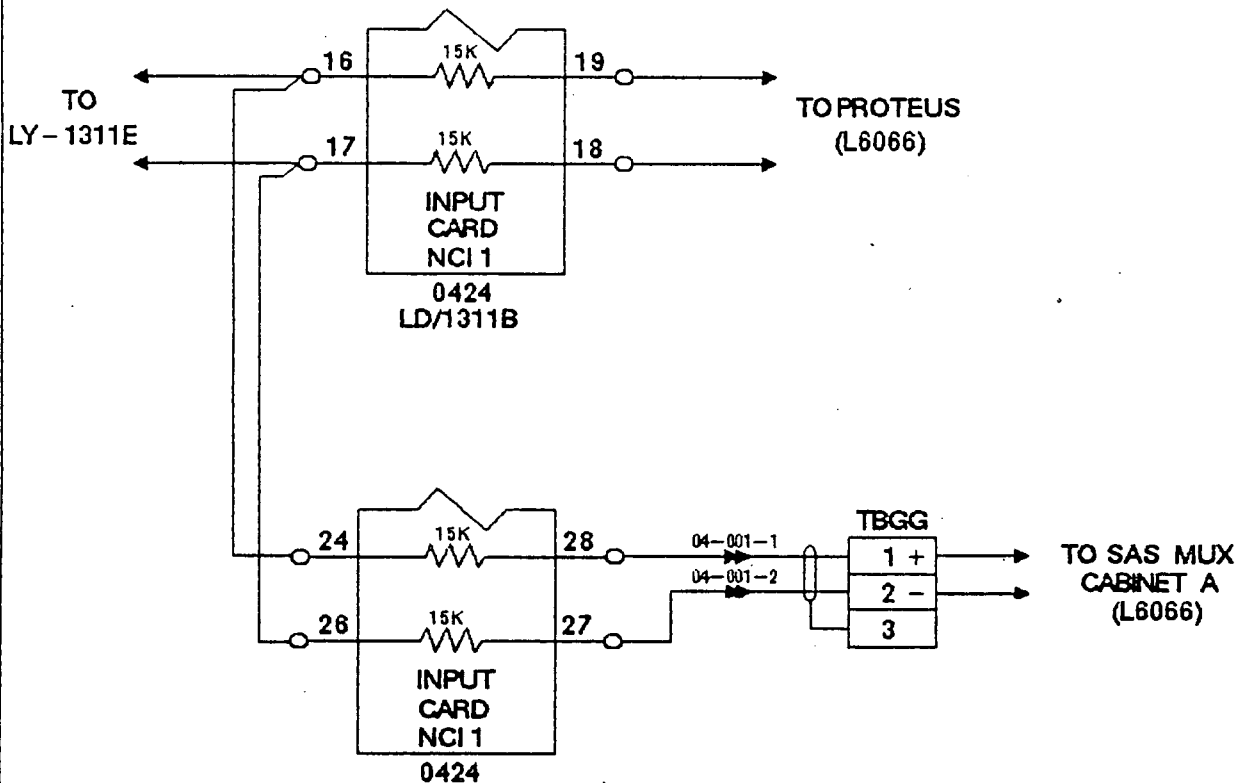
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
SAT TEMP MARGIN (T - SAT)	VLS	C&I	SKETCH NO. SAS - 111 REV. 0 SH. 1 OF 1
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>4/20/87</i>	
CHECKED BY: <i>King Look</i>		ENG. <i>VLD</i> DATE <i>4-20-87</i>	

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DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R08, POINTS 2 (POS.), 3 (NEG.), AND 4 (SHIELD).

REF. DWG.: B228125, W 1D421100 SH. 2  
 REF. DOCUMENT: IPP 171, RVLIS MANUAL, FIG. 5-9  
 REF. SKETCH: SAS-REF  
 REF. UDC: FEI-860018 REV. 0

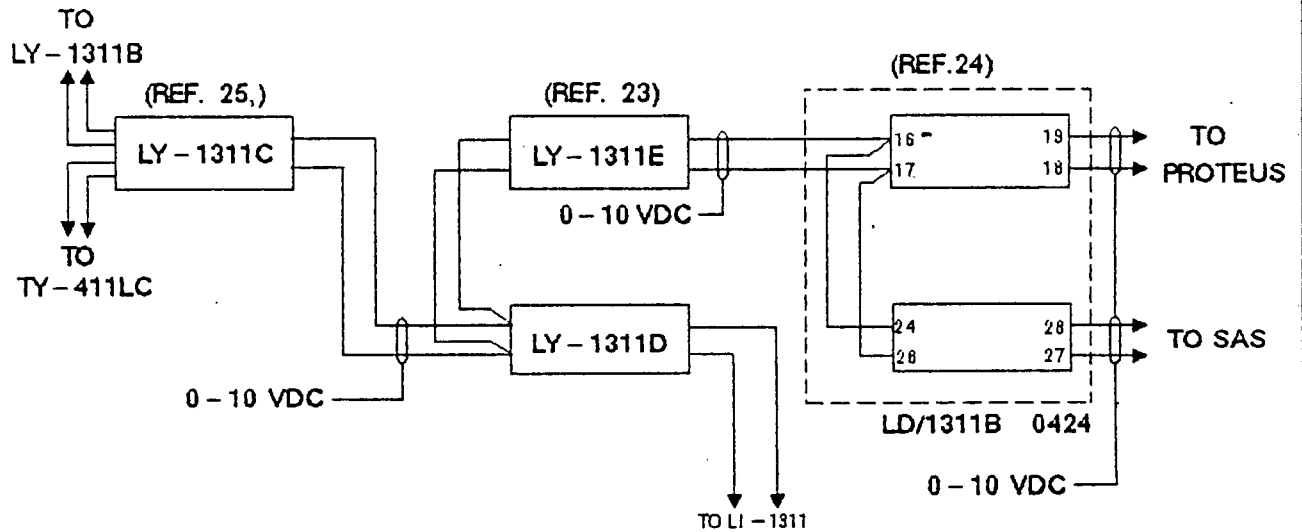
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG. C&J SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
REACTOR VESSEL LEVEL NR (LT-1311)		C&J	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>3/17/87</i>	
CHECKED BY: <i>King Toke</i>	ENG. <i>VAD</i> DATE <i>3/17/87</i>	SKETCH NO. SAS-112	REV. 1 SH. 1 OF 2

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Revision 0.

SAS INTERFACE



ENGINEERING JUSTIFICATION

LY-1311C (WESTINGHOUSE NMD 1) IS PART OF THE RVLIS PROTECTION I CHANNEL, AND PROVIDES A 0-10 VDC OUTPUT (SEE REF. DOCUMENTS). THE SAS INPUT CANNOT BE IMPLEMENTED HERE. LY-1311E (WESTINGHOUSE NLP 3) ISOLATES THE PROTECTION I CHANNEL, AND PROVIDES A 0-10 VDC OUTPUT. THE SAS SIGNAL CAN THEREFORE BE IMPLEMENTED HERE. THE SAS SIGNAL CAN BE OBTAINED BY PARALLEL JUMPERING OFF PINS 16 AND 17 OF LD/1311B, PROVIDING A 0-10 VDC SIGNAL TO SAS. A WESTINGHOUSE NCI 1 INPUT CARD IS UTILIZED TO PROVIDE A 30K OHM LOAD FOR SHORT CIRCUIT PROTECTION.

STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	CON EDISON ENG.- C&I SKETCH
TITLE SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
REACTOR VESSEL LEVEL NR (LT-1311)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TN</i> DATE <i>3/17/87</i>	
CHECKED BY: <i>King Lake</i>		ENG. <i>VAS</i> DATE <i>3/17/87</i>	SKETCH NO. SAS-112 REV. 1 SH. 2 OF 2

REVISION

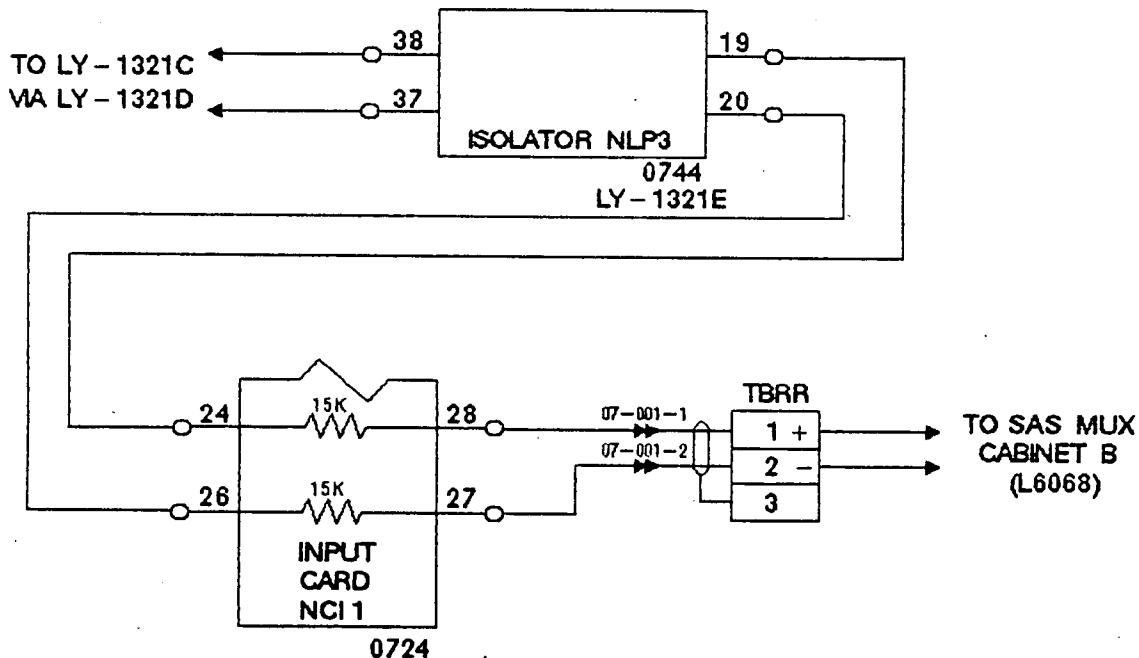
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FEI-860018  
Revision 0.

DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R10, POINTS 6 (POS.), 7 (NEG.), AND 8 (SHIELD).

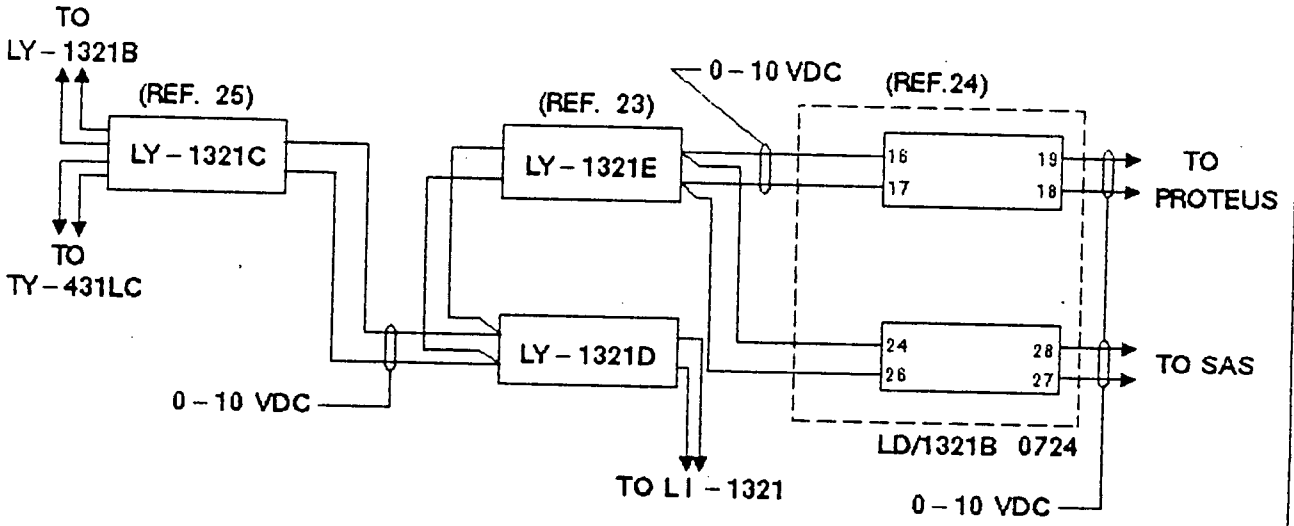
REF. DWG.: B228126, W 1D42110 SH. 12  
 REF. SKETCH: SAS - REF  
 REF. DOCUMENT: IPP 171, RVLIS MANUAL, FIG. 5-9  
 REF. UDC: FEI-860018 Rev. 0

STATION: INDIAN POINT 2	A P P R V E D	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
REACTOR VESSEL LEVEL NR (LT-1321)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>3/17/87</i>	
CHECKED BY: <i>King Lock</i>		ENG. <i>VAD</i> DATE <i>3/17/87</i>	SKETCH NO. SAS-113 REV. 1 SH. 1 OF 2

REVISION

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 Issued for record.  
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 Incorporated FEI-860018 Revision 0.

SAS INTERFACE



ENGINEERING JUSTIFICATION

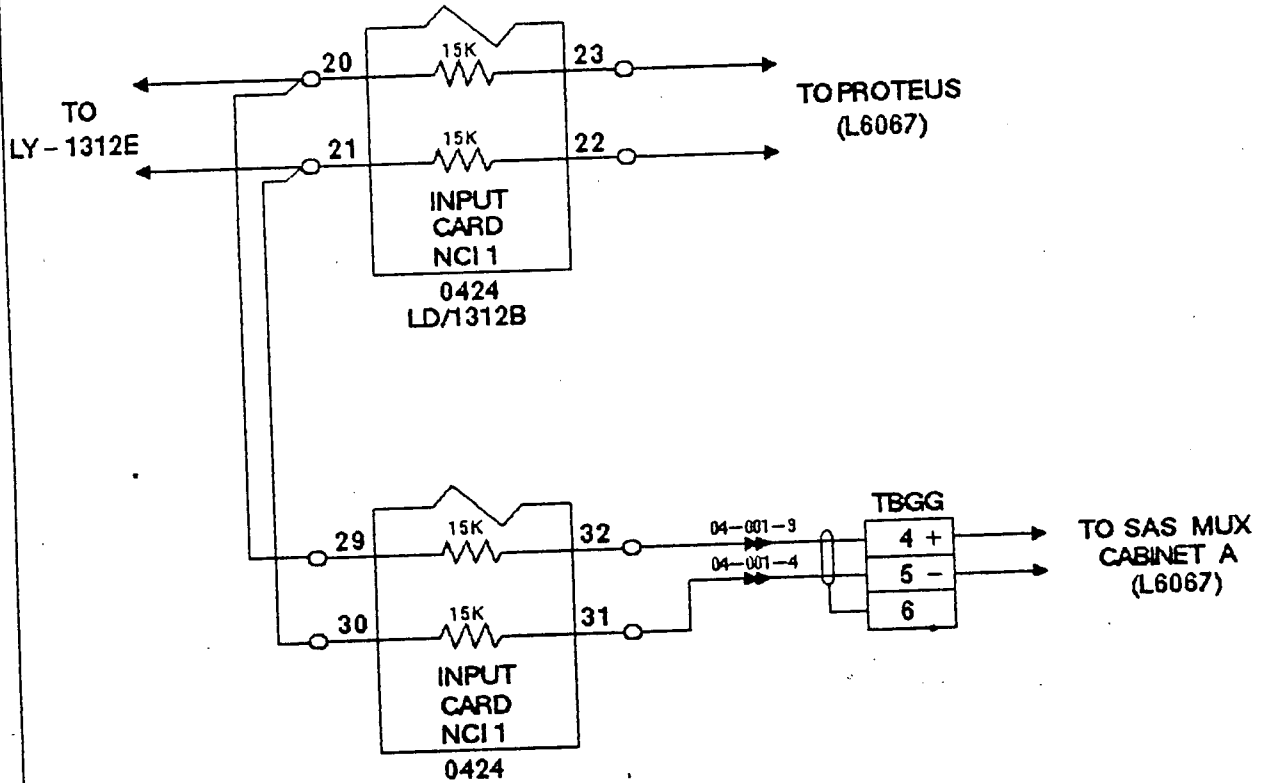
LY-1321C (WESTINGHOUSE NMD 1) IS PART OF THE RVLIS PROTECTION II CHANNEL, AND PROVIDES A 0-10 VDC OUTPUT (SEE REF. DOCUMENTS). THE SAS INPUT CANNOT BE IMPLEMENTED HERE. LY-1321E (WESTINGHOUSE NLP 3) ISOLATES THE PROTECTION II CHANNEL, AND PROVIDES A 0-10 VDC OUTPUT. THE SAS SIGNAL CAN THEREFORE BE IMPLEMENTED HERE. THE SAS SIGNAL CAN BE OBTAINED BY PARALLEL JUMPERING OFF PINS 19 AND 20 OF LY-1321E, PROVIDING A 0-10 VDC SIGNAL TO SAS. A WESTINGHOUSE NCI 1 INPUT CARD (LD/1321B) IS UTILIZED TO PROVIDE A 30K OHM LOAD FOR SHORT CIRCUIT PROTECTION.

STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>TM</i> DATE <i>3/17/87</i>	
REACTOR VESSEL LEVEL NR (LT-1321)		C&I	SKETCH NO. SAS-113 REV. 1 SH. 2 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. VAS DATE <i>3/17/87</i>	
CHECKED BY: <i>King Fook</i>			

REVISION

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 Issued for  
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 FEI-860018  
 Revision 0.

DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R07, POINTS 6 (POS.), 7 (NEG.), AND 8 (SHIELD).

REF. DWG.: B228125  
 REF. SKETCH: SAS - REF

REF. DOCUMENT: IPP 171, RVLIS MANUAL, FIG. 5-9  
 REF. UDC: FEI-860018 Rev. 0

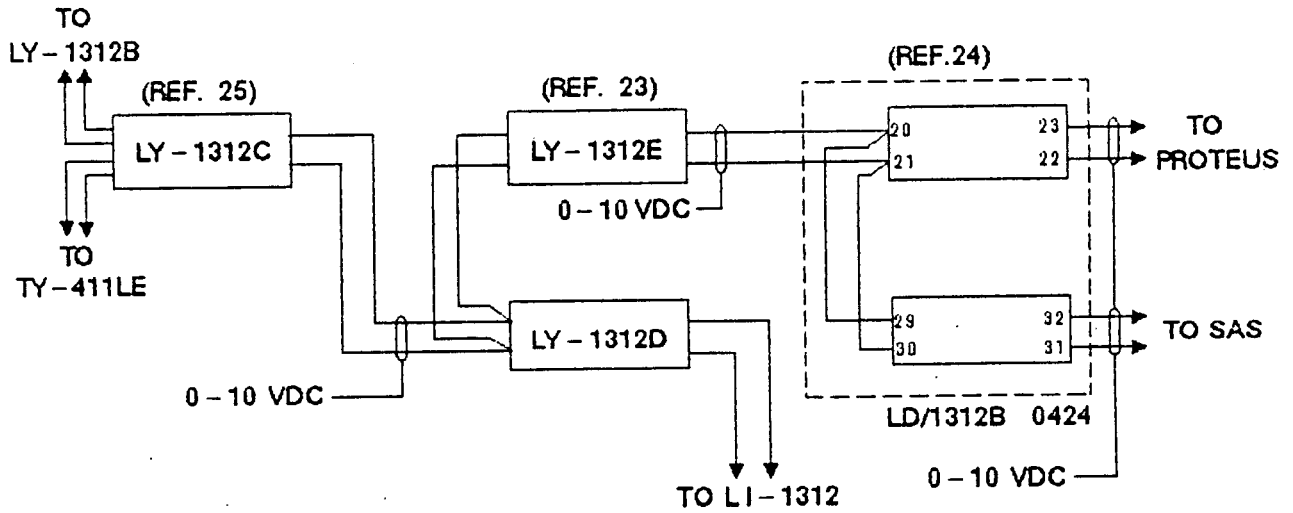
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG.</b> C&I SKETCH SKETCH NO. SAS - 114 REV. 1 SH. 1 OF 2
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
REACTOR VESSEL LEVEL WR (LT - 1312)		ENG. <i>TM</i> DATE <i>3/17/87</i>	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>VAD</i> DATE <i>3/17/87</i>	
CHECKED BY: <i>King John</i>			

REVISION

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 Issued for record.

Incorporated  
 FEI-660018  
 Revision 0.

SAS INTERFACE



ENGINEERING JUSTIFICATION

LY-1312C (WESTINGHOUSE NMD 1) IS PART OF THE RVLIS PROTECTION I CHANNEL, AND PROVIDES A 0-10 VDC OUTPUT (SEE REF. DOCUMENTS). THE SAS INPUT CANNOT BE IMPLEMENTED HERE. LY-1312E (WESTINGHOUSE NLP 3) ISOLATES THE PROTECTION I CHANNEL, AND PROVIDES A 0-10 VDC OUTPUT. THE SAS SIGNAL CAN THEREFORE BE IMPLEMENTED HERE. THE SAS SIGNAL CAN BE OBTAINED BY PARALLEL JUMPERING OFF PINS 20 AND 21 OF LD/1312B, PROVIDING A 0-10 VDC SIGNAL TO SAS. A WESTINGHOUSE NCI 1 INPUT CARD IS UTILIZED TO PROVIDE A 30K OHM LOAD FOR SHORT CIRCUIT PROTECTION.

STATION: INDIAN POINT 2	A P P R O V E S	MECH. PROGRAM	CON EDISON ENG..	
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE		C&I SKETCH
REACTOR VESSEL LEVEL WR (LT-1312)		C&I	ENG. <i>TM</i> DATE <i>3/17/87</i>	SKETCH NO. SAS-114 REV. 1 SH. 2 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>VAD</i> DATE <i>3/17/87</i>		
CHECKED BY: <i>King Cook</i>				



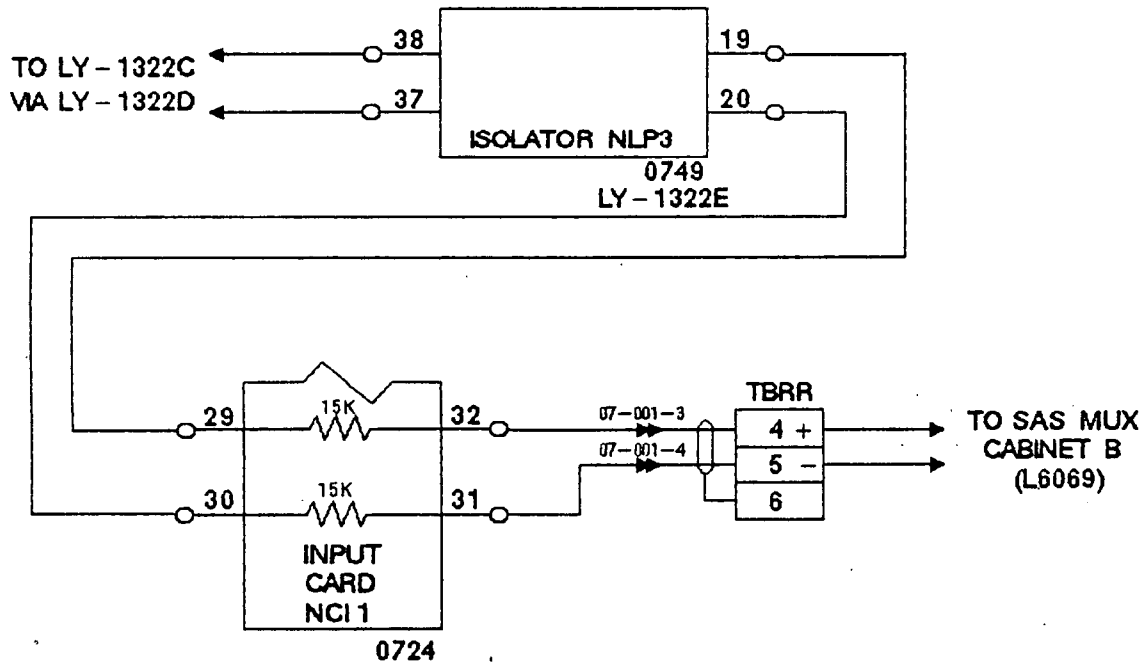
REVISION

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Incorporated  
FEI-860018  
Revision 0.

DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R06, POINTS 14 (POS.), 15 (NEG.), AND 16 (SHIELD).

REF. DWG.: B228126  
REF. SKETCH: SAS - REF

REF. DOCUMENT: IPP 171 RVLIS MANUAL, FIG. 5-9  
REF. UDC: FEI-860018 Rev. 0

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON</b> ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
REACTOR VESSEL LEVEL WR (LT-1322)		C&I	SKETCH NO. SAS-115 REV. 1 SH. 1 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>3/17/87</i>	
CHECKED BY: <i>King Cook</i>		ENG. <i>VAD</i> DATE <i>3/17/87</i>	

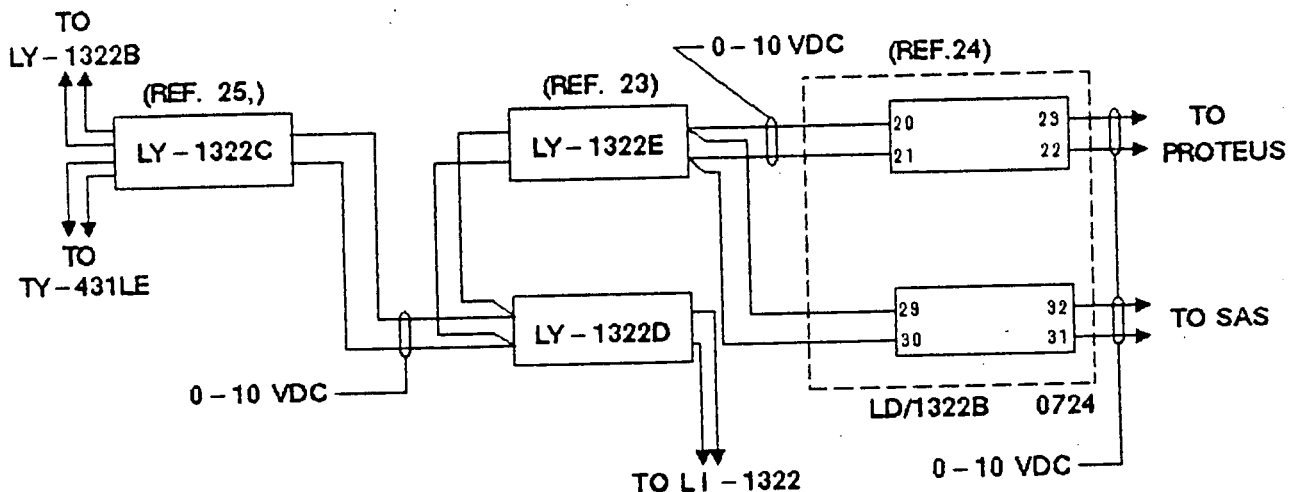
# SAS INTERFACE

REVISION

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cord.

Incorporated  
FEI-080018  
Revision 0.



### ENGINEERING JUSTIFICATION

LY-1322C (WESTINGHOUSE NMD 1) IS PART OF THE RVLIS PROTECTION II CHANNEL, AND PROVIDES A 0-10 VDC OUTPUT (SEE REF. DOCUMENTS). THE SAS INPUT CANNOT BE IMPLEMENTED HERE. LY-1322E (WESTINGHOUSE NLP 3) ISOLATES THE PROTECTION II CHANNEL, AND PROVIDES A 0-10 VDC OUTPUT. THE SAS SIGNAL CAN THEREFORE BE IMPLEMENTED HERE. THE SAS SIGNAL CAN BE OBTAINED BY PARALLEL JUMPERING OFF PINS 19 AND 20 OF LY-1322E, PROVIDING A 0-10 VDC SIGNAL TO SAS. A WESTINGHOUSE NCI 1 INPUT CARD (LD/1322B) IS UTILIZED TO PROVIDE A 30K OHM LOAD FOR SHORT CIRCUIT PROTECTION.

STATION: INDIAN POINT 2  
 TITLE: SAS COMPUTER INTERFACE  
 REACTOR VESSEL LEVEL WR (LT-1322)  
 SKETCHED BY: VICTOR S. D'AMORE  
 CHECKED BY: *King Tooh*

APPROVALS

MECH. PROGRAM  
 ENG. *W/A* DATE  
 C&I  
 ENG. *TM* DATE 3/17/87  
 ENG. *V&D* DATE 3/17/87

**CON  
EDISON ENG.  
C&I SKETCH**

SKETCH NO. SAS-115  
 REV. 1 SH. 2 OF 2

REVISION

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record.

# DESIGN DETAIL

GENERAL NOTE APPLICABLE TO THE BELOW LISTED  
RADIATION MONITORING CHANNELS :

NOTE :

THIS RAD SYSTEM IS NOT SAFETY-RELATED  
AND DOES NOT REQUIRE ISOLATION

APPLICABLE SAS SKETCHES :

- |           |           |
|-----------|-----------|
| SAS - 116 | SAS - 125 |
| SAS - 117 | SAS - 126 |
| SAS - 118 | SAS - 127 |
| SAS - 119 | SAS - 128 |
| SAS - 120 | SAS - 129 |
| SAS - 121 | SAS - 130 |
| SAS - 122 | SAS - 131 |
| SAS - 123 | SAS - 132 |
| SAS - 124 | SAS - 133 |

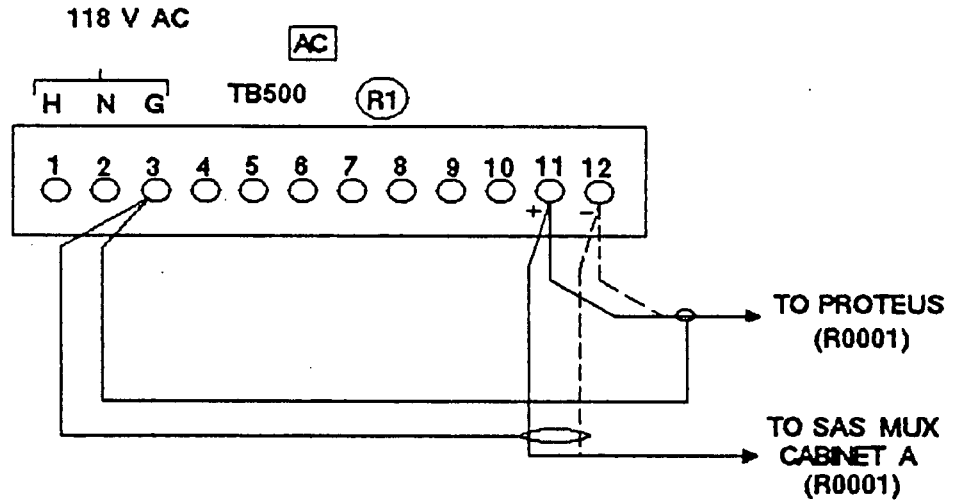
STATION: INDIAN POINT 2	A P R V L S	MECH. PROGRAM	CON EDISON ENG. CBI SKETCH
TIME SSS COMPUTER INTERFACE		ENO. W/L DATE	
RADIATION MONITORING NOTE		CBI	
SKETCHED BY: VICTOR S. DAMORE		ENG. TM DATE 10/23/77	SKETCH NO. SAS - 116A
CHECKED BY: R. MCV		ENG. VAS DATE 10/23/77	REV. 0 SH 1 OF 1

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# DESIGN DETAIL

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## DESIGN DETAIL



**NOTE :**

1. SAS SIGNAL DESTINATION: BTSCA 01R08, POINTS 23 (POS.), 24 (NEG), AND 25 (SHIELD).
2. SAS AND PROTEUS CONNECTIONS SHOWN ONLY.
3. POTENTIAL ACROSS TERMINALS 11 AND 12 IS 0 - 5 VDC.

REF. DWG.: A232023  
REF. SKETCH: SAS - REF

REF. UDC: FE1860031

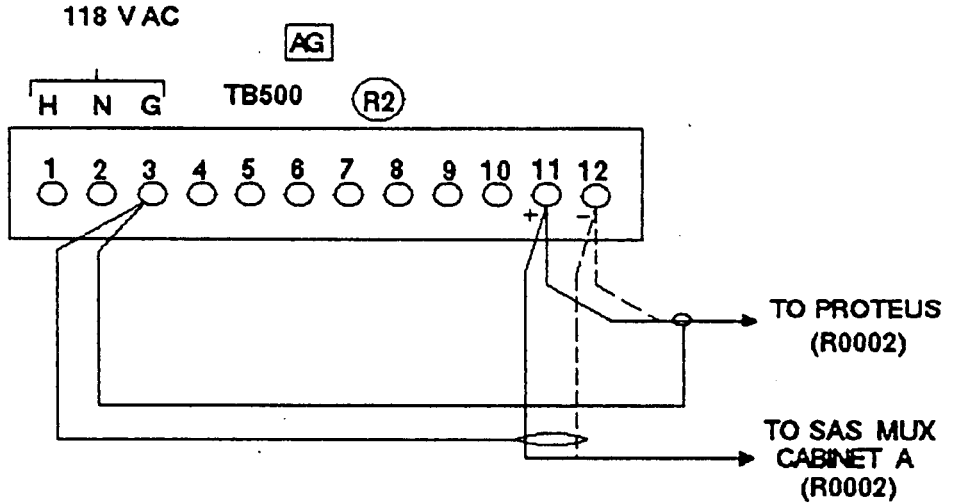
STATION: INDIAN POINT 2	A P P R Y	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>n/a</i> DATE	
AREA 1 R - CENTRAL CNTL ROOM (R1)		C&I	
SKETCHED BY: VICTOR B. D'AMORE		ENG. <i>TM</i> DATE <i>5/1/87</i>	
			SKETCH NO. SAS - 118

# DESIGN DETAIL

REVISION

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Issued for record.

1  
Incorporated UDC  
FEI860031



**NOTE :**

1. SAS SIGNAL DESTINATION: BTSCA 01R13, POINTS 27 (POS.), 28 (NEG), AND 29 (SHIELD).
2. SAS AND PROTEUS CONNECTIONS SHOWN ONLY.
3. POTENTIAL ACROSS TERMINALS 11 AND 12 IS 0 - 5 VDC.

REF. DWG.: A232023  
REF. SKETCH: SAS - REF

REF. UDC: FEI860031

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON</b> <b>EDISON</b> ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
AREA 2 R - CONTAINMENT (R2)		C&I	SKETCH NO. SAS - 117 REV. 1 SH. 1 OF 1
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>5/1/87</i>	
CHECKED BY: <i>King Look</i>		ENG. <i>VAD</i> DATE <i>5-1-87</i>	

REVISION

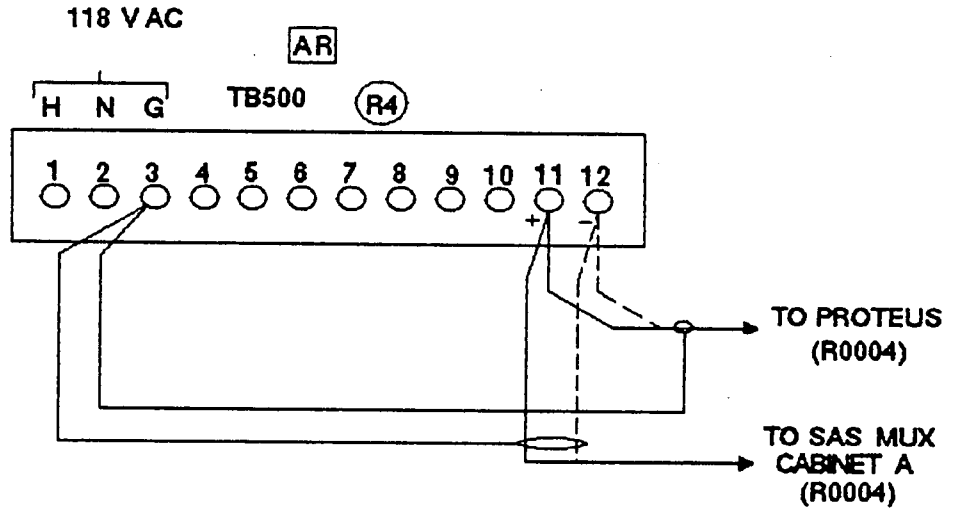
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DESIGN DETAIL



NOTE :

1. SAS SIGNAL DESTINATION: BTSCA 01R09, POINTS 2 (POS.), 3 (NEG), AND 4 (SHIELD).
2. SAS AND PROTEUS CONNECTIONS SHOWN ONLY.
3. POTENTIAL ACROSS TERMINALS 11 AND 12 IS 0 - 5 VDC.

REF. DWG.: A232023  
REF. SKETCH: SAS - REF

REF. UDC: FEI860031

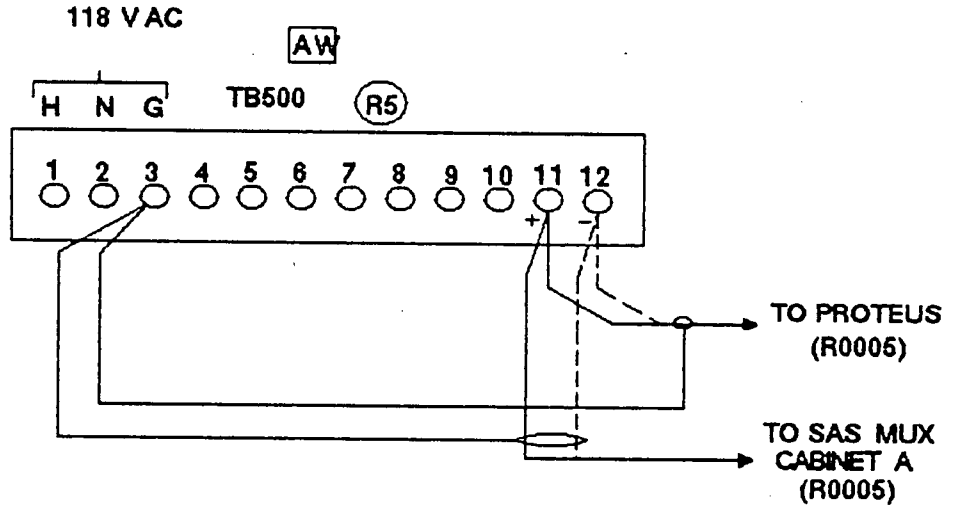
STATION: INDIAN POINT 2 TITLE: SAS COMPUTER INTERFACE AREA 4 R - CHARGING PUMP ROOM (R4) SKETCHED BY: VICTOR S. D'AMORE CHECKED BY: <i>King Looh</i>	APPROVALS	MECH. PROGRAM	<b>CON</b> <b>EDISON</b> ENG. <b>C&amp;I</b> SKETCH
		ENG. <i>N/A</i> DATE	
		C&I	SKETCH NO. SAS - 118 REV. 1 SH. 1 OF 1
		ENG. <i>TM</i> DATE <i>5/1/87</i>	
		ENG. <i>VA</i> DATE <i>5.1.87</i>	

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FEI860031

DESIGN DETAIL



NOTE:

1. SAS SIGNAL DESTINATION: BTSCA 01R09, POINTS 6 (POS.), 7 (NEG), AND 8 (SHIELD).
2. SAS AND PROTEUS CONNECTIONS SHOWN ONLY.
3. POTENTIAL ACROSS TERMINALS 11 AND 12 IS 0 - 5 VDC.

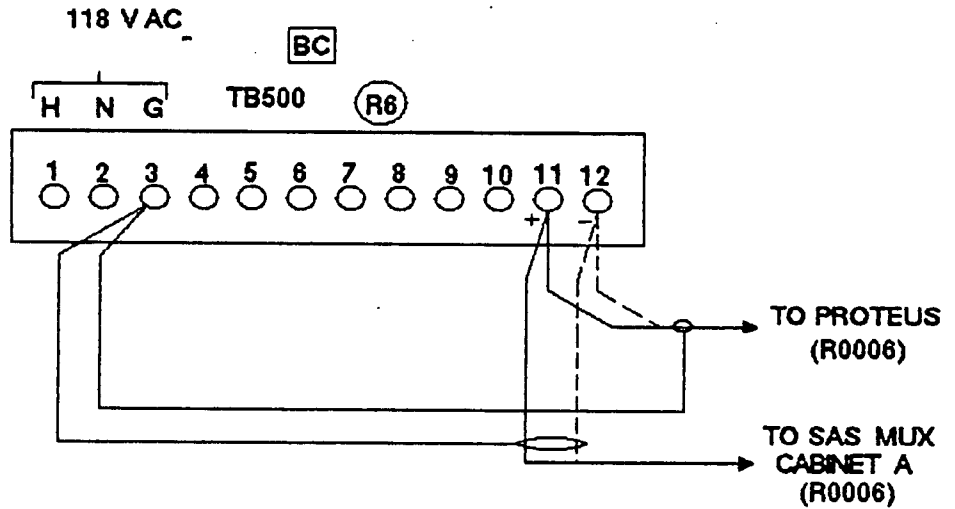
REF. DWG.: A232023  
REF. SKETCH: SAS - REF

REF. UDC: FEI860031

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG.</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
AREA 5 R - FUEL STORAGE BLDG (R5)		C&I	SKETCH NO. SAS - 119
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 5/1/87	
CHECKED BY: <i>King Look</i>		ENG. <i>VA</i> DATE 5.1.87	

# DESIGN DETAIL

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**NOTE :**

1. SAS SIGNAL DESTINATION: BTSCA 01R09, POINTS 10 (POS.), 11 (NEG), AND 12 (SHIELD).
2. SAS AND PROTEUS CONNECTIONS SHOWN ONLY.
3. POTENTIAL ACROSS TERMINALS 11 AND 12 IS 0 - 5 VDC.

REF. DWG.: A232023  
 REF. SKETCH: SAS - REF

REF. UDC: FEI860031

STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
AREA 6 R - SAMPLING ROOM (R6)		C&I	SKETCH NO. SAS - 120 REV. 1 SH. 1 OF 1
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>5/1/87</i>	
CHECKED BY: <i>King Loh</i>		ENG. <i>VAD</i> DATE <i>5.1.87</i>	

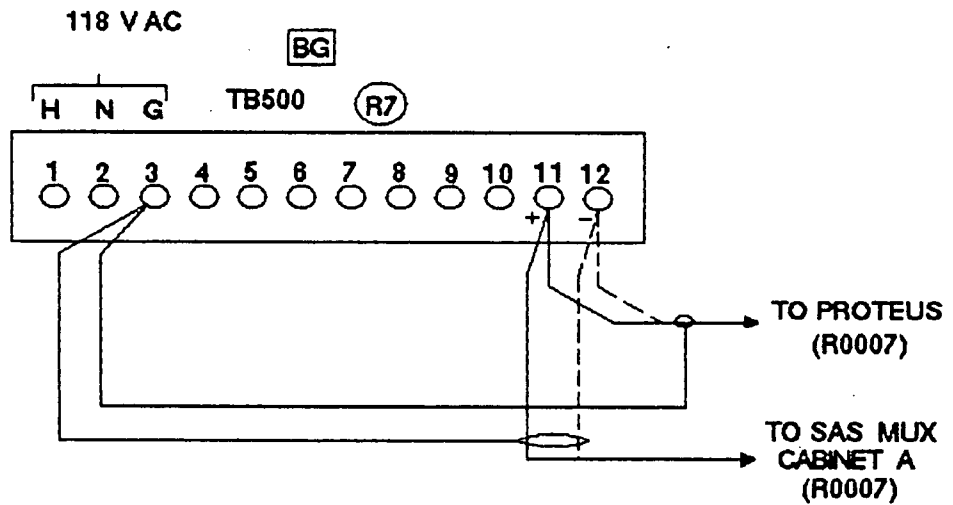


REVISION

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**DESIGN DETAIL**



NOTE :

1. SAS SIGNAL DESTINATION: BTSCA 01R08, POINTS 19 (POS.), 20 (NEG.), AND 21 (SHIELD).
2. SAS AND PROTEUS CONNECTIONS SHOWN ONLY.
3. POTENTIAL ACROSS TERMINALS 11 AND 12 IS 0 - 5 VDC.

REF. DWG.: A232023  
REF. SKETCH: SAS - REF

REF. UDC: FEI860031

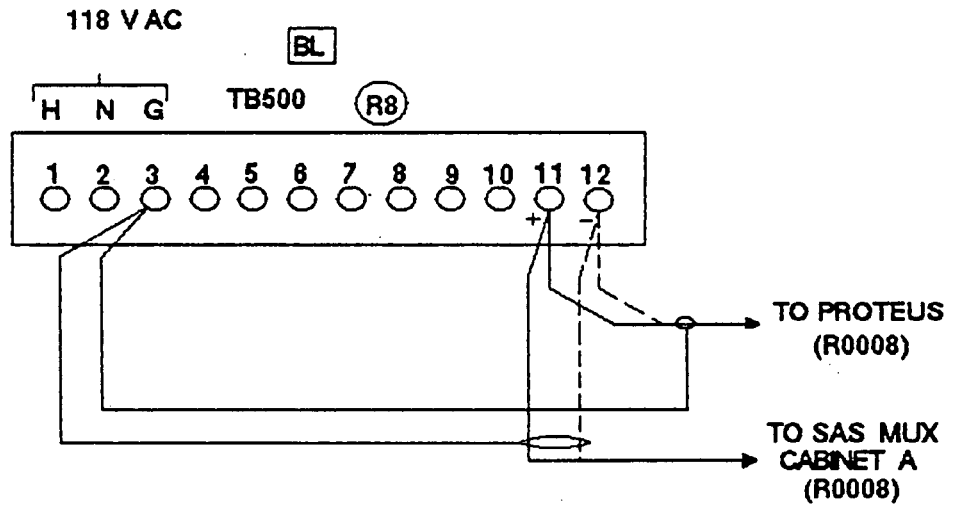
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG.</b> <b>C&amp;J SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
AREA 7 R - INCORE INSTR ROOM (R7)		C&J	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>5/1/87</i>	
CHECKED BY: <i>King Zook</i>		ENG. <i>VAD</i> DATE <i>5-1-87</i>	SKETCH NO. SAS-121 REV. 1 SH. 1 OF 1

REVISION

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Issued for record.

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INCORPORATED  
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FEI860031

**DESIGN DETAIL**



NOTE:

1. SAS SIGNAL DESTINATION: BTSCA 01R12, POINTS 31 (POS.), 32 (NEG), AND 33 (SHIELD).
2. SAS AND PROTEUS CONNECTIONS SHOWN ONLY.
3. POTENTIAL ACROSS TERMINALS 11 AND 12 IS 0 - 5 VDC.

REF. DWG.: A232023  
REF. SKETCH: SAS - REF

REF. UDC: FEI860031

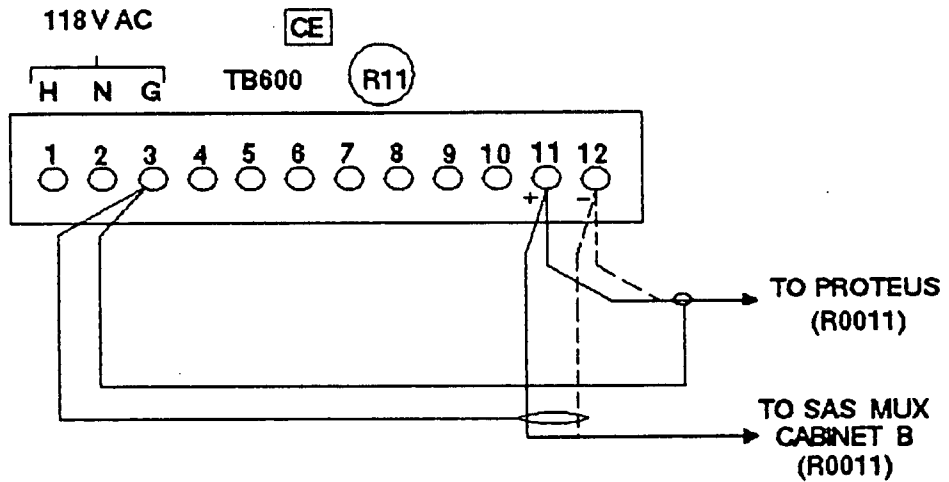
STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	CON EDISON ENG.
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
AREA 8 R - DRUMMING STATION (R8)		C&J	SKETCH NO. SAS - 122 REV. 1 SH. 1 OF 1
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>5/1/87</i>	
CHECKED BY: <i>Kevin Loh</i>		ENG. <i>VAS</i> DATE <i>5-1-87</i>	

REVISION

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Issued for record.

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INCORPORATED  
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FEI860031

**DESIGN DETAIL**



NOTE:

1. SAS SIGNAL DESTINATION: BTSCA 01R08, POINTS 23 (POS.), 24 (NEG), AND 25 (SHIELD).
2. SAS AND PROTEUS CONNECTIONS SHOWN ONLY.
3. POTENTIAL ACROSS TERMINALS 11 AND 12 IS 0 - 5 VDC.

REF. DWG.: A207638  
REF. SKETCH: SAS - REF

REF. UDC: FEI860031

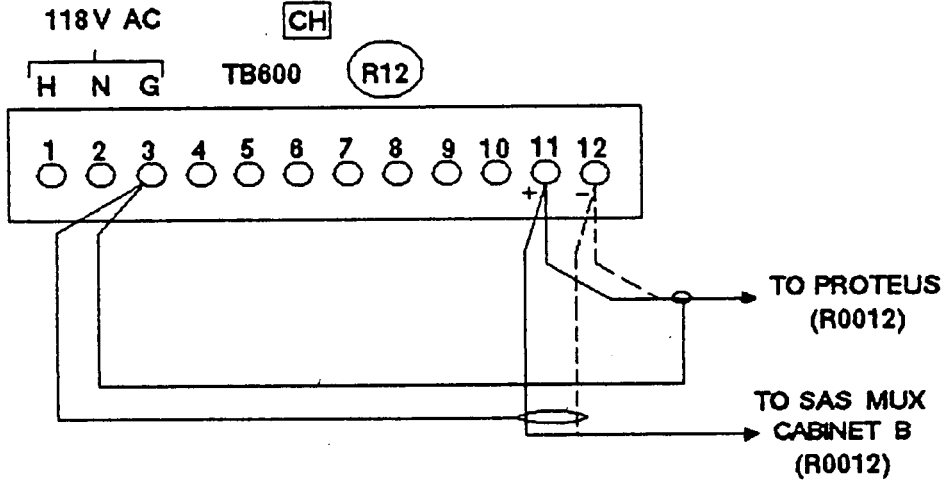
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG.</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
CONT AIR PARTICULATE RAD (R11)		C&I	SKETCH NO. SAS - 123
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>5/1/87</i>	
CHECKED BY: <i>King Lock</i>		ENG. <i>V.A.S</i> DATE <i>5.1.87</i>	

REVISION

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DESIGN DETAIL



NOTE:

1. SAS SIGNAL DESTINATION: BTSCA 01R08, POINTS 6 (POS.), 7 (NEG), AND 8 (SHIELD).
2. SAS AND PROTEUS CONNECTIONS SHOWN ONLY.
3. POTENTIAL ACROSS TERMINALS 11 AND 12 IS 0 - 5 VDC.

REF. DWG.: A207638  
REF. SKETCH: SAS - REF

REF. UDC FEI860031

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG.</b>
TITLE SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
CONT RADIO GAS RAD (R12)		C&I	SKETCH NO. SAS - 124
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>5/1/87</i>	
CHECKED BY: <i>King Lock</i>		ENG. <i>V.A.</i> DATE <i>5-1-87</i>	

REVISION

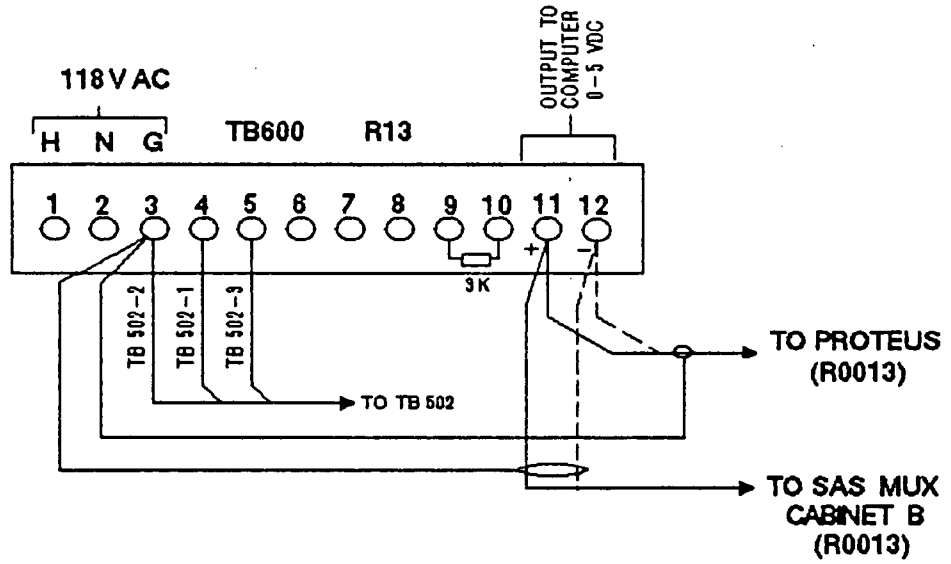
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FEI-860031  
Revision 0.

DESIGN DETAIL



NOTE : SAS SIGNAL DESTINATION: BTSCA 01R14, POINTS 23 (POS.), 24 (NEG), AND 25 (SHIELD).

REF. DWG.: B207639  
REF. SKETCH: SAS - REF

REF. UDC: FEI-860031 REV. 0

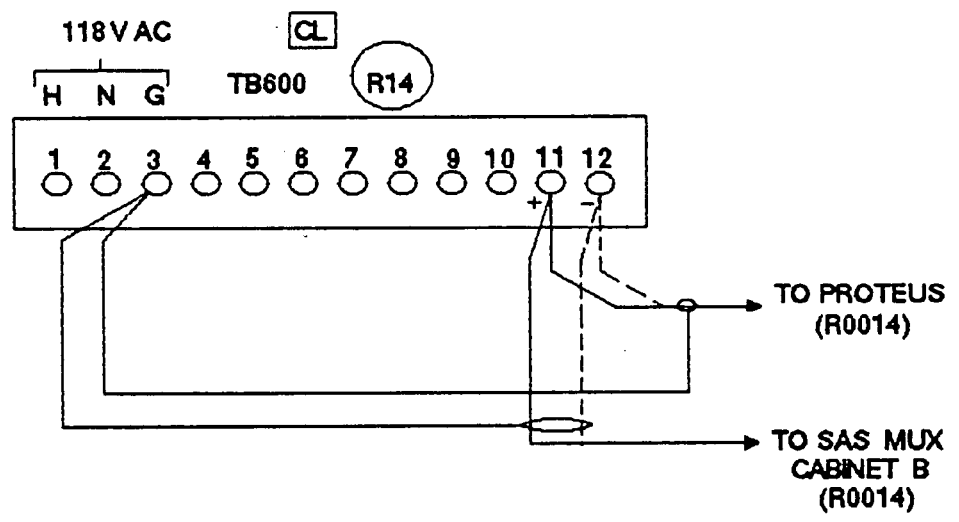
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
PLANT VENT (R13)		C&I	<b>C&amp;I SKETCH</b>
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>8/13/87</i>	SKETCH NO. SAS-125
CHECKED BY: <i>King Lark</i>	ENG. <i>VAD</i> DATE <i>8-13-87</i>	REV. 1 SH. 1 OF 1	

REVISION

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**DESIGN DETAIL**



**NOTE:**

1. SAS SIGNAL DESTINATION: BTSCA 01R08, POINTS 10 (POS.), 11 (NEG), AND 12 (SHIELD).
2. SAS AND PROTEUS CONNECTIONS SHOWN ONLY.
3. POTENTIAL ACROSS TERMINALS 11 AND 12 IS 0 - 5 VDC.

REF. DWG.: A207638  
REF. SKETCH: SAS - REF

REF. UDC: FEI860031

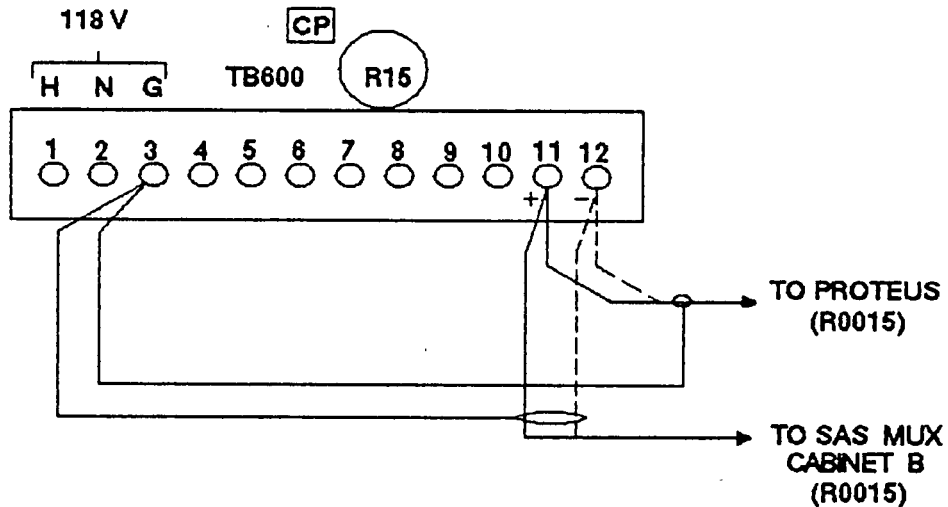
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG.</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>NA</i> DATE	
AUX BLDG EXHAUST GAS RAD (R14)		C&I	SKETCH NO. SAS - 126
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>5/1/87</i>	
CHECKED BY: <i>King Lock</i>		ENG. <i>VAD</i> DATE <i>5.1.87</i>	

REVISION

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Issued for record.

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INCORPORATED  
UDC  
FEI860031

**DESIGN DETAIL**



NOTE:

1. SAS SIGNAL DESTINATION: BTSCA 01R08, POINTS 14 (POS.), 15 (NEG), AND 16 (SHIELD).
2. SAS AND PROTEUS CONNECTIONS SHOWN ONLY.
3. POTENTIAL ACROSS TERMINALS 11 AND 12 IS 0 - 5 VDC.

REF. DWG.: A207638  
REF. SKETCH: SAS - REF

REF. UDC: FEI860031

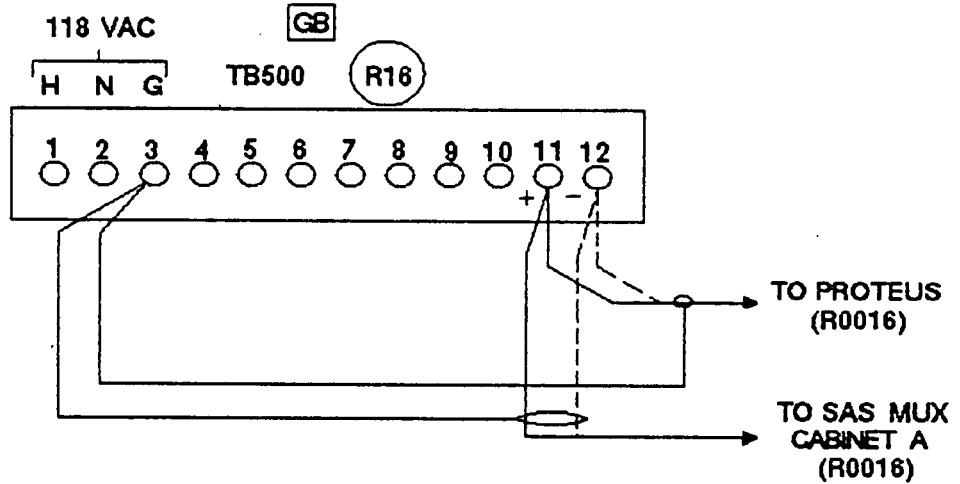
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM ENG. <i>N/A</i> DATE	<b>CON EDISON ENG.</b> C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		C&I ENG. <i>TM</i> DATE <i>5/1/87</i>	
STEAM JET AIR EJECT EXHAUST (R15)		ENG. <i>VAD</i> DATE <i>5-1-87</i>	
SKETCHED BY: VICTOR S. D'AMORE			
CHECKED BY: <i>King Leah</i>			

# DESIGN DETAIL

REVISION

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Incorporated UDC FE1860031



**NOTE:**

1. SAS SIGNAL DESTINATION: BTSCA 01R09, POINTS 14 (POS.), 15 (NEG), AND 16 (SHIELD).
2. SAS AND PROTEUS CONNECTIONS SHOWN ONLY.
3. POTENTIAL ACROSS TERMINALS 11 AND 12 IS 0 - 5 VDC.

REF. DWG.: A232022  
REF. SKETCH: SAS - REF

REF. UDC: FE1860031

STATION: INDIAN POINT 2 TITLE: SAS COMPUTER INTERFACE CONT: LINGHX SERV WTR OUT 2 RAD (R16) SKETCHED BY: VICTOR S. D'AMORE CHECKED BY: <i>King Fook</i>	A P P R V L S	MECH. PROGRAM ENG. <i>N/A</i> DATE C&I ENG. <i>TM</i> DATE <i>5/1/87</i> ENG. <i>VAD</i> DATE <i>5-1-87</i>	<b>CON EDISON ENG. C&amp;I SKETCH</b> SKETCH NO. SAS - 128 REV. 1 SH. 1 OF 1
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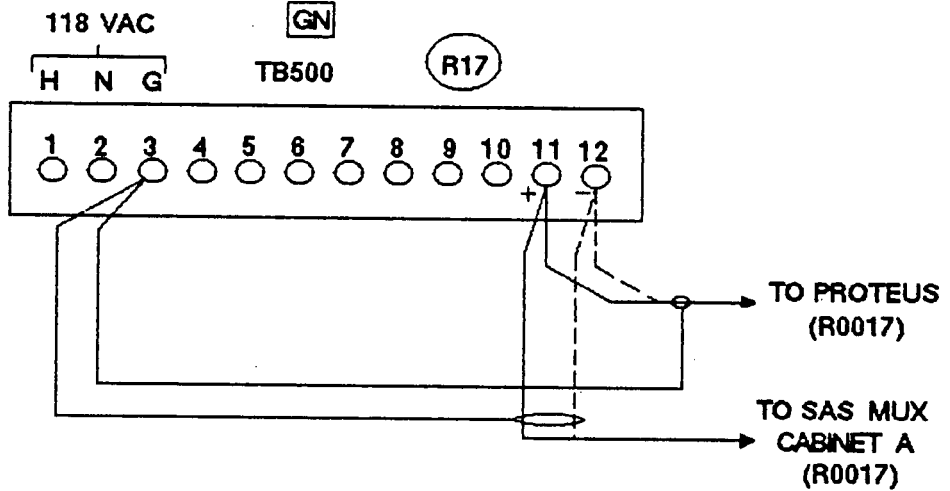


REVISION

0  
Issued for record.

1  
Incorporated UDC  
FEI860031

DESIGN DETAIL



NOTE:

1. SAS SIGNAL DESTINATION: BTSCA 01R09, POINTS 19 (POS.), 20 (NEG), AND 21 (SHIELD).
2. SAS AND PROTEUS CONNECTIONS SHOWN ONLY.
3. POTENTIAL ACROSS TERMINALS 11 AND 12 IS 0 - 5 VDC.

REF. DWG.: A232022  
REF. SKETCH: SAS - REF

REF. UDC: FEI860031

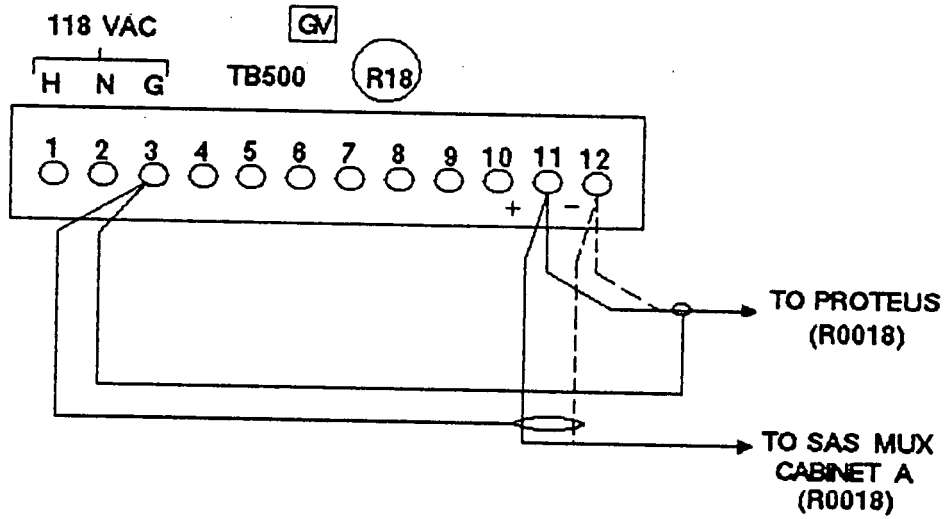
STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
COMP CLNG PMP SUCT HDR RAD (R17)		C&I	SKETCH NO. SAS - 129 REV. 1 SH. 1 OF 1
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>5/1/87</i>	
CHECKED BY: <i>King Lock</i>		ENG. <i>V.A.S.</i> DATE <i>5.1.87</i>	

REVISION

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Issued for record.

1  
Incorporated UDC FEI860031

DESIGN DETAIL



NOTE:

1. SAS SIGNAL DESTINATION: BTSCA 01R09, POINTS 23 (POS.), 24 (NEG), AND 25 (SHIELD).
2. SAS AND PROTEUS CONNECTIONS SHOWN ONLY.
3. POTENTIAL ACROSS TERMINALS 11 AND 12 IS 0 - 5 VDC.

REF. DWG.: A232022  
REF. SKETCH: SAS - REF

REF. UDC: FEI860031

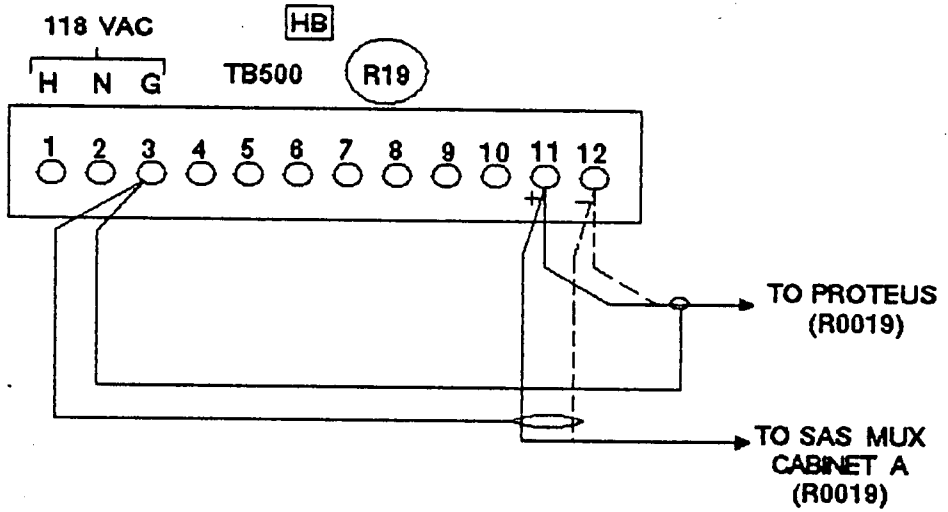
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>NA</i> DATE	
WASTE DISPOSAL LIQUID RAD (R18)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>5/1/87</i>	
CHECKED BY: <i>King Lock</i>		ENG. <i>VAN</i> DATE <i>5-1-87</i>	SKETCH NO. SAS - 130 REV. 1 SH. 1 OF 1

REVISION

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Issued for record.

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CORPORATED  
UDC  
FEI860031-

DESIGN DETAIL



NOTE :

1. SAS SIGNAL DESTINATION: BTSCA 01R09, POINTS 27 (POS.), 28 (NEG), AND 29 (SHIELD).
2. SAS AND PROTEUS CONNECTIONS SHOWN ONLY.
3. POTENTIAL ACROSS TERMINALS 11 AND 12 IS 0 - 5 VDC.

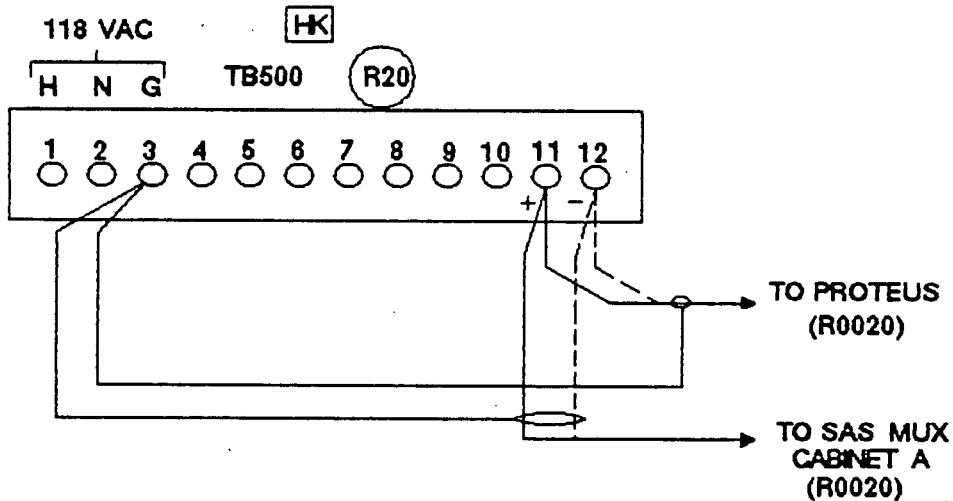
REF. DWG.: A232022  
REF. SKETCH: SAS - REF

REF. UDC: FEI860031

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STM GEN BLOWDOWN DRAIN RAD (R19)		C&I	<b>C&amp;I</b> SKETCH
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 5/1/87	SKETCH NO. SAS - 131
CHECKED BY: <i>King Lock</i>	ENG. <i>VMS</i> DATE 5-1-87	REV. 1 SH. 1 OF 1	

# DESIGN DETAIL

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FEI860031



**NOTE :**

1. SAS SIGNAL DESTINATION: BTSCA 01R12, POINTS 27 (POS.), 28 (NEG), AND 29 (SHIELD).
2. SAS AND PROTEUS CONNECTIONS SHOWN ONLY.
3. POTENTIAL ACROSS TERMINALS 11 AND 12 IS 0 - 5 VDC.

REF. DWG.: A232022  
REF. SKETCH: SAS - REF

REF. UDC: FEI860031

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG.</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
WASTE DISPOSAL GAS ANALYZER (R20)		ENG. <i>TM</i> DATE <i>5/1/87</i>	SKETCH NO. SAS - 132 REV. 1 SH. 1 OF 1
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>VAD</i> DATE <i>5.1.87</i>	
CHECKED BY: <i>King Lock</i>			

REVISION

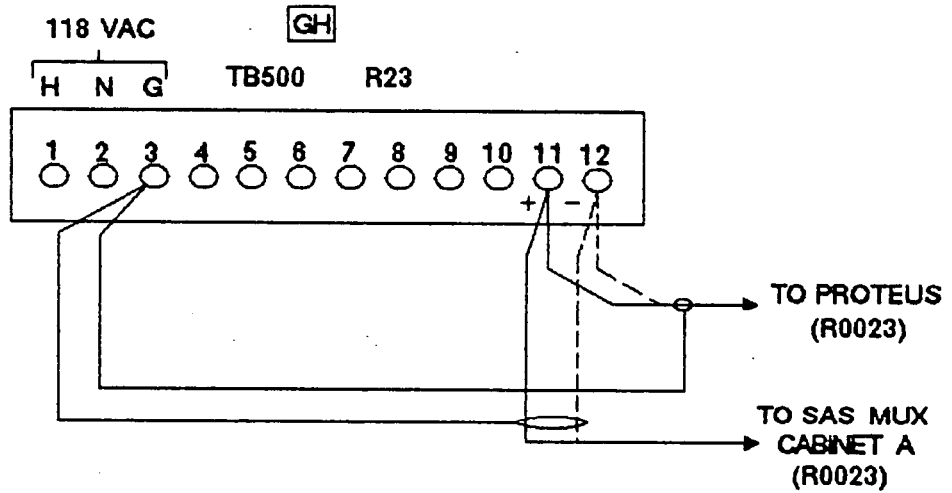
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Issued for record.

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CORPORATED  
DC  
FE1860031

DESIGN DETAIL



NOTE:

1. SAS SIGNAL DESTINATION: BTSCA 01R10, POINTS 2 (POS.), 3 (NEG), AND 4 (SHIELD).
2. SAS AND PROTEUS CONNECTIONS SHOWN ONLY.
3. POTENTIAL ACROSS TERMINALS 11 AND 12 IS 0 - 5 VDC.

REF. DWG.: A232022  
REF. SKETCH: SAS - REF

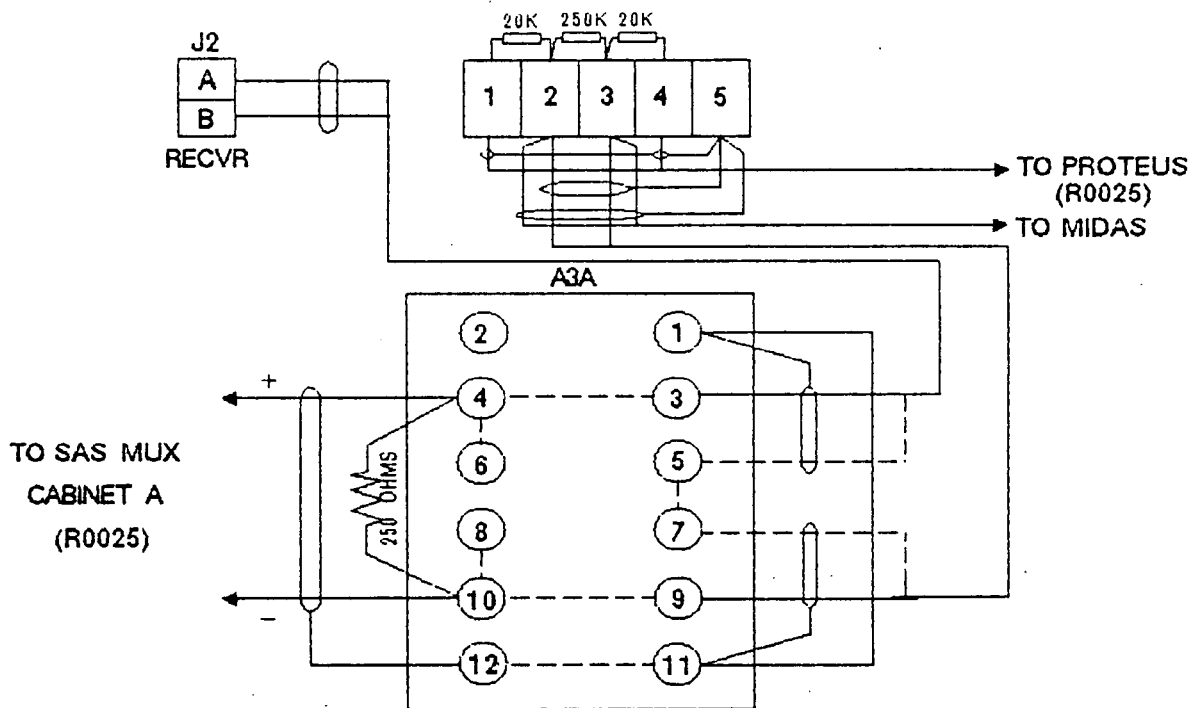
REF. UDC: FE1860031

STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
CONT CLNG SERV WTR OUT 2 RAD (R23)		C&I	SKETCH NO. SAS - 133 REV. 1 SH. 1 OF 1
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>5/1/87</i>	
CHECKED BY: <i>King Cook</i>		ENG. <i>VAN</i> DATE <i>5.1.87</i>	

REVISION

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DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R01, POINTS 19 (POS), 20 (NEG), AND 21 SHIELD.

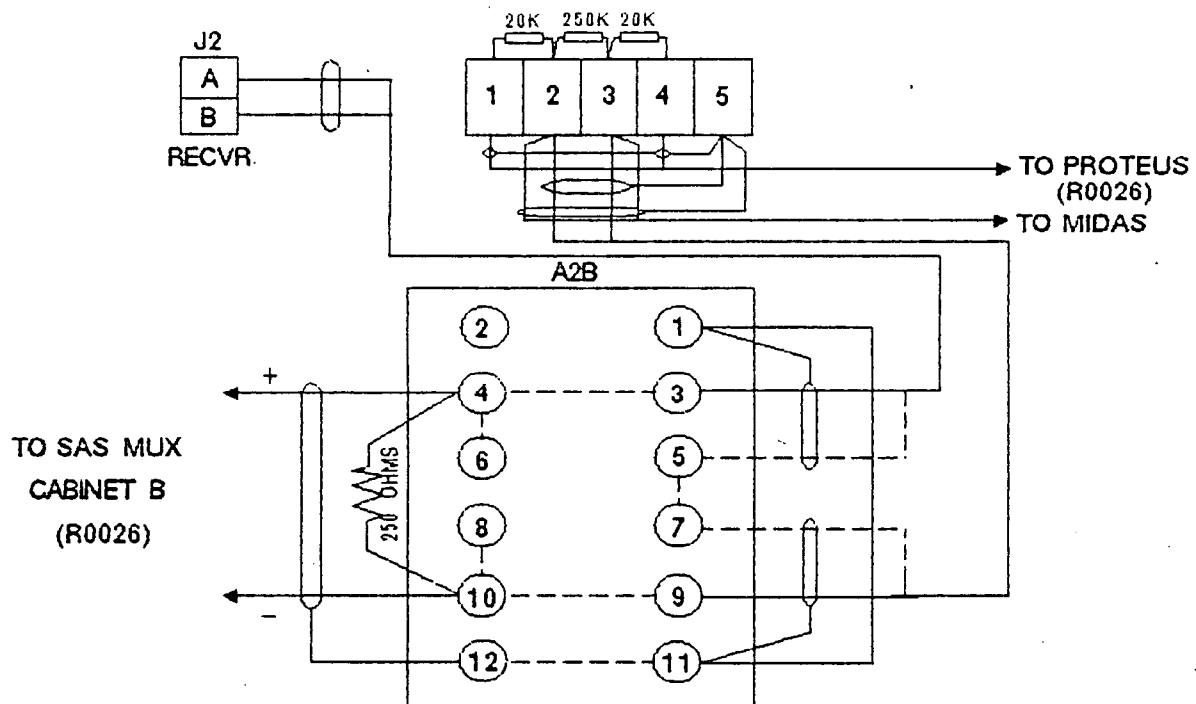
REF. DWG.: B208546  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>NA</i> DATE	
CONTAINMENT RADIATION (R25)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>8/18/87</i>	
CHECKED BY: <i>King Took</i>		ENG. <i>RMV</i> DATE <i>5/18/87</i>	
		SKETCH NO. SAS - 134 REV. 0 SH. 1 OF 1	

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DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R01, POINTS 2 (POS), 3 (NEG), AND 4 SHIELD..

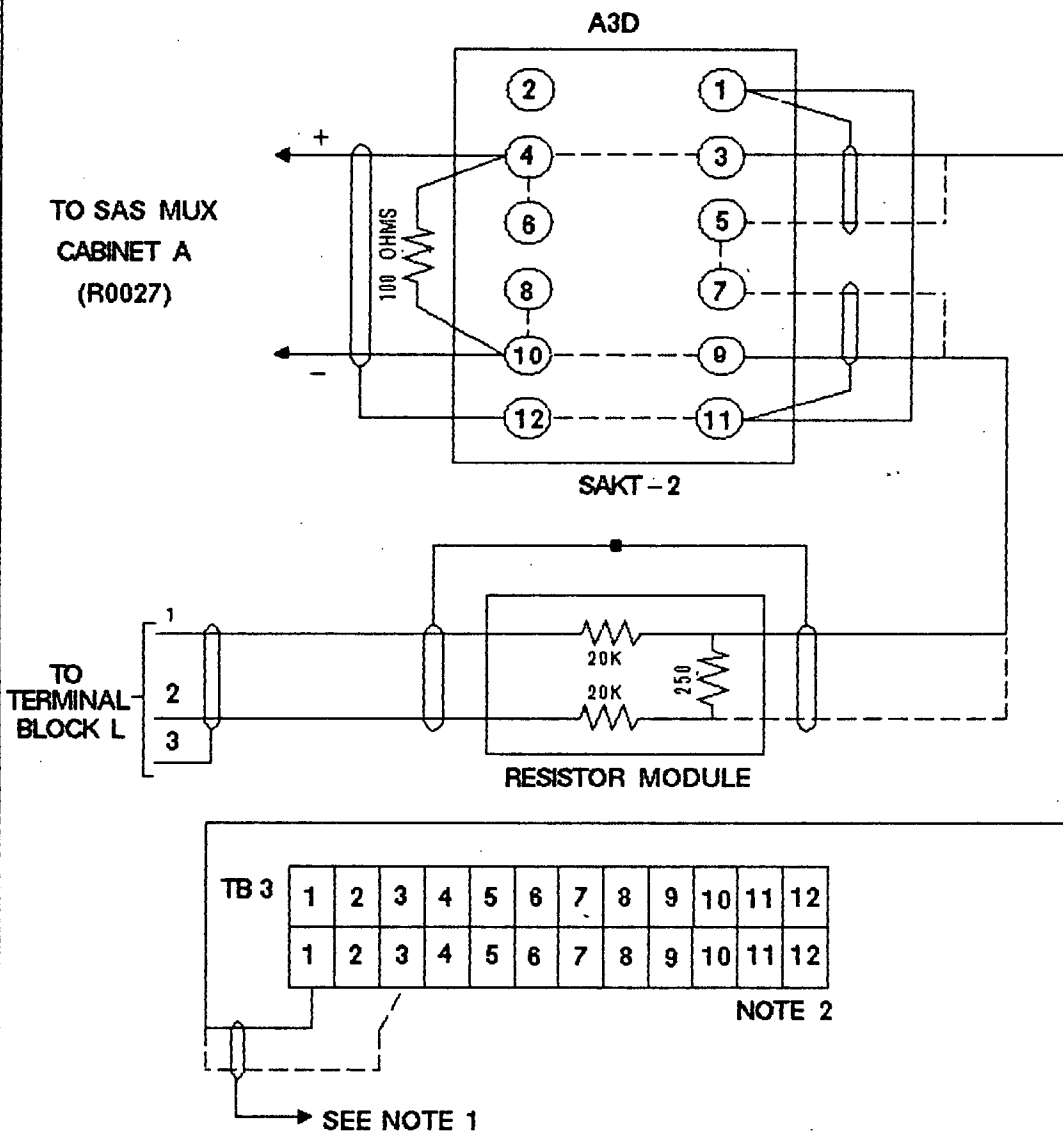
REF. DWG.: B208547  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	A P P R V E L S	MECH. PROGRAM	<b>CON EDISON ENG.</b> C&I SKETCH SKETCH NO. SAS - 135 REV. 0 SH. 1 OF 1
TITLE: SAS COMPUTER INTERFACE		ENG. <i>NA</i> DATE	
CONTAINMENT RADIATION (R26)	C&I	ENG. <i>JM</i> DATE <i>3/13/87</i>	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>LM</i> DATE <i>3/18/87</i>	
CHECKED BY: <i>King Tooh</i>			

REVISION

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record.

**DESIGN DETAIL**



- NOTE: 1.** SHIELD CONNECTED TO SHIELD ON WIRES A & B (DESTINATION H)  
**2.** EXISTING CONNECTIONS TO TB 3 ARE NOT SHOWN  
**3.** SAS SIGNAL DESTINATION: BTSCA 01R01, POINTS 14 (POS.), 15 (NEG.), AND 16 (SHIELD).  
**4.** THE PLANT VENT HI RAD CHANNEL IS SAFETY - RELATED. AN ACTION PAK AP4300 ISOLATING TRANSMITTER IS UTILIZED TO SEPARATE THE SAS AND PROTEUS COMPUTER INPUTS FROM THE SAFETY - RELATED PORTION OF THE CHANNEL (SEE REFERENCE 41).

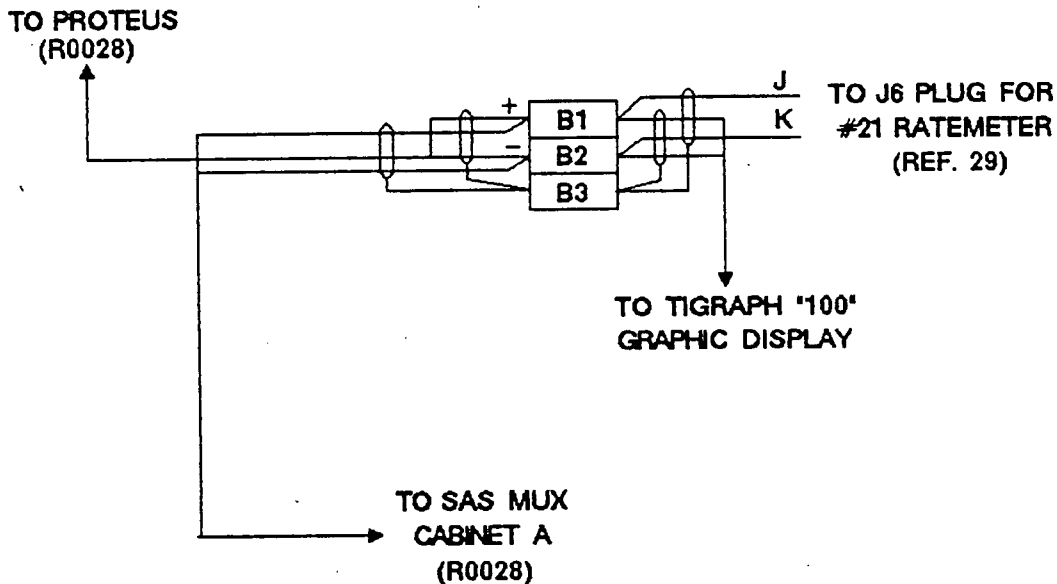
REF. DWG.: A208553  
 REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
PLANT VENT HI RAD (R27)	VLS	C&I	SKETCH NO. SAS - 136 REV. 0 SH. 1 OF 1
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 10/22/87	
CHECKED BY: <i>Rmcv</i>		ENG. <i>VLS</i> DATE 10/22/87	



# DESIGN DETAIL

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 FEI-860034  
 Rev. 1



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R04, POINTS 2 (POS.), 3 (NEG.), AND 4 (SHIELD).

### ENGINEERING JUSTIFICATION

THE VICTOREEN LOG RATEMETER 842-11 PROVIDES A 0-5 VDC ( $\pm 2\%$ ) COMPUTER OUTPUT (SEE PAGE 14, TABLE 3 OF REFERENCE 35). THE SAS INPUT CAN BE WIRED IN PARALLEL WITH THE EXISTING PROTEUS INPUT AND THE TIGRAPH "100" GRAPHIC DISPLAY.

THIS RAD SYSTEM IS NOT SAFETY RELATED, AND DOES NOT REQUIRE ISOLATION.

REF. DWG.: A208858  
 REF. SKETCH: SAS - REF.

REF. UDC: FEI-860034 Revision 1

STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STEAM LINE RAD LOOP 1 (R28)		C&I	SKETCH NO. SAS-137 REV. 1 SH. 1 OF 1
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 8/13/87	
CHECKED BY: <i>King Look</i>		ENG. <i>VSD</i> DATE 8-13-87	

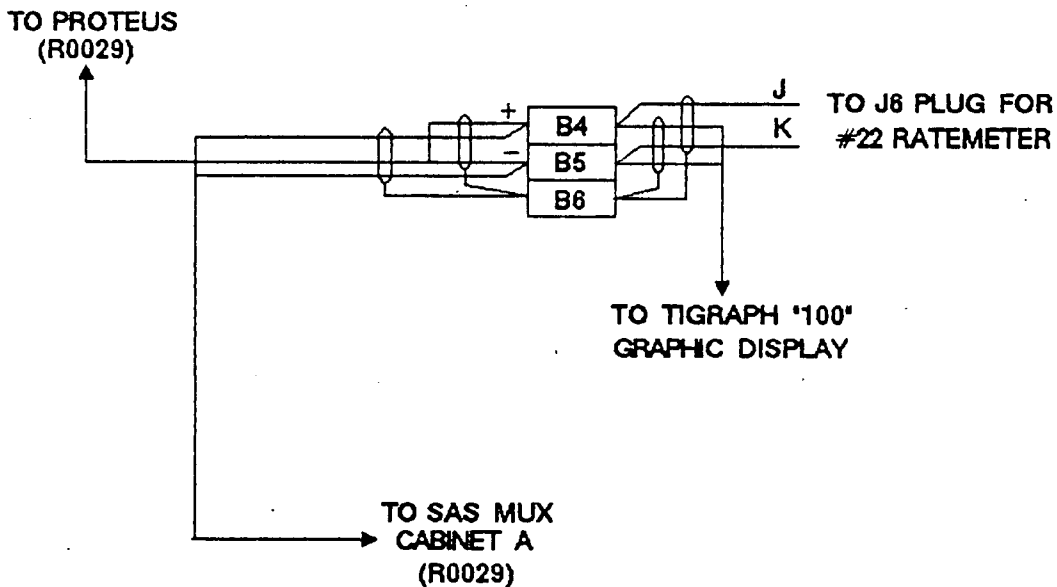
REVISION

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Incorporated  
FEI-880034  
Rev. 1

DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R01, POINTS 10 (POS.), 11 (NEG.), AND 12 (SHIELD).

ENGINEERING JUSTIFICATION

THE VICTOREEN LOG RATEMETER 842-11 PROVIDES A 0-5 VDC ( $\pm 2\%$ ) COMPUTER OUTPUT (SEE PAGE 14, TABLE 3 OF REFERENCE 35). THE SAS INPUT CAN BE WIRED IN PARALLEL WITH THE EXISTING PROTEUS INPUT AND THE TIGRAPH "100" GRAPHIC DISPLAY.

THIS RAD SYSTEM IS NOT SAFETY RELATED, AND DOES NOT REQUIRE ISOLATION.

REF. DWG.: A208858  
REF. SKETCH: SAS - REF.

REF. UDC: FEI-860034 Revision 1

STATION: INDIAN POINT 2	A P P R O V E S	MECH. PROGRAM	<b>CON EDISON ENG.</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STEAM LINE RAD LOOP 2 (R29)		C&I	SKETCH NO. SAS - 138 REV. 1 SH. 1 OF 1
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>8/13/87</i>	
CHECKED BY: <i>King Losh</i>		ENG. <i>VAD</i> DATE <i>8-13-87</i>	

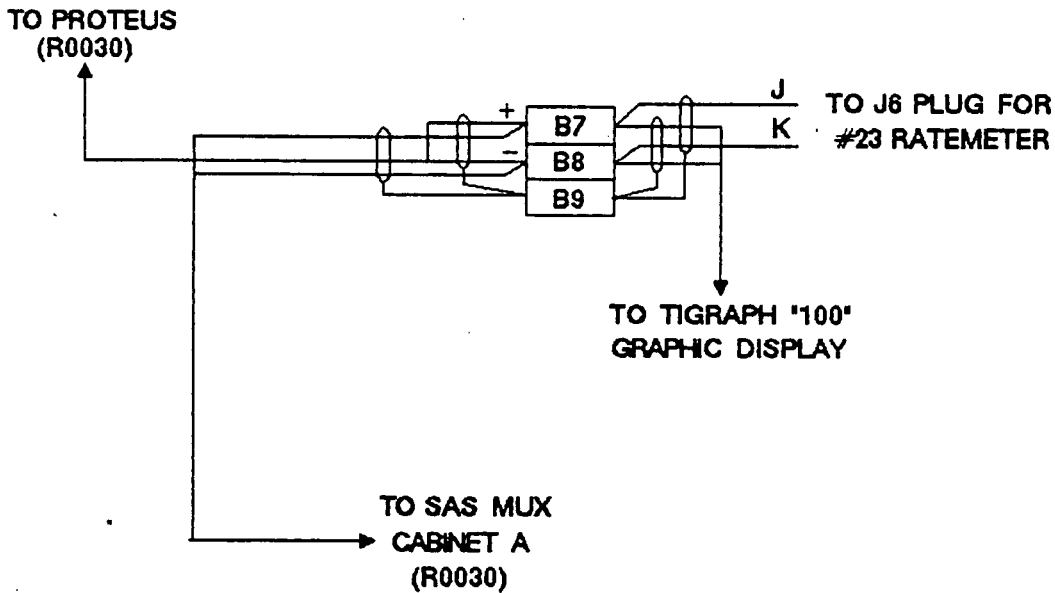
REVISION

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Incorporated  
FEI-860034  
Rev. 1

DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R03, POINTS 2 (POS.), 3 (NEG.), AND 4 (SHIELD).

ENGINEERING JUSTIFICATION

THE VICTOREEN LOG RATEMETER 842-11 PROVIDES A 0-5 VDC ( $\pm 2\%$ ) COMPUTER OUTPUT (SEE PAGE 14, TABLE 3 OF REFERENCE 35). THE SAS INPUT CAN BE WIRED IN PARALLEL WITH THE EXISTING PROTEUS INPUT AND THE TIGRAPH "100" GRAPHIC DISPLAY.

THIS RAD SYSTEM IS NOT SAFETY RELATED, AND DOES NOT REQUIRE ISOLATION.

REF. DWG.: A208858  
REF. SKETCH: SAS - REF.

REF. UDC: FEI-860034 Rev. 1

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG.</b> <b>C&amp;I SKETCH</b> SKETCH NO. SAS-139 REV. 1 SH. 1 OF 1
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STEAM LINE RAD LOOP 3 (R30)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>8/13/87</i>	
CHECKED BY: <i>King Tooh</i>		ENG. <i>VAD</i> DATE <i>8-13-87</i>	

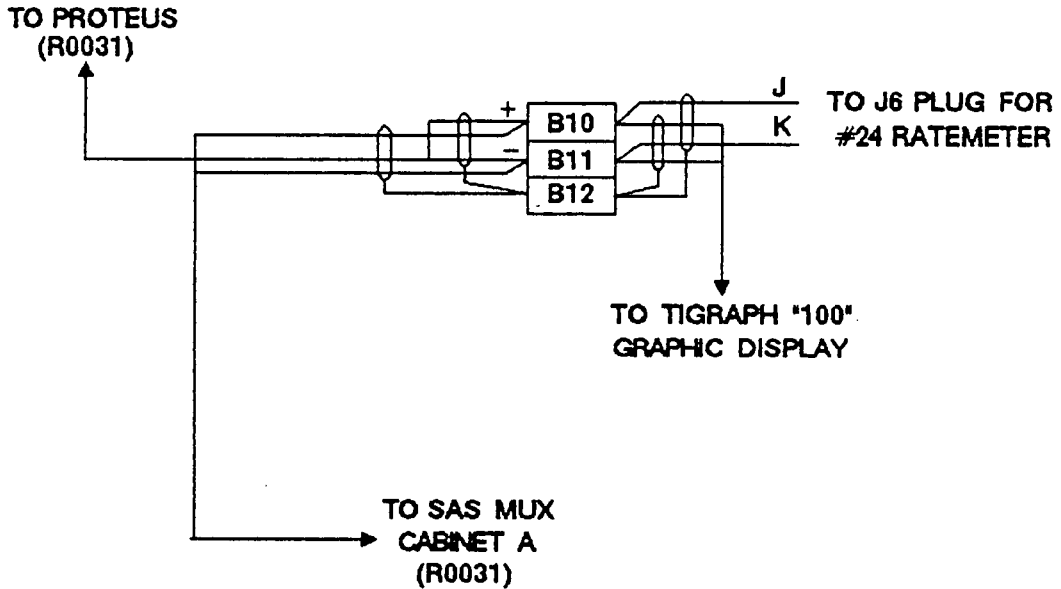
REVISION

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Incorporated  
FEI-860034  
Rev. 1

DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R02, POINTS 2 (POS.), 3 (NEG.), AND 4 (SHIELD).

ENGINEERING JUSTIFICATION

THE VICTOREEN LOG RATEMETER 842-11 PROVIDES A 0-5 VDC (+ 2%) COMPUTER OUTPUT (SEE PAGE 14, TABLE 3 OF REFERENCE 35). THE SAS INPUT CAN BE WIRED IN PARALLEL WITH THE EXISTING PROTEUS INPUT AND THE TIGRAPH "100" GRAPHIC DISPLAY.

THIS RAD SYSTEM IS NOT SAFETY RELATED, AND DOES NOT REQUIRE ISOLATION.

REF. DWG.: A208858  
REF. SKETCH: SAS - REF.

REF. UDC: FEI-860034 Rev. 1

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
STEAM LINE RAD LOOP 4 (R31)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 8/13/87	
CHECKED BY: <i>King Cook</i>		ENG. <i>VAS</i> DATE 8-13-87	SKETCH NO. SAS-140 REV. 1 SH. 1 OF 1

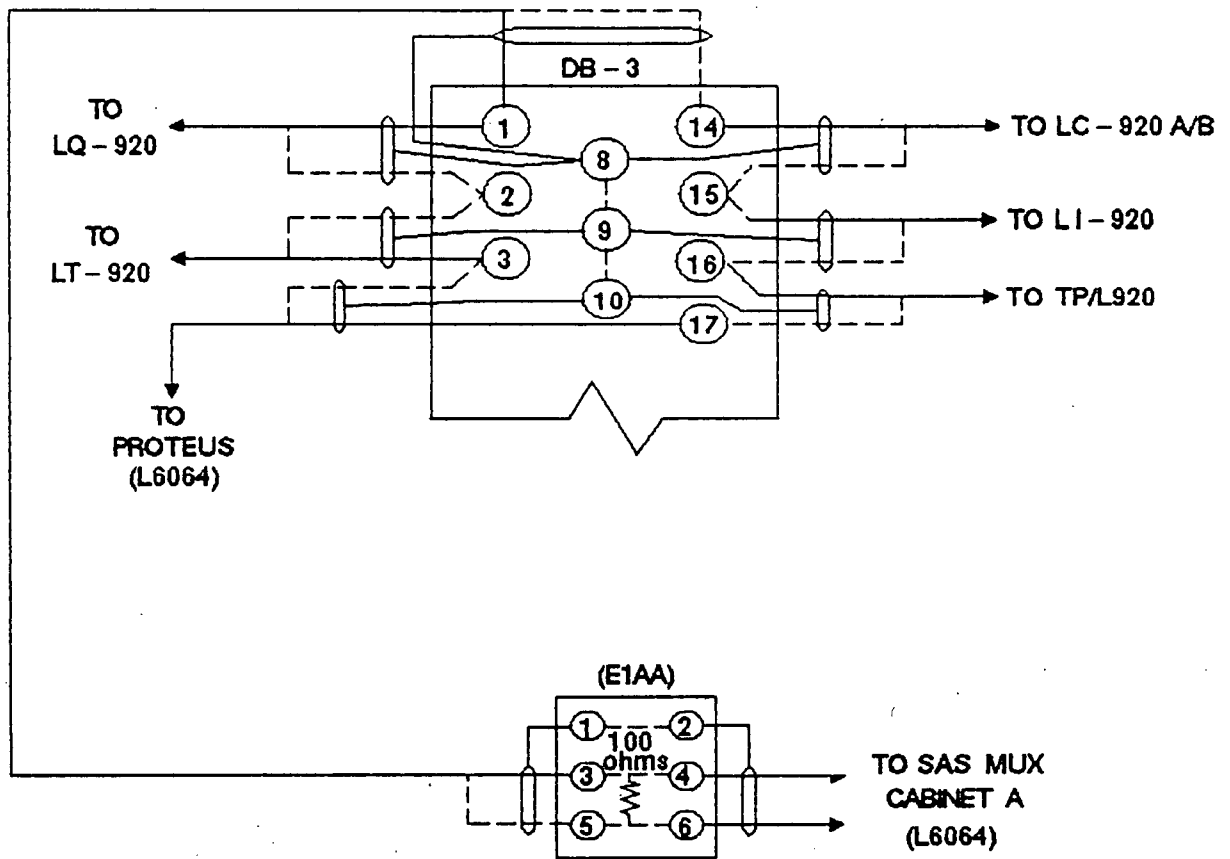
REVISION

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FEI-860063  
Rev. 0

DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R11, POINTS 10 (POS.), 11 (NEG.), AND 12 (SHIELD).

REF. DWG.: A225410  
REF. SKETCH: SAS-REF

REF. UDC: FEI-860063 REV. 0

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>U/A</i> DATE	
RWST LEVEL (LT-920)		C&I ENG. <i>TM</i> DATE <i>8/13/87</i>	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>VAD</i> DATE <i>8-13-87</i>	
CHECKED BY: <i>King Look</i>			SKETCH NO. SAS-141 REV. 1 SH. 1 OF 2

REVISION

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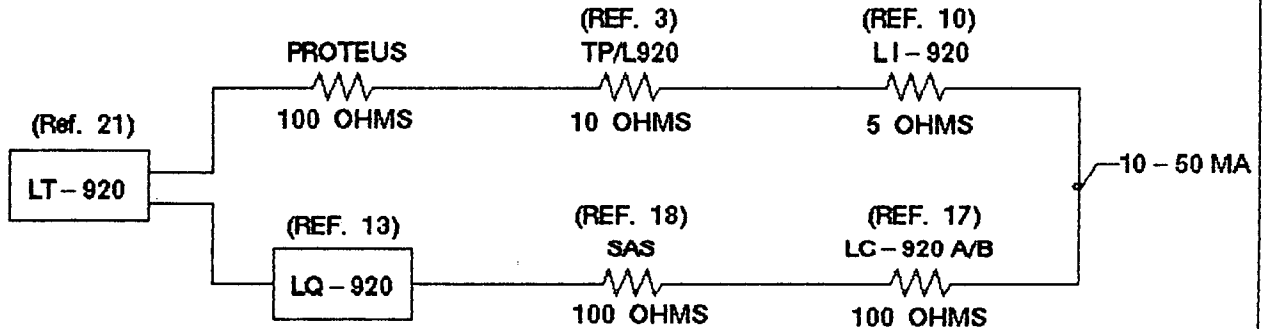
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FEI-860063  
Rev. 0

**IMPEDANCE CALCULATION**

**LT-920 REACTOR CONTROL CIRCUIT (Z EQUIV.)**



**ENGINEERING JUSTIFICATION**

LT-920 IS A FOXBORO MODEL NE11GM TRANSMITTER, PROVIDING A 10-50 MA OUTPUT INTO 975 OHMS (APPROXIMATE, 80 VDC POWER SUPPLY CONSIDERED). LQ-920 IS A FOXBORO MODEL 610AR POWER SUPPLY WHICH PROVIDES A NOMINAL 80 VDC OUTPUT. THE TOTAL IMPEDANCE OF THE LT-920 CIRCUIT WITH THE ADDITION OF THE SAS INPUT (100 OHMS) IS AS FOLLOWS:

TOTAL IMPEDANCE (Z EQUIV., OHMS) = 100 + 10 + 5 + 100 + 100 = 315

THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (100 OHMS), THE TOTAL IMPEDANCE (315 OHMS), FALLS WITHIN THE LOAD LIMIT (975 OHMS).

THE REFUELING WATER STORAGE TANK CHANNEL WILL BE UPGRADED TO CATEGORY 1 REQUIREMENTS, AND WILL BE CONSIDERED SAFETY-RELATED. AN ISOLATOR WILL BE PROVIDED TO SEPARATE THE SAS AND PROTEUS COMPUTER INPUTS FROM THE SAFETY-RELATED PORTION OF THE CHANNEL.

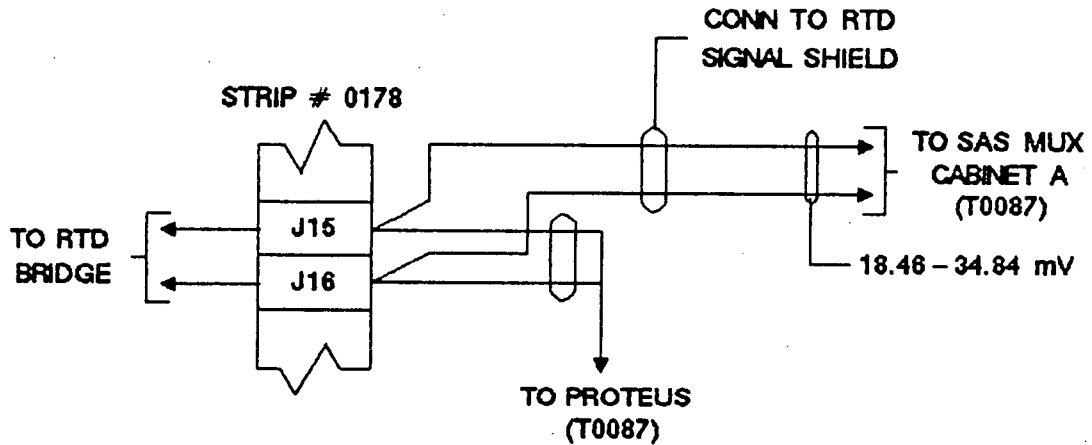
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG.</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
RWST LEVEL (LT-920)		C&I	SKETCH NO. SAS-141 REV. 1 SH. 2 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>10/22/87</i>	
CHECKED BY: <i>LMCJ</i>		ENG. <i>VAD</i> DATE <i>10/22/87</i>	

REVISION

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DESIGN DETAIL



TYPICAL FOR:

SAS  
MUX

JUNCTION BOX	SIGNAL	CAB	STRIP #	PNTS	PROTEUS ID	SAS ID	CAB	BTSCA	PTS.	SHLD
A1	JB - A1	01	0178	J15,16	T0087	T0087	A	01R12, +14, -15, 16		
A2	JB - A2	01	0176	K09,10	T0088	T0088	A	01R11, +31, -32 33		
B1	JB - B1	01	0177	J15,16	T0089	T0089	B	01R11, +2, -3, 4		
B2	JB - B2	01	0178	J13,14	T0090	T0090	B	01R10, +31, -32 33		

ENGINEERING JUSTIFICATION

CHANNELS JB - A1, A2, A3, A4 MONITOR THE TEMPERATURE AT REFERENCE JUNCTIONS A1, A2, B1, B2 RESPECTIVELY (TEMPERATURE RANGE 0 - 160 DEGREES). A VOLTAGE SIGNAL OF 18.46 TO 34.84 MV TO SAS CAN BE OBTAINED BY WIRING SAS IN PARALLEL TO PROTEUS AS SHOWN ABOVE.

THESE JUNCTION BOXES SERVE AS THE REFERENCE JUNCTION FOR THE INCORE T/C'S, WHICH HAVE BEEN DESIGNATED AS TYPE A VARIABLES PER NUREG 1.97. THE CURRENT INCORE T/C SYSTEM IS COMMERCIAL GRADE, AND THE UTILIZATION OF AN ISOLATOR TO SEPARATE THE COMPUTER SYSTEMS WOULD BE ACADEMIC. PRESENTLY, THE INCORE T/C SYSTEM IS IN THE PROCESS OF BEING REPLACED TO MEET THE INTENT OF NUREG 1.97 REV 3 AND NUREG - 0737.

REF. DWG.: B228227

REF. SKETCH: SAS - REF

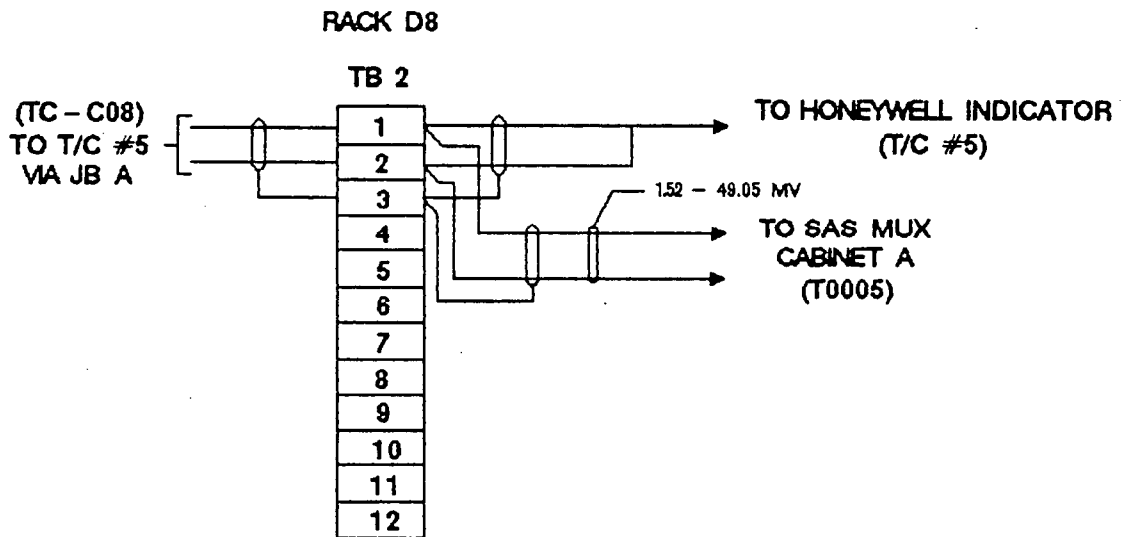
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
INCORE TC'S JB - A1, A2, B1, B2		C&I	SKETCH NO. SAS - 142
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 8/13/87	
CHECKED BY: <i>King Look</i>		ENG. <i>VSD</i> DATE 8-13-87	

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DESIGN DETAIL



NOTE: THE ABOVE SKETCH IS SPECIFIC TO T/C #5 (TC - C08), BUT IT REPRESENTATIVE OF ALL INCORE THERMOCOUPLE INPUT CONNECTIONS TO SAS. SEE TABLE ON SHEET 2 FOR ALL THERMOCOUPLE CONNECTIONS TO THE SAS COMPUTER.

REF. DWG.: A228236  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	A P P R O V E S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
INCORE THERMOCOUPLES		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 8/13/87	SKETCH NO. SAS-143
CHECKED BY: <i>King Cook</i>		ENG. <i>VAD</i> DATE 8.13.87	REV. 0 SH. 1 OF 2



REVISION

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TYPICAL FOR:

T/C #	JB	RACK D8			SAS	MUX			IND PNT	CMPTR ADDRSS
		TB	POINTS	SHLD	CAB	BTSCA	POINTS	SHIELD		
TC-C08	A	2	+1, -2	3	A	01R01	+27 29	5	5	T0005
TC-E04	A	2	+7 -8	9	A	01R01	+31 -32	3	7	T0007
TC-E08	A	2	+10 -11	12	A	01R02	+27 -28	29	8	T0008
TC-E10	A	3	+1 -2	3	A	01R02	+31 -32	33	9	T0009
TC-F12	A	3	+4 -5	6	A	01R03	+27 -28	29	10	T0010
TC-G09	A	3	+10 -11	12	A	01R03	+31 -32	33	12	T0012
TC-H03	A	4	+7 -8	9	A	01R04	+27 -28	29	15	T0015
TC-H08	A	4	+10 -11	12	A	01R05	+27 -28	29	16	T0016
TC-H10	A	5	+1 -2	3	A	01R04	+31 -32	33	17	T0017
TC-H13	A	5	+4 -5	6	A	01R05	+31 -32	33	18	T0018
TC-J10	A	5	+7 -8	9	A	01R06	+27 -28	29	19	T0019
TC-J11	A	5	+10 -11	12	A	01R07	+27 -28	29	20	T0020
TC-K03	A	6	+1 -2	3	A	01R06	+31 -32	33	21	T0021
TC-L12	A	6	+10 -11	12	A	01R07	+31 -32	33	24	T0024
TC-M05	A	7	+1 -2	3	A	01R08	+27 -28	29	25	T0025
TC-M08	A	7	+4 -5	6	A	01R09	+31 -32	33	26	T0026
TC-M10	A	7	+7 -8	9	A	01R08	+31 -32	33	27	T0027
TC-N08	A	8	+1 -2	3	A	01R10	+31 -32	33	29	T0029
TC-L07	B	10	+1 -2	3	B	01R10	+23 -24	25	57	T0057
TC-L11	B	10	+4 -5	6	B	01R09	+31 -32	33	58	T0058
TC-D04	B	11	+4 -5	6	B	01R01	+27 -28	29	38	T0038
TC-D09	B	11	+10 -11	12	B	01R01	+31 -32	33	40	T0040
TC-E05	B	12	+4 -5	6	B	01R03	+27 -28	29	42	T0042
TC-E11	B	12	+7 -8	9	B	01R03	+31 -32	33	43	T0043
TC-F05	B	13	+1 -2	3	B	01R04	+31 -32	33	45	T0045
TC-F09	B	13	+4 -5	6	B	01R05	+27 -28	29	46	T0046
TC-G04	B	13	+7 -8	9	B	01R05	+31 -32	33	47	T0047
TC-G08	B	13	+10 -11	12	B	01R06	+27 -28	29	48	T0048
TC-H05	B	14	+1 -2	3	B	01R06	+31 -32	33	49	T0049
TC-H09	B	14	+4 -5	6	B	01R07	+27 -28	29	50	T0050
TC-J07	B	14	+10 -11	12	B	01R08	+27 -28	29	52	T0052
TC-K11	B	15	+1 -2	3	B	01R07	+31 -32	33	53	T0053
TC-K13	B	15	+4 -5	6	B	01R08	+31 -32	33	54	T0054
TC-L05	B	15	+10 -11	12	B	01R09	+27 -28	29	56	T0056
TC-N09	B	17	+1 -2	3	B	01R10	+27 -28	29	61	T0061
TC-D07	B	11	+7 -8	9	B	01R02	+31 -32	33	39	T0039

ENGINEERING JUSTIFICATION

A VOLTAGE SIGNAL OF 1.52 TO 49.05 MV TO SAS CAN BE OBTAINED BY WIRING SAS IN PARALLEL TO THE HONEYWELL INDICATOR VIA THE APPROPRIATE TERMINAL BLOCK IN RACK D8.

THE INCORE THERMOCOUPLE SYSTEM HAVE BEEN DESIGNATED AS A TYPE A VARIABLE PER NUREG 1.97. PRESENTLY, THE INCORE THERMOCOUPLE SYSTEM IS COMMERCIAL GRADE, AND THE UTILIZATION OF ISOLATORS TO SEPARATE SAS WOULD BE ACADEMIC. THE INCORE THERMOCOUPLE SYSTEM IS CURRENTLY IN THE PROCESS OF BEING REPLACED, AND THE ANALOG T/C'S WILL BE REPLACED BY A DIGITAL DATA LINK.

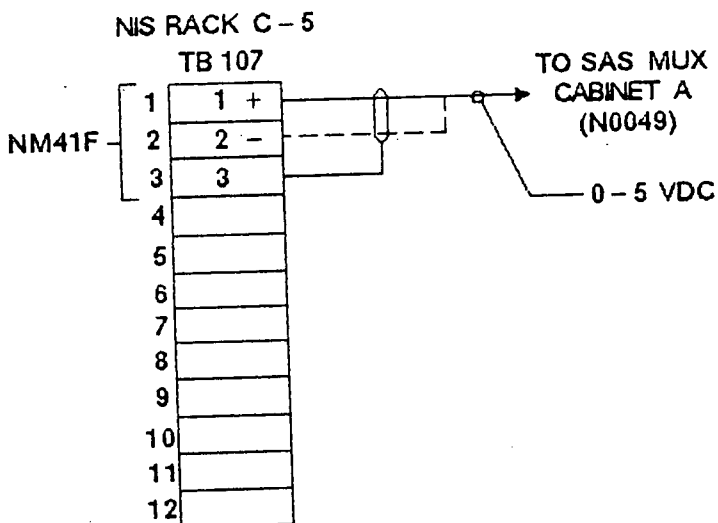
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
INCORE THERMOCOUPLES		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>JM</i> DATE <i>8/17/87</i>	
CHECKED BY: <i>King Cook</i>		ENG. <i>VSD</i> DATE <i>8.14.87</i>	SKETCH NO. SAS-143 REV. 0 SH. 2 OF 2

REVISION

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Issued for record.

DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R06, POINTS 19 (POS.), 20 (NEG.), AND 21 (SHIELD).

ENGINEERING JUSTIFICATION:

THE POWER RANGE CHANNEL 41 (QUAD4) DETECTOR Q SIGNAL PROVIDES CURRENT SIGNALS TO SUMMING AND LEVEL AMPLIFIER NM310. NM310 PROVIDES A 0-10 VDC SIGNAL TO ISOLATION AMPLIFIER NM303, WHICH PROVIDES AN ADJUSTABLE 0-5 VDC SIGNAL AT TB-107 (POINTS 1, 2, AND 3), IN THE NIS RACK C-5. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE (SEE SECTION 2.2.4.1.4, FIGURE 2-9, AND FIGURE 10-25 SHEET 1 OF 8 IN REFERENCE 28).

REF. DWG.: 9321 - F - 3313  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
PWR RNG CH41 (QUAD4) DET Q (NM41F)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>4/20/87</i>	
CHECKED BY: <i>King Lock</i>		ENG. <i>VAD</i> DATE <i>4-20-87</i>	SKETCH NO. SAS - 144 REV. 0 SH. 1 OF 1

REVISION

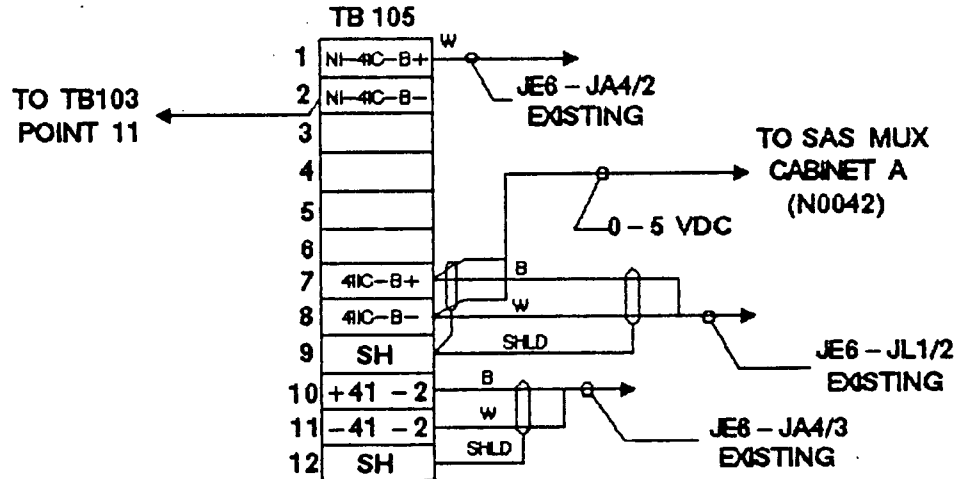
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Corporated  
FEI-860036  
Revision 0.

DESIGN DETAIL

NIS RACK C-5



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R07, POINTS 14 (POS.), 15 (NEG.), AND 16 (SHIELD).

ENGINEERING JUSTIFICATION:

THE POWER RANGE CHANNEL 41 (QUAD 4) DETECTOR Q BOTTOM SIGNAL PROVIDES A 0-2.5 VDC SIGNAL TO ISOLATION AMPLIFIER NM-302. NM-302 PROVIDES AN ADJUSTABLE 0-5 VDC SIGNAL AT TB-105 (POINTS 7, 8, AND 9), IN THE NIS RACK C-5. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE (SEE SECTION 2.2.4.1.3, FIGURE 2-9, AND FIGURE 10-25 SHEET 1 OF 8 IN REFERENCE 28).

REF. DWG.: 9321-F-3313 REF. UDC: FEI-860036 REV. 0.  
REF. SKETCH: SAS-REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG.	
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE		C&I SKETCH
PWR RING CH41(QUAD4) DET Q BOT (NM41D)		C&I	ENG. <i>TM</i> DATE 4/17/87	SKETCH NO. SAS-145 REV. 1 SH. 1 OF 1
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>VAD</i> DATE 4-17-87		
CHECKED BY: <i>King Laska</i>				

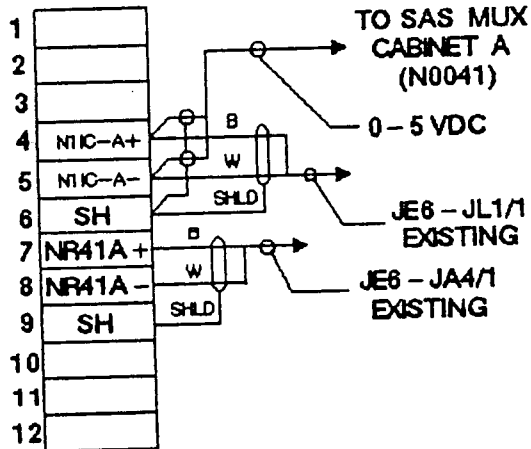
REVISION

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Incorporated  
FEI-860038  
Revision 0.

DESIGN DETAIL

NIS RACK C-5  
TB 104



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R07, POINTS 19 (POS.), 20 (NEG.), AND 21 (SHIELD).

ENGINEERING JUSTIFICATION:

THE POWER RANGE CHANNEL 41 (QUAD 4) DETECTOR Q TOP SIGNAL PROVIDES A 0-2.5 VDC SIGNAL TO ISOLATION AMPLIFIER NM301. NM301 PROVIDES AN ADJUSTABLE 0-5 VDC SIGNAL AT TB-104 (POINTS 4, 5, AND 6) AT THE NIS RACK C-5. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE (SEE SECTION 2.2.4.1.3, FIGURE 2-9, AND FIGURE 10-25 SHEET 1 OF 8 IN REFERENCE 28).

REF. DWG.: 9321-F-3313    REF. UDC: FEI-860038 REV 0  
REF. SKETCH: SAS-REF

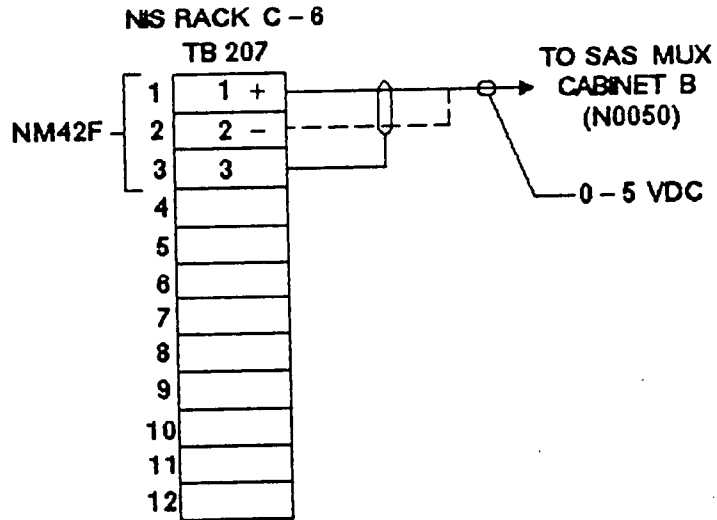
STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>R/A</i> DATE	
PWR RING CH41(QUAD4) DET Q TOP (NM41C)		C&I	SKETCH NO. SAS-146 REV. 1 SH. 1 OF 1
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 7/17/82	
CHECKED BY: <i>King Loh</i>		ENG. <i>VAS</i> DATE 4-17-87	

REVISION

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Issued for record.

**DESIGN DETAIL**



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R07, POINTS 10 (POS.), 11 (NEG.), AND 12 (SHIELD).

**ENGINEERING JUSTIFICATION:**

THE POWER RANGE CHANNEL 42 (QUAD 2) DETECTOR Q SIGNAL PROVIDES CURRENT SIGNALS TO SUMMING AND LEVEL AMPLIFIER NM310. NM310 PROVIDES A 0-10 VDC SIGNAL TO ISOLATION AMPLIFIER NM303, WHICH PROVIDES AN ADJUSTABLE 0-5 VDC SIGNAL AT TB-207 (POINTS 1, 2, AND 3), IN THE NIS RACK C-8. THE SAS SIGNAL CAN THEREFORE BE IMPLEMENTED HERE (SEE SECTION 2.2.4.1.4, FIGURE 2-9, AND FIGURE 10-25 SHEET 3 OF 8 IN REFERENCE 28).

REF. DWG.: 9321 - F - 3314  
REF. SKETCH: SAS - REF

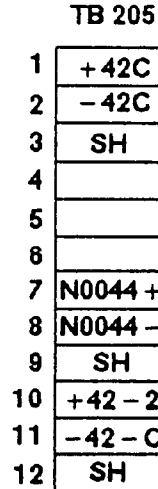
STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
PWR RNG CH42 (QUAD2) DET Q (NM42F)		ENG. <i>JM</i> DATE <i>4/17/87</i>	SKETCH NO. SAS-147
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>VAS</i> DATE <i>4-17-87</i>	REV. 0 SH. 1 OF 1
CHECKED BY: <i>King Look</i>			

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Issued for record.

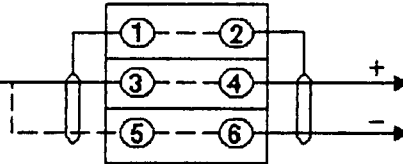
DESIGN DETAIL

NIS RACK C - 6



NOTE 1

TB 205A



TO PROTEUS (N0044)

0 - 5 VDC

- NOTES: 1. EXISTING CONNECTIONS TO TB 205 (OTHER THAN POINTS 7, 8, AND 9) ARE NOT SHOWN.  
 2. SAS SIGNAL DESTINATION: BTSCA 01R07, POINTS 6 (POS.), 7 (NEG.), AND 8 (SHIELD).

ENGINEERING JUSTIFICATION:

THE POWER RANGE CHANNEL 42 (QUAD 2) DETECTOR Q BOTTOM SIGNAL PROVIDES A 0 - 2.5 VDC INPUT TO ISOLATION AMPLIFIER NM302. NM302 PROVIDES AN ADJUSTABLE 0 - 5 VDC SIGNAL AT TB - 205 (POINTS 7, 8, AND 9), IN THE NIS RACK C - 6. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE (SEE SECTION 2.2.4.1.3, FIGURE 2 - 9, AND FIGURE 10 - 25 SHEET 3 OF 8 IN REFERENCE 28).

REF. DWG.: 9321 - F - 3314  
 REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
PWR RNG CH 42 (QUAD 2) DET Q BOT (NM42D)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 4/17/87	
CHECKED BY: <i>King Loda</i>		ENG. <i>VAS</i> DATE 4-17-87	SKETCH NO. SAS - 148 REV. 0 SH. 1 OF 1

REVISION

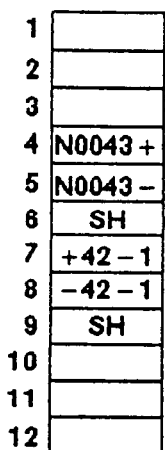
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**DESIGN DETAIL**

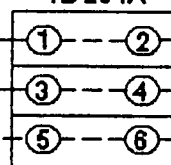
NIS RACK C-6

TB 204



NOTE 1

TB 204A



TO SAS MUX  
CABINET B  
(N0043)

TO PROTEUS  
(N0043)

0-5 VDC

- NOTES: 1. EXISTING CONNECTIONS TO TB 204 (OTHER THAN POINTS 4, 5, AND 6) ARE NOT SHOWN.  
2. SAS SIGNAL DESTINATION: BTSCA 01R07, POINTS 19 (POS.), 20 (NEG.), AND 21 (SHIELD).

ENGINEERING JUSTIFICATION:

THE POWER RANGE CHANNEL 42 (QUAD 2) DETECTOR Q TOP SIGNAL PROVIDES A 0-2.5 VDC INPUT TO ISOLATION AMPLIFIER NM301. NM301 PROVIDES AN ADJUSTABLE 0-5 VDC SIGNAL AT TB-204 (POINTS 4, 5, AND 6), IN THE NIS RACK C-6. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE (SEE SECTION 2.2.4.1.3, FIGURE 2-9, AND FIGURE 10-25 SHEET 3 OF 8 IN REFERENCE 28).

REF. DWG.: 9321-F-3314  
REF. SKETCH: SAS-REF

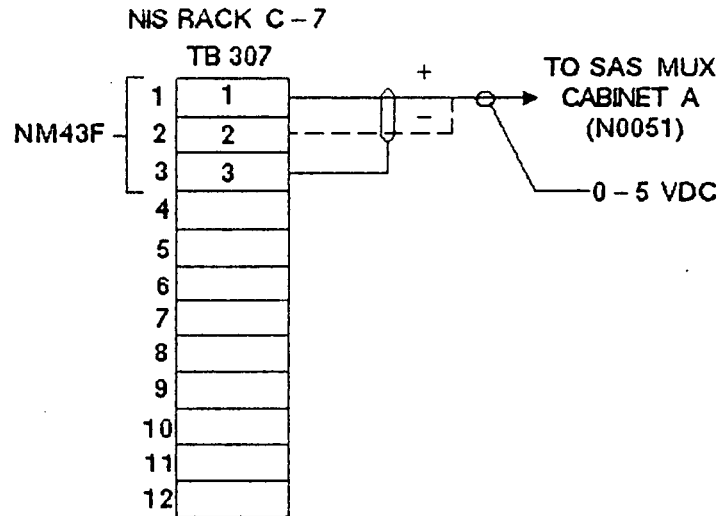
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG. C&J SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
PWR RNG CH42 (QUAD2) DET Q TOP (NM42C)		C&J	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>JM</i> DATE <i>4/17/87</i>	
CHECKED BY: <i>King Loh</i>	ENG. <i>VAD</i> DATE <i>4-17-87</i>	SKETCH NO. SAS-149	REV. 0 SH. 1 OF 1

REVISION

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**DESIGN DETAIL**



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R13, POINTS 23 (POS.), 24 (NEG.), AND 25 (SHIELD).

ENGINEERING JUSTIFICATION:

THE POWER RANGE CHANNEL 43 (QUAD 1) DETECTOR Q SIGNAL PROVIDES CURRENT SIGNALS TO SUMMING AND LEVEL AMPLIFIER NM310. NM310 PROVIDES A 0-10 VDC. SIGNAL TO ISOLATION AMPLIFIER NM303, WHICH PROVIDES AN ADJUSTABLE 0-5 VDC SIGNAL AT TB-307 (POINTS 1, 2, AND 3) IN THE NIS RACK C-7. THE SAS SIGNAL CAN THEREFORE BE IMPLEMENTED HERE (SEE SECTION 2.2.4.1.4, FIGURE 2-9, AND FIGURE 10-25 SHEET 5 OF 8 IN REFERENCE 28).

REF. DWG.: A228129  
REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APP R V L S	MECH. PROGRAM	CON EDISON ENG: C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
PWR RNG CH43 (QUAD1) DET Q (NM43F)		ENG. <i>TM</i> DATE <i>4/20/87</i>	SKETCH NO. SAS-150
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>V/LD</i> DATE <i>4.20.87</i>	REV. 0 SH. 1 OF 1
CHECKED BY: <i>King Tooh</i>			

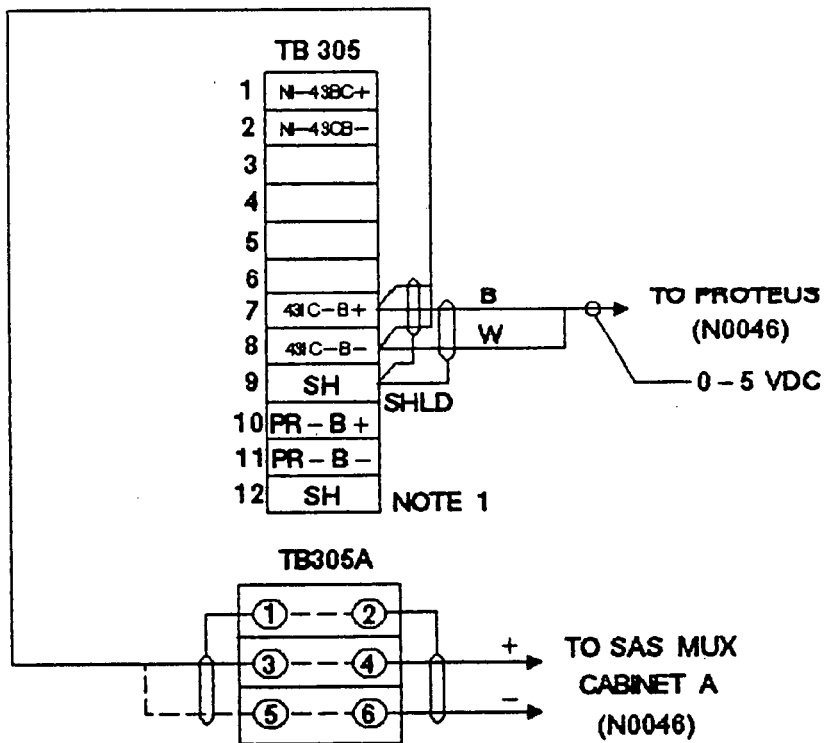


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**DESIGN DETAIL**



- NOTE: 1.** EXISTING CONNECTIONS TO TB 305 TERMINAL POINTS (OTHER THAN 7, 8, & 9) ARE NOT SHOWN.  
**2.** SAS SIGNAL DESTINATION: BTSCA 01R13, POINTS 19 (POS.), 20 (NEG.), AND 21 (SHIELD).

**ENGINEERING JUSTIFICATION:**

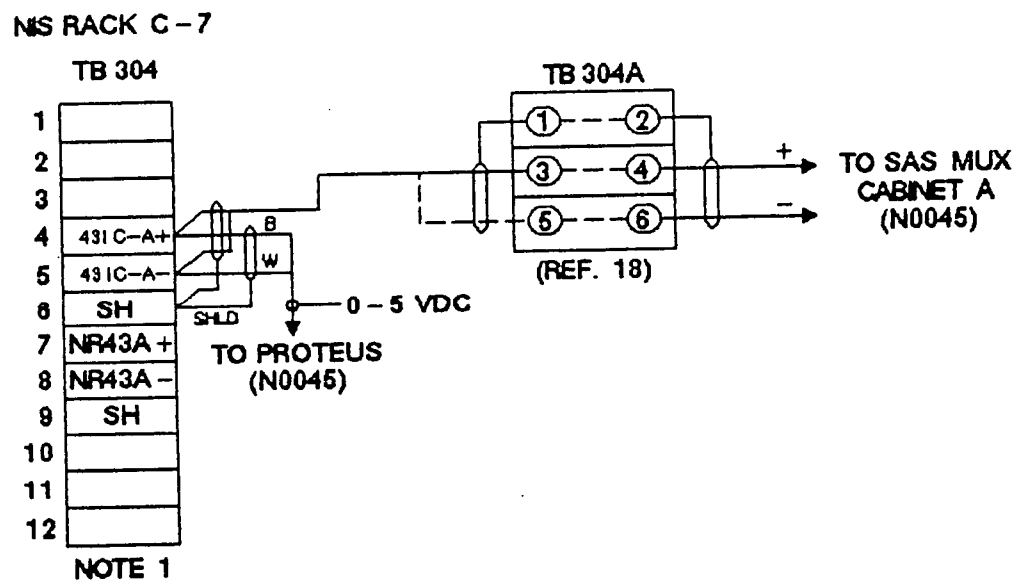
THE POWER RANGE CHANNEL 43 (QUAD 1) DETECTOR Q BOTTOM SIGNAL PROVIDES A 0-2.5 VDC INPUT TO ISOLATION AMPLIFIER NM302. NM302 PROVIDES AN ADJUSTABLE 0-5 VDC SIGNAL AT TB-305 (POINTS 7, 8, AND 9), IN THE NIS RACK C-7. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE (SEE SECTION 2.2.4.1.3, FIGURE 2-8, AND FIGURE 10-25 SHEET 5 OF 8 IN REFERENCE 28).

REF. DWG.: A228129  
 REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	APP R V L S	MECH. PROGRAM	CON EDISON ENG. C&J SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>MA</i> DATE	
PWR RNG CH43 (QUAD1) DET Q BOT (NM43D)		C&J	SKETCH NO. SAS-151 REV. 0 SH. 1 OF 1
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 4/17/87	
CHECKED BY: <i>King Lock</i>		ENG. <i>VAS</i> DATE 4-17-87	

REVISION
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## DESIGN DETAIL



- NOTES:**
- EXISTING CONNECTIONS TO TB 304 (OTHER THAN POINTS 4, 5, AND 6) ARE NOT SHOWN.
  - SAS SIGNAL DESTINATION: BTSCA 01R07, POINTS 23 (POS.), 24 (NEG.), AND 25 (SHIELD).

**ENGINEERING JUSTIFICATION:**

THE POWER RANGE CHANNEL 43 (QUAD 1) DETECTOR Q TOP SIGNAL PROVIDES A 0-2.5 VDC INPUT TO ISOLATION AMPLIFIER NM301. NM301 PROVIDES AN ADJUSTABLE 0-5 VDC SIGNAL AT TB-304 (POINTS 4, 5, AND 6), IN THE NIS RACK C-7. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE (SEE SECTION 2.2.4.1.3, FIGURE 2-9, AND FIGURE 10-25 SHEET 5 OF 8 IN REFERENCE 28).

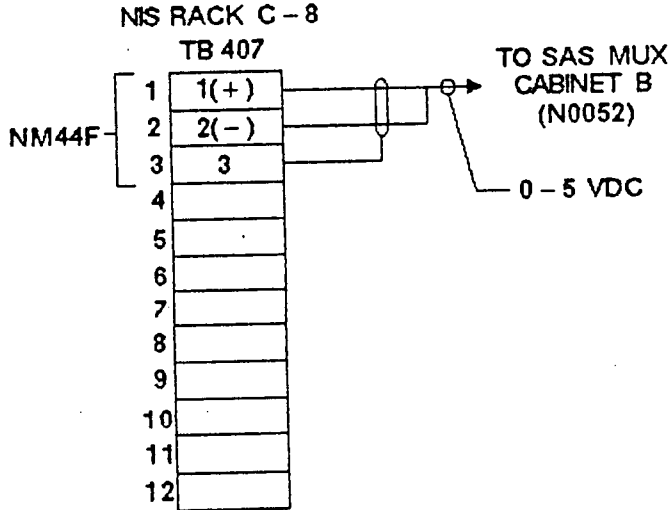
REF. DWG.: A228129  
 REF. SKETCH: SAS-REF

STATION: INDIAN POINT 2	A P P R V E D	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
PWR RNG CH43 (QUAD1) DET Q TOP (NM43C)		C&I ENG. <i>TM</i> DATE <i>4/17/87</i>	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>VSD</i> DATE <i>4-17-87</i>	
CHECKED BY: <i>King Loh</i>			SKETCH NO. SAS-152 REV. 0 SH. 1 OF 1

REVISION

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 INCORPORATED  
 FEI-880023  
 REVISION 1

DESIGN DETAIL



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R10, POINTS 14 (POS.), 15 (NEG.), AND 16 (SHIELD).

ENGINEERING JUSTIFICATION:

THE POWER RANGE CHANNEL 44 (QUAD 3) DETECTOR Q SIGNAL PROVIDES CURRENT SIGNALS TO SUMMING AND LEVEL AMPLIFIER NM310. NM310 PROVIDES A 0-10 VDC SIGNAL TO ISOLATION AMPLIFIER NM303, WHICH PROVIDES AN ADJUSTABLE 0-5 VDC SIGNAL AT TB-407 (POINTS 1, 2, AND 3) IN THE NIS RACK C-8. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE (SEE SECTION 2.2.4.1.4, FIGURE 2-9, AND FIGURE 10-25 SHEET 7 OF 8 IN REFERENCE 28).

REF. DWG.: 9321-F-3316 REF. UDC: FEI-860023 REV 1  
 REF. SKETCH: SAS-REF

STATION: INDIAN POINT 2	A P P R O V E S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>NA</i> DATE	
PWR RNG CH44 (QUAD3) DET Q (NM44F)		C&I ENG. <i>TM</i> DATE <i>8/18/87</i>	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>R.M.V.</i> DATE <i>8/18/87</i>	
CHECKED BY: <i>King Jock</i>			SKETCH NO. SAS-153 REV. 1 SH. 1 OF 1

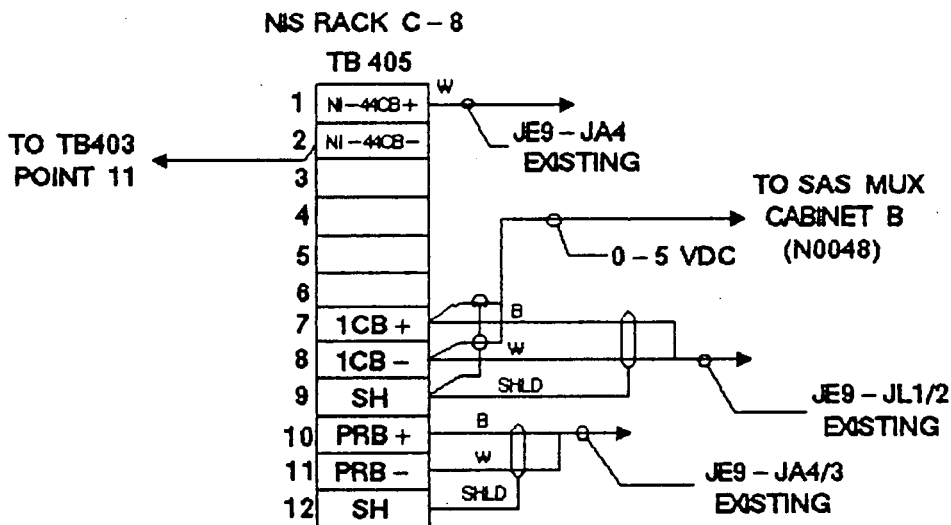
REVISION

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Incorporated  
FEI-860023  
Revision 1.

**DESIGN DETAIL**



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R010, POINTS 10 (POS.), 11 (NEG.), AND 12 (SHIELD).

ENGINEERING JUSTIFICATION:

THE POWER RANGE CHANNEL 44 (QUAD 3) DETECTOR Q BOTTOM SIGNAL PROVIDES A 0-2.5 VDC INPUT TO ISOLATION AMPLIFIER NM302. NM302 PROVIDES AN ADJUSTABLE 0-5 VDC SIGNAL AT TB-405 (POINTS 7, 8, AND 9) AT THE NIS RACK C-8. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE (SEE SECTION 2.2.4.1.3, FIGURE 2-9, AND FIGURE 10-25 SHEET 7 OF 8 IN REFERENCE 28).

REF. DWG.: 9321-F-3316 REF. UDC: FEI-860023 REV. 1  
REF. SKETCH: SAS-REF

STATION: INDIAN POINT 2  
TITLE: SAS COMPUTER INTERFACE  
PWRRNG CH44(QUAD3) DET Q BOT (NM44D)  
SKETCHED BY: VICTOR S. D'AMORE  
CHECKED BY: *King Look*

A  
P  
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V  
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S  
MECH. PROGRAM  
ENG. *N/A* DATE  
C&I  
ENG. *TM* DATE *4/17/87*  
ENG. *VAS* DATE *4.17.87*

**CON EDISON ENG.**  
**C&I SKETCH**  
SKETCH NO. SAS-154  
REV. 1 SH. 1 OF 1

REVISION

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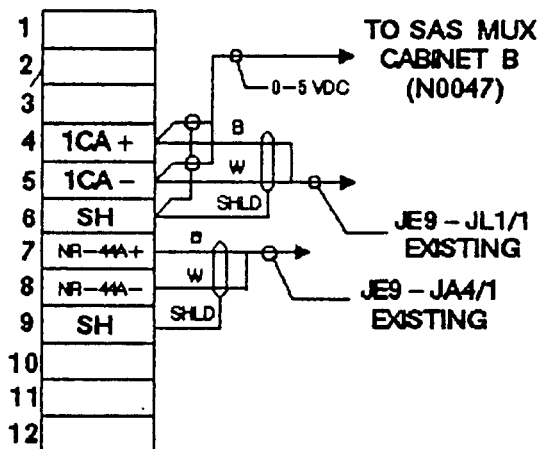
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Incorporated  
FEI-860029  
Revision 1.

DESIGN DETAIL

NIS RACK C - 8

TB 404



NOTE: SAS SIGNAL DESTINATION: BTSCA 01R06, POINTS 23 (POS.), 24 (NEG.), AND 25 (SHIELD).

ENGINEERING JUSTIFICATION:

THE POWER RANGE CHANNEL 44 (QUAD 3) DETECTOR Q TOP SIGNAL PROVIDES A 0-2.5 VDC INPUT TO ISOLATION AMPLIFIER NM301. NM301 PROVIDES AN ADJUSTABLE 0-5 VDC SIGNAL AT TB-404 (POINTS 4, 5, AND 6) IN THE NIS RACK C-8. THE SAS SIGNAL CAN THEREFORE BE IMPLEMENTED HERE (SEE SECTION 2.2.4.1.3, FIGURE 2-9, AND FIGURE 10-25 SHEET 7 OF 8 IN REFERENCE 28).

REF. DWG.: 9321 - F - 3316    REF. UDC: FEI - 860023 REV. 1  
REF. SKETCH: SAS - REF

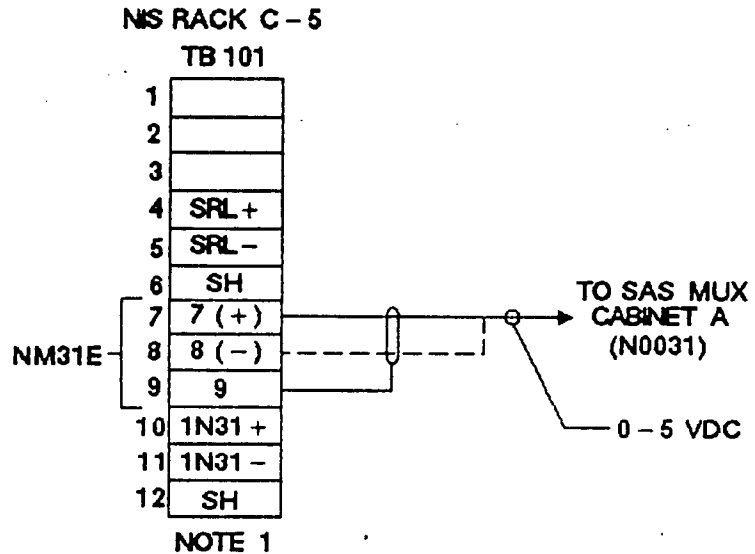
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON</b> <b>EDISON ENG.</b> <b>C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
PWRRNG CH44(QUAD3) DET Q TOP (NM44C)		C&I	SKETCH NO. SAS - 155 REV. 1 SH. 1 OF 1
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 4/17/87	
CHECKED BY: <i>King Lock</i>		ENG. <i>VAD</i> DATE 4.17.87	

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DESIGN DETAIL



- NOTE: 1. EXISTING CONNECTIONS TO TB 101 TERMINAL POINTS (OTHER THAN 7, 8, AND 9) NOT SHOWN.  
2. SAS SIGNAL DESTINATION; BTSCA 01R08, POINTS 10 (POS.), 11 (NEG.), AND 12 (SHIELD).

ENGINEERING JUSTIFICATION:

THE SOURCE RANGE DETECTOR 1 LOG Q SIGNAL CAN BE DERIVED FROM ISOLATION AMPLIFIER NM106, WHICH PROVIDES AN ADJUSTABLE 0-5 VDC SIGNAL AT TB-101 POINTS (7, 8, AND 9) IN THE NIS RACK C-5. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE (SEE SECTION 2.2.2.2.7, FIGURE 2-8, AND FIGURE 10-25 SHEET 1 OF 8 IN REFERENCE 28).

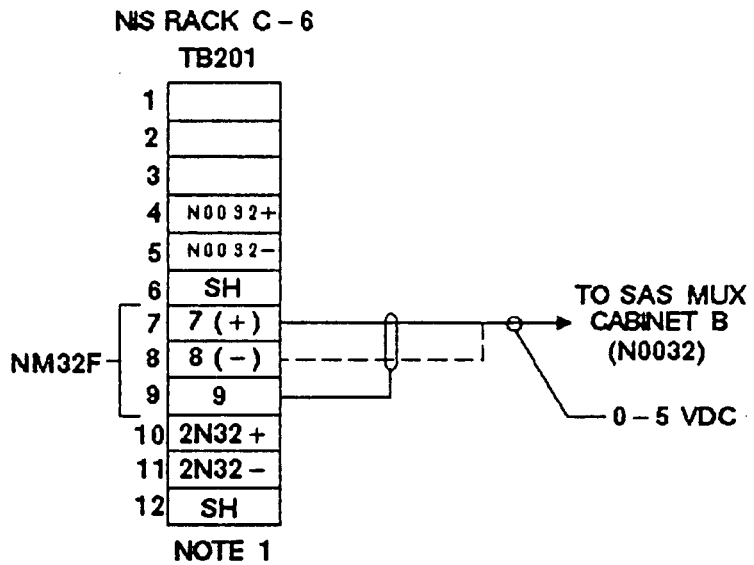
REF. DWG.: 9321-F-3313  
REF. SKETCH: SAS-REF

STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
SOURCE RNG DETECTOR 1 LOG Q (NM31E)		C&I ENG. <i>TM</i> DATE <i>4/17/87</i>	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>VAD</i> DATE <i>4-17-87</i>	
CHECKED BY: <i>King Look</i>			SKETCH NO. SAS-156 REV. 0 SH. 1 OF 1

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issued for record.

**DESIGN DETAIL**



- NOTE: 1. EXISTING CONNECTIONS TO TB 201 TERMINAL POINTS (OTHER THAN 7, 8, AND 9) ARE NOT SHOWN.  
 2. SAS SIGNAL DESTINATION; BTSCA 01R07, POINTS 14 (POS.), 15 (NEG.), AND 16 (SHIELD).

ENGINEERING JUSTIFICATION:

THE SOURCE RANGE DETECTOR 2 LOG Q SIGNAL CAN BE DERIVED FROM ISOLATION AMPLIFIER NM106, WHICH PROVIDES AN ADJUSTABLE 0 - 5 VDC SIGNAL AT TB - 201 (POINTS 7, 8, AND 9), IN THE NIS RACK C - 6. THE SAS INPUT CAN THEREFORE BE IMPLEMENTED HERE (SEE SECTION 2.2.2.2.7, FIGURE 2 - 8, AND FIGURE 10 - 25 SHEET 3 OF 8 IN REFERENCE 28).

REF. DWG.: 9321 - F - 3314  
 REF. SKETCH: SAS - REF

STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
SOURCE RNG DETECTOR 2 LOG Q (NM32F)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE <i>4/17/87</i>	
CHECKED BY: <i>King Cook</i>		ENG. <i>VAD</i> DATE <i>4-17-87</i>	
		SKETCH NO. SAS - 157	
		REV. 0 SH. 1 OF 1	

REVISION

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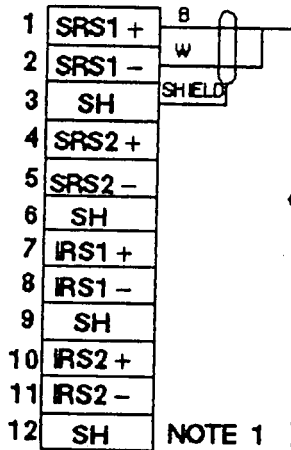
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Incorporated  
FEI-860023  
Revision 1

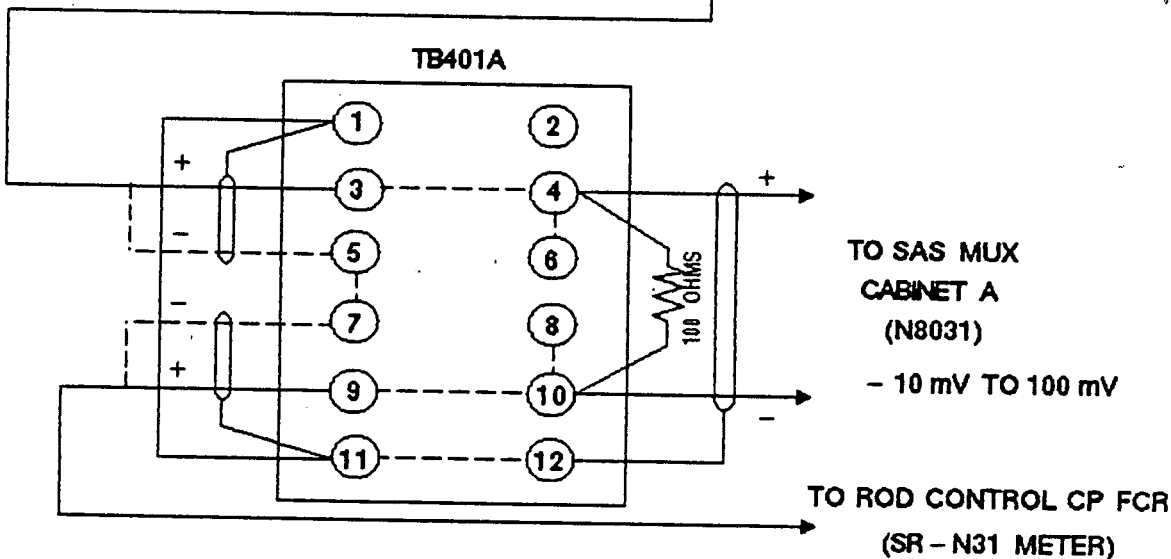
**DESIGN DETAIL**

NIS RACK C - 8

TB 401



NOTE 1



- NOTE 1. EXISTING CONNECTIONS TO TB401 NOT SHOWN.  
 2. SAS SIGNAL DESTINATION: BTSCA 01R18, POINTS 10 (POS.), 11 (NEG.), AND 12 (SHIELD).

ENGINEERING JUSTIFICATION

TB 401 POINTS 1 AND 2 PROVIDE A - 0.1 TO 1.0 MA OUTPUT (SEE REF. 28, FIG 10-25 SHEET 7 OF 8). SR N31 REMOTE METER R406 ADJUSTED PER SECTION 5.6.6.4 TO COMPENSATE FOR 100 OHM SAS INPUT RESISTOR (SEE REF. 28, FIG 10-5, SHEET 2 OF 2). SURN 31 IS NON-SAFETY RELATED.

REF. DWG.: 9321-F-3316, 9321-F-3273 REF, UDC: FEI-860023 REV.1  
 REF. SKETCH: SAS-REF

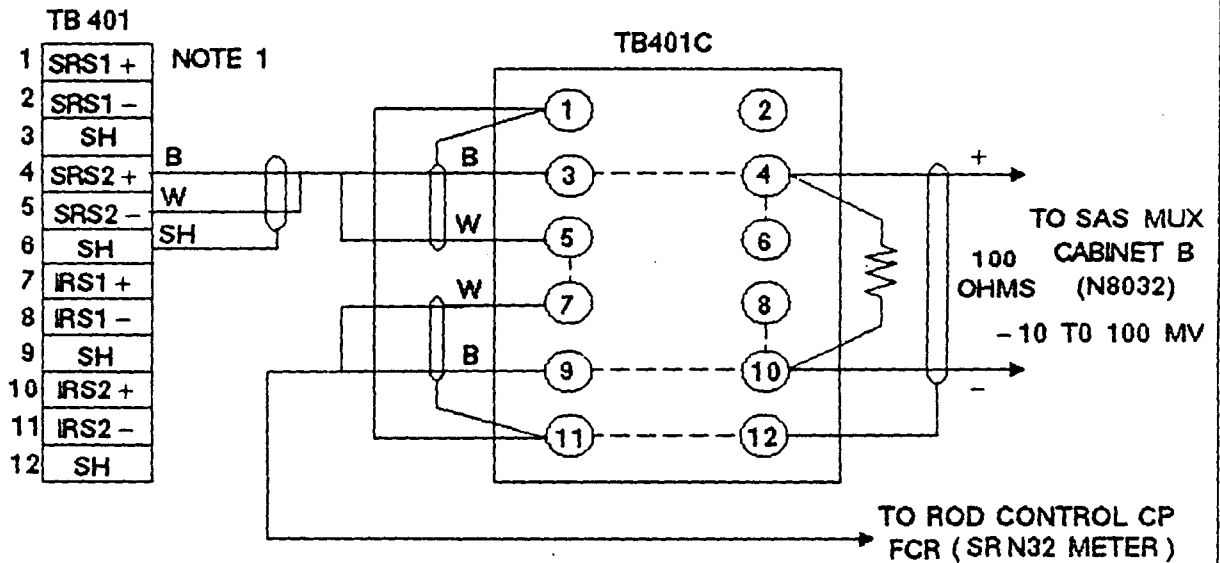
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
SOURCE RNG START UP RATE 31 (SURN31)		C&I	
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>YM</i> DATE <i>8/13/87</i>	
CHECKED BY: <i>King Loh</i>	ENG. <i>VAD</i> DATE <i>8-13-87</i>	SKETCH NO. SAS-158	REV. 1 SH. 1 OF 1



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Issued for record.

**DESIGN DETAIL**



NOTE 1. EXISTING CONNECTIONS TO TB 401 NOT SHOWN

2. SAS SIGNAL DESTINATION: BTSCA 01R08, POINTS 19 (POS.), 20 (NEG.), AND 21 (SHIELD).

ENGINEERING JUSTIFICATION

TB 401 POINTS 4 AND 5 PROVIDE A - 0.1 TO 1.0 MA OUTPUT (SEE REF. 28, FIG 10-25 SHEET 7 OF 8). SR N32 REMOTE METER R507 ADJUSTED PER SECTION 5.6.6.4 TO COMPENSATE FOR 100 OHM SAS INPUT RESISTOR (SEE REF. 28, FIG 10-5, SHEET 2 OF 2). SURN 32 IS NON-SAFETY RELATED.

REF. DWG.: 9321 - F - 3316 , 9321 - F - 3273  
REF. SKETCH: SAS - REF

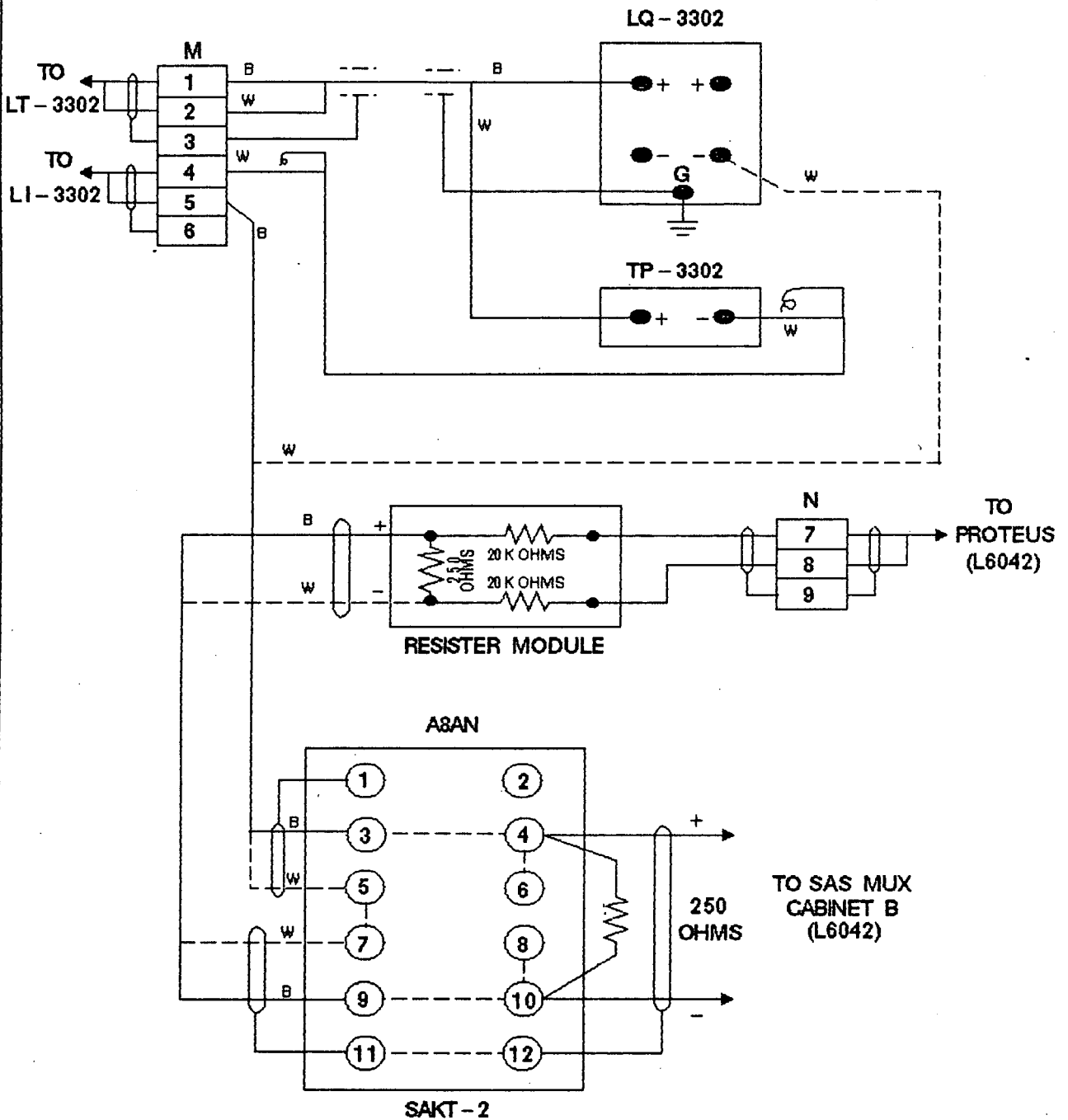
STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. <i>N/A</i> DATE	
SOURCE RNG START UP RATE 32 (SURN32)	VLS	C&I	SKETCH NO. SAS - 159 REV. 0 SH. 1 OF 1
SKETCHED BY: VICTOR S. D'AMORE		ENG. <i>TM</i> DATE 8/13/87	
CHECKED BY: <i>King Lake</i>		ENG. <i>VAD</i> DATE 8.13.87	

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Incorporated UDC-880044 Rev. 0 & Record of conversation.

**DESIGN DETAIL**



NOTE: SAS SIGNAL DESTINATION; BTSCA 01R04, POINTS 23 (POS.), 24 (NEG.), AND 25 (SHIELD).

REF. DWG.: A225429

REF. 1. UDC: FEI-860044 Rev. 0

REF. SKETCH: SAS-REF

2. RECORD OF CONVERSATION (V. D'AMORE & B.LEE), DATED 10/15/87

STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. N/A. DATE	
CAVITY PIT SUMP LEVEL		ENG. TM DATE 10/22/87	SKETCH NO. SAS-160 REV. 1 SH. 1 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. VAS DATE 10/22/87	
CHECKED BY: <i>RMCV</i>			

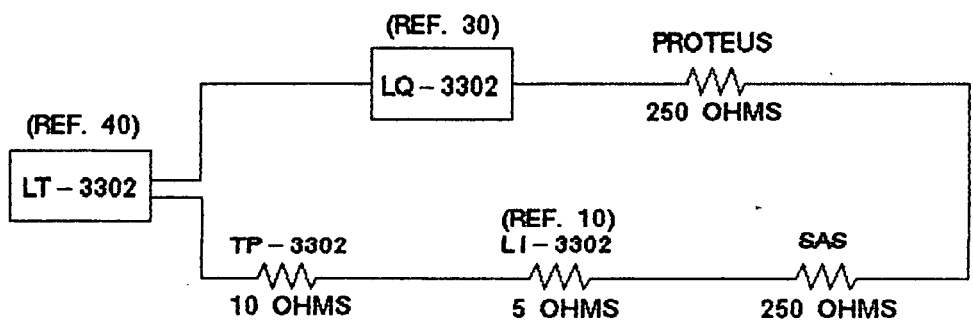
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Incorporated UDC-880044 REV.0 & Record of Conversation

**IMPEDANCE CALCULATION**

**LT-3302 CIRCUIT (Z EQUIV.)**



**TOTAL IMPEDANCE (OHMS) = 250 + 250 + 5 + 10 = 515**

**ENGINEERING JUSTIFICATION:**

LT-3302 IS A GOULD PD/PDH DP TRANSMITTER THAT PROVIDES 4-20 MA INTO 2000 OHMS (52 VDC NOMINAL POWER SUPPLY CONSIDERED). LQ-3302 IS A FOXBORO M/610 AC POWER SUPPLY, MODIFIED TO PROVIDE 52 VDC (PLUS OR MINUS 1 VDC). THE IMPEDANCE CALCULATION ABOVE DEMONSTRATES THAT WITH THE ADDITION OF THE SAS INPUT (250 OHMS), THE TOTAL LOOP IMPEDANCE (515 OHMS), FALLS WITHIN THE LOAD LIMIT (2000 OHMS).

STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	CON EDISON ENG. C&I SKETCH
TITLE: SAS COMPUTER INTERFACE		ENG. N/A DATE	
CAVITY PIT SUMP LEVEL (LT-3302)		C&I	SKETCH NO. 160 REV. 1 SH. 2 OF 2
SKETCHED BY: VICTOR S. D'AMORE		ENG. TM DATE 10/22/87	
CHECKED BY: RMOJ.		ENG. VAS DATE 10/22/87	

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SAS REFERENCES

1. Foxboro Model 66BT-OH Current Repeater, TI 39-162C February 1968, 18-657 March 1971
2. Foxboro Model 64H Electronic Consotrol Recorder GSA 2A-3A1 December 1968
3. Foxboro Testpoint, EM 198906 IT 2.1
4. Babcock & Wilcox Instruction Manual for Saturation Meter, 01-1106849-01, BWN-20004 (6-76) page 10
5. Foxboro CT-10 Block, EM 198939.2 IT # 1.55
6. Weidmuller Terminals SAKT 2, Section A2, 1981 page 9
7. Resistor Module EM 198939.2 # 1.55
8. L & N see refernce 37.
9. Foxboro Model 610A Single Power Supply, 18-635 August 1968
10. Westinghouse Edgewise Instruments, V-252, H-252 AD 43-200 March 1977
11. Foxboro Model 66BR-OH Current Repeater
12. Foxboro Model 613 DM D/P Cell Transmitter Foxboro Main. 18-186,90,92 PL-8616
13. Foxboro 610 AR Power Supply, Foxboro Main. 196
14. Foxboro 66GR-OW, Foxboro Main. 18-241
15. Barton Model 764 Lot 4, Westinghouse Manual No. 86A2
16. Foxboro Model 694 AR R/I

STATION: INDIAN POINT 2	A P P R V L S	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS REFERENCE DOCUMENTS		ENG. <i>N/A</i> DATE	
SKETCHED BY: RMCV		C&I	SKETCH NO. SAS - REF REV. SH. 1 OF 3
CHECKED BY: <i>N/A</i>		ENG. <i>N/A</i> DATE	

REVISION

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17. Foxboro Model 63S-BR-OCHA, G 3649, 3645
18. Weidmuller Terminals, DK4R SAKT4, Section A1 1981
19. Foxboro Model 613 HM, Main. G2813, 18-186
20. Moore SCT Signal Converter, Data Sheet 146-710-01G August 1985
21. Foxboro N-E13DM, N-E11GM, Product Spec PSS 9-1B1A, 1984
22. Foxboro Model 611 GM Transmitter, Foxboro Main Manual 18-176,190,192
23. Westinghouse NLP3 Isolator, WRVLS Equipment Reference Manual
24. Westinghouse NCI1 Input Card, WRVLS Equipment Reference Manual
25. Westinghouse NMD1 Multiplier/Divider WRVLS Equipment Manual
26. Esterline Angus Miniseries V1 Strip Chart Recorder Instruction Manual, Sept 1969
27. CPI RTP 4736/50 Universal High Speed Wide-Range Gate Card, Tech Spec MC 1148 1982
28. Westinghouse NIS Technical Manual Sept 1969
29. Victoreen Log Ratemeter Model 842-11 E350021
30. Modification Procedure MMC-80-2-15 (dated 9/5/74) to M610A Power Supply
31. Leeds & Northrup Speedomax Recorder M Mark III General Specifications

STATION: INDIAN POINT 2		A P P R V L S	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS REFERENCE DOCUMENTS			ENG. <i>N/A</i> DATE	
SKETCHED BY: R MCV			C&I	
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			SKETCH NO. SAS - REF REV. SH. 2 OF 3	

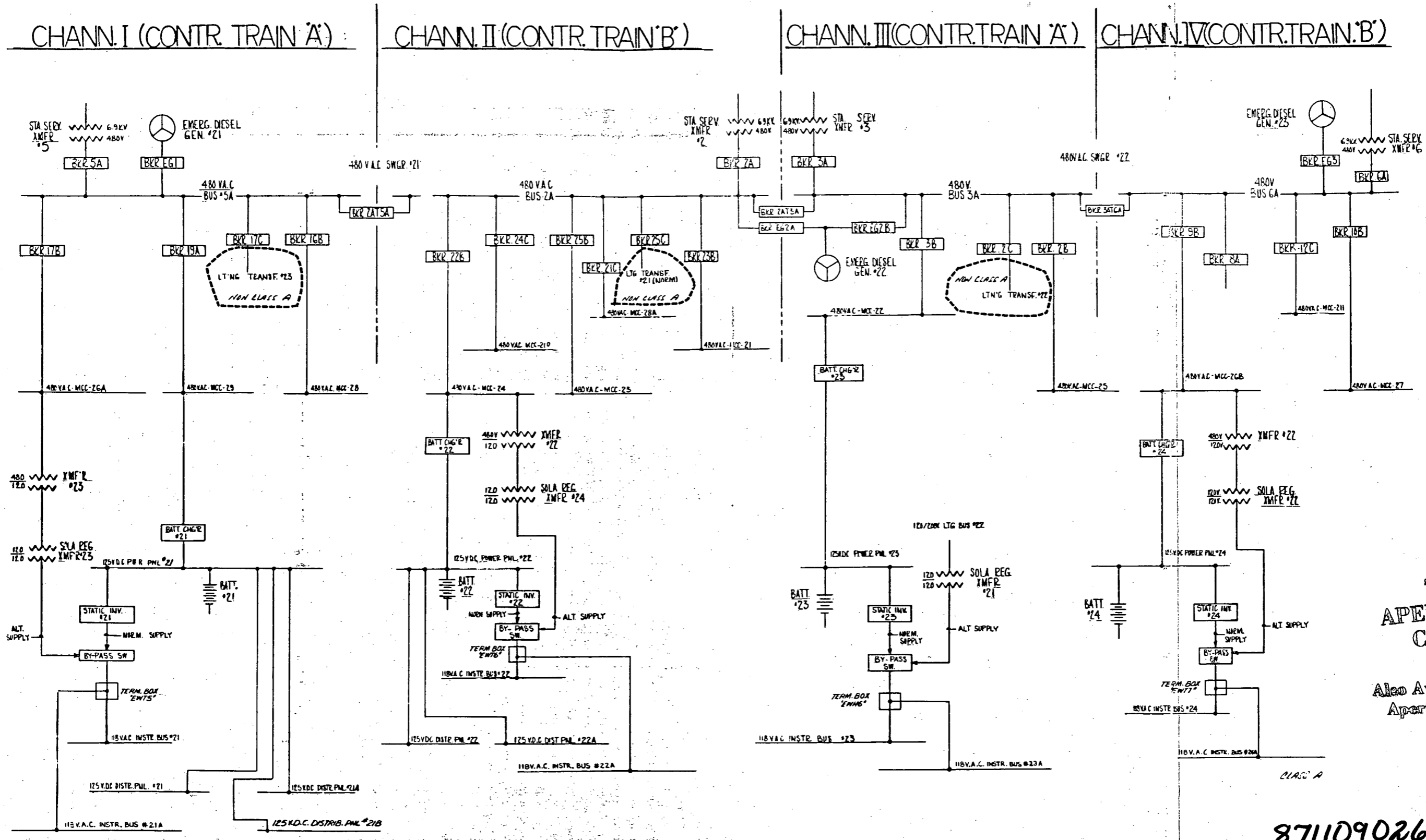
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- 32. Rosemount Transmitter 1153, Product Data Sheet 22, 1978
- 33. Rosemount Power Supply SPS-2101-P
- 34. A227341-0  
Schematic Diagram for RIS CO or Alarm Units # ET-1215
- 35. Rosemount Transmitter 1151DP, Product Data Sheet 2256, 1986
- 36. Foxboro 66C Series Summing Amp TI-39-1636  
Sept 1972 : Input Impedance 150 ohms
- 37. Foxboro 65PX-OHW Indicator  
MI 18-273 May 1974  
Input Impedance : 1.2 ohms

STATION: INDIAN POINT 2	APPROVALS	MECH. PROGRAM	<b>CON EDISON ENG. C&amp;I SKETCH</b>
TITLE: SAS REFERENCE DOCUMENTS		ENG. <i>N/A</i> DATE	
		C&I	
SKETCHED BY: R MCV		ENG. <i>N/A</i> DATE	
CHECKED BY: <i>N/A</i>		ENG. <i>N/A</i> DATE	SKETCH NO. SAS - REF REV. SH. 3 OF 3



TI APERTURE CARD

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8711090263-02

CONSOLIDATED EDISON CO.  
 INDIAN POINT UNIT 2

Figure 8.2-17  
 Single Line Diagram of Unit Safeguard  
 Channeling & Control Train Development

ELECTRICAL SYSTEM CLASS A BOUNDARIES

SK-15805-12

FIGURE I-2.2

VERY LOW STEAM GENERATOR LEVEL

TURBINE PRESSURE 1ST STAGE HIGH LOAD

SYMBOLS:

- 10 TO 50 MA DC ANALOG SIGNAL
- LOGIC SIGNAL "1" OR "0"
- TYPE RACK OR ○ PANEL FACE
- ⊖ CHANNEL: 118V AC INVERTER POWER
- I/I - CLASS I/E ISOLATOR
- I/I \* - NEW CLASS I/E ISOLATOR
- PS - POWER SUPPLY
- BISTABLE LOGIC "1" WHEN:  $\lceil$  PARAMETER > PRESET VALUE
- $\lfloor$  PARAMETER < PRESET VALUE

- TS TEST SWITCH
- TJ TEST JACK FOR SIGNAL INSERTION
- TP/PT 2 POSITION SELECTOR SWITCH W/PUSH TO TEST
- ⊖ INDICATING LIGHT: R-RED, G-GREEN, A-AMBER
- $\int$  TIME DELAY DROP OUT ADJUSTABLE
- $\int$  TIME DELAY PICK UP ADJUSTABLE

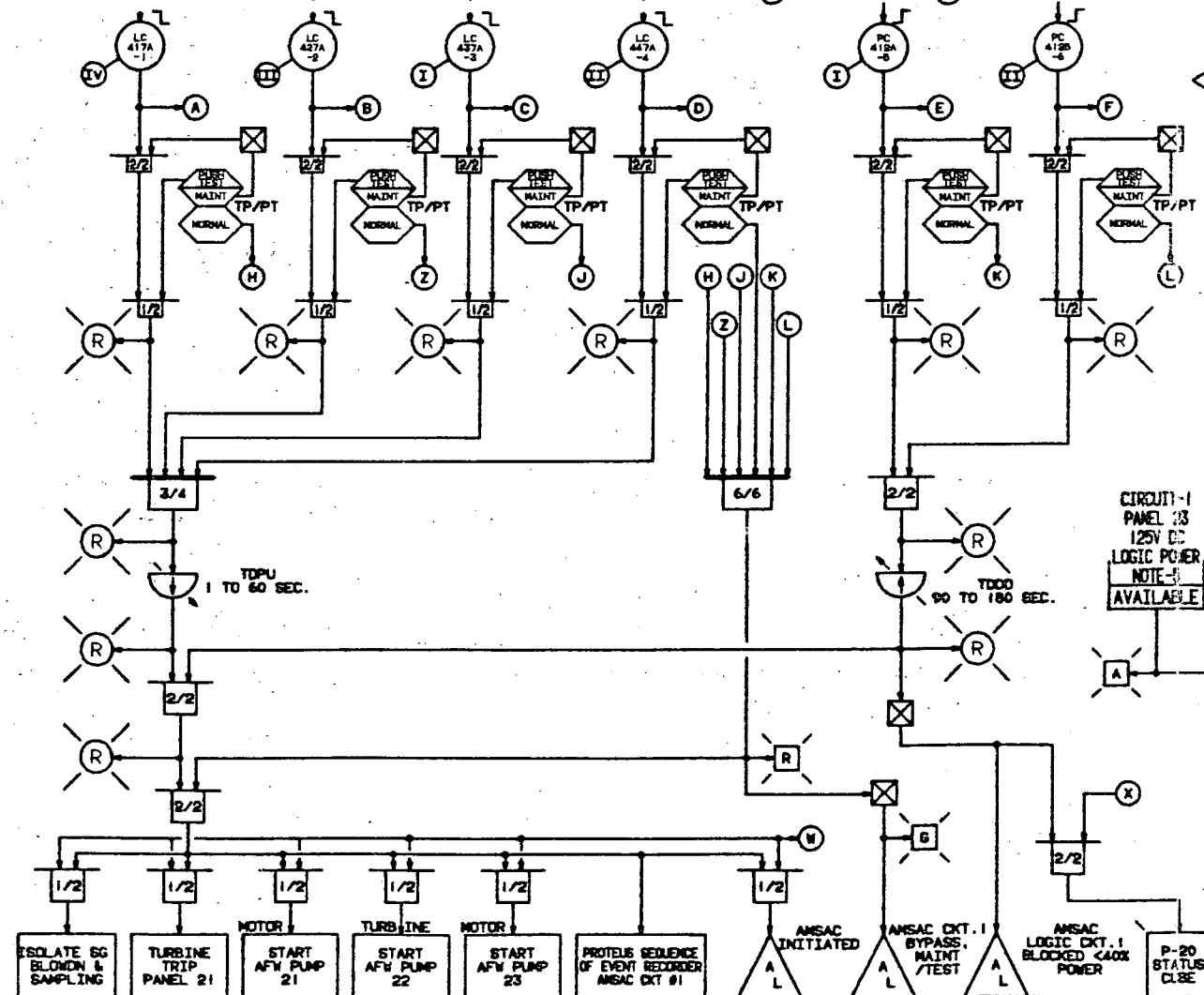
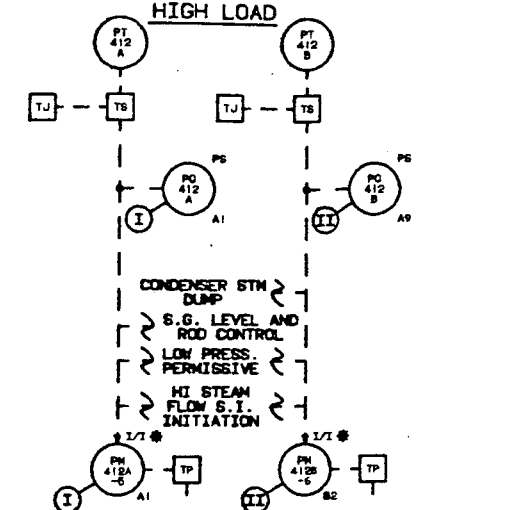
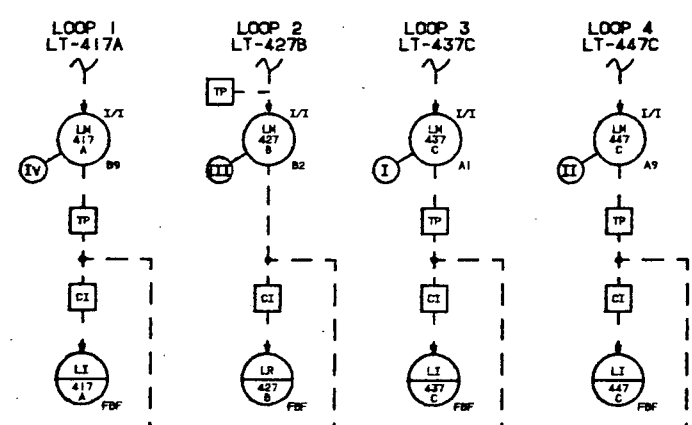
NOTES:

1. AMSAC LOGIC CIRCUIT NORMALLY DE-ENERGIZED ENERGIZE TO TRIP
2. LOSS OF STEAM GENERATOR LEVEL ANALOG SIGNAL, AC CHANNEL POWER AND/OR CONTROL MODULE SHALL PLACE AMSAC IN FAIL SAFE TRIP POSITION
3. AMSAC EQUIPMENT SHALL BE CAPABLE OF WITHSTANDING ENVIRONMENTAL CONDITIONS OF 70°F TO 100°F, RELATIVE HUMIDITY OF 15% TO 95% AND NEGLIGIBLE RADIATION
4. AMSAC EQUIPMENT SHALL BE PURCHASED AND INSTALLED AS CLASS A. EQUIPMENT IS NON SAFETY GRADE WITH SAFETY GRADE INTERFACES, 10CFR PART 21 IS NOT APPLICABLE, EXCEPT FOR I/I WHICH SHALL BE PROVIDED AS CLASS I/E SAFETY GRADE, 10CFR PART 21 IS APPLICABLE
5. AMSAC LOGIC CIRCUITS SHALL BE POWERED FROM 125V DC POWER SUPPLY
6. SEE SK-15805-22 FOR TEST PANEL ASSEMBLY

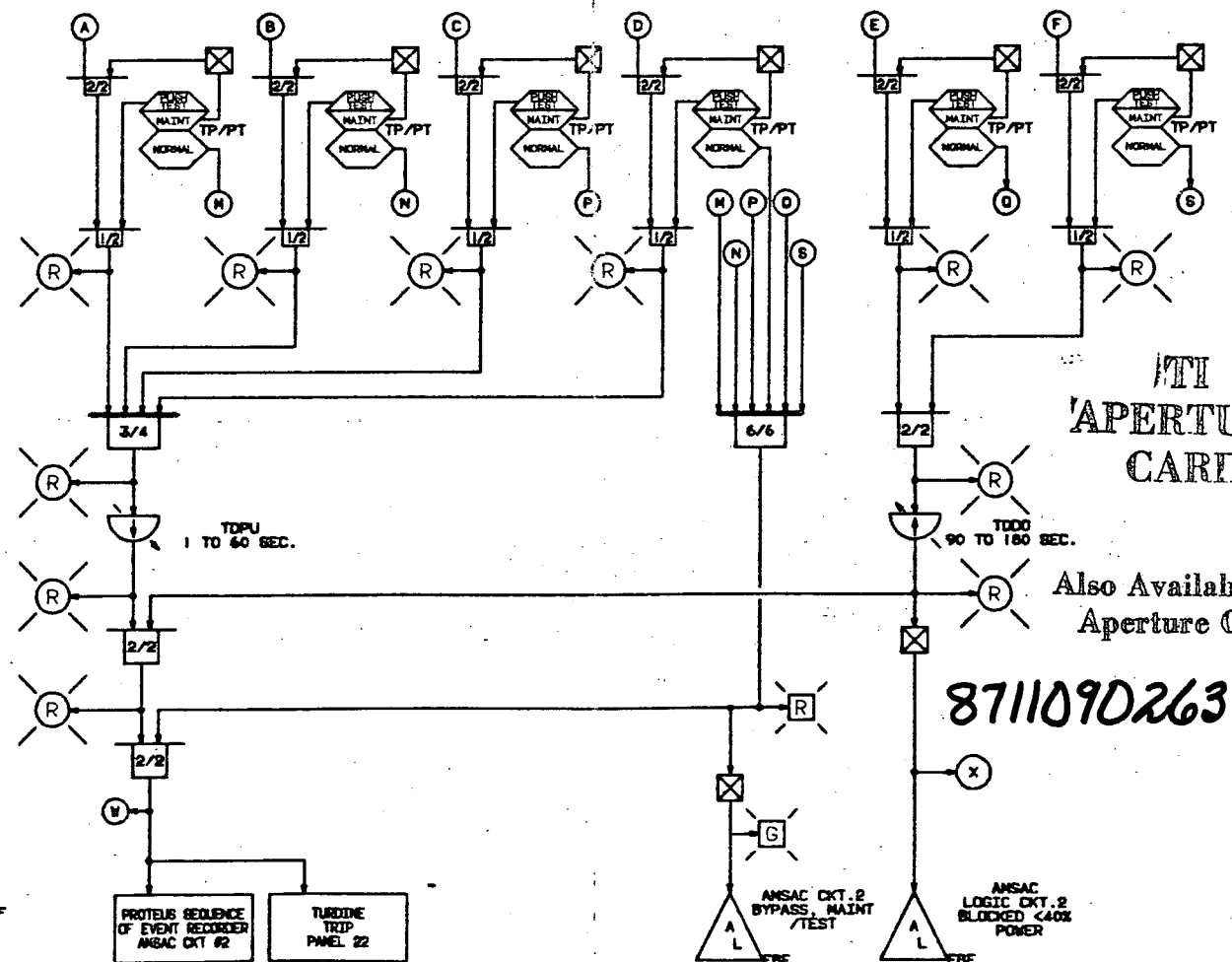
EXISTING INSTRUMENTS

AMSAC EQUIPMENT

SYSTEMS ACTUATED



AMSAC LOGIC



Also Available On Aperture Card  
8711090263-01

COMPUTER GENERATED DRAWING NOT TO BE HAND REVISED

<b>PRELIMINARY</b>		REVISION				TITLE: ATWS MITIGATION SYSTEM		STATION	
		DES	ENG	DATE	CHKR.	SUPV.	ACTUATION CIRCUIT (AMSAC)		INDIAN PT 2
CAD DS, FILE AMSAC IP		REVIEW		APPROVALS		DRWN. BY	SCALE	REC'D	DWG. NO.
						NONE	XXXXXX	SK-15805-12	