MERCURY COMPANY OF NORWOOD, INC.
A FISCHBACH COMPANY

10 BURKE DRIVE, P.O. BOX 1687
BROCKTON, MASSACHUSETTS 02403

TELEPHONE (508) 583-4880

September 27, 1988

Office of Nuclear Reactor Regulation
Nuclear Regulatory Commission
Washington, D.C. 20555

ATTENTION: Director

Subject: Mercury Company of Norwood, Inc.
10CFR, Part 21 Notification

Dear Sir:

In accordance with Mercury Company's procedure for reporting 10CFR, Part 21 Defects and Noncompliance, we are providing notification of a potential reportable condition.

On September 20, 1988 we received written notification (copy attached) from Rochester Instrument Systems, Inc., Rochester, NY advising that several parts shipped to Mercury could fail under non-standard operating conditions. They recommended the parts be replaced and provided new parts and replacement instructions for same. Additionally, their report indicates they notified the NRC on 8/31/88 of this 10CFR, Part 21 condition.

Mercury Company immediately initiated an investigation and determined that the items in question were installed into Emergency Core Cooling System Analog Trip Cabinets Nos. C-2233A and C-2233B which were shipped to Boston Edison Company's Pilgrim Nuclear Station on 12/13/85 and 1/16/86 respectively. Three (3) units were installed in each cabinet and two (2) units were furnished as spares.

Oral notification was provided to Mr. Frank Schellenger - Boston Edison Co. QA Supervisor via telephone on September 22, 1988. Written notice was forwarded to F.N. Famulari, QA Manager by fax machine and U.S. Mail also on September 22, 1988 (copy attached).

IE19
1/1

In subsequent phone conversations with Boston Edison's Frank Schellenger, Don Richards and Kathy Ward on September 26, 1988, we were advised that Boston Edison is initiating an engineering evaluation of this condition which could take as long as two weeks. They also indicated they had not notified the NRC and probably would not until their evaluation was complete. Kathy Ward requested that Boston Edison be informed if Mercury notified the NRC.

As Mercury's procedure calls for notification to the NRC if the Owner does not provide the notification, Mercury contacted the NRC office at King of Prussia, Pennsylvania on September 26, 1988. This regional office directed us to the Vendor Inspection Office in Washington, D.C. where the above information was provided to Mr. Uldis Potapovs. He advised this written report be sent to your office.

If you have any questions or require further information, please contact the undersigned.

Very truly yours,

MERCURY COMPANY OF NORWOOD, INC.

F.N. Zinkevich
Corporate Q.A. Manager

FNZ/dma
attachment

cc: S.A. Adamic - President, Mercury Co.
F.N. Famulari - Boston Edison Co. QA Manager

cc: SAA, TIH, WHP, FNZ, GPL, File

MERCURY COMPANY OF NORWOOD, INC.
10 BURKE DRIVE, P.O. BOX 1687
BROCKTON, MASSACHUSETTS 02403
TELEPHONE (508) 583-4880

September 22, 1988
N10143

Boston Edison Company
Pilgrim Nuclear Station
Rocky Hill Road
Plymouth, Massachusetts 02360

Attention: Mr. Frank N. Famulari
Quality Assurance Manager

Subject: RIS Signal Converters

Reference: ECCS Analog Trip Cabinets
Boston Edison Purchase Order No. 10794

Mercury Job No. N10143

Dear Sir:

Attached is a copy of correspondence received from Rochester Instrument Company relative to a NRC 10CFR, Part 21 Report of Defect. Oral notification was provided to your Frank Schellenger at 11:00 a.m. on September 22, 1988.

The signal converters were furnished as components in the Emergency Core Cooling System Analog Trip Cabinets C-2233A and C-2233B which were shipped to Pilgrim Station by Mercury on 12/13/85 and 1/16/86 respectively. Three (3) Units were installed in each cabinet and two (2) Units were furnished as spares.

Mercury is in possession of replacement Signal Convertors and capacitors. Please advise where Mercury should forward these components necessary to repair the defect.

In accordance with Mercury's procedure for reporting 10CFR Part 21 conditions, we will be notifying the Office of Inspection and Enforcement U.S. Nuclear Regulatory Commission, King of Prussia, Pennsylvania within 48 hours unless advised by you that this notification has been satisfied by Boston Edison Company.

If you have any questions please do not hesitate to contact the undersigned at area code (508) telephone 583-4880 in Brockton, Massachusetts.

Very truly yours,

MERCURY COMPANY OF NORWOOD, INC.

Fred N. Zinkevich

September 1, 1988

RECEIVED
SEP 20 1988
MERCURY COMPANY

Mercury Company Of Norwood, Inc.
10 Burke Drive
Brockton, MA 02403

Attention: M. Macleod

Subject: NRC 10CFR-21 Report of Defects and Non-Compliance on RiS Model Numbers: SC-1302-323, SC-1326-323 and SC-1326W-323 QA ID No. 88-001A

Gentlemen:

In accordance with NRC 10CFR-21 reporting requirements for defects and non-compliance, attached please find our report notice QA ID No. 88-001A for providing corrective action on Rochester Instrument Systems SC-1302-323, SC-1326-323 and SC-1326W-323 products.

Warranty repair units may be returned to RiS for a no charge repair and return. Please contact our Technical Support Group at (716)263-7700 for an RMA (Return Material Authorization) number. Out of warranty repairs may be corrected by the user. The required parts and instructions are enclosed.

Customer P.O. No.	RiS S.O. No.	Unit Type	Unit S/N	Warranty
74088-N10143	753301	SC-1302-323-I	753301-1 To -6	Out Of Warranty
	753301-1	SC-1302-323-I	753301-7,-8	Out Of Warranty

We regret having to inform you of this problem, however you are a valued customer and we appreciate your business. If we can be of any further assistance, please do not hesitate to call on us.

Sincerely,

ROCHESTER INSTRUMENT SYSTEMS, INC.

A. Wayne Engbrecht

A. Wayne Engbrecht
Manager Of Quality Assurance

AWE:ky

Attachments

England
Maxim Road, Crayford,
Dartford, Kent DA1 4BG

Canada
915 Kipling Avenue
Toronto M8Z 5H4

Terra Technology
3800 148th Ave. NE
Redmond, WA 98052

ROCHESTER INSTRUMENT SYSTEMS, INC.
255 North Union Street, Rochester, New York 14605 U.S.A.
Telephone 716 263-7700 • FAX 716 262-4717 • Telex 978-452

A member of The Marmon Group of companies

ATTACHMENT A
(60-05)

ROCHESTER INSTRUMENT SYSTEMS, INC.

QA ID NO: 88-001-A
Page 1 of 2

REPORT OF DEFECTS AND NON-COMPLIANCE PER NRC 10CFR-21

INITIAL & FINAL REPORT

DATE: AUGUST 31, 1988

A. Receipt of Information:

From: Manufacturing Final Test — Phone No: 716-263-7700

Address: Rochester Instrument Systems — Date: May 2, 1988

255 N. Union St. — Plant: Rochester

Rochester, N.Y. 14605

Reported by: C. Walker — Title: Supervisor of Test

Project: SC-1302-323; SC-1326-323 and SC-1326W-323

Reference No:

Defect/Description of Problem: During a non-standard operation configured for downscale burnout and the input left open for several hours, a reverse bias of 1.4 volts appears across C12 RiS P/N 1044-238. This causes a gradual decay in the capacitor and after about 24 hours or more it shorts out. Problem was discovered during manufacturing testing. No field reported problems were ever received.

A.W. Engbrecht

Received by: A. W. Engbrecht
Manager of Quality Assurance

B. Action Plan for Evaluation/Investigation: Scheduled by: May 6, 1988
Date

Product and Design Engineering to review test set-up and witness problem. Q.A. to verify.

C. Evaluation: Test set-up correct and problem verified. Engineering Design Change Order No. 007146 dated 5/9/88 updates the design to inhibit possible failures during non-standard (open input) operation. Special aluminum bipolar capacitor C12 to be ordered. Estimate 90 day delivery to be on or before 8/9/88.

D. Notification to NRC? Yes By Date: 8/31/88

Problem Not Generic - No Notification Required (Comments): _____

E. Probable Cause: Design problem. C-12 is a tantalum type capacitor and should be an aluminum bi-polar type capacitor to insure proper operation during reverse bias mode or downscale operation and open sensor operation. Also, C-14 is superfluous & not needed. An additional capacitor .22 uF @ 63V C-17 has been added to provide additional filtering.

F. Recommendation/Corrective Action: Remove C-12 P/N 1044-238, a 22 uF tantalum capacitor and replace with P/N 1066-957, a 22 uF aluminum bi-polar electrolytic capacitor. Remove C14 P/N 1049-137. Add C17.22 uF & 63V P/N 1066-960. Warranty repair units may be returned to RiS for no charge repair and return. Out of warranty repairs may be corrected by user. Required parts and instructions are enclosed. If customer desires, out of warranty repairs may be returned to RiS at a nominal repair fee for update and a complete retest.

G. Scheduled Corrective Action Completion Date: Send above information to field by 8/31/88.

H. Approvals:

A. Wayne Englert — Manager of QA — 8/31/88 Date

Jim Ehl — Product Manager — 9-2-88 Date

Ronald C. Mathis — ~~V.P. Engineering~~ CHIEF ENGINEER — 9/2/88 Date

I. Follow Up/Verification: NTS has verified these changes have no impact on the qualification to IEEE-323, 1974. Reference AETC Report No. 16376 and their letter of 8/16/88 to RiS.

Verified by: J. Burgher — Title Sr. Structural Engineer — 9/2/88 Date

Approved by: A. Wayne Englert 9/2/88 Date

J. Customer Notification Required: Yes X No ___

Completed by: A. Wayne Englert (Name) — Mgr of QA (Title) — 9/6/88 (Date)

Send NRC Notifications to: Mr. James Taylor
Nuclear Regulatory Commission
Director of Inspection & Enforcement
EWW/357
Washington, DC 20555

cc: K. R. Naidu
IE/NPS

TITLE: Attachment to 10CFR21 Report #88-001-A

PURPOSE:

The following set of instructions are guidelines for the proper removal and insertion of the components stated on the attached 10CFR21 Report #88-001-A.

REFERENCE:

Attached Test Procedure #A-1039-757

INSTRUCTIONS:

These instructions should be performed by qualified personnel using proper equipment and employing good workmanship techniques.

All instructions should be carefully read before actual implementation takes place.

A. Removal From Service:

The unit must be removed from service and brought to a repair/calibration lab with the capabilities of soldering and desoldering, along with the necessary test equipment to perform unit test and calibration. Attached is a copy of Rochester Instrument Systems, Inc. test procedure #A-1039-757 for testing and calibration.

B. Removal of Capacitor C14:

Capacitor C14 must be deleted from the circuit. The capacitor should be desoldered from the wire side of the printed circuit board, removed and discarded. Note that this circuit position will remain as an open circuit.

C. Replacement of Capacitor C12:

Capacitor C12 must be deleted from the circuit. The capacitor should be desoldered from the wire side of the printed circuit board, removed and discarded.

The replacement capacitor for C12 (a bipolar electrolytic capacitor) must be added to the circuit. This capacitor must be inserted into circuit position C12 and soldered from the wire side of the printed circuit board.

England:
Maxim Road, Crayford,
Dartford, Kent DA1 4BG

Canada:
915 Kipling Avenue

ROCHESTER INSTRUMENT SYSTEMS, INC.
255 North Union Street, Rochester, New York 14605 U.S.A.
Telephone: 1 716 263-7700 • Cable: RISROCNY • Telex: 978457

A member of The Marmon Group of companies

D. Addition of Capacitor C17:

Capacitor C17 must be added to the circuit. This capacitor must be soldered to cambion terminals E16 and E49 on the component side of the printed circuit board.

E. Testing and Calibration:

The unit should be reassembled back into the enclosure and completely tested and calibrated using Rochester Instrument Systems, Inc. test procedure #A-1039-757.

After changes/testing/calibration is completed, the unit may be returned to service.

England
Maxim Road, Crayford,
Dartford, Kent DA1 4BG

Canada
915 Kipling Avenue

ROCHESTER INSTRUMENT SYSTEMS, INC.
255 North Union Street, Rochester, New York 14605 U.S.A.
Telephone: 1 716 263-7700 • Cable: RISROCNY • Telex: 978457

A member of The Marmon Group of companies

Data Log 1039-759

Schematic Ref: SC-1326-323; D1039-763
SC-1326W-323; D1039-772
SC-1302-323; D1039-754

Equipment Required:

Power Supply (variable ±20%)
DVM
Precision mV calibrator source (1326/26W only)
Appropriate type thermocouple (1326W only)
Ice Bath or T/C Compensator (1326W only)
Input Signal Source (1302 only)

IEEE 323 QUALIFIED
NOT TO BE CHANGED
WITHOUT Q. A. APPROVAL

1.0 Power Options: Check Data Log Reference wire list A-1039-809.
Verify unit is -323 module.

1.1 115 VAC Operation - insure that transformer T1, B1041-050 is in place and wire per wiring list "A". (H1 Option) Fuse 0620-354 (150 mA SLO-BLO).

1.2 230 VAC Operation - insure that transformer T1, B1041-050 is in place and wire per wiring list "B". (H2 Option) Fuse 0620-354 (150 mA SLO-BLO).

1.3 24 VDC Non-isolated - wire per list "C". (H Option) Fuse 6006-204 (1/4A SLO-BLO).

1.4 24 VDC Isolated - add power supply A1039-807 and wire per list "E". (I Option) Fuse 6006-204 (1/4A SLO-BLO).

1.5 48 VDC Isolated - a-d power supply A1039-808 and wire per list "D". (I-1 Option) Fuse 6006-204 (1/4A SLO-BLO).

2.0 Resistor Selection: Check Data Log

3.0 Hi-Pot Check - Check Data Log

Perform Hi-Pot Test from all terminals to case as follows:
1000 VAC for a minimum of 1 second, @ 1 mA trip.

4.0 Hi-Pot Isolation - Check Data Log

Except for power option "H", Input to Output and Output to Power Isolation will be performed with 600 VAC, for a minimum of 1 second from terminals 1 to 11, terminals 1 to 5, and terminals 5 to 11 without failure. When power option "H" is included this test will be performed between terminals 1 and 5 only.

REV.	DESCRIPTION	CHK.
M	DCO7320 PSW 8/18/88	
L	DCO3728 6/7/34 sdb	
K	DCO3518 4/3/84 sdb	
J	DCO3390 PSJ 3/1/84 (retyped)	

REVISIONS

ROCHESTER INSTRUMENT SYSTEMS
255 NORTH UNION STREET, ROCHESTER, NEW YORK 14605
915 KIPLING AVE., TORONTO M8Z 5H4 CANADA
MAXIM RD., CRAYFORD, DARTFORD, KENT DA1 4BG, U.K.

TITLE
Test Procedure for the SC1302-323,
SC1326-323, SC1326W-323

DRAWN	CHECKED	APPR.
		J. E. Powers 7/27/84

DRAWING NO. A-1039-757 REV. M

SHEET 1 OF 10

1008-606

5/83

5.0 Connect the SC-1302-323 and the SC-1326-323 as shown in Figure 1A. Connect the SC-1326W-323 as shown in Figure 1B.

For voltage output, do not connect R1 and R2. For current output, connect R1 and R2 as shown and see Step 13 for correct values.

Fig. 1A

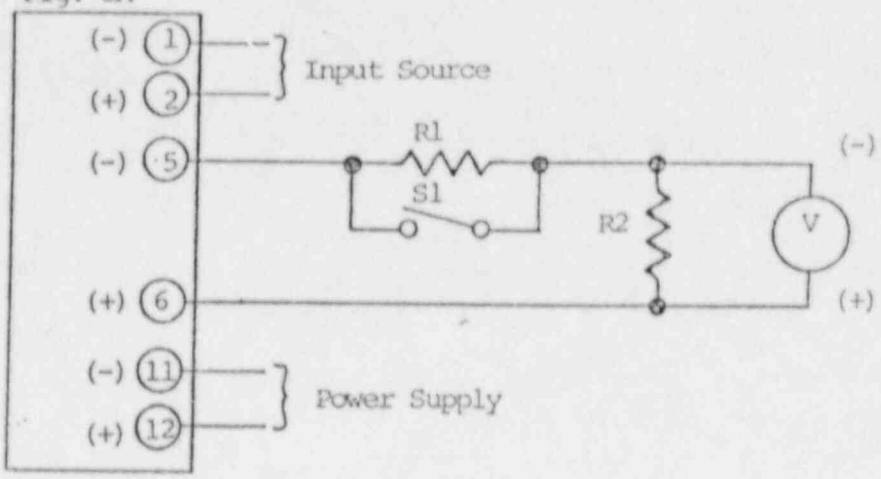
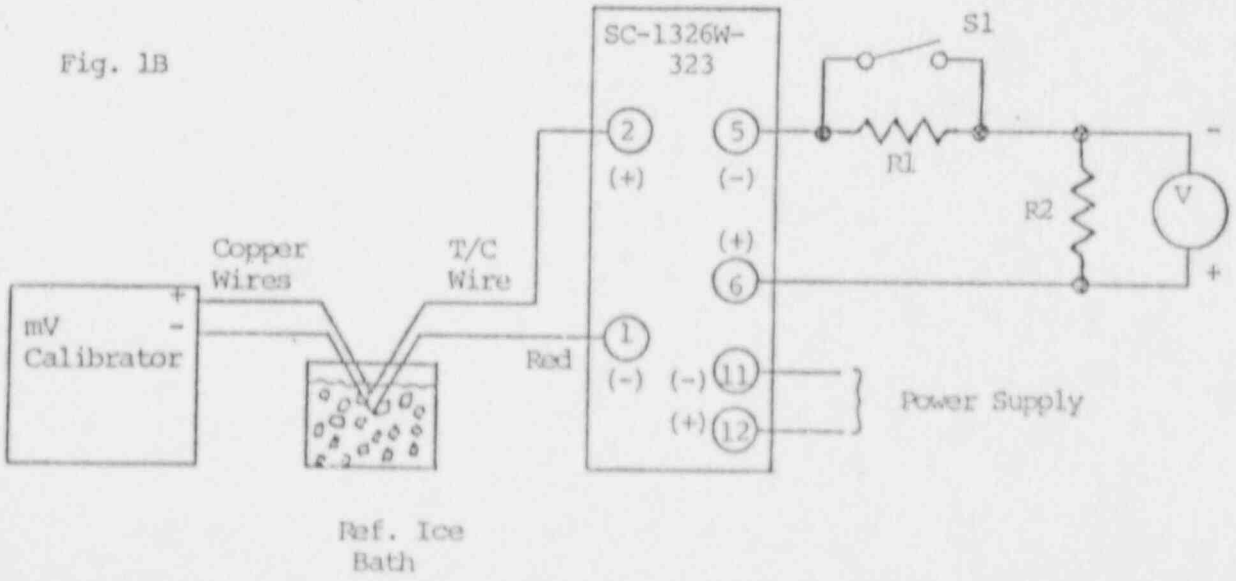


Fig. 1B



6.0 Master Voltage Checks - Record on Data Log

Apply a nominal value of primary input power to the unit under test. Measure the following voltages and record on data sheet.

	+ Lead	- Lead	Allowable Range
6.1	E10	E11	23V to 28V
6.2	Cathode CR10	E16	-14.25V to -15.75V
6.3	Cathode VR2	E45	5.85 to 6.55V
6.4	E16	Anode VR3	5.85V to 6.55V
6.5	C5(+)	C5(-)	8.5V to 14.8V
6.6	C4(+)	C4(-)	13.5V to 16.0V

7.0 Calibration: SC1302-323 and SC1326-323 (For 1326W-323, see Step 8) - Check Data Log

7.1 Set the input to the customers specified minimum input. Adjust R10 (zero pot) for the specified minimum output. If, the output is zero based, set the input to 10% and adjust R10 for 10% output.

7.2 Set the input to the customers specified maximum input. Adjust R21 (span pot) for the specified full scale output.

7.3 Return to Steps 7.1 and 7.2 until the output is within ±0.1% of output span without any further adjustment.

8.0 Calibration of SC-1326W-323 - Check Data Log

8.1 Remove R8 from circuit. Connect a DVM across R13 (E38 positive, E39 negative). By adjusting R37 (compensation adjustment pot) and the use of the chart below, set the correct mv across R13 by picking the correct T/C type and the ambient temperature the unit is being calibrated in. Reconnect R8.

mV Settings for Ambient Temperature:

Temp °F	R,S	T	J	E	K
58	1.721	17.25	14.94	11.77	11.48
60	1.728	17.32	14.99	11.82	11.52
62	1.734	17.39	15.05	11.87	11.57
64	1.740	17.45	15.11	11.91	11.61
66	1.747	17.52	15.16	11.96	11.66
68	1.753	17.58	15.22	12.00	11.70
70	1.761	17.65	15.28	12.04	11.75
72	1.766	17.71	15.34	12.09	11.79
74	1.774	17.77	15.39	12.13	11.83
76	1.780	17.83	15.45	12.18	11.88
78	1.787	17.89	15.51	12.22	11.92
80	1.793	17.96	15.56	12.27	11.97
82	1.800	18.01	15.62	12.31	12.01
84	1.807	18.07	15.68	12.36	12.05
86	1.814	18.13	15.74	12.41	12.10
88	1.820	18.21	15.80	12.45	12.14
90	1.827	18.28	15.85	12.50	12.19
92	1.834	18.35	15.91	12.54	12.23
94	1.841	18.42	15.97	12.59	12.28
96	1.848	18.48	16.03	12.64	12.32

8.2 After setting the correct mV across R13, follow steps 7.1 - 7.3 for calibration of the output.

9.0 Temperature Specification - SC-1326-323 and SC-1326w-323 only. Record % drift / °F on Data Log.

Temperature testing must be performed on all units with input spans less than or equal to 10mV. The maximum allowable drift per degree F is given by:

$$\% \text{ Drift}/^{\circ}\text{F} = \frac{10\text{mV}}{\text{Input Span (mV)}} \times .02\%$$

Where: °F refers to change in temperature.

% Drift is the output value at fullscale and/or zero at an elevated temperature (125°F) minus the output at ambient (initial) temperature divided by the output span X 100. Also, the output value at ambient (initial) temp. minus the output value at fullscale and/or zero at low temp. (25°F) divided by the output span x 100.

9.1 % Drift/ °F at elevated temperature is given by the the formula:

$$\text{High Temp. \% Drift}/^{\circ}\text{F} = \frac{\text{HTO} - \text{ITO}}{\text{Output Span}} \times \frac{100\%}{\text{TS}}$$

Where : HTO = High Temperature Output value
ITO = Initial Temperature Output value
TS = Temperature Span

Example : ITO = 5.000 V. , 1.000 V. @ 75.0 Deg. F.
HTO = 4.950 V. , 0.960 V. @ 125.0 Deg. F.
TS = 50.0 Deg. F. (125 Deg. - 75 Deg.)

$$\% \text{ Drift}/\ ^{\circ}\text{F} = \frac{4.950-5.000}{4.000} \times \frac{100\%}{50\ ^{\circ}\text{F}} \ , = \frac{0.960-1.000}{4.000} \times \frac{100\%}{50\ ^{\circ}\text{F}}$$

$= -0.0125 \times 2\%/\text{F}$, $= -0.010 \times 2\%/\text{F}$
$= -0.025\%/^{\circ}\text{F}$, $= -0.020\%/^{\circ}\text{F}$
Therefore % Drift/ °F Max. = -0.025

9.2 % Drift/ °F at cold temp. is given by the formula:

$$\% \text{ Drift}/^{\circ}\text{F} = \frac{\text{ITO} - \text{LTO}}{\text{Output Span}} \times \frac{100\%}{\text{TS}}$$

Where : ITO = Initial Temp. Output
LTO = Low Temp. Output
TS = Temp. Span

Example : ITO = 5.000 V. , 1.000 V. @ 75.0 Deg. F
LTO = 4.920 V. , 0.900 V. @ 25.0 Deg. F
TS = 50.0 Deg. F (75°F - 25°F)

$$\% \text{ Drift}/^{\circ}F = \frac{5.000-4.920}{4.000} \times \frac{100\%}{50^{\circ}F}, = \frac{1.000-0.900}{4.000} \times \frac{100\%}{50^{\circ}F}$$

$$= 0.020 \times 2\%/F \quad , = 0.025 \times 2\%/F$$
$$= 0.040\%/^{\circ}F \quad , = 0.050\%/^{\circ}F$$

Therfore % Drift/ °F Max. = 0.050

9.3 Performing Temperature Test

Equipment required : Temperature testing chamber - minimum range of 25°F to 125°F.

Thermometer - accurate to 1/2 Deg. F.

Install the unit to be tested into the temperature chamber. Monitor the output signal with a 4 1/2 digit volt meter and ensure that the input source is stable and does not drift over time. Apply power to the unit under test and observe the output of the unit at ambient temperature. When the output has stablized, record both the output and the temperature from the thermometer. Set the temperature chamber for 25 °F operation. After the oven has reached the set temperature allow 2 Hrs. before recording the output of the unit along with the measured temperature. After recording the data @ 25°F, set the oven temperature for 125°F. Again allow at least 2 hrs. before recording the output and temperature. Return the oven temperature to 75°F and remove unit from chamber. Refer to step 9.0 to evaluate temperature performance.

10.0 Recompensation for Excess Temp. Drift: SC1326W-323 only

If a unit displays drift characteristics exceeding the Max. allowed spec. (10Mv./Input Span x .02% per Deg. F), an adjustment or recompensation of the unit must be performed. This recompensation is done by readjusting the mV. setting across R13 (refer to Step 8.0). The new setting is determined by first deriving a correction factor (CF), then subtracting CF from the corresponding compensation coefficient (T/C α), listed in table 9.4a. Finally, the sum of T/C α - CF is multiplied by the temperature (T) plus 459.67 Deg. F (Ref. absolute zero).

Table 10.0a

	R,S	E	J	T	K
T/C α	13.324uV.	33.298uV.	28.838uV.	22.729uV.	22.167uv.

10.1 Correction Factor (CF)

To find the correction factor (CF) of a unit that fails to meet its % Drift/ °F spec., use the following formula to derive CF :

$$CF = \frac{HTD + LTD}{2} \times \text{Input Span}$$

Where : HTD = Elevated temp. % Drift/ °F Max.(see Step 9.1)
LTD = Cold temp. % Drift/ °F Max.(see Step 9.2)

Example : HTD = -0.025%/°F Max.
LTD = 0.050%/°F Max.
Input Span = 5mV.

$$CF = \frac{-0.025\% + 0.050\%}{2} \times 5mV.$$

$$= 0.0125\% \times 5mV.$$
$$= 0.000125 \times 5mV.$$
$$CF = .000625mV. \text{ or } .625uv.$$

10.2 New mV. Setting = (T/C∝ - CF) x (459.67 + T)

Where : T/C∝ = Coresponding value in table 10.0a
CF = Correction Factor (refer to step 10.1)
T = Ambient Temperature during calibration

Example : SC-1326W-323, J T/C, 5mV. input span

New mV. setting = (T/C∝ - CF) x (459.67 + T)

Where : T/C∝ = Value listed in Table 10.0a.
CF = Value calculated in Step 10.1.
T = 75.0 Deg. F

New mV. setting =(28.838uV. - .625uV.) x (459.67 + 75.0)
= 28.213uV. x 534.67
= 15.085mV.

New mV. setting across R13 = 15.085mV. @ 75 Deg. F

10.3 Repeat Steps 9.0 - 9.3 after mV. setting across R13 has been readjusted for correction of excess temp. drift.

11.0 Linearity - Record on Data Log

Apply a 50% input: $\frac{\text{Maximum Input} + \text{Minimum Input}}{2}$

The output of the unit should be at midpoint ±0.1% of span.

12.0 Upscale/Downscale Protection - (1326/26W-323 only) - Check Data Log

Disconnect the thermocouple from either input terminal (Term 1 or 2). If upscale protection is supplied, the output will rise above 6 VDC. If downscale protection is supplied, the output will go to less than 1V. Unless otherwise specified, the SC-1326W-323 will be supplied with upscale protection, and the SC1326-323 will be supplied with downscale protection.

13.0 Power Supply/Load Effect - Current Output - Record on Data Log (If HO option, go to step 15.0)

13.1 For current outputs, the load effect must be checked with the values of R1 and R2 as shown in the chart below:

See Figures 1A & 1B.

OUTPUT	R1		R2	
4-20 ma	550Ω	1%	250Ω	.01%
1-5 ma	2200Ω	1%	1000Ω	.01%
10-50 ma	220Ω	1%	100Ω	.01%
0-10 ma	1100Ω	1%	500Ω	.01%
0-1 ma	11KΩ	1%	5KΩ	.01%

13.2 With Switch S1 open, and at the nominal power supply voltage, measure the voltage across R2. Reduce the input power by 20% and measure the voltage across R2. At +20% power, close S1 and measure voltage. The maximum change in voltage across R2 between any of the above steps should be ±.15% of output span.

Example: Input - 1.000 to 5.000V
Output - 4.00 to 20.00 mA
R1 = 550Ω 1/2W, 1%
R2 = 250Ω 1/2W, .01%
Power Supply - 115 VAC ± 20%

Power Supply	S1	Voltage Across R2
Nom. 115V	OPEN	5.000V
-20% 92V	OPEN	4.994 to 5.006V
+20% 138V	CLOSE	4.994 to 5.006V

The voltage across R2 must be within 0.15% of the span of the initial reading for all segments of the load test.

14.0 Power Supply Effect - For Voltage Output Only - Record on Data Log

14.1 For voltage output, set the inputs to full scale and record the output. Adjust the power supply for ±20% and record the output. The output should not change by more than ±.15% of output span.

Example: Input: 4.0 - 20.0 mA
Output: 1.000 - 5.000V
Power Supply: 115 VAC ±20%

Power		Output (Maximum Allowable Shift)
-20%	(92 VAC)	4.994 to 5.006V
Nom.	(115 VAC)	5.000V
+20%	(138 VAC)	4.994 to 5.006V

15.0 High Loop Drive Output

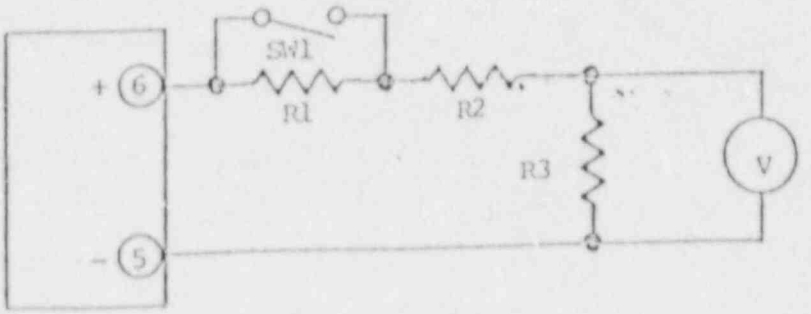
15.1 Wiring (Check Data Log)

15.1.1 Wire the HO p.c. board per wire list A-1041-044. Check Data Log.

15.2 Calibration (Check Data Log)

15.2.1 Connect the output terminals of the unit as shown in Figure 1 and output resistor chart.

FIGURE 1



Output Resistor Chart

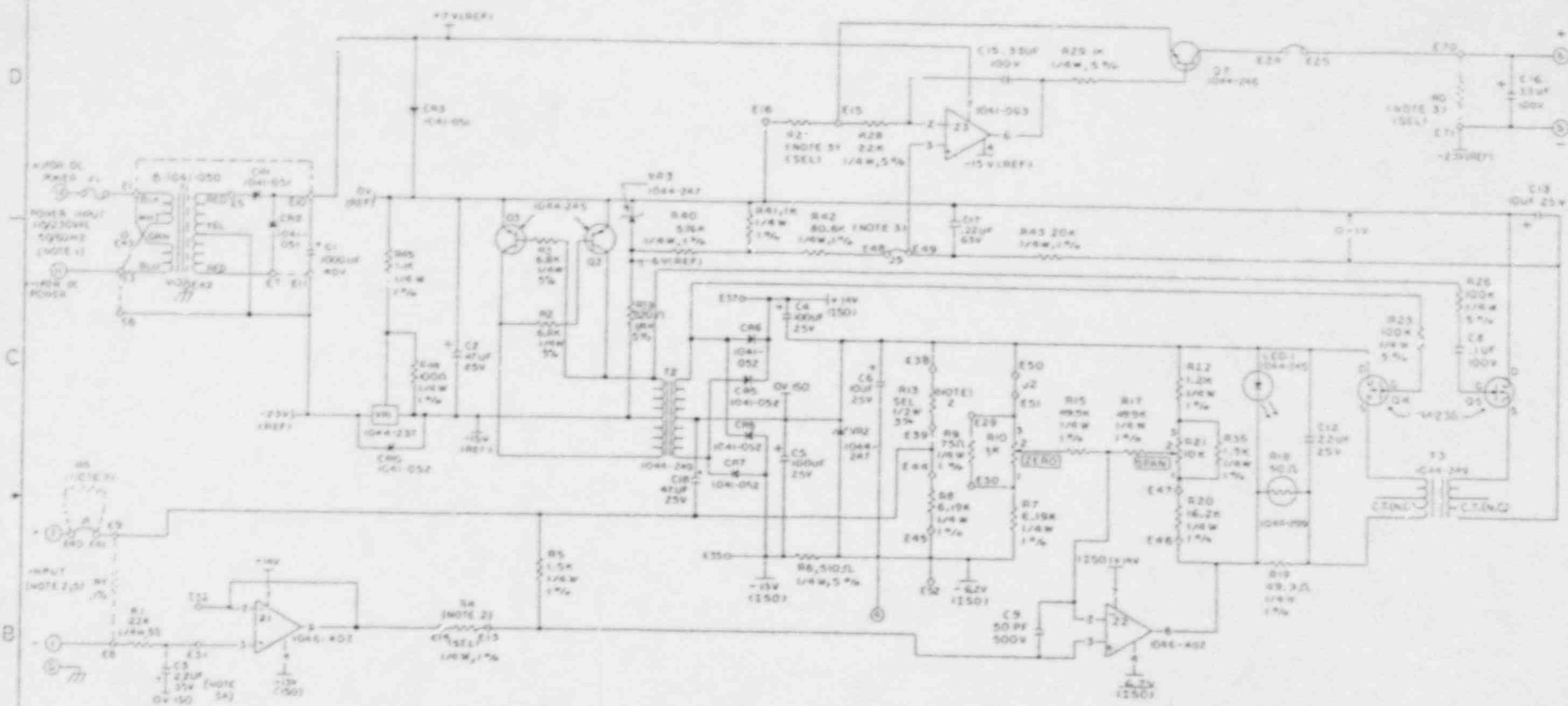
Output	R1	R2	R3
0,4-20 mA	800Ω 1%	550Ω 1%	250Ω .01%
0,1-5 mA	2800Ω 1%	2200Ω 1%	1000Ω .01%
0,10-50 mA	280Ω 1%	220Ω 1%	100Ω .01%
0-10 mA	1400Ω 1%	1100Ω 1%	500Ω .01%
0-1 mA	14KΩ 1%	11KΩ 1%	5KΩ .01%

15.3 Line/Load Effect

15.3.1 Apply -20% power supply voltage to the unit under test (92 VAC for 115 VAC operation). With S1 open, record the voltage across R3.

15.3.2 Apply +20% power supply voltage to the unit under test (138 VAC for 115 VAC operation) with S1 closed, record the voltage across R3.

The maximum allowable change in voltage across R3 between the above two (2) readings is .012 VDC,



NOTES:

1. POWER OPTIONS REFER TO WIRE LIST A1039-809.
   A. FOR 115 VAC OPERATION FUSE NO. 0620-35* 150MA SLO-BLO.
   B. FOR 230 VAC OPERATION FUSE NO. 0620-15* 150MA SLO-BLO.
   C. FOR 24 VDC OPERATION FUSE NO. 6006-204 (1/8 AMP) SLO-BLO.
   D. FOR 48 VDC OPERATION FUSE NO. 6006-204 (1/4 AMP) SLO-BLO.

2. INPUT SIGNAL OPTION
   R4 AND R13 ARE SELECTED PER INPUT - SEE INPUT CHART AND NOTE 5.

3. OUTPUT OPTION
   A. VOLTAGE OUTPUTS MAY BE OBTAINED BY ADDING THE APPROPRIATE SHUNT TO THE 4-20MA CURRENT OUTPUT. SEE THE OUTPUT CHART DETAILING THIS INFORMATION.

4. HIGH LOOP DRIVE (OPTION HD)
   A. ADD MODULE A-1041-040.
   B. WIRE PER A-1041-044.

5. FOR INVERTER APPLICATIONS THE FOLLOWING CHANGES WILL BE MADE:
   A. C3 POLARITY IS REVERSED.
   B. INPUT TERMINALS ARE 1(+), 2(-).
   C. R13 IS 75Ω, 1/10W, 1%, ... FOR ALL INPUTS.
   D. MINIMUM OUTPUT MAY BE ADJUSTED FOR BY USING ZERO POT R10 WITH FULL SCALE INPUT.
   E. FULL SCALE OUTPUT MAY BE ADJUSTED BY USING SPAN POT R21 WITH MINIMUM INPUT.

6. FINISH
   HUMISEAL BOARD WITH HUMISEAL TYPE 1A20 AFTER FINAL TESTING. MASK TERMINAL BLOCK & FUSE CLIPS BEFORE APPLYING HUMISEAL.

7. FOR "R" OPTION, CALCULATE R8 AND SELECT ... RESISTOR SERIES AS FOLLOWS:
   [illegible]
   REMOVE ... AND REPLACE WITH R8.

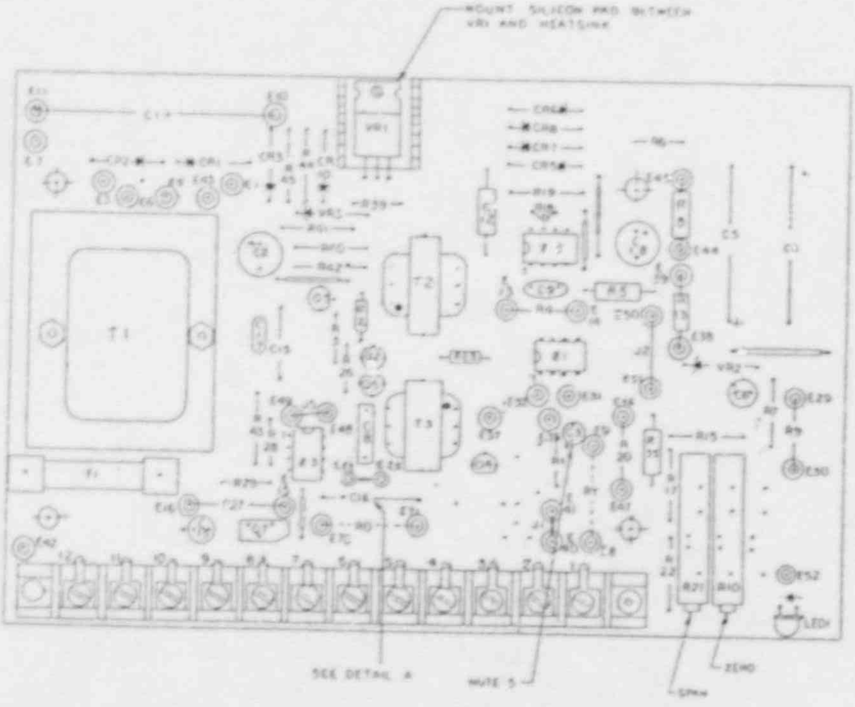
IEEE 323 QUALIFIED
NOT TO BE CHANGED WITHOUT Q.A. APPROVAL

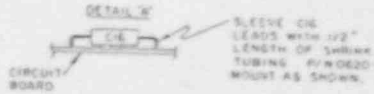
SCHEMATIC & ASSEMBLY
ISOLATED SIGNAL TRANSMITTER
SC1302-323

RIS ROCHESTER INSTRUMENT SYSTEMS

ECO 7165 AV 6/5/85

D-1039-754 P





OUTPUT CHART (NOTE 1)

ZERO BASED OUTPUT *	R0	R.S. P/N	R27	R.S. P/N	LIVE ZERO OUTPUT
0-20mA	—	—	49.9Ω	4709-090	4-20mA
0-50mA	—	—	20.5Ω	4711-113	10-50mA
0-5mA	—	—	200Ω	4709-[illegible]	1-5mA
0-10mA	—	—	100Ω	4709-125	2-10mA
0-10mV	[illegible]	4711-136	49.9Ω	4709-090	2-10mV
0-100mV	[illegible]	4711-[illegible]			20-100mV
0-1V	49.9Ω	4709-[illegible]			.2-1V
0-5V	249Ω	4709-119			1-5V
0-10V	499Ω	4709-205	49.9Ω	4709-090	2-10V
0-1mA	—	—	1kΩ	4709-248	.2-1mA

* DELETE J5

INPUT CHART (NOTE 2)

INPUT	R7	R.S. P/N	R4	R.S. P/N	R3	R.S. P/N
0-20mA	250Ω/.1%	1015-552	150K	4709-512	26.7Ω	4711-125
4-20mA	250Ω/.1%		121K	-501	12.4Ω	-094
0-50mA	100Ω/.1%	1015-551	150K	-512	26.7Ω	-125
10-50mA			121K	-501	12.4Ω	-094
0-10mA	500Ω/.1%	1011-766	150K	[illegible]	26.7Ω	-125
2-10mA			121K	-501	12.4Ω	-094
0-5mA	1KΩ .1%	1015-553	150K	-512	26.7Ω	-125
1-5mA			121K	-501	12.4Ω	-094
0-5V	—	—	150K	-512	26.7Ω	-125
1-5V			121K	-501	12.4Ω	-094
0-1V	—	—	29.4K	-[illegible]	26.7Ω	-125
.25-1.25V					12.4Ω	-094
0-1mA	5K .1%	1011-767	150K	-512	26.7Ω	-125
.2-1mA	5K .1%		121K	-501	12.4Ω	-094
0-500mV	—	—	137K	-393	26.7Ω	-125
0-200mV	—	—	4.53K	-334	26.7Ω	-125
0-100mV	—	—	[illegible]	4709-275	26.7Ω	4711-125
0-X V	100K	4709-[illegible]	150K	4709-512	26.7Ω	4711-125
.2X-X V	100K	4709-[illegible]	150K	4709-512	12.4Ω	4711-094

"X" OPTION: 5 ≤ X ≤ 100

SEE NOTE 6 SHEET 1

SCHEMATIC ASSEMBLY ISOLATED SIGNAL TRANSMITTER SC1302-323

RIS ROCHESTER INSTRUMENT SYSTEMS

D-1039754 P