DAVIS BESSE

PERFORMANCE TESTING

AND

EQUIPMENT QUALIFICATION

ENGINEERING REPORT NO. 1061

October 26, 1976

Rev. A - November 9, 1976

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Products Manager

CONSOLIDATED CONTROLS CORPORATION

BETHEL, CONNECTICUT

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1.0 Scope

This report details the qualification and acceoptance testing performed on the CCC Part Number 9N16 Safety Features Actuation System for the Davis Besse Unit 1, Nuclear Power Station. Testing was performed on both the system and module level.

2.0 Applicable Documents

KYM 315/1	Rev D	Quality Conformance Test Procedure Bistable #1, CCC P/N 6N81
KYM 315/2	Rev B	Quality Conformance Test Procedure for Bistable #2, CCC P/N 6N82
KYM 315/3	Rev B	Quality Conformance Test Procedure for Output Module, CCC P/N 6N83
KYM 315/4	Rev A	Quality Conformance Test Procedure for Sam Logic Module, CCC P/N 6N84
KYM 315/5	Rev B	Quality Conformance Test Procedure for Auto Test Module, CCC P/N 6N85
KYM 315/6	Rev A	Quality Conformance Test Procedure for Analog Module, CCC P/N 6N86
KYM 315/7	Rev B	Quality Conformance Test Procedure for Sequencer Module, CCC P/N 6N87
KYM 315/8	-	Acceptance Test: Unregulated Power Supply P/N KDE 1907
KYM 315/9	Rev B	Quality COnformance Test Procedure Surveillance Indicator Assembly
KYM 315/10	Rev B	Quality Conformance 9N16
ER 785		Seismic Analysis
ER 803		Environmental Test Modules
ER 832		Seismic Vibration Qualification
KGZ 317		Seismic Test Procedure

3.0 Test Programs Performed

3.1 Module Acceptance and Qualification Tests

3.2 System Acceptance and Qualification Tests

3.2.1 Visual Examination

3.2.2 Dielectric Strength

3.2.3 Insulation Resistance

3.2.4 Functional Test

3.2.5 Noise Rejection Test

3.2.6 Full Load Burn-In Test

3.2.7 Power Test

3.2.8 Seismic Analysis and Vibration

4.0 Test Program Discussion

4.1 Module Acceptance and Qualification Testing.

Each type of module for the 9N16 SFAS was subjected to a series of Acceptance Tests. These tests included dielectric strength between Input, Output Pins and the Chassis, insulation resistance between Input, Output Pins and Chassis, and a full function Operational Test. These Module Tests are detailed in Test Procedures KYM 315/1-9. In addition one of each type Module was subjected to an Environmental Test as detailed in CCC Engineering Report 803. These tests were made to the requirements of Bechtel Specification 7749-E-30, Paragraph 7.0 and 15.3. Performance of the modules was verified at an environment of 130° at a relative

humidity of 94% for seven days (168 hours) and the module performance verified by conducting the Module Acceptance Test Procedure and recording the associated Data each 24 hours.

4.2 System Acceptance and Qualification Testing

The complete 9N16 Safety Features Actuation System was subjected to the following tests:

4.2.1 The equipment was visually examined for the following: workmanship, assembly, fit, materials, parts, finishes, markings, treatment for corrosion.

4.2.2 Each 52 Pin Module Connector, located at the rear of each module, and each 104 Pin Input-Output Connector, located at the base and back of each SFAS Cabinet, was tested to Chassis, for a dielectric strength of 500 VAC 60 Hz. Test voltage was applied for a minimum of 60 seconds. Each circuit was checked for visible or audible corona or breakdown.

4.2.3 Each 52 Pin Module Connector and each 104 Pin Input-Output Connector was tested to Chassis for insulation resistance (IR) at 500 VDC. Each circuit was checked for

a minimum IR of 10 megohms.

4.2.4 The equipment was connected to the test set-up as per CCC Drawing KWJ1316/10. The complete system was then aligned and functionally tested to CCC Test Procedure KYM1315/10 Paragraph 3.4 and 3.5.

4.2.5 The equipment was subjected to an External Electrical Noise Test as specified in CCC Procedure KYM1315/10 Paragraph 3.0 and on CCC Drawing Y08-354-15. The equipment was connected as shown in Drawing Y08-354-15, attached, actual cabinet positioning is shown in Figure 1 of this report.

This apparatus serves to inject electromagnetic noise transients into the cabling between SFAS cabinets and to remotely located input and output devices. Both DC and AC (60 Hz) sources are utilized to include as many of the encountered plant noise conditions as possible.

Inductors at the end of the noise insertion cable have their current interupted by opening the noise circuit via switches S1 and S2. The resulting voltage transient ($V = L\frac{dI}{dt}$)

is present on the insertion cable which is in close proximity to the SFAS interconnecting and signal cables. The values of the inductors have been chosen emperically by observations developed and measured over the past 20 years for shipboard instrumentation and control equipment in the Naval Reactors Program.

The procedure is to connect the equipment, lay the noise insertion wires in with the system inter-connecting and input/output cables and then introduce the noise by alternately closing and breaking the noise circuit via switches S1 and S2. The system performance is monitored to verify that the noise has no effect on the system function.

Noise transients were generated in close proximity to all interconnecting wiring including essential and non-essential wiring. The equipment was energized with input and output parameters set to normal values. The generated noise was monitored using an oscilloscope at the locations shown in Figure 1. Voltage spikes of greater than 1500-1700 volts peak were observed at the

input and output ends of the noise injection cable. No equipment actuation or response was observed or recorded.

4.2.6 The equipment was connected to the Test Set-Up and operated at full load for 1100 hours. This constituted the Full Load Burn-In Test.

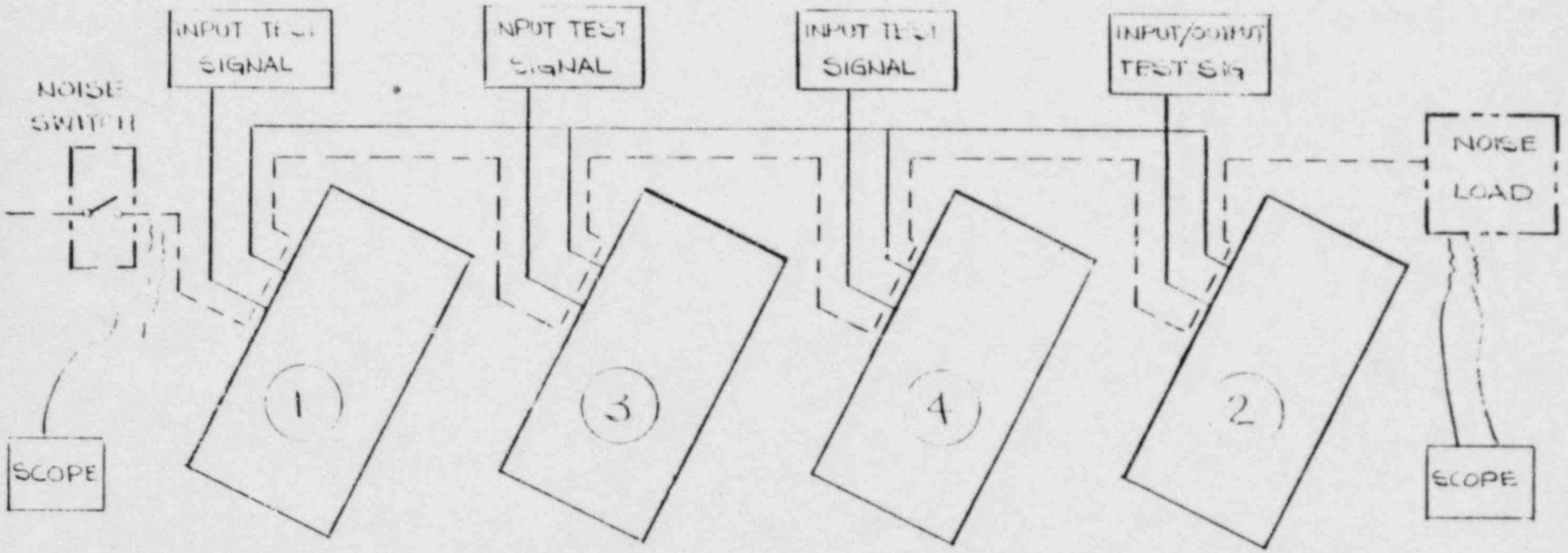
4.2.7 A Power Test was made of each of the SFAS channels to measure and record the inrush current. This information was submitted to Bechtel in a letter dated 20 March 1974. SFAS Channel 1, 8.75 Amps AC, SFAS Channel 2, 3, 4, 6.75 Amps AC.

4.2.8 The 9N16 SFAS Equipment was subjected to a detailed seismic analysis. This analysis is detailed in CCC Engineering Report 785. In addition the 9N16-1 Cabinet was subjected to a Seismic Vibration Qualification Test. Details of this test and the results are contained in CCC Engineering Report 832.

5.0 Conclusion

The equipment met all the Performance and other Qualification requirements of the Bechtel Design Specification 7749-E-30 and CCC Developed Performance Specifications. Performance was verified by Test Programs and Documented Test Results.

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



INTERCABINET OUTPUT TRIP SIGNALS

FIG. 1

		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES X XX XXX ANGLES ± .03 ± .01 ± .005 ± 1/2° FRACTIONS ± ALL MACH. SURFACES ✓ RMS DRILL HOLES PER ANSI B94.11M-1979 BURRS & SHARP EDGES PER IZL315 45° CHAMFER FIRST THREAD TOLERANCES PER USASI Y14.5-1966 COML TOL APPLY TO STOCK SIZES	DRAWN CHECKED ENGR RELEASED	CONSOLIDATED CONTROLS CORPORATION BETHEL, CONN. EL SEGUNDO, CALIF.
NEXT ASSY	USED ON	MATERIAL:		SIZE A | CODE IDENT NO. 02750
APPLICATION		FINISH:		SCALE | WT. CALC ACT. | SHEET

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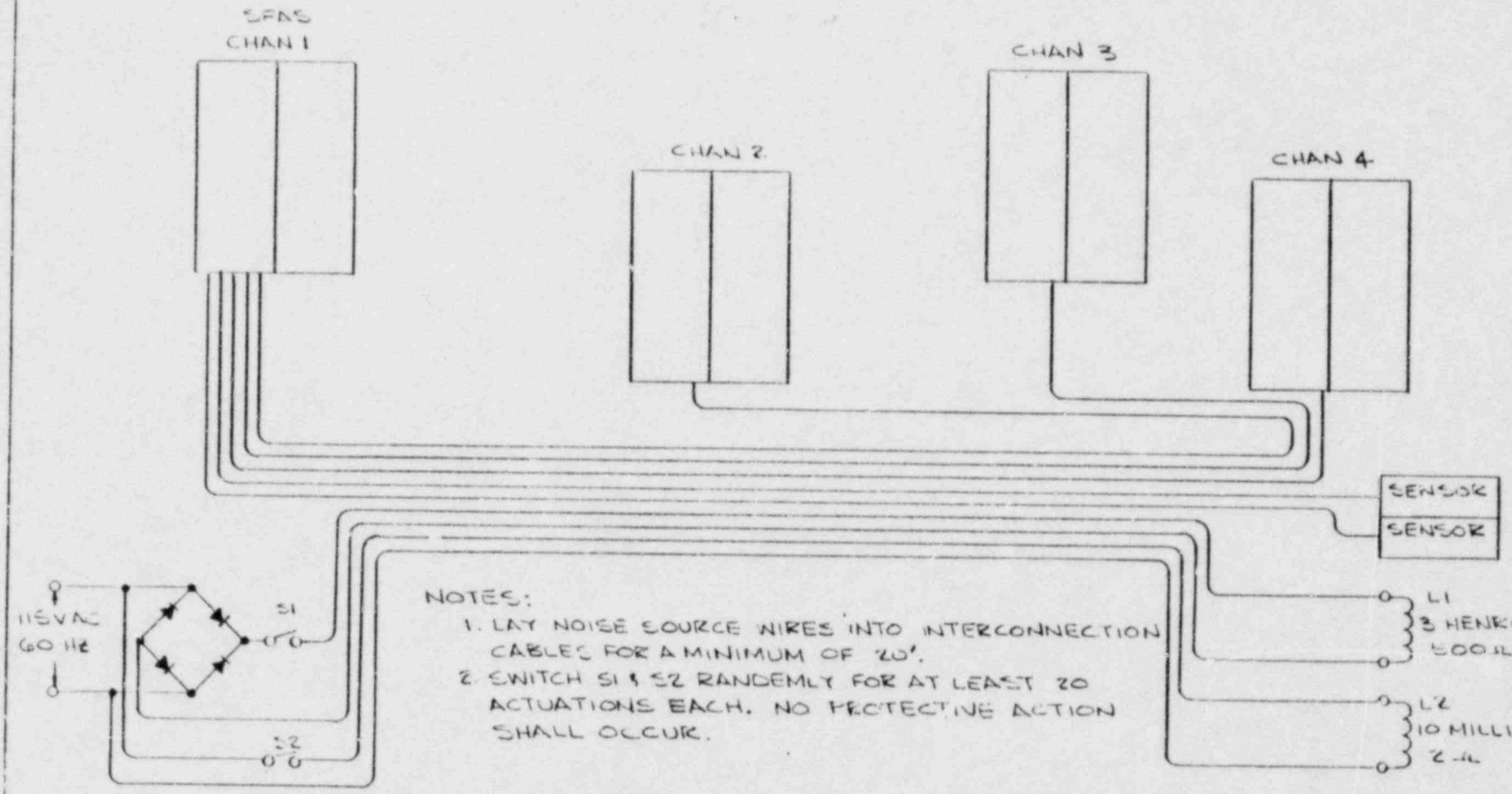

NOTES:

1. LAY NOISE SOURCE WIRES INTO INTERCONNECTION CABLES FOR A MINIMUM OF 20'.
2. SWITCH S1 & S2 RANDOMLY FOR AT LEAST 20 ACTUATIONS EACH. NO PROTECTIVE ACTION SHALL OCCUR.

SUSCEPTIBILITY TEST CONN

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CCC DWG NO. Y08-354-15

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KYM315/1

QUALITY CONFORMANCE TEST PROCEDURE

AND

TEST DOCUMENTATION

FOR

BISTABLE #1, CCC PART NUMBER 6N81

1. TEST EQUIPMENT

1.1 High Pot Tester, Model 805-2 Beta Electric Co.

1.2 Megohm Tester, Model L6B, Industrial Instrument, Inc.

1.3 Voltmeter, Digital, Model DVX-315, Data Tech or equivalent.

1.4 Oscilloscope, Tektronix Model 564 or equivalent.

1.5 Scope Probe

1.6 Megacycle Pulse Generator, Electro-Pulse Model 3450D.

2. DRAWINGS

2.1 Assembly 6N81

2.2 Test Set-up KWJ1316/1

3. TESTS TO BE PERFORMED

3.1 Visual Examination

3.2 Dielectric Strength

3.3 Insulation Resistance

3.4 Operating Tests.

VENDOR'S QA PROGRAM REVIEW

1 [X] Approval without comments

2 [ ] Approval with comments, released for interim use, resubmit within 20 days per ED 6038

3 [ ] Not approved. See comments marked on Procedure. Resubmit for approval within 30 days per ED 6038

Approval of this QA Program does not relieve supplier from full compliance with contract or purchase order requirements.

By BCH BECHTEL Date 9/7/76

Job No. 7749

BECHTEL COMPANY
Power & Industrial Division
P.O. Box 607 Gaithersburg, Md.

7749-E-30Q-5-5

LTR	REVISION	DATE	LTR	REVISION	DATE
C	REL ON C/N N4756	6/29/72	B	C/N N4756, REVISED 1 PROCEDURE	12/29/72
A	C/N N4864 P2, ADDED REV; REVISED P's 4.4.47, 4.4.57, 4.4.61, P4.4.60 WAS 4.4.61 SAT 12, DELETED P4.4.60	10/25/72	C	C/N N5549 ADD'D P4.4.51	2/23/73
			D	C/N N5925 ADD'D P4.4.44 TO 4.4.45 RENUMBERED	5/30/76

Quality Conformance Test Procedure Bistable #1, CCC P/N 6N81

CONSOLIDATED CONTROLS CORP.
BETHEL CONNECTICUT, U.S.A.

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4. TESTING

Note: When "Check (✓)" appears in the procedure, check off the appropriate block of the Test Documentation sheet.

4.1 Visual Examination

The equipment shall be visually examined for the following in accordance with the applicable assembly drawings.

4.1.1 Workmanship, assembly and fit.

4.1.2 Materials, parts and finishes.

4.1.3 Treatment for prevention of corrosion.

4.1.4 Markings.

4.1.5 Check (✓).

4.2 Dielectric Strength

4.2.1 Form a single isolated circuit by connecting all pins on the module, connector together.

4.2.2 Apply a potential of 500 VAC, 60 Hz, between the isolated circuit and the module instrument frame, for a period of one (1) minute. There shall be no arcing or breakdown.

4.2.3 Check (✓).

4.3 Insulation Resistance

4.3.1 Form a single isolated circuit by connecting all pins on the module connector together.

4.3.2 Apply a test potential of 500 VDC between the isolated bus and the module frame for a period of one minute.

Record the value for insulation resistance, ambient temperature and relative humidity at the time of test.

The insulation resistance measurements shall be corrected to a 77° F value. Corrections shall be made on the basis of insulation resistance doubling for every 27° F decrease in temperature.

4.3.3 The minimum insulation resistance reading for the above test shall be 10 megohms at 77° F.

4.3.4 Check (✓).

4.4 Operating Tests

4.4.1 Connect the 6N81 module as shown on KWJ1316/1.

4.4.2 Set the test panel switch as follows:

PWR	Off
FUNCTION	Increasing
BLOCK	Normal
LOGIC 1 THRU 6	Lo
AT1-P	Lo
AT1-A	Hi

4.4.3 Adjust the external power supplies to their respective plus and minus 15V DC potentials.

4.4.4 Set the test panel PWR switch to ON.

4.4.5 Connect the voltmeter between test panel BP4 (Hi) and BP5 (Lo). Adjust the signal input to obtain 0.0V DC on the voltmeter.

4.4.6 Adjust the following module pots as indicated:

TRIP SET	0.0
R4	Fully CCW
R3	Fully CCW

4.4.7 4.4.7 Observe that module TRIP lamp is OFF. If not, depress and release module RESET switch. The TRIP lamp should extinguish and remain OFF. Check (✓).

4.4.8 Depress and release the module TRIP lamp. The TRIP lamp shall illuminate and extinguish. Check (✓).

4.4.9 Connect the voltmeter between module BIAS and COM jacks. Adjust module R4 fully CW, the voltmeter shall indicate an increasing negative reading from 0 ± .050V DC fully CCW to -.460 ± .050V DC fully CW. Check (✓).

4.4.10 Adjust module pot R4 kfully CCW.

4.4.11 Connect the voltmeter between module TRIP and COM jacks. Adjust TRIP pot fully CW, the voltmeter shall indicate an increasing negative reading from 0 ± .050V DC fully CCW to -6.2 ± .3 VDC fully CW. Check (✓).

4.4.12 Adjust module pot R3 fully CW. The voltmeter shall indicate a decreasing negative reading from -6.2 ± .3V DC fully CCW to -4.1 ± .3V DC fully CW. Check (✓).

4.4.13 Adjust the following module pots as indicated:

TRIP SET	0.0
R3	fully CCW
R4	fully CW

4.4.14 Connect a jumper between module jacks TRIP & COM. Connect the voltmeter to test panel binding posts BP4 (Hi) and BP5 (Lo). Adjust the signal input to obtain 0.250 ± .010V DC.

4.4.15 Adjust the module R4 pot until TRIP lamp illuminates. Check (✓).

4.4.16 Depress and hold the module RESET switch. Decrease the signal input until the TRIP lamp extinguishes, then release the RESET switch.

4.4.17 Slowly increase the Signal input until the TRIP lamp illuminates. The voltmeter shall indicate 0.250 ± .010V DC. Check (✓).
Note: If the above condition is not met set R4 fully CW, reset per para. 4.4.16, then repeat para. 4.4.14 thru 4.4.17.

4.4.18 Remove the jumper from module TRIP and COM jacks and set the TRIP SET pot to 10.0.

4.4.19 Increase the signal input to 5.250 ± .010V DC. Depress and release the module RESET switch.

4.4.20 Adjust the module R3 pot until the module TRIP lamp illuminates. Reset per para. 4.4.16.

4.4.21 Slowly increase the signal input until the TRIP lamp illuminates. The voltmeter shall indicate 5.250 ± .035V DC. Check (✓).
Note: If the above condition is not met, set R3 fully CCW, adjust the signal input to 5.250 ± .010V DC, reset per para. 4.4.16, then repeat para. 4.4.20 and 4.4.21.

4.4.22 Set the TRIP SET pot to 0.0.

4.4.23 Reduce the signal input to 0 VDC. Depress and release module RESET switch to extinguish the module TRIP lamp.

4.4.24 Increase the signal input until the TRIP lamp illuminates. The voltmeter shall indicate 0.250 ± .035 VDC. Check (✓).

4.4.25 Reset per paragraph 4.4.16.

4.4.26 Set the TRIP SET pot to 5.0 Increase the signal input until the TRIP lamp illuminates. The voltmeter shall indicate 2.750 ± .100V DC. Check (✓).

4.4.27 Reset per paragraph 4.4.16.

4.4.28 Depress and release the module TEST switch. The module TRIP lamp shall illuminate. Depress and release the module RESET switch, the TRIP lamp shall extinguish. Check (✓).

4.4.29 Increase the signal input until the TRIP lamp illuminates. Test panel lamp L1 & L2 shall be OFF. Check (✓).

4.4.30 Reset per paragraph 4.4.16. Lamps L1 & L2 shall be ON. Check (✓).

4.4.31 Set the test panel BLOCK switch to BLOCK position.

4.4.32 Increase the signal input until the module TRIP lamp illuminates. Lamps L1 and L2 shall remain ON. Check (✓).

4.4.33 Set the BLOCK switch to NORMAL. Lamps L1 and L2 shall extinguish. Check (✓).

4.4.34 Reset per paragraph 4.4.16.

4.4.35 Observe and measure the following conditions. Check (✓).

L-BUS & AT1 lamps	OFF
Q7 - Collector/COM	Lo
Q8 - Emitter/COM	.000 VDC ±.010
Q9 - Collector/COM	Hi

4.4.36 Set LOGIC 1 & 2 to Hi, set AT1-P to Hi. Observe and measure the following conditions. Check (✓).

L-BUS & AT1 lamps	ON
Q7 - Collector/COM	Hi
Q8 - Collector/COM	Lo
Q9 - Collector/COM	Lo

4.4.37 Set the AT1-P to Lo. The AT1 and L-BUS lamps shall remain ON. Check (✓).

4.4.38 Set the AT1-A to Lo. Depress and release the module TEST switch. The L-BUS & AT1 lamps

shall remain ON. Check (✓).

4.4.39 Depress and release the module RESET switch.

4.4.40 Set the AT1-A to Hi. Depress and release the module TEST switch. The L-BUS and AT1-A lamps shall extinguish. Check. (✓).

4.4.41 Depress and release the module RESET switch.

4.4.42 Set the Megacycle Pulse Generator to produce the waveform shown in Figure 1. Connect the generator signal output to BP6, and the signal return to BP2. Set the AT1-P switch to HI and readjust the generator to obtain Figure 1 if necessary. Increase the input signal until the voltmeter indicates 4.250V ± 0.035V.

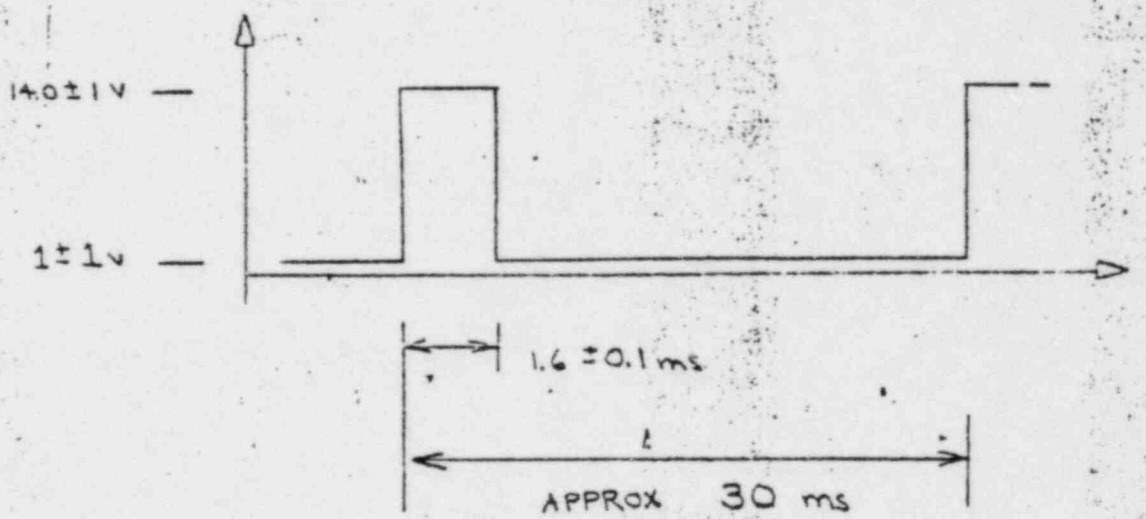

FIGURE 1 - P-TRAIN INPUT WAVEFORM

LTR	REVISION	DATE	LTR	REVISION	DATE

Quality Conformance Test Procedure, Bistable #1
CCC P/N 6N81

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4.4.43 Set the Test Set FUNCTION switch to DECREASING, and adjust the HI and LO pots fully CCW.

4.4.44 Connect the scope probe to the module ATI jack. The displayed waveform shall be similar to Figure 2, with the variable test level at ≤ 1.9V.

Check (✓)

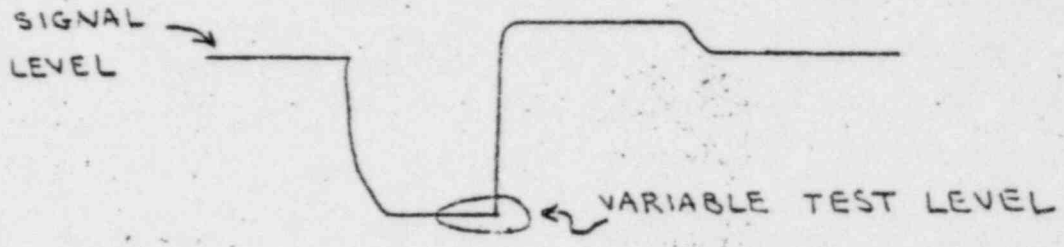

FIGURE 2 - NORMAL ATI TEST PULSES

4.4.45 Adjust the HI pot fully CW. The Variable Test Level shall increase to 4.250V ± 0.25V.

Check (✓)

4.4.46 Set the ATI-A switch to LO, and adjust the module LOW opt to fully CW. The Variable Test Level shall decrease to 1.9V.

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Check (✓)

4.4.47 Increase the pulse width of the Megacycle Pulse Generator. The duration of the Variable Test Level shall not extend beyond 4 ms.

Check (✓)

4.4.48 Remove the test pulse from BP6.

4.4.49 Set the Test Set FUNCTION switch to INCREASING.

4.4.50 Reset per Paragraph 4.4.16.

4.4.51 Set LOGIC 1 & 2 switches Lo and AT1-A to Hi. Depress Matrix One Switch. Set the following LOGIC switches Hi and Lo and note the conditions of L-BUS & AT1 lamps. When the lamps illuminate, Reset by depressing and releasing the designated MATRICES. Check (✓).

Logic	Lamps	Matrices
1	OFF	--
2	OFF	--
1,2	ON	#1
3	OFF	--
4	OFF	--
3,4	ON	#2
5	OFF	--
6	OFF	--
5,6	ON	#3

4.4.52 Set the following switches as indicated:

FUNCTION	-	Decreasing
AT1-A	-	Hi
ATI-P	-	Lo
LOGIC	-	Lo

4.4.53 Set the signal input to 1.0V DC and the TRIP SET pot to 0.0. Depress and release the module RESET switch. The TRIP lamp shall be OFF. Check (✓).

4.4.54 Decrease the signal input until the TRIP lamp illuminates. Check (✓).

4.4.55 Increase the signal input to 1.0V DC. Depress and release the RESET switch to extinguish the TRIP lamp.

4.4.56 Set LOGIC 1 & 2 Hi. Set AT1-P to Hi, observe and measure the following conditions. Check (✓).

L-BUS & AT1 Lamps ON
Q9- Collector/COM Hi

4.4.57 Set the AT1-P to Lo. Observe and measure the following conditions. Check (✓).

L-BUS & AT1 Lamps ON
Q9 - Collector/COM Hi

4.4.58 Depress and release the module TEST switch. The module TRIP lamp shall illuminate and the L-BUS and AT1 lamps shall extinguish. Check (✓).

4.4.59 Set the test panel PWR switch to OFF. Disconnect test set-up.

4.4.60 Check continuity between P1-F & U4-14; P1-p & U4-15. Check (✓).

4.5 Test Documentation

After satisfactory completion of all tests, affix inspection stamp and date applicable block of test documentation sheet.

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TEST DOCUMENTATION SHEET
FOR
BISTABLE #1
CCC P/N 6N81

	S/N	S/N	S/N	S/N	S/N	S/N	S/N	S/N	S/N	S/N	S/N
Tests Performed											
Para. 4.1 Visual											
Para. 4.2 Dielectric											
Para. 4.3 Insulation											
Para. 4.4.7 Reset											
Para. 4.4.8 Press to Test (TRIP)											
Para. 4.4.9 R4 Range											
Para. 4.4.11 Trip Range											
Para. 4.4.12 R3 Range											
Para. 4.4.15 B/A Alignment											
Para. 4.4.17 B/A Alignment											
Para 4.4.21 B/A Alignment											
Para. 4.4.24 B/A Repeatabilty											
Para. 4.4.26 B/A Trip Linearity											

LTR	REVISION	DATE	LTR	REVISION	DATE

Test Documentation Sheet for Bistable #1, CCC P/N 6N81

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Tests Performed	S/N	S/N	S/N	S/N	S/N	S/N	S/N	S/N	S/N	S/N	S/N
Para. 4.4.28 Test Function											
Para. 4.4.29 Relays & ISO Output											
Para. 4.4.30 Relays & ISO Output											
Para. 4.4.32 Block Function											
Para. 4.4.33 Block Function											
Para. 4.4.35 AT1 Check											
Para. 4.4.36 AT1 Check											
Para. 4.4.37 AT1 Check											
Para 4.4.38 AT1 Check											
Para. 4.4.40 AT1 Check											
Para. 4.4.44 AT1 Check											
Para. 4.4.45 AT1 Check											
Para. 4.4.46 AT1 Check											
Para. 4.4.47 AT1 Check											
Para. 4.4.51 Logic & Matrices											
Para. 4.4.53 B/A Decreasing											
Para. 4.4.54 B/A Decreasing											
Para. 4.4.56 AT1 Decreasing											
Para. 4.4.57 AT1 Decreasing											
Para. 4.4.58 AT1 Decreasing											
Para. 4.4.60 Continuity											
Inspection Stamp											
Date											

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Test Documentation Sheet for Bistable #1, CCC P/N 6N81

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KYM315/2

QUALITY CONFORMANCE TEST PROCEDURE

AND

TEST DOCUMENTATION

FOR

BISTABLE #2, CCC PART NUMBER 6N82

1. TEST EQUIPMENT

1.1 High-Pot Tester, Model 805-2 Beta Electric Co.

1.2 Megohm Tester, Model L6B, Industrial Instrument, Inc.

1.3 Voltmeter, Digital, Model DVX-315, Data Tech or equivalent.

2. DRAWINGS

2.1 Assembly 6N82 Rev F

2.2 Test Set-up KWJ1316/2 Rev A

3. TEST TO BE PERFORMED

3.1 Visual Examination.

3.2 Dielectric Strength

3.3 Insulation Resistance

3.4 Operating Tests.

4. TESTING

Note: When "Check (✓)" appears in the procedure, check off the appropriate block of the Test Documentation sheet.

VENDOR'S QA PROGRAM REVIEW
1 ☐ Approval not required
2 ☐ Approved with comments, released for interim use, resubmit within 20 days per ED 6035
3 ☐ Not approved. See comments marked on Procedure, resubmit for approval within 20 days per ED 6035
Approval of this QA Program does not relieve supplier from full compliance with contract or purchase order requirements.
By MKA [illegible] Date 3-22-73

Job No.	ELCITEL COMPANY
7749	Power & Industrial Division P.O. Box 607 Gaithersburg, Md.

7749-E-300-Z-3

LTR	REVISION	DATE	LTR	REVISION	DATE
0	[illegible] 6N82	5/10/72			
A	S/N 6N82 REVISED PER [illegible]	12/15/72			
B	S/N 6N82 REVISED TO 4.4.2.2, 4.4.4.3, 4.4.4.4 & 4.4.3.3	3/1/73			

Quality Conformance Test Procedure for Bistable #2 CCC Part No. 6N82

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DATE 3/1/73

KYM315/2

4.1 Visual Examination

The equipment shall be visually examined for the following in accordance with the applicable assembly drawings.

4.1.1 Workmanship, assembly and fit.

4.1.2 Materials, parts and finishes.

4.1.3 Treatment for prevention of corrosion.

4.1.4 Markings.

4.1.5 Check (✓).

4.2 Dielectric Strength

4.2.1 Form a single isolated circuit by connecting all pins on the module, connector together.

4.2.2 Apply a potential of 500 VAC, 60 Hz, between the isolated circuit and the module instrument frame, for a period of one (✓) minute. There shall be no arcing or breakdown.

4.2.3 Check (✓).

4.3 Insulation Resistance

4.3.1 Form a single isolated circuit by connecting all pins on the module connector together.

4.3.2 Apply a test potential of 500 VDC between the isolated bus and the module frame for a period of one minute.

Record the value for insulation resistance, ambient temperature and relative humidity at the time of test.

The insulation resistance measurements shall be corrected to a 77°F value. Corrections shall be made on the basis of insulation resistance doubling for every 27°F decrease in temperature.

4.3.3 The minimum insulation resistance reading for the above test shall be 10 megohms at 77°F.

4.3.4 Check (✓).

4.4 Operating Tests

4.4.1 Connect the 6N82 module as shown on KWJ1316/2.

4.4.2 Set the test panel switches as follows:

PWR	Off
BLOCK	Normal
LOGIC 1 & 2	LO
ATI-P	LO
ATI-A	LO

4.4.3 Adjust the external power supplies to their respective plus and minus 15 VDC potentials and + 24 VDC potentials.

4.4.4 Set the test panel PWR switch to ON.

4.4.5 Connect the voltmeter between test panel BP4 (Hi) and BP5 (Lo). Adjust the input signal to obtain 1.0VDC the voltmeter.

4.4.6 Adjust the following module pots as indicated:

TRIP SET	0.0 VDC
R4	Fully CCW
R3	Fully CCW

LTR	REVISION	DATE	LTR	REVISION	DATE

Quality Conformance Test Procedure for Bistable #2
CCC Part No. 6N82

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4.4.7 Depress and release the module TRIP and BLOCKED lamps. The lamps shall illuminate and extinguish. Check (✓).

4.4.8 Connect the voltmeter between module bias and COM jacks. Adjust R4 fully CW, the voltmeter shall indicate an increasing negative reading from 0 ± .050V DC fully CCW to -.460 ± .050V DC fully CW. Check (✓).

4.4.9 Adjust module pot R4 fully CCW.

4.4.10 Connect the voltmeter between module TRIP and COM jacks. Adjust TRIP pot fully CW, the voltmeter shall indicate an increasing negative reading from 0 ± .050V DC fully CCW to -6.2 ± .3 VDC fully CW. Check (✓).

4.4.11 Adjust module pot R3 fully CW. The voltmeter shall indicate a decreasing reading from -6.2 ± .3 VDC fully CCW. To -4.1 ± .3 VDC fully CW. Check (✓).

4.4.12 Adjust the following module pots as indicated:

TRIP SET	-	0.0
R3	-	Fully CW
R4	-	Fully CCW

4.4.13 Connect the voltmeter to test panel binding posts BP4 (Hi) and BP5 (Lo). Adjust the SIGNAL INPUT to obtain 0.250 ± .010 VDC. Connect a jumper between module TRIP & COM jacks.

4.4.14 Adjust the module R4 pot until the module TRIP lamp illuminates. Check (✓).

4.4.15 Adjust the signal input to obtain 5.250 ± .010 VDC on the voltmeter. Remove the jumper from module TRIP and COM jacks.

4.4.16 Set the TRIP SET pot to 10.0. Adjust the module R3 pot until the module TRIP lamp illuminates. Check (✓).

4.4.17 Adjust the signal input to obtain 6.0 VDC. Slowly reduce the signal input until the module TRIP lamp illuminates. The voltmeter shall indicate 5.250 ± .035 VDC. Check (✓).

4.4.18 Increase the signal input to 6.0 VDC. Depress and release the module TEST switch. The module TRIP lamp shall illuminate and extinguish. Check (✓).

4.4.19 Set the module TRIP SET pot to 0.0. Decrease the signal input until the TRIP lamp illuminates. The voltmeter shall indicate 0.250 ± .035 VDC. Check (✓).

4.4.20 Set the module TRIP SET pot to 5.0. Adjust the signal input until the TRIP lamp extinguishes. Slowly decrease the signal input until the TRIP lamp illuminates. The voltmeter shall indicate 2.750 ± .100 VDC. Check (✓).

4.4.21 Increase the signal input until the TRIP lamp extinguishes, observe that lamps L3 and L5 are on; L1, L4 and BLOCKED are OFF. Check (✓).

4.4.22 Connect the voltmeter between test panel BP7 (Hi) and BP2 (Lo). Decrease the signal input until the TRIP lamp illuminates. Lamps L1, & L3 shall be ON, lamps L4, L5 and BLOCK shall be OFF. The voltmeter shall indicate Hi (approximately 15 VDC). Check (✓).

4.4.23 Depress and release module BLOCK SW. Lamps L1, L4, L5, TRIP & Blocked shall be ON, Lamp L3 shall be OFF. The voltmeter shall indicate Lo (approximately 0 VDC). Check (✓).

4.4.24 Increase the signal input until module TRIP lamp extinguishes. Lamps L3 & L5 shall be ON, lamps L1, L4 and Blocked shall be OFF. Check (✓).

4.4.25 Decrease the signal input until the TRIP lamp illuminates. Lamps L1, L3 shall be ON, lamps L4, L5 and BLOCKED

shall be OFF. Check (✓).

4.4.26 Set test panel RMT BLOCK switch to BLOCK, then return to NORMAL. Lamps L1, L4, L5, TRIP & BLOCKED shall be ON, lamp L3 shall be OFF. Check (✓).

4.4.27 Increase the signal input to 6.0 VDC, lamps L3 & L5 shall be ON, lamps L1, L4, BLOCKED and TRIP shall be OFF. Check (✓).

4.4.28 Set LOGIC 1 "Hi", LOGIC 2 "Lo", ATI-P "Lo" ATI-A "Hi". Observe and measure the following conditions. Check (✓).

ATI & L-BUS Lamps	-	OFF
Q1 - Collector/COM	-	Low
Q2 - Emitter/COM	-	0 ± .010 VDC

4.4.29 Set LOGIC 1 "Lo", LOGIC 2 "Hi", observe and measure the following conditions. Check (✓).

ATI- & L-BUS Lamps	-	OFF
Q1 - Collector/COM	-	Low
Q2 - Emitter/COM	-	0±.010 VDC

4.4.30 Set LOGIC 1 "Hi". Observe and measure the following conditions. Check (✓).

ATI & L-BUS Lamps	-	OFF
Q1 - Collector/COM	-	Low
Q2 - Emitter/COM	-	0± .010 VDC

4.4.31 Set ATI-P to "Hi". Observe and measure the following conditions. Check (✓).

ATI & L-BUS Lamps	-	ON
Q1 - Collector/COM	-	Hi
Q2 - Collector/COM	-	Lo
Q3 - Collector/COM	-	Hi

4.4.32 Set AT1-A to "Lo". Observe and measure the following conditions. Check (✓).

AT1 & L-BUS Lamps - ON
Q3 - Collector/COM - Lo

4.4.33 Set Logic 1 to "Lo". Decrease the signal input until the module TRIP lamp illuminates. The AT1 & L-BUS lamps shall extinguish. Check( ).

4.5 Test Documentation

After satisfactory completion of all tests affix inspection stamp and date applicable block of test documentation sheet.

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TEST DOCUMENTATION SHEET

FOR

BISTABLE #2

CCC PART NO. 6N82

	S/N	S/N	S/N	S/N	S/N	S/N	S/N	S/N	S/N	S/N
TESTS PERFORMED										
Para. 4.1. Visual										
Para. 4.2. Dielectric										
Para. 4.3 Insulation										
Para. 4.4.7 Trip & Block Lamps Press to Test										
Para. 4.4.8 R4-Range of Adj.										
Para. 4.4.10 TRIP-Range of Adj.										
Para. 4.4.11 R3-Range of Adj.										
Para. 4.4.14 B/A Alignment										
Para 4.4.16 B/A Alignment										
Para 4.4.17 B/A Alignment Check										
Para. 4.4.18 B/A Manual Test										
Para. 4.4.19 B/A Alignment Check										
Para. 4.4.20 TRIP Pot Linearity										
Para. 4.4.21 Relay Functions										

LTR	REVISION	DATE	LTR	REVISION	DATE

Test Documentation Sheet
for Bistable #2
CCC Part No. 6N82

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	S/N	S/N	S/N	S/N	S/N	S/N	S/N	S/N	S/N	S/N
TESTS PERFORMED										
Para. 4.4.22 Relay Functions										
Para. 4.4.23 Local Block Function										
Para. 4.4.24 Block Re-Set										
Para. 4.4.25 Relay Function										
Para. 4.4.26 RMT Block Function										
Para. 4.4.27 Block Re-set										
Para. 4.4.28 AT1 Check										
Para. 4.4.29 AT1 Check										
Para. 4.4.30 AT1 Check										
Para. 4.4.31 AT1 Check										
Para. 4.4.32 AT1 Check										
Para. 4.4.33 AT1 Check										
Inspectors Stamp										
Date										

Test Documentation Sheet for
Bistable #2
CCC Part No. 6N82

CONSOLIDATED CONTROLS CORP.
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Tests Performed	S/N	S/N	S/N	S/N	S/N	S/N	S/N	S/N	S/N	S/N	S/N
Para. 4.4.28 Test Function											
Para. 4.4.29 Relays & ISO Output											
Para. 4.4.30 Relays & ISO Output											
Para. 4.4.32 Block Function											
Para. 4.4.33 Block Function											
Para. 4.4.35 AT1 Check											
Para. 4.4.36 AT1 Check											
Para. 4.4.37 AT1 Check											
Para. 4.4.38 AT1 Check											
Para. 4.4.40 AT1 Check											
Para. 4.4.42 Logic & Matrices											
Para. 4.4.44 B/A Decreasing											
Para. 4.4.45 B/A Decreasing											
Para. 4.4.47 AT1 Decreasing											
Para. 4.4.49 AT1 Decreasing											
Para. 4.4.51 Continuity											
Inspection Stamp											
Date											

LTR	REVISION	DATE	LTR	REVISION	DATE

Test Documentation Sheet for Bistable #1, CCC P/N. 6N81

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BETHEL CONNECTICUT, U.S.A.

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KYM315/3 B

QUALITY CONFORMANCE TEST PROCEDURE

AND

TEST DOCUMENTATION

FOR

OUTPUT MODULE CCC PART NUMBER 6N83

1. TEST EQUIPMENT

   1.1 High Pot Tester, Model 805-2 Beta Electric Co.

   1.2 Megohm Tester, Model L6B, Industrial Instrument, Inc.

2. DRAWINGS

   2.1 Assembly 6N83 Rev. C

   2.2 Test Set-up KWJ1316/3 Rev B

3. TESTS TO BE PERFORMED

   3.1 Visual Examination.

   3.2 Dielectric Strength

   3.3 Insulation Resistance

   3.4 Operating Tests.

4. TESTING

Note: When "Check (√)" appears in the procedure, check off the appropriate block of the Test Documentation sheet.

VENDOR'S QA PROGRAM REVIEW
1 ☑ Approval without comments.
2 ☐ Approval with comments, released for interim use, resubmit within 10 days per ED 4034.
3 ☐ Not approved. See comments marked on procedure. Resubmit for approval within 10 days per ED 4034.
Approval of this QA Program does not relieve supplier from full compliance with contract or purchase order requirements.
By MKA/SNS Date 3-1-73
BECHTEL
Job No. 7749
BECHTEL COMPANY
Power & Industrial Division
P. O. Box 607 Gaithersburg, Md.

7749-E-300-CL-3

LTR	REVISION	DATE	LTR	REVISION	DATE
C	REL ON 4N4156	8/13/74	B	4N4433 Revised P. 2, 4.4.5; 4.4.8; 4.4.9; 4.4.10	12/...
A	[illegible]	10/24/72			

Quality Conformance Test Procedure for Output Module CCC Part Number 6N83

CONSOLIDATED CONTROLS CORP.
BETHEL CONNECTICUT, U.S.A.

DR. [illegible] | CH. [illegible] | APP. [illegible] | DATE [illegible]

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4.1 Visual Examination

The equipment shall be visually examined for the following in accordance with the applicable assembly drawings.

4.1.1 Workmanship, assembly and fit.

4.1.2 Materials, parts and finishes.

4.1.3 Treatment for prevention of corrosion.

4.1.4 Markings.

4.1.5 Check (✓).

4.2 Dielectric Strength

4.2.1 Form a single isolated circuit by connecting all pins on the module, connector together.

4.2.2 Apply a potential of 500 VAC, 60 Hz, between the isolated circuit and the module instrument frame, for a period of one (1) minute. There shall be no arcing or breakdown.

4.2.3 Check (✓).

4.3 Insulation Resistance

4.3.1 Form a single isolated circuit by connecting all pins on the module connector together.

4.3.2 Apply a test potential of 500 VDC between the isolated bus and the module frame for a period of one minute.

Record the value for insulation resistance, ambient temperature and relative humidity at the time of test.

The insulation resistance measurements shall be corrected to a 77°F value. Corrections shall be made on the basis of insulation resistance doubling for every 27°F decrease in temperature.

4.3.3 The minimum insulation resistance reading for the above test shall be 10 megohms at 77°F.

4.3.4 Check (✓).

4.4 Operating Tests

4.4.1 Connect the 6N83 module as shown on KWJ1316/3.

4.4.2 Set all test panel switches to OFF or normal spring return.

4.4.3 Adjust the external power supplies to their respective plus 15 VDC and plus 24 VDC potentials.

4.4.4 Set the test panel PWR switch to ON.

4.4.5 Depress the module RESET switch and observe the condition of the following lamps. Check (✓)

Module lamps DS1 thru DS5	- OFF
Test panel lamps L3, L4 & L6	ON
Test panel lamp L5	OFF

4.4.6 Check press - to - test function of each module lamp DS1 thru DS5, the lamp shall illuminate when pressed and extinguish when released. Check (✓).

4.4.7 Depress and release the following switches. The corresponding lamp shall illuminate and extinguish as the switch is depressed and released. Check (/).

SWITCH	MODULE LAMPS
Module Test S1	DS1
Test Panel Matrix 1 thru 4	DS1
Module Test S2	DS2
Test Panel Matrix 5 thru 8	DS2
Module Test S3	DS3
Test Panel Matrix 9 thru 12	DS3

4.4.8 Depress and release test panel RMT TRIP. Observe the condition of the following lamps. Check (/).

Module Trip	ON
Module Block	OFF
[illegible]	[illegible]
Test Panel L3, L4	OFF

4.4.9 Depress and release RESET switch and observe the condition of the following lamps. (Check (/).

Module Trip	OFF
Module Block	OFF
Test Panel [illegible], L5	OFF
Test Panel L3, L4, L6	ON

4.4.10 Depress and release or place the switches in the positions noted and observe the corresponding lamp conditions. Check (✓).

SWITCH	LAMPS	
	ON	OFF
Module Trip	Trip	Block, L3, L4, L5, L6
Module Block	Trip, Block, L3, L4, L5	L6
Module Reset	L3, L4, L6	Trip, Block, L5
Module Trip	Trip	Block, L3, L4, L5, L6
RMT Block	Trip, Block, L3, L4, L5	L6
Module Reset	L3, L4, L6	Trip, Block, L5
Module Trip	Trip	Block, L3, L4, L5, L6
Seq. Block (Block)	Trip, L3, L4	Block, L5, L6
Seq. Block (Norm)	Trip	Block, L3, L4, L5, L6
Module Reset	L3, L4, L6	Trip, Block, L5

4.4.11 Depress and release each pair of MATRIX switches simultaneously. The DS1, DS2 or DS3 lamps shall illuminate and extinguish as the switches are depressed and released. The module TRIP lamp shall illuminate and remain ON. After each switching action reset the TRIP lamp by depressing and releasing the module RESET switch. Check (✓)

MATRIX	LAMPS
1-2, 1-3, 1-4, 2-3, 2-4, 3-4	DS1, TRIP
5-6, 5-7, 5-8, 6-7, 6-8, 7-8	DS2, TRIP
9-10, 9-11, 9-12, 10-11, 10-12, 11-12	DS3, TRIP

4.4.12 Set test panel PWR switch OFF and disconnect test set-up.

4.5 Test Documentation

After satisfactory completion of all tests affix inspection stamp and date applicable block of test documentation sheet.

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TEST DOCUMENTATION SHEET
FOR
OUTPUT MODULE
CCC PART NO. 6N83

S/N	TESTS PERFORMED											DATE
	Para. 4.1 Visual	Para. 4.2 Dielectric	Para. 4.3 Insulation	Para. 4.4.5 Relays Normal	Para. 4.4.6 Press to Test	Para. 4.4.7 1/5 Function	Para. 4.4.8 RMT Trip	Para. 4.4.9 Reset	Para. 4.4.10 Block	Para. 4.4.11 Matrix	Inspection Stamp	

LTR	REVISION	DATE	LTR	REVISION	DATE

Test Documentation Sheet
for Output Module
CCC P/N 6N83

CONSOLIDATED CONTROLS CORP
DETHEL CONNECTICUT, U.S.A.

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KYM315/4

QUALITY CONFORMANCE TEST PROCEDURE
AND
TEST DOCUMENTATION
FOR
SAM LOGIC MODULE, CCC PART NUMBER 6N84

1. TEST EQUIPMENT

   1.1 High Pot Tester, Model 805-2, Beta Electric Company

   1.2 Megohm Tester, Model L6B, Industrial Instruments, Inc.

2. DRAWINGS

   2.1 Assembly 6N84 Rev. A

   2.2 Test Set-Up KWJ1316/4

3. TESTS TO BE PERFORMED

   3.1 Visual Examination

   3.2 Dielectric Strength

   3.3 Insulation Resistance

   3.4 Operating Tests

VENDOR'S QA PROGRAM REVIEW
1 ☐ Approval without comments.
2 ☐ Approval with comments, released for interim use, resubmit within 10 days per ED 6056
3 ☐ Not approved. See comments marked on procedures, resubmit for approval within 10 days per ED 6056
Approval of this QA Program does not relieve supplier from full compliance with contract or purchase order requirements.
By MK / SMS Date 3-7-73
BECHTEL
BECHTEL COMPANY
Power & Industrial Division
P. O. Box 607 Gaithersburg, Md.
Job No. 7749

4. TESTING

   Note: When "Check (✓)" appears in the procedure, check off the appropriate block of the Test Documentation sheet.

7749-E-300-11-2

LTR	REVISION	DATE	LTR	REVISION	DATE	
	[illegible]	[illegible]				Quality Conformance Test Procedure For Sam Logic Module, CCC P/N 6N84
A	[illegible]	[illegible]				CONSOLIDATED CONTROLS CORP. BETHEL CONNECTICUT, U.S.A.
						DR. SH / CH / APP / DATE — SHEET 1 OF 5
						KYM315/4

4.1 Visual Examination

The equipment shall be visually examined for the following in accordance with the applicable assembly drawings.

4.1.1 Workmanship, assembly, and fit.

4.1.2 Materials, parts, and finishes.

4.1.3 Treatment for prevention of corrosion.

4.1.4 Markings.

4.1.5 Check (✓).

4.2 Dielectric Strength

4.2.1 Form a single isolated circuit by connecting all pins on the module connector together.

4.2.2 Apply a potential of 500 VAC, 60 Hz, between the isolated circuit and the module instrument frame for a period of one (1) minute. There shall be no arcing or breakdown.

4.2.3 Check (✓).

4.3 Insulation Resistance

4.3.1 Form a single isolated circuit by connecting all pins on the module connector together.

4.3.2 Apply a test potential of 500 VDC between the isolated bus and the module frame for a period of one (1) minute.

Record the value for insulation resistance, ambient temperature, and relative humidity at the time of test.

The insulation resistance measurements shall be corrected to a 77°F value. Corrections shall be made on the basis of insulation resistance doubling for every 27°F decrease in temperature.

4.3.3 The minimum insulation resistance reading for the above test shall be 10 megohms at 77°F.

4.3.4 Check (✓).

4.4 Operating Tests

4.4.1 Connect the 6N84 module as shown on KWJ1316/4.

4.4.2 Set the test panel switch as follows:

PWR	Off
SAM IND.	Pos 1
BLOCK 1 & 2	Normal
Trip 1 & 2	Lo
ATI	Lo
SAM RELAY	Closed

4.4.3 Adjust the external power supply to plus 15 VDC.

4.4.4 Set the test panel PWR switch to ON.

4.4.5 For each position of the test panel SAM IND switch, perform the tests indicated in Table 1. Observe the conditions of L1 and L2 for each test. Check (✓).

4.4.6 Set test panel PWR switch OFF and disconnect test set-up.

4.5 After satisfactory completion of all tests, affix inspection stamp, and date applicable block of Test Documentation sheet.

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TABLE 1

		TESTS								
		1	2	3	4	5	6	7	8	9
SAM RELAY	Closed	X						X	X	X
	Open		X	X	X	X	X			
BLOCK 1	Normal	X	X	X	X		X	X	X	X
	Block					X				
BLOCK 2	Normal	X	X	X	X	X				
	Block						X	X	X	X
TRIP 1	Lo				X			X	X	X
	Hi	X	X	X		X	X			
TRIP 2	Lo			X				X	X	X
	Hi	X	X		X	X	X			
AT1	Lo	X	X	X	X	X	X	X		X
	Hi								X	
LAMPS CONDITION	L1	Off	Off	Off	Off	ON	ON	ON	Off	ON
	L2	Off	ON	Off	Off	Off	Off	Off	Off	Off

LTR	REVISION	DATE	LTR	REVISION	DATE

Quality Conformance Test Procedure for SAM Logic Module, CCC P/N 6N84

CONSOLIDATED CONTROLS CORP.
BETHEL CONNECTICUT, U.S.A.

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TEST DOCUMENTATION SHEET FOR
SAM LOGIC MODULE
CCC P/N 6N84

	TEST PERFORMED PER TABLE 1						
S/N	SAM IND 1	SAM IND 2	SAM IND 3	SAM IND 4	SAM IND 5	INSPECTION STAMP	DATE

LTR	REVISION	DATE	LTR	REVISION	DATE	
						TEST DOCUMENTATION SHEET FOR SAM LOGIC MODULE, CCC P/N 6N84
						CONSOLIDATED CONTROLS CORP. BETHEL CONNECTICUT, U.S.A.
						DR. / CH. / APP. / DATE — SHEET 5 OF 5 — KYM315/4

0031

KYM315/5 B

QUALITY CONFORMANCE TEST PROCEDURE
AND
TEST DOCUMENTATION
FOR
AUTO TEST MODULE, CCC PART NUMBER 6N85

1. TEST EQUIPMENT

   1.1 High Pot Tester, Model 805-2, Beta Electric Company

   1.2 Megohm Tester, Model L6B, Industrial Instruments, Inc.
   1.3 Oscilloscope, Tektronix Model 564, or equivalent

2. DRAWINGS

   2.1 Assembly 6N85, Rev. C.

   2.2 Test Set-Up KWJ1316/5, Rev. A.

3. TESTS TO BE PERFORMED

   3.1 Visual Examination

   3.2 Dielectric Strength

   3.3 Insulation Resistance

   3.4 Operating Tests

VENDOR'S DRAWING REVIEW (stamp crossed out)

4. TESTING

Note: When "Check (✓)" appears in the procedure, check off the appropriate block of the Test Documentation sheet.

VENDOR'S QA PROGRAM REVIEW
1 [X] Approval without comments.
2 [ ] Approval with comments, released for interim use, resubmit within 10 days per ED 6055
3 [ ] Not approved. Re... Procedure. Resubmit for approval within 10 days per ED 6055
Approval of this QA Program does not relieve supplier from full compliance with contract or purchase order requirements.
By MKA/WS Date 2/12/73
BECHTEL
Job No. 7749 — BECHTEL COMPANY, Power & Industrial Division, P.O. Box 607, Gaithersburg, Md.

7749-E-30-12-3 Q

LTR	REVISION	DATE	LTR	REVISION	DATE
O	REL ON S/N N4763	9/1/72			
A	S/N N4982 ADDED R 1.3; REVISED R 2.1, 2.2, 4.4.6, 4.4.7; ADDED FIG 2	11/30/72			
B	REVS R 4.4.7 & 4.4.8 N5232	2/12/73			

Quality Conformance Test Procedure for Auto Test Module, CCC P/N 6N85

CONSOLIDATED CONTROLS CORP.
BETHEL CONNECTICUT, U.S.A.

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CK. [illegible]
APP. [illegible]

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0031

4.1 Visual Examination

The equipment shall be visually examined for the following in accordance with the applicable assembly drawings.

4.1.1 Workmanship, assembly, and fit.

4.1.2 Materials, parts, and finishes.

4.1.3 Treatment for prevention of corrosion.

4.1.4 Markings.

4.1.5 Check (✓).

4.2 Dielectric Strength

4.2.1 Form a single isolated circuit by connecting all pins on the module connector together.

4.2.2 Apply a potential of 500 VAC, 60 Hz, between the isolated circuit and the module instrument frame for a period of one (1) minute. There shall be no arcing or breakdown.

4.2.3 Check (✓).

4.3 Insulation Resistance

4.3.1 Form a single isolated circuit by connecting all pins on the module connector together.

4.3.2 Apply a test potential of 500 VDC between the isolated bus and the module frame for a period of one (1) minute.

Record the value for insulation resistance, ambient temperature, and relative humidity at the time of test.

LTR	REVISION		LTR	REVISION	DATE

Quality Conformance Test Procedure for Auto Test Module, CCC P/N 6N85

CONSOLIDATED CONTROLS CORP.
BETHEL CONNECTICUT, U.S.A.

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The insulation resistance measurements shall be corrected to a 77°F value. Corrections shall be made on the basis of insulation resistance doubling for every 27°F decrease in temperature.

4.3.3 The minimum insulation resistance reading for the above test shall be 10 megohms at 77°F.

4.3.4 Check (✓).

4.4 Operating Tests

4.4.1 Connect the 6N85 module as shown on KWJ1316/5.

4.4.2 Set the test panel PWR switch to OFF.

4.4.3 Adjust the external power supply to plus 15 VDC.

4.4.4 Set the test panel PWR switch to ON.

4.4.5 Observe the test panel COUNTER lamps:

a) A count is determined by a lamp extinguishing and illuminating.

b) UNIT lamps 00 to 09 and TENS lamps 00 to 60 shall extinguish and illuminate sequentially.

c) After each 09 count, a TENS count shall extinguish and remain OFF until a subsequent TENS count is extinguished.

d) The counter shall count to 65 after which it shall reset and begin another cycle.

e) Check (✓).

4.4.6 Observe that test panel lamps L1 and L2 are alternately flashing. Check (✓).

4.4.7 Connect the oscilloscope between test panel binding posts BP3 (Hi) and BP2 (Lo). The wave shape shall represent Figure 1.

Depress and release test panel FAULT switch. The module ATI FAULT lamp shall illuminate and L3 shall extinguish. Check (✓).

4.4.8 Depress and release the module ATI FAULT lamp. The module FAULT lamp shall extinguish and L3 shall illuminate. Check (✓).

4.4.9 Set the test panel PWR switch to OFF and disconnect test set-up.

4.5 After satisfactory completion of tests, affix inspection stamp, and date applicable block of Test Documentation sheet.

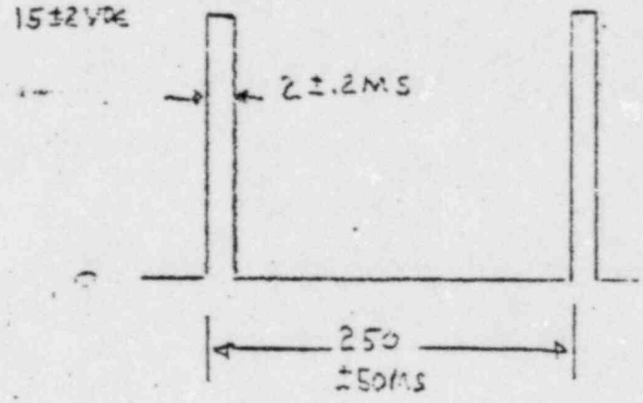

FIGURE 1

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TEST DOCUMENTATION SHEET
FOR
AUTO TEST MODULE, CCC P/N 6N85

Serial No.	TEST PERFORMANCE									
	Para. 4.1 Visual	Para. 4.2 Dielectric	Para. 4.3 Insulation	Para. 4.4.5 Counter	Para. 4.4.6 "A" Train	Para. 4.4.7 "B" Train and Fault Indication	Para. 4.4.8 Reset	Inspection Stamp	Date

LTR	REVISION	DATE	LTR	REVISION	DATE

Test Documentation Sheet
For Auto Test Module,
CCC P/N 6N85

CONSOLIDATED CONTROLS CORP.
BETHEL CONNECTICUT, U.S.A.

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9031

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QUALITY CONFORMANCE TEST PROCEDURE
AND
TEST DOCUMENTATION
FOR
ANALOG MODULE, CCC PART NUMBER 6N86

1. TEST EQUIPMENT

1.1 High Pot Tester, Model 805-2, Beta Electric Company.

1.2 Megohm Tester, Model L6B, Industrial Instruments, Inc.

1.3 Voltmeter,Digital, Model DVX-350, Data Tech or equivalent.

1.4 Weston 901 DC Milliammeter.

2. DRAWINGS

2.1 Assembly 6N86. Rev. B

2.2 Test Set-Up KWJ1316/6.

3. TESTS TO BE PERFORMED

3.1 Visual Examination.

3.2 Dielectric Strength.

3.3 Insulation Resistance.

3.4 Operating Tests

VENDOR'S QA PROGRAM REVIEW
1 ☐ Approval without comments.
2 ☐ Approval with comments, released for interim use, resubmit within 10 days per ED 6268
3 ☐ Not approved. See comments marked on Procedures. Resubmit for approval within 10 days per ED 6268
Approval of this QA Program does not relieve supplier from full compliance with contract or purchase order requirements.
By M. Atkins Date 3-2-77
BECHTEL
Job No. 7749
BECHTEL COMPANY
Power & Industrial Division
P. O. Box 607 Gaithersburg, Md.

4. TESTING

Note: When "Check (✓)" appears in the procedure, check off the appropriate block of the Test Documentation sheet.

4.1 Visual Examination

The equipment shall be visually examined for the following in accordance with the applicable assembly drawings.

4.1.1 Workmanship, assembly, and fit.

4.1.2 Materials, parts, and finishes.

7749-E-300-15-2

LTR	REVISION	DATE	LTR	REVISION	DATE
B	REV. ON [illegible]	3-1-77			
A	[illegible] APPROVAL ... PARA. 4.4.2, 4.4.3, 4.4.4, TABLE 2.	11/1/76			

Quality Conformance Test Procedure for Analog Module, CCC P/N 6N86

CONSOLIDATED CONTROLS CORP.
BETHEL CONNECTICUT, U.S.A.

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DATE

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4.1.3 Treatment for prevention of corrosion.

4.1.4 Markings.

4.1.5 Check (✓).

4.2 Dielectric Strength

4.2.1 Form a single isolated circuit by connecting all pins on the module connector together.

4.2.2 Apply a potential of 500 VAC, 60 Hz, between the isolated circuit and the module instrument frame for a period of one (1) minute. There shall be no arcing or breakdown.

4.2.3 Check (✓).

4.3 Insulation Resistance

4.3.1 Form a single isolated circuit by connecting all pins on the module connector together.

4.3.2 Apply a test potential of 500 VDC between the isolated bus and the module frame for a period of one (1) minute.

Record the value for insulation resistance, ambient temperature, and relative humidity at the time of test. The insulation resistance measurements shall be corrected to a 77°F value. Corrections shall be made on the basis of insulation resistance doubling for every 27°F decrease in temperature.

4.3.3 The minimum insulation resistance reading for the above test shall be 10 megohms at 77°F.

4.3.4 Check (✓).

4.4 Operating Tests

4.4.1 Connect the 6N86 module as shown on KWJ1316/6.

4.4.2 Set the test panel PWR switch to OFF.

LTR	REVISION	DATE	LTR	REVISION	DATE

Quality Conformance Test Procedure for Analog Module, CCC P/N 6N86

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4.4.3 Adjust the external power supplies to their respective PLUS and MINUS 15 VDC potentials.

4.4.4 Set the test panel PWR switch to ON.

4.4.5 Set the module GAIN and METER pots to their center of travel.

4.4.6 Connect the voltmeter between module jacks VI and COM and adjust the signal input to obtain -1.000 ± .010 VDC.

4.4.7 Connect the voltmeter between module jacks VO and COM and adjust the NULL pot to obtain 0.000 ± .050 VDC. Check (✓).

4.4.8 Connect the voltmeter between module jacks VI and COM and adjust the signal input to obtain -5.000 ± .010 VDC.

4.4.9 Connect the voltmeter between module jacks VO and COM and adjust the GAIN pot to obtain + 5.000 ± .050 VDC. Check (✓).

4.4.10 Connect the voltmeter between test panel binding posts BP6 (Hi) and BP3 (Lo). The voltmeter should indicate + 5.000 ± .050 VDC. Check (✓).

4.4.11 Adjust the module METER pot to obtain 1.000 ± .050 MA. Check (✓).

4.4.12 Perform a linearity test per table 1 as follows:

(a) Connect the voltmeter between module jacks VI and COM to measure INPUT voltage.

(b) Connect the voltmeter between module jacks VO and COM to measure OUTPUT voltage.

(c) Check (✓).

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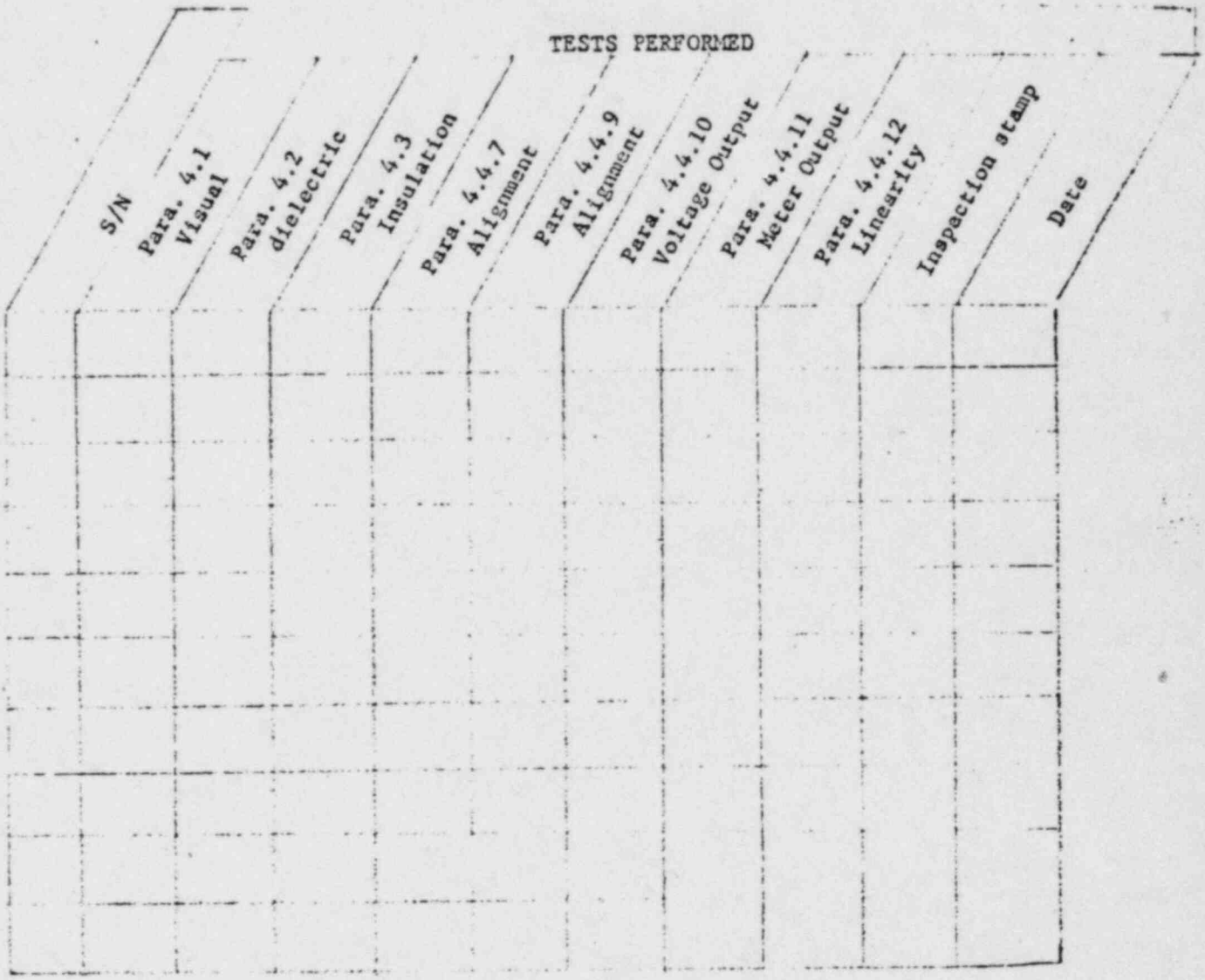
TEST DOCUMENTATION SHEET
FOR
ANALOG MODULE
CCC P/N 6N86



LTR	REVISION	DATE	LTR	REVISION	DATE

Test Documentation Sheet
for Analog Module
CCC P/N 6N86

CONSOLIDATED CONTROLS CORP.
BETHEL CONNECTICUT, U.S.A.

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KYM315/7

QUALITY CONFORMANCE TEST PROCEDURE
AND
TEST DOCUMENTATION
FOR
SEQUENCER MODULE, CCC PART NUMBER 6N87

1. TEST EQUIPMENT

1.1 High Pot Tester, Model 805-2, Beta Electric Company

1.2 Megohm Tester, Model L6B, Industrial Instruments, Inc.

1.3 Function Generator, HP3310A

1.4 Megacycle Pulse Generator, Electro Pulse model 3450D

1.5 Oscilloscope, Storage; Tektronics

2. DRAWINGS

2.1 Assembly 6N87 REV "E"

2.2 Test Set-Up KWJ1316/7 REV "A"

3. TESTS TO BE PERFORMED

3.1 Visual Examination

3.2 Dielectric Strength

3.3 Insulation Resistance

3.4 Operating Tests

VENDOR'S OR PROGRAM REVIEW
1 [X] Approved without comments.
2 [ ] Approval with comments, released for fabrication use, resubmit within 30 days per EO 6123
3 [ ] Not approved. See comments marked on [illegible] with [illegible] for approval within 30 days [illegible]
Approval [illegible] does not relieve supplier from [illegible] damages or purchase [illegible]
By MKA 6-6-73

Job No.	BENDIX CORPORATION
7749	Power & Industrial Division P.O. Box 607 Centreburg, Md.

4. TESTING

Note: When "Check (✓)" appears in the procedure, check off the appropriate block of the Test Documentation sheet.

7749-E-300-17-2

LTR	REVISION	DATE	LTR	REVISION	DATE
C	[illegible]	[illegible]			
A	[illegible]	12/73			
B	[illegible]	7/2/73			

Quality Conformance Test Procedure For Sequencer Module, CCC P/N 6N87

CONSOLIDATED CONTROLS CORP
BETHEL CONNECTICUT, U.S.A.

DR. [illegible] SHEET 1 OF 9
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APP'D [illegible]
DATE [illegible]

KYM315/7

The insulation resistance measurements shall be corrected to a 77°F value. Corrections shall be made on the basis of insulation resistance doubling for every 27°F decrease in temperature.

4.3.3 The minimum insulation resistance reading for the above test shall be 10 megohms at 77°F.

4.3.4 Check (✓).

4.4 Operating Tests

4.4.1 Connect the 6N87 module as shown on KWJ1316/7.

4.4.2 Set the test panel switches as follows:

PWR	off
INPUT	off
ENABLE 1 & 2	off
ATI-A-	Hi

4.4.3 Adjust the external power supply to +15V DC. Adjust the Function Generator for +15V DC square wave 60 Hz. Adjust the Pulse Generator for +15V DC 2 MS pulse, set the pulse generator time base switch to external after calibration.

4.4.4 Using short mini-clip jumpers, make connections 1 and 2 of Table 1.

4.4.5 Set the test panel PWR switch to ON.

4.4.6 Observe the following lamp conditions: Check (✓).

Test panel lamps L1, L2, L3, L4, L5 -	ON
Module "ON" lamp -	OFF
Module "OFF" lamp -	ON

4.4.7 The module "ON" lamp shall illuminate and extinguish when the lamp is depressed and released. Check (✓).

4.1 Visual Examination

The equipment shall be visually examined for the following in accordance with the applicable assembly drawings.

4.1.1 Workmanship, assembly, and fit.

4.1.2 Materials, parts, and finishes.

4.1.3 Treatment for prevention of corrosion.

4.1.4 Markings.

4.1.5 Check (√).

4.2 Dielectric Strength

4.2.1 Form a single isolated circuit by connecting all pins on the module connector together.

4.2.2 Apply a potential of 500 VAC, 60 Hz, between the isolated circuit and the module instrument frame for a period of one (1) minute. There shall be no arcing or breakdown.

4.2.3 Check (√).

4.3 Insulation Resistance

4.3.1 Form a single isolated circuit by connecting all pins on the module connector together.

4.3.2 Apply a test potential of 500 VDC between the isolated bus and the module frame for a period of one (1) minute.

Record the value for insulation resistance, ambient temperature, and relative humidity at the time of test.

4.4.8 Depress and release the module TEST switch. Test panel lamps L1 through L5 shall extinguish, module "ON" lamp shall illuminate and "OFF" lamp shall extinguish. The module "OFF" lamp shall illuminate and extinguish when the lamp is depressed and released. After approximately 30 seconds, the lamps shall return to the states described in paragraph 4.4.6. Check (✓).

Note: This test may be repeated by again depressing and releasing the module TEST switch.

4.4.9 Connect the scope between BP4 (Hi) and BP2 (Lo). Depress and release the module TEST switch. The scope trace shall represent that shown in Figure 1. Check (✓).

4.4.10 Set the test panel INPUT switch ON and OFF. The scope trace shall represent that shown in Figure 2. Check (✓).

4.4.11 Make connections 3 thru 6 of Table 1.

4.4.12 Depress and release the module TEST switch. The scope trace shall represent that shown in Figure 3. Check (✓).

4.4.13 Disconnect connections 3 thru 6, and make connections 7 thru 10. Connect the scope to BP5 (Hi) and BP2 (Lo). Repeat paragraph 4.4.12. Check (✓).

TABLE 1

MODULE PC BOARD CONNECTIONS

CONNECTION	JUMPER
1	1 & 14
2	2 & 7
3	A & 16
4	D & 10
5	E & 9
6	F & 8
7	G & 16
8	K & 10
9	L & 9
10	M & 8
11	N & 16
12	Q & 10
13	R & 9
14	S & 8
15	T & 16
16	W & 10
17	X & 9
18	Y & 8

NOTE: Check component board "B". If selected capacitor C11 is not installed, connect a Decade Capacitor Box set for 2 Mfd in C11's position.

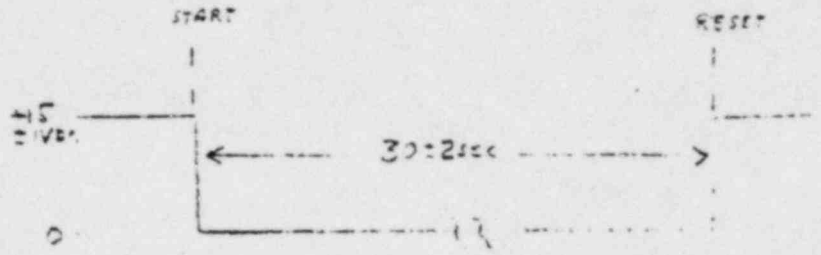

FIG 1 (REF)

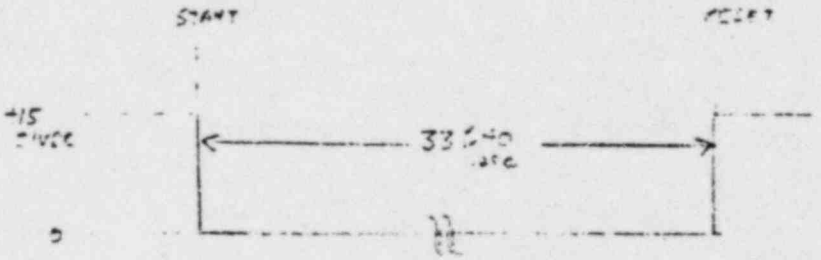

FIG 2 (REF)

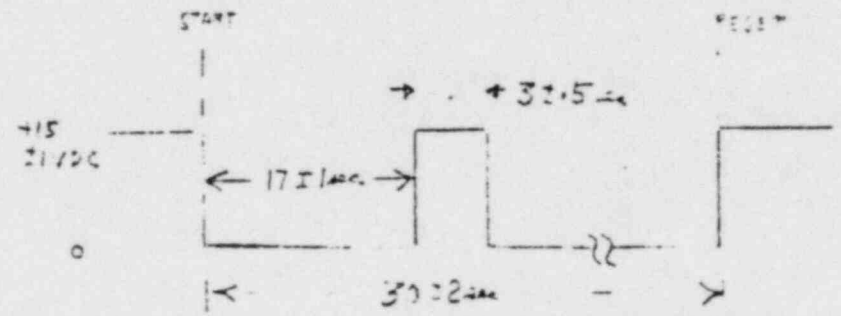

FIG 3 (REF)

LTR	REVISION	DATE	LTR	REVISION	DATE

Quality Conformance Test Procedure for Sequencer Module, CCC P/N 6N87

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BETHEL CONNECTICUT, U.S.A.

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4.4.14 Disconnect connections 7 thru 10 and make connections 11 thru 14. Connect the scope to BP6 (Hi) and BP2 (Lo). Repeat paragraph 4.4.12. Check (✓).

4.4.15 Disconnect connections 11 thru 14. Make connections 15 thru 18. Connect the scope to BP7 (Hi) and BP2 (Lo). Repeat paragraph 4.4.12. Check (✓).

4.4.16 Disconnect connections 15 thru 18. Adjust the module DELAY pot to its center of travel.

4.4.17 Set the test panel ENABLE switches to ON. Observe the following lamp conditions. Check (✓).

Module OFF, L1 through L5 - ON
Module ON and L6 - OFF

4.4.18 Depress and release the Pulse Generator ONE SHOT switch. Observe the following lamp conditions. Check (✓).

Module "OFF", L1 through L5 - ON
Module "ON" - OFF

4.4.19 Set the test panel AT1-A switch to Lo. Depress and release the Pulse Generator ONE SHOT switch. Observe the following lamp conditions. Check (✓).

Module "OFF", L1 through L5 - ON
Module "ON", L6 - OFF

Note: If lamp L6 is not extinguished, adjust module DELAY pot CW two turns and repeat paragraph.

4.4.20 Connect the scope to BP9 (Hi) and BP2 (Lo). Set test panel switch AT1-A to Hi and ENABLE 1 to OFF. Depress and release the ONE SHOT switch. L6 shall not illuminate, the scope shall indicate (Hi) approximately 15 VDC. Check (✓).

4.4.21 Set test panel switches ENABLE 1 to ON and ENABLE 2 to OFF. Depress and release the ONE SHOT switch. L6 shall not illuminate, the scope shall indicate (Hi). Check (✓).

4.4.22 Set test panel ENABLE2 to ON. Depress and release the ONE SHOT switch. L6 shall illuminate, the scope shall indicate (Lo). Check (✓).

4.4.23 Set the test panel PWR switch to OFF and disconnect test set-up.

4.5 After satisfactory completion of all tests, affix inspection stamp and date applicable block of Test Documentation sheet.

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TEST DOCUMENTATION SHEET
FOR
SEQUENCER MODULE
CCC P/N 6N87

TESTS PERFORMED Per Paragraph	S/N	S/N	S/N
4.1 Visual			
4.2 Dielectric			
4.3 Insulation			
4.4.6 Relays			
4.4.7 "ON" press-to-test			
4.4.8 Seq. programming, reset; "OFF" press-to-test			
4.4.9 Seq. Clock-Norm			
4.4.10 Seq. Clock-delay			
4.4.12 Seq. Block 1			
4.4.13 Seq. Block 2			
4.4.14 Seq. Block 3			
4.4.15 Seq. Block 4			
4.4.17 ATI-Norm			
4.4.18 ATI-Test			
4.4.19 ATI-Test			
4.4.20 ATI-Enable			
4.4.21 ATI-Enable			
4.4.22 ATI-Enable			
Inspection Stamp			
Date			

LTR	REVISION	DATE	LTR	REVISION	DATE

Test Documentation Sheet for Sequencer Module CCC P/N 6N87

CONSOLIDATED CONTROLS CORP
BETHEL CONNECTICUT, U.S.A.

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KYM315/8

ACCEPTANCE TEST
UNREGULATED POWER SUPPLY ASSEMBLY

KDE1907

Dwg. KDE-1907 Rev. A

VENDOR'S QA PROGRAM REVIEW
1 [X] Approved without comments
2 [ ] Approved with comments, released for fabrication, resubmit within 30 days per ED 6058
Approval of this QA Program does not relieve vendor from fulfilling contract requirements.
By [illegible] Date 10-22-74
APPROVER
SUPPLIER 7749
BIONEL COMPANY
Power A Industrial Division
P.O. Box 607 Gaithersburg, Md.

1. Visual Examination

Visually examine the power supply for the following in accordance with drawing KDE1907:

a) Workmanship, Assembly and Fit.
b) Materials, Parts and Finishes.
c) Markings.

2. Dielectric Strength

a) Form a single isolated circuit by connecting all terminals on TB1 together.

b) Apply a potential of 500 VAC, 60 Hz (high pot tester) between the isolated circuit and assembly frame for a period of (1) minute. There shall be no arcing or breakdown.

3. Operational

a) Connect an ohmmeter between TB1-4 and TB1-5. The resistance shall be 470 ± 50 ohm.

b) Connect the power supply per Figure 1.

c) With no load the output voltage shall be 28 ± 2 VDC.

d) With 5A load the output voltage shall be 24 ± 2 VDC.

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Acceptance Test-Unregulated Power Supply
CCC P/N KDE1907

CONSOLIDATED CONTROLS CORP.
BETHEL CONNECTICUT, U.S.A.

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DATE [illegible]

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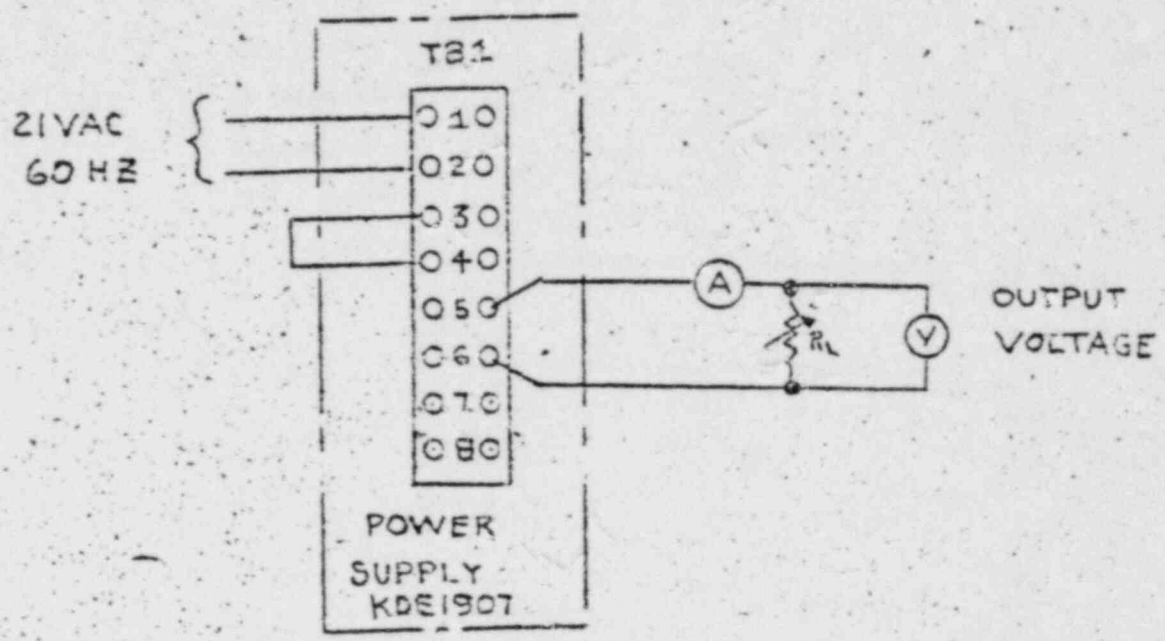

FIGURE 1

QTY TESTED _____

QTY ACCEPTED _____

QTY REJECTED _____

CCC Q.C. _____

DATE _____

						Acceptance Test-Unregulated Power Supply CCC P/N KDE1907	
						CONSOLIDATED CONTROLS CORP. BETHEL, CONNECTICUT, U.S.A.	
						SIZE	SHEET 2 OF 2
	REVISION	DATE		REVISION	DATE		KYM315/3

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KYM315/9 B

QUALITY CONFORMANCE TEST PROCEDURE AND TEST DOCUMENTATION FOR SURVEILLANCE INDICATOR ASSY CCC PART NUMBER KF1913-1 & KF1913-2

1.0 TEST EQUIPMENT

1.1 High Pot Tester, Model 805-2 Beta Electric Co.

1.2 Megohm Tester, Model L6B, Industrial Instrument Inc.

1.3 Multimeter Simpson Model 269 or equivalent.

2.0 DRAWINGS

2.1 Assembly KF1913, Rev. D

2.2 Test set-up KWJ1316/9, Rev. B

VENDOR'S QA PROGRAM REVIEW
1 [X] Approval without comments
2 [ ] Approval with comments, released for interim use, resubmit within 20 days per ED 6058
3 [ ] Not approved. See comments marked on Procedures. Resubmit for approval within 30 days per ED 6058
Approval of this QA Program does not relieve supplier from full compliance with contract or purchase order requirements.
By MKAISNS BECHTEL Date 2/30/74

Job No.	BECHTEL COMPANY
7749	Power & Industrial Division P.O. Box 627 Gaithersburg, Md.

7749-E30Q-9-3

LTR	REVISION	DATE	LTR	REVISION	DATE
-	RELEASED MAY 74	5/1/74			
A	CHANGED [illegible] METEC [illegible] 1.4.5	12/13/72			
B	CHG TO 6.7% ADC 2015 [illegible] 2.0	3/13/74			

MAR 20 1974

Quality Conformance Test Procedure for Surveillance Indicator Assy CCC Part No. KF1913

CONSOLIDATED CONTROLS CORP. BETHEL CONNECTICUT, U.S.A.

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APP. [illegible]
DATE 3/[illegible]/74

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3.0 TESTS TO BE PERFORMED

3.1 Visual Examination.

3.2 Dielectric Strength.

3.3 Insulation Resistance.

3.4 Operating Tests.

4.0 TESTING

4.1 Visual Examination (KF1913-1 & KF1913-2)

The equipment shall be visually examined for the following in accordance with the applicable assembly drawings.

4.1.1 Workmanship, assembly and fit.

4.1.2 Materials, parts and finishes.

4.1.3 Treatment for prevention of corrosion.

4.1.4 Markings.

4.1.5 Check (✓) appropriate block of Test Documentation sheet.

4.2 Dielectric Strength (KF1913-1 & KF1913-2)

4.2.1 Form a single isolated circuit by connecting all pins on the module connector together.

4.2.2 Apply a potential of 500V AC, 60 Hz, between the isolated circuit and the module instrument frame, for a period of one (1) minute. There shall be no arcing or breakdown.

4.2.3 Check (✓) appropriate block of Test Documentation sheet.

4.3 Insulation Resistance (KF1913-1 & KF1913-2)

4.3.1 Form a single isolated circuit by connecting all pins on the module connector together.

4.3.2 Apply a test potential of 500V DC between the isolated bus and the module frame for a period of one minute.

Record the value for insulation resistance, ambient temperature and relative humidity at the time of test.

The insulation resistance measurements shall be corrected to a 77°F value. Corrections shall be made on the basis of insulation resistance doubling for every 27°F decrease in temperature.

4.3.3 The minimum insulation resistance reading for the above test shall be 10 megohms at 77°F.

4.3.4 Check (✓) appropriate block of Test Documentation sheet.

4.4 Operating Tests (KF1913-1 & KF1913-2)

4.4.1 Connect the KF1913 unit as shown on KWJ1316/9.

4.4.2 Connect the simpson (AC voltage range) between test panel binding posts BP1 & BP2.

4.4.3 Set the test panel switch S1 to Pos. 1 for KF1913-1 or Pos. 2 for KF1913-2.

4.4.4 Set test panel PWR switch to ON.

4.4.5 Set Test Panel switch S2 to Pos. 1 and check that AC meter indicates 14.4±2.0 VAC. Check (✓) appropriate block of Test Documentation sheet.

4.4.6 Set test panel switch S2 to Pos. 2 and check that AC meter indicates 23.0±2.0 VAC. Check (✓) appropriate block of Test Documentation sheet.

4.4.7 (KF1913-1 only) Depress and hold test panel switch S3 and check that AC meter indicates 0 VAC. Check (✓) appropriate block of Test Documentation sheet.

4.4.8 (KF1913-1 only) Release test panel switch S3, and check that AC meter indicates 23.0±2.0 VAC. Check (✓) appropriate block of Test Documentation sheet.

4.4.9 Set test panel PWR switch to OFF and disconnect test-up.

4.5 Test Documentation

After satisfactory completion of all tests affix inspection stamp and date applicable blocks of Test Documentation sheet.

KYM315/9 E

TEST DOCUMENTATION SHEET
FOR
SURVEILLANCE INDICATOR ASSY
CCC PART NO. KF 1913-1

S/N	TEST PERFORMED								Inspectors Stamp	Date
	Para 4.1 Visual	Para 4.2 Dielectric	Para 4.3 Insulation	Para 4.4.5 Voltage	Para 4.4.6 Voltage	Para 4.4.7 Voltage	Para 4.4.8 Voltage			

LTR	REVISION	DATE	LTR	REVISION	DATE

Test Documentation Sheet for Surveillance Indicator Assy P/N KF1913-1

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TEST DOCUMENTATION SHEET
FOR
SURVEILLANCE INDICATOR ASSY
CCC PART NO. KF1913-2

S/N	TEST PERFORMED					Inspectors Stamp	Date
	Para 4.1 Visual	Para 4.2 Dielectric	Para 4.3 Insulation	Para 4.4.5 Voltage	Para 4.4.6 Voltage		

LTR	REVISION	DATE	LTR	REVISION	DATE

Test Documentation Sheet for Surveillance Indicator Assy P/N KF1913-2

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BETHEL CONNECTICUT, U.S.A.

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KYM315/10 B

QUALITY CONFORMANCE TEST
ALIGNMENT AND DOCUMENTATION
FOR
SAFETY FEATURES ACTUATION SYSTEM
CCC P/N 9N16

1.0 **TEST EQUIPMENT**

1.1 High Pot Tester Model 805-2, Beta Electric Company.

1.2 Megohm Tester, Model L6B, Industrial Instruments, Inc.

1.3 Digital Voltmeter, Model DVX-350, Data Tech or equivalent.

2.0 **DRAWINGS**

S9N16-1, Rev. B
S9N16-2, Rev. B
S9N16-3, Rev. B
S9N16-4, Rev. B
KWJ1316/10

RECORD PRINT

3.0 **TESTS TO BE PERFORMED**

3.1 Visual.

3.2 Dielectric Strength.

3.3 Insulation Resistance.

3.4 Alignment.

3.5 Function.

3.6 Noise Rejection Test

3.7 Full Load Test

3.8 Radiation Monitoring Equipment

VENDOR'S QA PROGRAM REVIEW

1 [X] Approval without comments

2 [ ] Approval with comments, released for interim use, resubmit within 20 days per ED 6058

3 [ ] Not approved. See comments marked on Procedures. Resubmit for approval within 30 days per ED 6058

Approval of this QA Program does not relieve supplier from full compliance with contract or purchase order requirements.

By [illegible] Date 11-17-73
BECHTEL

Job No. 7749 | BECHTEL COMPANY, Power & Industrial Division, P.O. Box 607 Gaithersburg, Md.

7749-E-30Q-29-3

LTR	REVISION	DATE	LTR	REVISION	DATE
A	C/N NS342 Rev'd [illegible]	6/29/73			
B	C/N NS377 Rev'd [illegible]	11/12/73			

Quality Conformance Test
Alignment & Documentation
SFAS, CCC P/N 9N16

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BETHEL CONNECTICUT, U.S.A.

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TESTING

Note: When "Check ( )" appears in this procedure, check off appropriate block of the Test Documentation Sheet. Full load testing para. 3.7 shall be performed prior to alignment.

3.1 Visual Examination (Preliminary)

The equipment shall be visually examined for the following in accordance with the applicable drawings.

3.1.1 Workmanship, assembly and fit.

3.1.2 Materials, parts and finishes.

3.1.3 Treatment for prevention of corrosion.

3.1.4 Markings.

3.1.5 Check ( ).

3.2 Dielectric Strength

3.2.1 Jack-out all modules on all cabinets.

3.2.2 Insert a shorting plug (all pins connected together forming an isolated circuit) on the module extender KM14.

3.2.3 Disconnect the plus 15 volt (+), minus 15 volt (-), and common connection from PS 05, 06, 07 and 08 in the cabinet under test.

3.2.4 Remove a module and insert in its place the module extender. Apply a potential of 500 VAC, 60 Hz between the isolated circuit and the cabinet frame for a period of one (1) minute. There shall be no arcing or breakdown. After testing remove the extender and re-insert the module (do not make electrical connection).

3.2.5 Repeat paragraph 3.2.3 for the modules in all cabinets. Check ( ).

3.2.6 Form a single isolated circuit by connecting all pins together on a 104 pin (male) plug. Insert this plug into a 104 connector located in the rear of a cabinet. Apply 500 VAC, 60 Hz between the isolated circuit and the cabinet for one (1) minute. There shall be no arcing or breakdown Repeat for all 104 pin connectors in all cabinets. Check ( ).

3.3 Insulation Resistance

3.3.1 Repeat paragraph 3.2.1.

3.3.2 Repeat paragraph 3.2.2.

3.3.3 Repeat paragraph 3.2.3.

3.3.4 Repeat paragraph 3.2.4 except use a 500 VDC potential, and record the value of insulation resistance, ambient temperature and relative humidity at the time of test.

3.3.5 The insulation resistance measurements shall be corrected to a 77°F value. Corrections shall be madeon the basis of insulation resistance doubling for every 27°F decrease in temperature.

3.3.6 The minimum insulation resistance reading for the above test shall be 10 megohms at 77°F. Check ( ).

3.3.6 Insert a 104 pin shorting plug into each connector in turn in each cabinet. At each connection apply 500 VDC between the shorting plug (isolated circuit) and cabinet frame for one (1) minute. The minimum insulation resistance reading for the above test shall be 10 megohms at 77°F. Check ( ).

3.3.7 Repeat paragraph 3.3.4 for all cabinets. Check ( ).

3.4 Alignment

3.4.1 Insert all modules and surveillance cards in all cabinets.

3.4.2 Connect all interconnecting cables between cabinets.

3.4.3 Connect test set up per KWJ1316/10 in all test panels (4): Set SAM logic switches to N.C. position; all other switches to N.O. position.

3.4.4 Set the power switch on each test panel to the ON position. Observe that the cabinet power lamps are ON. Check ( ).

Note: Refer to Table I when performing the following preliminary steps:

a) Adjust all bistable trip set (dial) potentiometers, on all cabinets to their respective percentage setting.

b) Adjust the signal inputs to obtain the following normal cabinet meter indications. (Normal inputs for testing).

CTMT Radiation	-	1×10^1 MR/HR
R.C. Pressure	-	2000 PSIG
CTMT Pressure	-	14.5 PSIA
BWST Level	-	33 Feet

c) Assure that no bistable trips are present. The 6N81 bistable can be reset by depressing and releasing the bistable rest switch. If trips are still prevalent, decrease or increase the module trip set pot.

3.4.5 Analog Amplifier Alignment

Refer to Table I and align each analog amplifier in each cabinet as follows:

3.4.6 Connect the digital voltmeter between test panel binding posts BP1(+) and BP2(-). Set the test panel DVM selector switch to the applicable position and adjust the signal input pot to obtain -400 ± 10 MVDC.

* See Note #1 3.4.7 Connect the voltmeter to module jacks VO and COM and adjust the module NULL pot to obtain 0.250 ± .010 VDC. Adjust the mechanical screw on the applicable meter to obtain the first major division.

3.4.8 With the voltmeter connected to BP1(+) and BP2(-) adjust the signal input to obtain -2.00 + .01 VDC.

* See Note #1 3.4.9 With the voltmeter connected to module jacks VO and COM adjust the module GAIN pot to obtain 5.250 ± 0.050 VDC.

3.4.10 Adjust the module METER pot to obtain full scale on the applicable cabinet meter.

3.4.11 Perform a linearity check per Table II. Check ( ).

3.4.12 Adjust the signal input to obtain the NORMAL input defined in paragraph 5.4 B). Reset all tripped bistables.

3.4.13 Bistables

For each bistable listed in Table I, perform the following applicable alignments:

NOTE: Jack out the bistable being aligned and reinsert using a module extender

3.4.13.1 Bistable Function 6N81 (INC), or 6N81 (DEC), 6N82 (DEC).

3.4.13.2 Adjust the module pots as indicated.

	INC.	DEC.
TRIP SET	0.0	0.0
R3	Fully CCW	Fully CW
R4	Fully CW	Fully CCW

3.4.14 Alignment for 6N81

Set the input signal to 4.00 MA ± .01

3.4.15 Set trip set pot to (000) on dial.

3.4.16 Adjust R4 (CCW for increasing, or CW for decrease trip) until the trip light just illuminates.

(If the bistable is tripped, it can be reset by increasing the dial setting, pressing and releasing the Reset and then returning to 000 on dial).

3.4.17 Set the trip set potentiometer to 100 and adjust the input current to 20 ± .03 MA

3.4.18 Adjust R3 CW for increasing or CCW for decreasing until the trip light just illuminates.

If the trip light is tripped, it can be reset with the reset pushbutton.

3.4.19 Adjust the dial potentiometer to the value indicated in Table I.

Example Bistable 04:

$$\frac{2500}{100}\ \text{psig} : \frac{1600}{X}\ \text{psig} = 64\%$$

$$\frac{16.00}{100}\ \text{MA} : \frac{X}{64} + 4.00 = 14.25\ \text{MA}$$

3.4.20 Align the ATI as follows:

3.4.21 With the module on the extender, jumper U1 pin #2 to the ATI common.

3.4.21 Monitor R16 with the oscilloscope placed between R16 and system common.

3.4.22 Adjust the input signal to the trip value of the bistable.

3.4.23 Set the oscilloscope to center reference, and return the input signal to its normal operating value.

3.4.24 Adjust the high potentiometer to result in an over test of 0.25 to 0.70 VDC. (see note #2)

3.4.25 Adjust the low potentiometer to give an under test pulse of 0.25 to 0.70VDC. (see note #2)

3.4.26 Alignment for 6N82

Set the input signal to 4.00 MA ± .01.

3.4.27 Set trip set pot to (000) on dial.

3.4.28 Adjust R3 (CCW) until the trip light just goes off. Adjust R3 CW until the trip lamp illuminates.

3.4.29 Set the trip set potentiometer to 100 and adjust the input current to 20 ± .03 MA.

3.4.30 Adjust R4 CW and then CCW until the lamp just illuminates.

3.4.3 If the trip light is tripped, it can be reset with the reset pushbutton.

3.4.31 Adjust the dial potentiometer to the value indicated in Table I.

Example Bistable 03:

$$\frac{2500}{100}\ \text{psig} : \frac{1800}{X}\ \text{psig} = 72\%$$

$$\frac{16.00}{100}\ \text{MA} : \frac{X}{72} + 4.00 = 15.52\ \text{MA}$$

3.4.32 Align the ATI as follows:

With the module on the extender, jumper U1 Pin #2 to the ATI common.

3.4.33 Monitor R37 with the oscilloscope placed between R37 and system common.

3.4.34 Adjust the input signal to the trip value of the bistable.

3.4.35 Set the oscilloscope to center reference.

3.4.36 Adjust the high potentiometer to result in a over test of 0.25 to 0.70 VDC. (see note #2)

3.4.37 Adjust the low potentiometer to give an under test pulse of 0.25 to 0.70 volts DC(see note #2)

NOTE #1 -

When aligning the BWST trip bistable, BA12, substitute the following :

Para. 3.4.7:
Replace .250 ± .010 VDC with
.750 ± .010 VDC

Para. 3.4.9:
Replace 5.250 ± 0.05 VDC with
5.750 ± 0.05 VDC.

NOTE #2

The high potentiometer will effect the setting of the low potentiometer. The high potentiometer may have to be re-adjusted to obtain the desired low set point. Obtimium setting should be ±0.40 VDC.

3.5 Function Tests

Adjust all signal inputs on all test panels to obtain Normal conditions described in paragraph 3.4.4B.

Tape the door interlock switches closed.

3.5.1 Reset tripped 6N81 bistable by depressing and releasing the module RESET switch. Observe the following test panel lamp condition.

BISTABLES	TRIPS	OFF
	Permission to block	OFF
	BLOCK	OFF
	ANN	ON
Relays	INTERLOCK	ON
Output Modules	ANN	ON
SAM Logic	RMT INDICATION	OFF
Sequencer	ON A	ON
	B	OFF
	SEQUENCE 1, 2, 3, 4	ON
Door	Interlock	ON

Observe the ATI lamps (cabinet #1). Proper ATI sequence must conform to Table I of S9N16-1, Sheet #5. The ATI module FAULT lamps may be ON due to testing. If so, depress and release the lamp. It shall extinguish and if no faults exist, remain OFF throughout the 65 counts ( ).

3.5.2 On cabinet #1, set the test panel function switch to CTMT radiation. Hold the spring return CTMT Radiation OPER-TEST switch in TEST position and rotate the corresponding test input. It shall be possible to adjust the input from .400 to 1.999 VAC and produce a corresponding full scale swing on the CTMT RAD meter. Check ( ). Clear all trips after test.

3.5.3 Repeat paragraph 3.5.2, substituting RC pressure. Check ( ).

3.5.4 Repeat paragraph 3.5.2, substituting CTMT pressure. Check ( ).

3.5.5 Repeat paragraph 3.5.2, substituting BWST level. Check ( ).

3.5.6 Repeat paragraphs 3.5.2 thru 3.5.5 for cabinet #2 thru #4. Check ( ).

3.5.7 On all cabinets, depress and release each 6N81 bistable test pushbutton. The bistable trip lamp will go on and the test panel lamp will go off. The lamps will remain in this state until reset by the reset pushbutton.

The 6N82 block bistables (BA03, BA05) will not latch when the test pushbutton is depressed. Module test pushbutton depressed - test panel ann. - off, module trip light - on, perm. to block light - on. Module test pushbutton released- test panel ann. on, module trip light - off, perm. to block light - off.

3.5.8 Trip the CTMT Hi trip bistable (BA101)in cabinet #1.

Observe that the 1/5 lamps on L111, L121, L112, L122, L113, L123, L114 and L124 are illuminated Check ( ). Reset BA101.

3.5.9 Repeat paragraph 3.5.8 using BA201. Check ( ). and reset BA201.

3.5.10 Repeat paragraph 3.5.8 using BA301. Check ( ) and reset BA301.

3.5.11 Repeat paragraph 3.5.8 using BA401. Check ( ) and reset BA401.

3.5.12 Trip RCP Lo trip bistable (BA104) in Cabinet #1.

Observe that the 1/5 lamps on L111, L121, L211, L221, L231, L241, L251, L261, L271, L281, L291, L112, L122, L212, L222, L232, L242, L252, L262, L272, L282, L292, L113, L123, L213, L223, L233, L243, L253, L263, L273, L283, L293, L114, L124, L214, L224, L234, L244, L254, L264, L274, L284 and L294 are illuminated. Check( ). and reset BA104

3.5.13 Repeat paragraph 3.5.12 using BA204. Check ( ). and reset BA204.

3.5.14 Repeat 3.5.12 using BA304. Check ( ) and reset BA304.

3.5.15 Repeat paragraph 3.5.12 using BA404. Check ( ). and reset BA404.

3.5.16 Trip RCP Lo Lo trip bistable (BA106) in cabinet #1.

Observe that the 1/5 lamps on L311, L321, L331, L312, L322, L332, L313, L323, L333, L314, L324, L334 are illuminated. Check (v) and reset BA 106.

3.5.17 Repeat para. 3.5.16 using BA 206. Check ( ) and reset BA 206

3.5.18 Repeat para. 3.5.16 using BA306. Check ( ) and reset BA306.

3.5.19 Repeat para. 3.5.16 using BA406. Check ( ) and reset BA406.

3.5.20 Trip CTMT pressure Hi Hi bistable (BA109) in Cabinet #1.

Observe that the 1/5 indicators on L411, L421, L431, L412, L422, L432, L413, L423, L433, L414, L424 and L434 are illuminated. Check ( ) and reset BA109.

3.5.21 Repeat para. 3.5.20 using BA209. Check ( ) and reset BA209.

3.5.22 Repeat para. 3.5.20 using BA309. Check ( ) and reset BA309.

3.5.23 Repeat para. 3.5.20 using BA409. Check ( ) and reset BA409.

3.5.24 Trip CTMT pressure hi bistable (BA110) in cabinet #1.

Observe that the 1/5 indicators on L111, L121, L211, L221, L231, L241, L251, L261, L271, L281, L291, L311, L321, L331, L112, L122, L212, L222, L232, L242, L252, L262, L272, L282, L292, L312, L322, L332, L113, L123, L213, L223, L233, L243, L253, L263, L273, L283, L293, L313, L323, L333, L114, L124, L214, L224, L234, L244, L254, L264, L274, L284, L294, L314, L324 and L334 are illuminated. Check ( ) and reset BA110.

3.5.25 Repeat para. 3.5.24 using BA210. Check ( ) and reset BA210.

3.5.26 Repeat para. 3.5.24 using BA310. Check ( ) and reset BA 310.

3.5.27 Repeat para. 3.5.24 using BA410. Check ( ) and reset BA410.

3.5.28 Trip BWST level bistable (BA112) in cabinet #1.

Observe that the 1/5 indicators on L511, L512, L513 and L514 are illuminated. Check ( ) and reset BA112.

3.5.29 Repeat para. 3.5.28 using BA212. Check ( ) and reset BA212.

3.5.30 Repeat para. 3.5.28 using BA312. Check ( ) and reset BA312.

3.5.31 Repeat para. 3.5.28 using BA412. Check ( ) and reset BA412.

3.5.32 Adjust the analog value of reactor coolant pressure to 1700 PSIG in all four cabinets, the module trip lamps on BA103, 203, 303 and 403 should illuminate. Actuate the local block pushbuttons on BA103, 203, 303 and 403 and verify that the block lamp illuminates on each. Reduce the pressure to 1000 PSI in all four cabinets. The 1/5 lamps of Incident #1 and #2 should not illuminate. Check ( ).

3.5.33 Adjust the analog value of reactor coolant pressure to 500 PSIG in all four cabinets, the module trip lamps on BA105, 205, 305, 405 should illuminate. Actuate the local block pushbuttons on BA105, 205, 305, 405 and verify that the block lamp illuminates on each. Reduce the pressure to 100 PSIG in all four cabinets. The 1/5 lamps of Incident #3 should not be illuminated. Check ( ).

3.5.33A Return all parameters to normal values.

3.5.34 Repeat para. 3.5.32 except use the remote block switch on the test panel. Check ( ).

3.5.35 Repeat para. 3.5.33 except use the remote block switch on the test panel. Check ( ).

Return all parameters to the values per para. 3.3.4B.

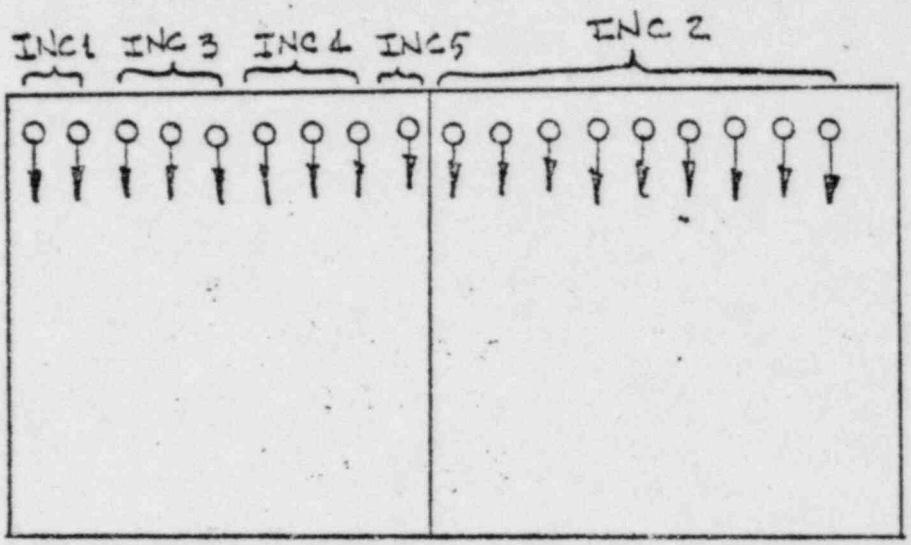
3.5.36 Trip and Reset BA102 (channel failure) and observe trip lamp on the test panel is extinguished and illuminated.

Repeat for all channel failure bistables

BA102	BA107	BA108	BA111
BA202	BA207	BA208	BA211
BA302	BA307	BA308	BA311
BA402	BA407	BA408	BA411

Check ( ).

3.5.37 Observe the Surveillance Indicators on the front of each cabinet when performing the following test. The indicators are arranged as follows on each pair of cabinets.



Depress the trip pushbuttons on the output modules associated with Incident #1 (L111, L121). Surveillance Indicators on Cabinet #1 should be dim and the indicators on Cabinet #3 should be bright. Check ( ).

3.5.38 Repeat paragraph 3.3.37 using L113 and L123. Check( ).

3.5.39 Depress the trip pushbuttons on the output modules associated with Incident #3 L311, L321, L331). Surveillance indicators on Cabinet #1 should be dim and Cabinet #3 should be bright. Check ( ). The associated HIS lamps on the tripped cabinet will go out.

3.5.40 Repeat 3.3.39 using L313, L323 and L333. Check( ).

3.5.41 Repeat 3.3.39 using Incident #4 in Cabinet #1. Check( ).

3.5.42 Repeat paragraph 3.3.40 using Incident #4 in Cabinet #3. Check ( ).

3.5.43 Repeat 3.3.39 using Incident #5 in Cabinet #1. Check( ).

3.5.43A Repeat 3.3.39 using Incident #2 in Cabinet #1. Check( ).

3.5.44 Repeat 3.3.39 using Incident #5 in Cabinet #3. Check( ).

3.5.44A Repeat 3.3.39 using Incident #2 in Cabinet #3. Check( ).

3.5.45 Repeat paragraph 3.3.37 thru 3.3.44 using Cabinets #2 and #4. Check ( ).

3.5.46 Return all inputs to the values of paragraph 3.3.4(b) and reset all trips. Observe that all SAM lights on the test panel are extinguished . Check ( ).

3.5.47 Trip all output modules in Cabinet #1. Observe that all SAM lights remain out. Check ( ).

3.5.48 Reset Cabinet #1 trips and repeat paragraph 3.3.47 using all trips in Cabinet #3. Check ( ).

3.5.49 Repeat 3.3.47 and 3.3.48 using Cabinet #2 and #4.

3.5.50 Place all remote switches in the actuated position (down). Introduce a trip condition in all output modules of Cabinet #1 and #3, all SAM Indicators on dim. Check ( ).

3.5.51 Place all remote switches in the hot actuated position (UP) associated SAM INDICATORS should be out. Check ( ).

3.5.52 Introduce a block in all output modules of Cabinet #1. All SAM Indicators should flash. Check ( ).

3.5.53 Place all remote switches in the not actuated position (down). The associated SAM INDICATORS should remain on bright. Check ( ).

3.5.54 Repeat paragraph 3.5.50 thru 3.5.53, except introduce the block signal from Cabinet #3. Check ( ).

3.5.55 Repeat paragraph 3.5.50 thru 3.5.54 using cabinet #2 and #4. Reset all trips and blocks.

3.5.56 Set the test panel SEQ. START switch to ON & OFF and observe the following:

Test panel SEQ ON lamps change state.

Test panel SEQUENCE lamps 1, 2, 3, & 4 extinguish then sequentially illuminate and extinguish, at the same time, the following surveillance lamps shall illuminate and extinguish:

After approximately 30 seconds, the test panel Sequence lamps 1, 2, 3 & 4 shall illuminate and SEQ ON lamps A & B shall change state. Check ( ).

3.5.57 Trip all cabinet #1 output modules and depress the local SEQUENCER START pushbutton, observe that the following occurs:

Sequence #1 - Zero seconds

L111, L121, L231, L261, L271, L281, L291, L321, L331, L421, and L431 do not change state. Check ( ).

Sequence #2 - 5 seconds.

L241 Blocks for 5 seconds, unblock for 3 sec. and re-block until end of sequence. Make a chart recording of this sequence.

Sequence #3 - 10 seconds.

L211 blocks for 10 sec., unblocks for 3 sec, and re-blocks until the end of sequence. Make a chart recording of this sequence.

Sequence #4 - 15 seconds.

L311 blocks for 15 sec., unblocks for 3 sec, re-blocks until the end of sequence.
Make a chart recording of this sequence.

Sequence #5 - 20 seconds.

L221, L251, L411 and L511 block for 20 sec, unblocks for 3 sec, and re-blocks until the end of sequence.
Make a chart recording of this sequence.

3.5.58 Repeat for cabinet #2, #3 and #4.

3.5.59 Trip BA 113 and observe that the trip lamp on the test panel is de-energized. Reset the bistables, the lamp is energized. Check ( ). The K03 relay lamps on the test panel will also change state.

3.5.60 Repeat for cabinet #2, #3 and #4. Check ( ).

3.5.61 Remove the tape holding door interlock switch closed on cabinet #1. Door Interlock lamps on all four test panels shall illuminate. Check ( ). Replace tape.

3.5.62 Perform paragraph 3.5.61 for all four cabinets. Check ( ).

3.5.63 FINAL VISUAL

After completion of all testing, disconnect test set-up and perform a final visual as follows:

A) Check for chipped or marred finishes.
B) All modules and knobs secured.
C) Cable ties, clamps, etc., secured.

3.5.64 TEST DOCUMENTATION

After satisfactorily completing all tests, affix inspection stamp and date applicable block of test documentation sheet. Remove all tapes holding door

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interlock switches closed on cabinet #1 thru #4.
Check ( ).

LTR	DIVISION	DATE	LTR	DIVISION	DATE	

Quality Conformance Test
Alignment & Documentation
SFAS, CCC P/N 9N16

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3.6 Noise Rejection Test

3.6.1 With all bistable trips set at the values indicated in Table I and input parameters set to the values of para. 3.4.4 (B) connect the noise rejection circuit per drawing number Y08-354-15.

Perform the switching test per the Notes on Y08-354-15.

3.7 Full Load Test

Connect the ESAS cabinets 1 thru 4 to the KWJ1316/10 test panels. During the initial checkout of the equipment, and functional testing, maintain the equipment energized to provide a minimum of 100 operating hours on all cabinets.

This test has been complied with by virtue of the fact that approximately 1100 operating hours have been logged on the equipment to date.

March 1 thru March 31	15 hours
April 1 thru April 30	175 hours
May 1 thru May 31	325 hours
June 1 thru June 25	500 hours

3.8 Radiation Monitoring Equipment

Parts required:

1) Victoreen Cable part number 1254.
2) Ion Chamber
3) 845 Area Monitor (mounted in each cabinet)

NOTE: The radiation monitoring equipment requires a variable gamma input to produce a linear output signal over seven decades of information.

The CCC plant is not in a position to test this equipment from the detector input and the following is substituted:

The 845 monitor output is a 4.0ma to 20.0ma analog current and this is disconnected at terminal board.

A variable current source is substituted at these points and the bistables, Matrix, etc., are checked out using this source.

After completion of the functional test para. 3.5 of KYM315/10, the current source is to be removed and the Victoreen cable and source are to be connected.

Check out the Victoreen equipment per para. 3.3 of the Victoreen Manual.

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TEST DOCUMENTATION SHEET
FOR
TEST PROCEDURE KYM135/10

Paragraph No.	Check
3.1.5	
3.2.5	
3.2.6	
3.3.6	
3.3.7	
3.4.4	
3.4.11	
3.5.1	
3.5 2	
3.5.3	
3.5.4	
3.5.5	
3.5.6	
3.5.7	
3.5.8	
3.5.9	
3.5.10	

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Quality Conformance Test
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Paragraph No.	Check
3.5.11	
3.5.12	
3.5.13	
3.5.14	
3.5.15	
3.5.16	
3.5.17	
3.5.18	
3.5.19	
3.5.20	
3.5.21	
3.5.22	
3.5.23	
3.5.24	
3.5.26	
3.5.27	
3.5.28	
3.5.29	
3.5.30	
3.5.31	

Paragraph No.	Check
3.5.32	
3.5.33	
3.5.34	
3.5.35	
3.5.36	
3.5.37	
3.5.38	
3.5.39	
3.5.40	
3.5.41	
3.5.42	
3.5.43	
3.5.44	
3.5.45	
3.5.46	
3.5.47	
3.5.48	
3.5.49	
3.5.50	
3.5.51	

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Quality Conformance Test
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Paragraph No.	Check
3.5.52	
3.5.53	
3.5.54	
3.5.55	
3.5.56	
3.5.57	
3.5.60	
3.5.61	
3.5.62	
3.5.63	
3.5.64	
3.6.1	
3.8	

TABLE 2

ANALOG LINEARITY

INPUT PARAMETER							
CTMT RADIATION	Input (VDC) ± .010	.400	.800	1.200	1.600	2.000	
	Output (MR)	10^{-1}	10^{0}	10^{1}	10^{2}	10^{3}	
	Tolerance	±.2x10^{0}	±.2x10	±.2x10	±.2x10	±.2x10	
REACTOR COOLANT PRESSURE	Input (VDC) ±.010	.400	.720	1.040	1.360	1.680	2.000
	Output (psig x 100) ± 50	0	5	10	15	20	25
Containment PRESSURE	Input (VDC) ±.010	.400	.666	.932	1.198	1.462	1.730	2.000
	Output (Psia) ± 1.2	0	10	20	30	40	50	60
BWST Level	Input (VDC) ±.010	.400	.720	1.040	1.360	1.680	2.000
	Output (Feet) ±.8	0	10	20	30	40	50

REVISION | DATE | BY | REVISION | DATE | BY

Quality Conformance Test, Alignment & Documentation for Safety Features Actuation Sys.
CCC P/N. 9N16

CONSOLIDATED CONTROLS CORP.

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TABLE 1.

INPUT Parameter	DESIGNATION Analog	BA	Description	Function	Trip	Trip SET	Range
CTMT Radiation	01	-	-	-	-	-	10^{-1} to 10^{3} MR/hr
	-	01	Hi TRIP	6N81 (INC)	25	61%*	
	-	02	Chann. Failure	6N81 (DEC)	$-5 \times 10^{*}$	16.5%	
Reactor Coolant Pressure	02	-	-	-	-	-	0-2500 psig
	-	03	Lo BLOCK	6N82 (DEC)	1800	72%	
	-	04	Lo TRIP	6N81 (DEC)	1600	64%	
	-	05	Lo-Lo-Block	6N82 (DEC)	600	24%	
	-	06	Lo-Lo Trip	6N81 (DEC)	400	16%	
	-	07	Chann. Failure	6N81 (INC)	2300	92%	
	-	13	Hi TRIP	6N82 (DEC)	280*	11.2%	
CTMT Press	03	-	-	-	-	-	0-60 psia
	-	08	Chann. Failure	6N81 (DEC)	5	8.35%	
	-	09	Hi-Hi-Trip	6N81(INC)	38.4	64%	
	-	10	Hi Trip	6N81 (INC)	18.4	30.5%	
BWST Water Level	04	-	-	-	-	-	0-50 feet
	-	11	Chann. Failure	6N81 (INC)	39	78%	
	-	12	Lo Trip	6N81 (DEC)	3	6%	

* channel #2 & #3 800 PSIG

Quality Conformance Test, Alignment & Documentation for Safety Features Actuation Sys.

CCC P/N. 9N16

CONSOLIDATED CONTROLS CORP.

BETHEL, CONNECTICUT

SHEET 27 OF

KYM315/10

TABLE 3

CONDITION		1	2	3	4	5	6	7	8
Channel Tripped	2 1	No	Yes *	Yes	Yes	Yes *	Yes	Yes *	Yes
	4 3	No	No	Yes	Yes	No	Yes	No	Yes
Channel Blocked	2 1	No	No	No	No	Yes *	Yes *	Yes *	Yes *
	4 3	No	No	No	No	No	No/Yes	No	No/Yes
Equipment Actuated		No/Yes	No/Yes	No	Yes	Yes	Yes	No	No
SAM Light Status		Out	Out	Out	Dim	Bright	Bright	Flashing	Flashing

No/Yes - Means "either" condition. * = Or Vice Versa

ADDENDUM I

TO

PROCEDURE KYM315/10

1.0 Test Trip Bypass Switch

1.1 Verify that the TTBS keys cannot be removed when the switch is in any position other than operate.

Cabinet #1	Cabinet #2	Cabinet #3	Cabinet #4
( )	( )	( )	( )

1.2 Verify that only one TTBS can be operated at any one time (all others are inhibited).

Cabinet #1	Cabinet #2	Cabinet #3	Cabinet #4
( )	( )	( )	( )

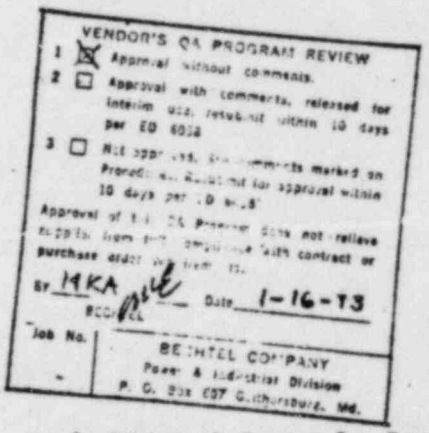
1.3 Verify that the TTBS prevents the processing of trip information to the remaining three cabinets for all input parameters.

	Cabinet #1	Cabinet #2	Cabinet #3	Cabinet #4
CR	( )	( )	( )	( )
RCP	( )	( )	( )	( )
CP	( )	( )	( )	( )
BWST	( )	( )	( )	( )

ENGINEERING REPORT NBR. #785

SEISMIC ANALYSIS OF DAVIS-BESSE SAFEGUARD SYSTEM

(CCC Part No. 9N16)



Prepared for: Consolidated Controls Corp.
Bethel, Connecticut

Prepared by: J. E. Motherway, Ph.D.
Consultant

Date: December 18, 1972

I. INTRODUCTION

A. Purpose

The purpose of this study is to demonstrate by analysis that the Davis-Besse Safety Features Actuation System cabinets satisfy the earthquake resistance design requirements of Bechtel Power and Industrial Division Specification No. 7749-C-41, Revision 4. The method of force analysis used is outlined in the specification (1)[1] as Method B; this is essentially the "normal mode method" as outlined in the literature of structural dynamics (2) (3). This method was used because the cabinet structure and loading were too complex to consider the equipment as a single mass and single spring as in Method A and, based on previous experience with similar equipment, the "peak value" approach of Method C was unnecessarily conservative and could lead to an uneconomical design.

B. Preliminary Work

A preliminary and very approximate analysis was conducted on a fairly large (110 member, 66 joint) model to ascertain validity of simplifications to be used in making more extensive and detailed studies. This model was quite accurate, (including, for example, the effective stiffness of all bins) but it was sufficiently complex that extensive analysis appeared to be uneconomical. The conclusions of this preliminary work were:

---

[1] Numbers in parentheses denote references listed in the Bibliography.

TOTAL WEIGHT - 1210# (ESTIMATED)

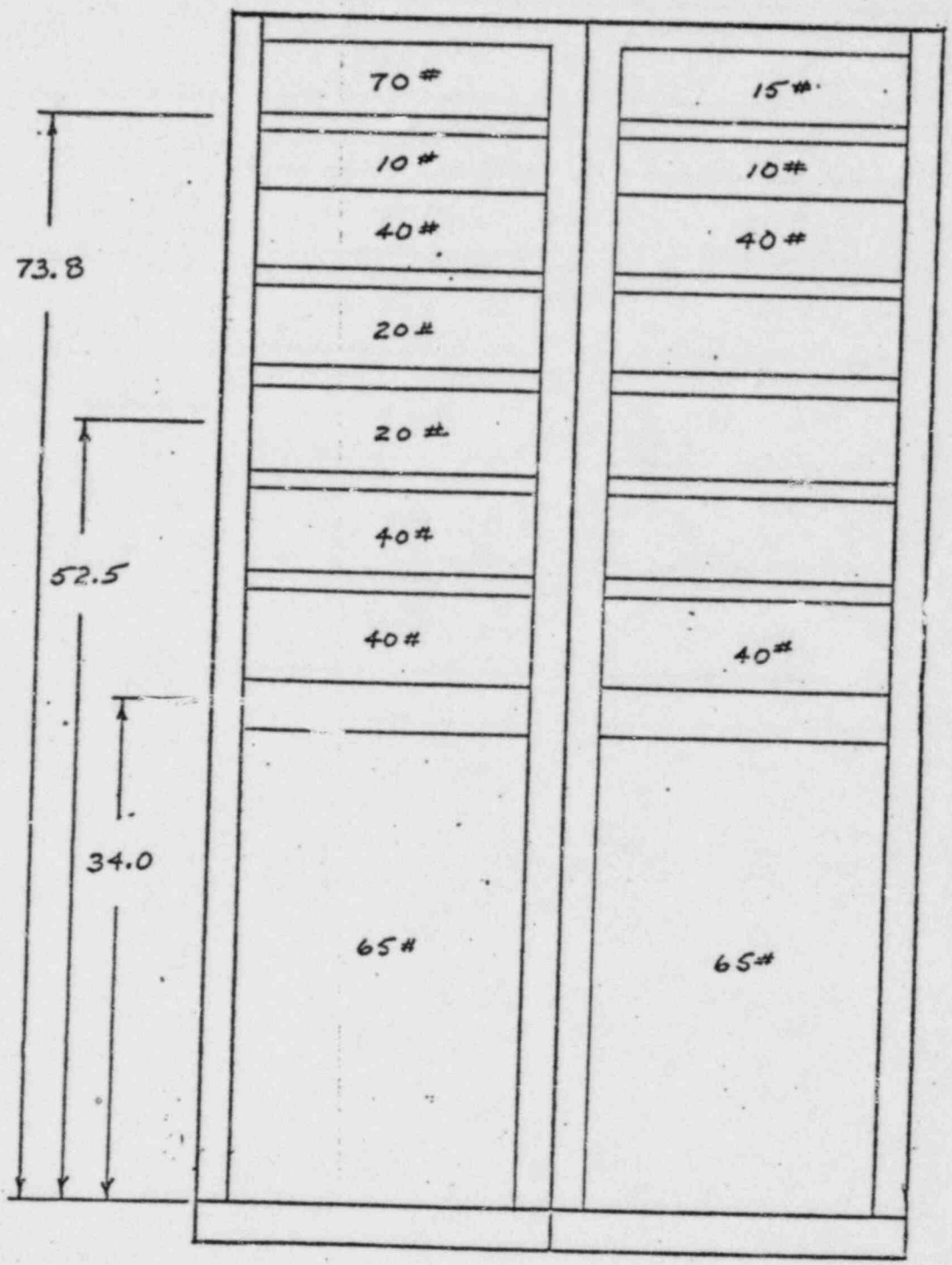
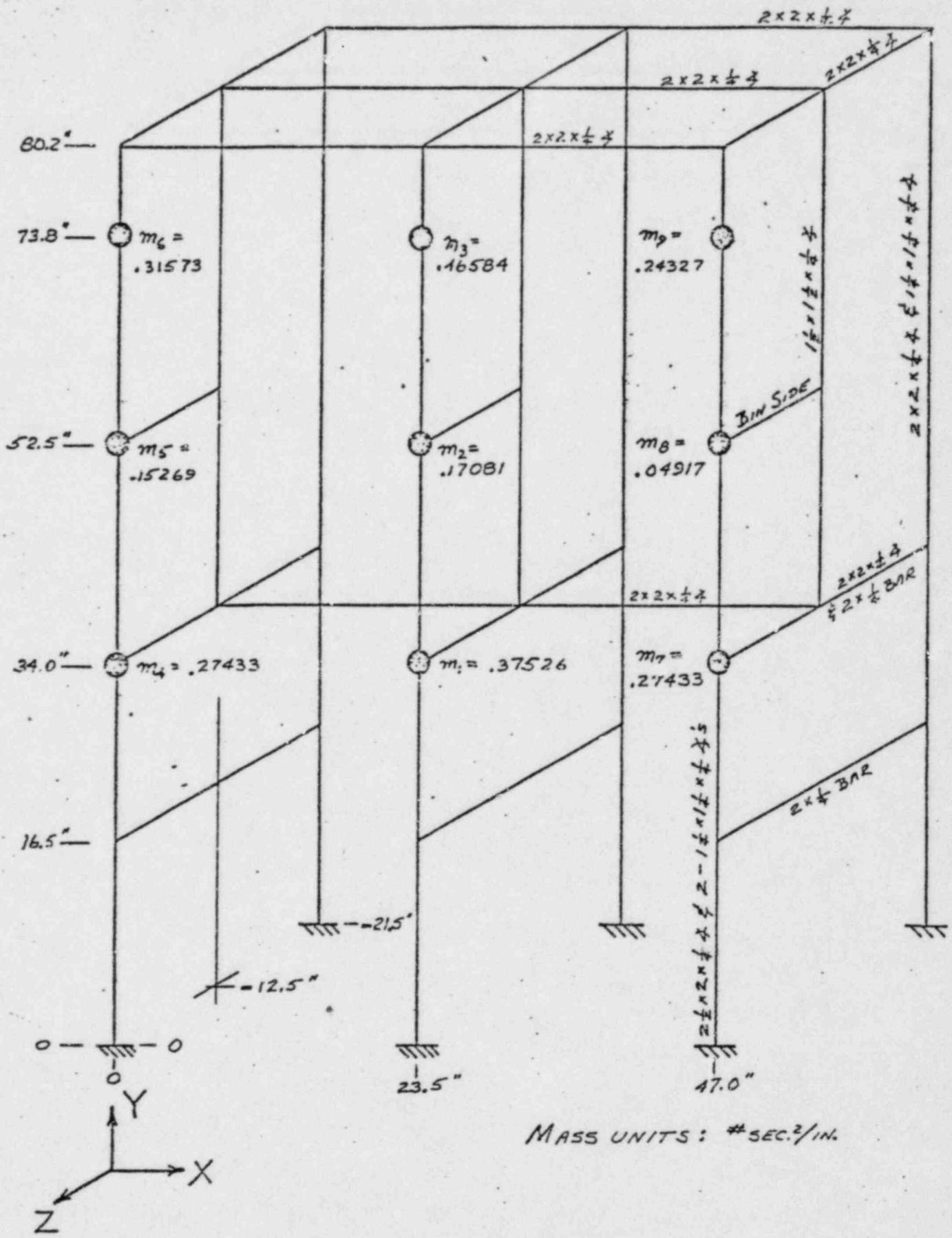


FIGURE 1



MASS UNITS: #SEC.²/IN.

FIGURE 2

Only the basic structural elements (with the exception of members 31, 32, 33 for reasons explained later) were used in the model. The neglect of bin stiffness effects clearly is a conservative assumption.

Damping due to bolted connections (bin-to-frame and cabinet-to-cabinet) was neglected, thus requiring the use of larger acceleration spectra values.

Wherever members were connected by bolting in such a way as to transmit bending-induced shear through the bolts, such shear load carrying capability was neglected. This produces an inherently "softer" structure and is, therefore, a conservative assumption.

Due to the actual concentration of bin loading near the front of the cabinets, some coupling exists between vertical and horizontal vibrational modes. Based on the large value of estimated first vertical mode natural frequency (211 Hz.), this coupling was neglected. This assumption was later proved totally justifiable; masses in the simplified model were lumped in the front of the cabinets so as to produce maximum coupling, but examination of structural deformation (in connection with determining flexibility influence coefficients) at the mass points clearly showed that coupling was negligible.

II. METHOD

The structural model is shown in Figure 3. It contains 53 members and 36 joints. Member numbers are inside ellipses and joints numbers are inside octagons. X, Y, and Z are the global

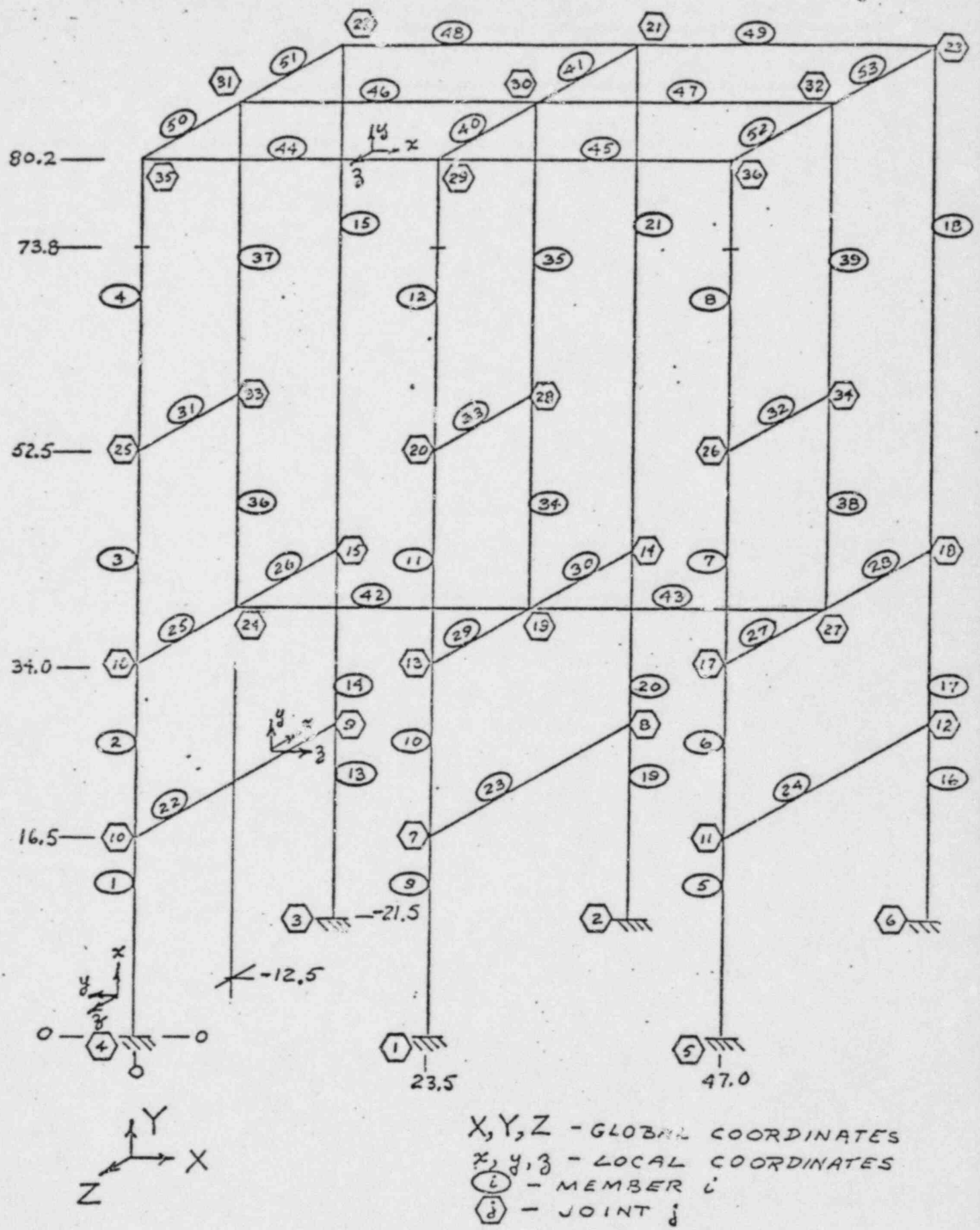

80.2
73.8
52.5
34.0
16.5
0
-21.5
-12.5
23.5
47.0
X, Y, Z - GLOBAL COORDINATES
x, y, z - LOCAL COORDINATES
(i) - MEMBER i
(j) - JOINT j

FIGURE 3

coordinates axes. Y coordinates are measured from the top of the $3 \times 4 \times \frac{3}{8}$ angle base, i. e., from a point 3 inches above the floor. Local coordinate conventions for vertical, front-to-rear, and side-to-side members are shown in lower case letters. The bins are actually supported between members 3 and 11, 36 and 34, 4 and 12, 37 and 35, 11 and 7, 34 and 38, 12 and 8, 35 and 39. Members 31, 32, and 33 are stiffness equivalents of bin sides (all other bin member structural models were dropped from the original 110 member model); these were introduced only for the purpose of transmitting some force to the rear bin supports (members 34, 35, 36, 37, 38, and 39). Comparison of Figures 2 and 3 shows that masses are lumped at joints 13, 16, 17, 20, 25, 26, and at 3 points each 21.3 inches above joints 20, 25, and 26. Member sectional properties are in Table 1; these are based on sections shown on C.C.C. Drawings KAR 202 (sheets 1, 2, and 4) and KBD 200. Area and bending properties were obtained from tables for standard shapes. Shear and torsional properties were determined by methods outlined in (4).

Dynamic coordinates and masses are located as follows:

z_1 and m_1 at joint 13

z_2 and m_2 at joint 20

z_3 and m_3 21.3" above joint 20

z_4 and m_4 at joint 16

z_5 and m_5 at joint 25

z_6 and m_6 21.3" above joint 25

z_7 and m_7 at joint 17

z_8 and m_8 at joint 26

z_9 and m_9 21.3" above joint 26

MEMBER	A_x (IN.^{2})	A_y (IN.^{2})	A_z (IN.^{2})	I_x (IN.^{4})	K (IN.^{3})	I_{yy} (IN.^{4})	S_{yy} (IN.^{3})	I_{zz} (IN.^{4})	S_{zz} (IN.^{3})
1-8	2.18	1.139	1.077	.4883	.781	1.688	1.009	.949	.548
9-12	4.36	2.278	2.154	.9766	1.562	3.376	2.018	1.898	1.096
13-18	1.5	.655	.655	.4883	.781	.5212	.427	.5212	.427
19-21	3.0	1.31	1.31	.9766	1.562	1.0424	.854	1.0424	.854
22,24	0.5	.333	.333	.0104	.0416	.0026	.0208	.1667	.1667
23	1.0	.667	.667	.0208	.0832	.0052	.0416	.3333	.3334
25-28	1.4375	.685	.685	.0299	.078	.3526	.25	.5167	.25
29,30	2.875	1.37	1.37	.0598	.156	.7052	.50	1.0334	.50
31,32	.219	0.1	0.1	.0013	.0104	.00546	.01654	1.188	.5098
33	.438	0.2	0.2	.0026	.0208	.01092	.03308	2.376	1.0196
34-35	1.375	.528	.528	.0286	.1144	.28	.26	.28	.26
36-39	.6875	.264	.264	.0143	.0572	.14	.13	.14	.13
40,41	1.875	.704	.704	.039	.156	.70	.50	.70	.50
42-53	.9375	.352	.352	.0195	.078	.35	.25	.35	.25

A_x = AREA ⊥ x AXIS ; A_y = y DIRECTION SHEAR AREA ; A_z = z DIRECTION SHEAR AREA
I_x = TORSION CONSTANT IN $\theta = \frac{T}{I_x G}$; K = TORSIONAL SHEAR CONSTANT IN $\gamma = \frac{T}{K}$
S_{yy}, S_{zz} ARE MINIMUM BENDING SECTION MODULI.

TABLE 1

The mass matrix (in lb. sec.^{2}/in. units) is shown in Figure 4.

B. Flexibility Matrix

The flexibility matrix elements were determined by applying, in turn, a unit load in the Z direction at each mass m_1 thru m_6 and by taking advantage of structural symmetry. Static coupling in the X and Y directions was found to be small, and in many instances, was due to the "softening" of the model which resulted from removing all bin stiffnesses (except members 31, 32, and 33). The flexibility matrix (in in./lb. units) is shown in Figure 5.

C. Normal Modes

Standard numerical techniques were used to find the eigenvalues and eigenvectors of the matrix equation:

$$[F][M][\beta] = \frac{1}{\omega^2}[\beta]$$

The eigenvectors were normalized according to the orthogonality relation:

$$[\Phi][M][\Phi] = [I]$$

where $[\Phi]$ is the modal matrix. The modal matrix and the system natural frequencies are shown in Figure 6. It should be noted that the two lowest horizontal natural frequencies are quite close to the building vertical natural frequency (18.53 Hz.); this is not considered to be a problem since horizontal-vertical coupling is quite small and, as will be seen stresses due to the horizontal acceleration spectrum are low.

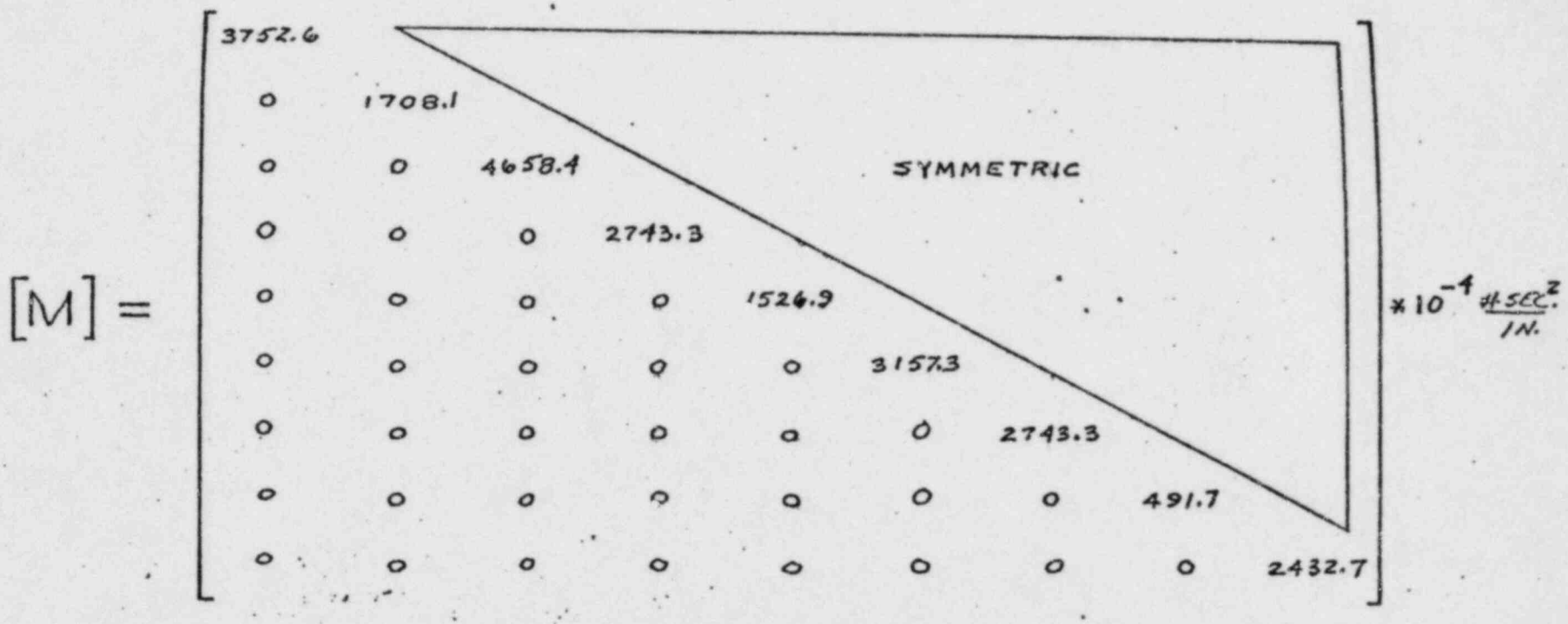

[M] =
3752.6
0 1708.1
0 0 4658.4
0 0 0 2743.3
0 0 0 0 1524.9
0 0 0 0 0 3157.3
0 0 0 0 0 0 2743.3
0 0 0 0 0 0 0 491.7
0 0 0 0 0 0 0 0 2432.7
SYMMETRIC
× 10^-4 #SEC^2/IN.

FIGURE 4

$$[F] = \begin{bmatrix}
.2141 & & & & & & & \\
.2411 & .3826 & & & & & & \\
.2191 & .3765 & .5572 & & & & & \\
.0837 & .1243 & .1736 & .4749 & & & & \\
.1243 & .1978 & .2964 & .5560 & .8854 & & & \\
.1718 & .2929 & .4670 & .5469 & .9353 & 1.4066 & & \\
.0837 & .1243 & .1736 & -.0467 & -.0738 & -.1101 & .4719 & \\
.1243 & .1978 & .2964 & -.0738 & -.1203 & -.1844 & .5560 & .8854 \\
.1718 & .2929 & .4670 & -.1088 & -.1822 & -.2860 & .5469 & .9353 & 1.4006
\end{bmatrix} \times 10^{-4} \frac{\text{IN.}}{\#}$$

SYMMETRIC

FIGURE 5

$$[\Phi] = \begin{bmatrix}
.2797 & .2431 & -.5877 & -.6018 & .7443 & -.8249 & -.0698 & -.7612 & .0369 \\
.4510 & .3888 & -.8097 & -.5369 & .5705 & -.1511 & .1261 & 2.0432 & -.1310 \\
.6460 & .5430 & -.6366 & .0366 & -.2395 & .9135 & .0748 & -.3542 & .0706 \\
.5876 & -.2090 & .8342 & -1.1763 & -.0346 & .4233 & -.9975 & .0335 & -.0082 \\
.3338 & -.3265 & .8553 & -.6686 & -.0883 & -.0746 & 2.0909 & -.0885 & .0316 \\
1.2734 & -.4297 & .1093 & .9296 & -.0699 & -.5583 & -.4000 & .0864 & -.0431 \\
.0305 & .6851 & .7801 & .5511 & 1.3098 & .4576 & .0285 & -.0539 & -.5779 \\
.0493 & 1.0760 & .8586 & .4391 & .6514 & -.1145 & -.0912 & .3250 & 4.2066 \\
.0711 & 1.4932 & .4982 & -.0555 & -.9407 & -.7734 & -.0790 & .0702 & -.3612
\end{bmatrix}$$

$f_{n_1} = 18.31$ Hz.

$f_{n_2} = 20.87$ Hz.

$f_{n_3} = 49.60$ Hz.

$f_{n_4} = 59.55$ Hz.

$f_{n_5} = 63.11$ Hz.

$f_{n_6} = 93.79$ Hz.

$f_{n_7} = 139.65$ Hz.

$f_{n_8} = 183.82$ Hz.

$f_{n_9} = 220.40$ Hz.

FIGURE 6

D. Damping

Damping due to bin bolting was assumed negligible. In accordance with the specification (1), 1% damping (corresponding to welded construction at low stress levels) was used in selecting appropriate acceleration spectra.

E. Structure Loads

Although only the first two modes are required by the specification to be considered in the force analysis (since their modal frequencies are below 35 Hz.), some initial consideration was also given to the third mode to ascertain the order of its effect.

For the first three modes, modal masses, modal participation factors and base shears were calculated from the equations

$$M_j = \frac{\left(\sum_{i=1}^{9} m_i \varphi_i^{(j)}\right)^2}{\sum_{i=1}^{9} m_i \left(\varphi_i^{(j)}\right)^2} = \left(\sum_{i=1}^{9} m_i \varphi_i^{(j)}\right)^2$$

$$P_j = \frac{\sum_{i=1}^{9} m_i \varphi_i^{(j)}}{\sum_{i=1}^{9} m_i \left(\varphi_i^{(j)}\right)^2} = \sum_{i=1}^{9} m_i \varphi_i^{(j)}$$

$$\left(\sum_{i=1}^{9} m_i \left(\varphi_i^{(j)}\right)^2 = 1 \quad \text{by orthogonality}\right)$$

$$V_j = M_j * g * \ddot{z}_j$$

where

M_j = effective mass in j^{th} mode

P_j = participation factor of j^{th} mode

V_j = base shear in j^{th} mode

$\varphi_i^{(j)}$ = normalized displacement of mass i in j^{th} mode

$\ddot{Z}_j$ = spectral acceleration in g units for the j^{th} mode (obtained from the specification)

Results of these calculations are listed in Table 2.

Effective forces at the mass lumping locations were calculated from the equation

$$F_{ij} = \frac{m_i \varphi_i^{(j)}}{P_j} * V_j$$

where F_{ij} = effective force in the j^{th} mode at mass i. The results are listed in Table 3. It is clear that the third mode contribution is negligible, and, therefore, it was ignored in the subsequent stress analysis.

III. RESULTS

Effective forces were used as inputs for a library structural analysis program to determine forces and moments in each structural member under each modal loading condition. Since the effective forces were so low, the analysis was made only for the Maximum Possible Earthquake Condition (o.15 g); it was assumed that the stresses produced by this loading condition would clearly demonstrate the adequacy of the design.

MODE	NATURAL FREQ (Hz.)	MODAL MASS	PARTICIPATION FACTOR	SPECTRAL ACCELERATION (G)		BASE SHEAR (#)	
				.08G SHOCK	.15G SHOCK	.08G SHOCK	.15G SHOCK
1	18.31	1.4808	1.2169	.70	1.00	400.5	572.2
2	20.87	.5957	.7718	.62	.94	142.7	216.4
3	49.60	.0131	.1144	.252	.409	1.269	2.069

TABLE 2

MASS NUMBER	EFFECTIVE FORCE (#)					
	.08 G SHOCK			.15 G SHOCK		
	1ST MODE	2ND MODE	3RD MODE	1ST MODE	2ND MODE	3RD MODE
1	34.5	16.9	-2.4	49.3	25.6	-4.0
2	25.4	12.3	-1.5	36.2	18.6	-2.5
3	99.0	46.8	-3.3	141.5	70.9	-5.4
4	53.1	-10.6	2.5	75.8	-16.1	4.1
5	46.9	-9.2	1.4	67.0	-14.0	2.4
6	132.3	-25.1	0.4	189.0	-38.0	0.6
7	2.8	34.8	2.4	3.9	52.7	3.9
8	0.8	9.8	0.5	1.1	14.8	0.8
9	5.7	67.2	1.3	8.1	101.8	2.2

TABLE 3

Stresses were calculated only for those members of each section type where forces and moments indicated relatively high values for that type. Stresses were calculated by combining results of the first two modal loadings on a root mean square basis. Axial, bending (about y and z local coordinate axes), and torsional stresses were calculated; beam-type shear stresses were neglected as small. Results for the most severely loaded points in the structure are summarized in Table 4.

IV. CONCLUSIONS

The analysis clearly demonstrates that, under realistic but most conservative model assumptions, the equipment is well within specification requirements.

MEMBER	JOINT	AXIAL STRESS (PSI)	TORSIONAL SHEAR STRESS (PSI)	BENDING STRESS (PSI)	
				Y AXIS BENDING	Z AXIS BENDING
1	4	252	104	3848	580
9	1	139	101	1937	530
13	3	364	108	2988	637
14	15	308	109	3662	77
22	10	132	48	86	5441
26	15	76	141	14	8988
31	25	246	19	109	4443
36	24	228	49	6500	23
51	22	47	17	224	3252
WORST LOADED ½" ANCHOR BOLT		4226	N.A.	N.A.	N.A.

NOTE: ABOVE STRESSES ARE FOR MAXIMUM POSSIBLE EARTHQUAKE CONDITION (0.15G).

TABLE 4

BIBLIOGRAPHY

1. The Toledo-Edison Company and the Cleveland Electric Illuminating Company Davis-Besse Nuclear Power Station Unit No 1 Construction Specification for Earthquake Resistance Design of Class I Equipment, Specification No.7749-C-41, Revision 4, February 4, 1972.

2. W. C. Hurty and M. F. Rubinstein, Dynamics of Structures, Prentice-Hall, Inc. 1964.

3. G. J. O'Hara and P. F. Cuniff, "Elements of Normal Mode Theory," Naval Research Lab Report 6002, November 15, 1963.

4. S. Timoshenko, Strength of Materials, Parts I and II, 3rd edition, D. Van Nostrand Co., 1956.

7749-E-30Q-27-1

ENGINEERING REPORT NO. 803

ENVIRONMENTAL TESTS OF MODULES

FOR

SAFETY FEATURES ACTUATION SYSTEM

CCC P/N 9N16

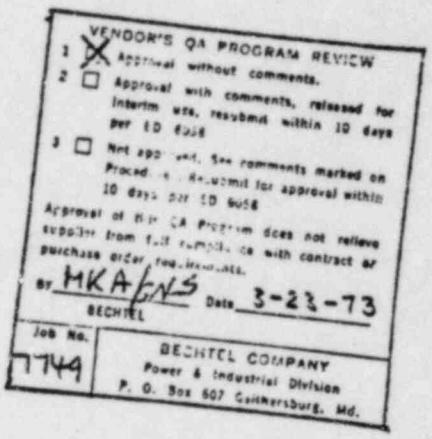
EQUIPMENT MANUFACTURED FOR:

DAVIS-BESSE NUCLEAR POWER STATION

UNIT NUMBER 1

OAK HARBOR, OHIO

February 21, 1973



Prepared by:

John M. Stashinsky
Development Engr.

RECORD PRINT

CONSOLIDATED CONTROLS CORPORATION

Bethel, Connecticut

TABLE OF CONTENTS

1.0 SUBJECT

Environmental Tests per paragraphs 7.0 and 15.3 of Bechtel Specification No. 7749-E-30.

2.0 PROCEDURE

One of each typical module that had successfully passed Quality Conformance Testing was selected at random and placed in an environmental chamber (Figure 1). Each module was electronically connected to its applicable test panel (Figure 2) and the following initial conditions were noted:

2.1 6N81 Bistable #1 S/N029

Increasing trip 3.072 VDC.

2.2 6N82 Bistable #2 S/N014

Decreasing trip 2.783 VDC

2.3 6N83 Output Module S/N056

Switch	Position	L3	L4	L5	L6
Trip	Momentary	OFF	OFF	OFF	OFF
Reset	↓	ON	ON	OFF	ON
Trip		OFF	OFF	OFF	OFF
Block	Block	ON	ON	OFF	OFF
Reset	Momentary	ON	ON	OFF	ON
Block	Normal	ON	ON	OFF	ON
Trip	Momentary	OFF	OFF	OFF	OFF
Block	↓	ON	ON	ON	OFF
Reset		ON	ON	OFF	ON

2.4 6N84 Sam Logic Module S/N009

Switch	Position	L1	L2
Sam Relay	Closed	OFF	OFF
	Open	OFF	ON
Block 1	Block	ON	OFF
	Normal	OFF	ON
Block 2	Block	ON	OFF
	Normal	OFF	ON
Trip 1	LO	OFF	OFF
	HI	OFF	ON
Trip 2	LO	OFF	OFF
	HI	OFF	ON

2.5 6N85 ATI Module S/N001

A. L1 & L2 alternately flashing.

B. Clock operation indicated by sequential "ON" & "OFF" of units and tens lamps - ATI resets on count 65.

2.6 6N86 Analog Module S/N014

Meter output 1.0 ma.

2.7 6N87 Sequencer Module S/N001

A. Lamps 1 thru 5 on. Detent "Input Switch" from OFF-ON-OFF.

B. Lamps 1 thru 5 OFF.

C. Lamps 2 thru 5 illuminate & extinguish in sequence. Lamps L1 thru L5 reset (illuminate) after approximately 30 seconds.

3.0 TESTING

Testing commenced at 2:00 PM on Tuesday, 2/13/73 and terminated at 2:00 PM Tuesday, 2/20/73. The dry bulb temperature was maintained at 130°F; The wet bulb at 128°F. This differential produces a relative humidity of 94%. (Data sheets 1 thru 7). A daily function test and/or observation of each module was performed and results recorded. (Data sheets 8 thru 21).

4.0 RESULTS

No faults occurred during these tests. The 6N81 bistable trip point deviated a maximum of 7 mv. The 6N82 bistable trip point deviated a maximum of 3 mv. The analog amplifier maintained 1.0 ma output throughout the test. All other modules performed as required. Raw data taken during this test will remain on file along with this report at Consolidated Controls Corporation.

5.0 CONCLUSION

The equipment has satisfactorily passed the rigid environmental test requirements of this order.

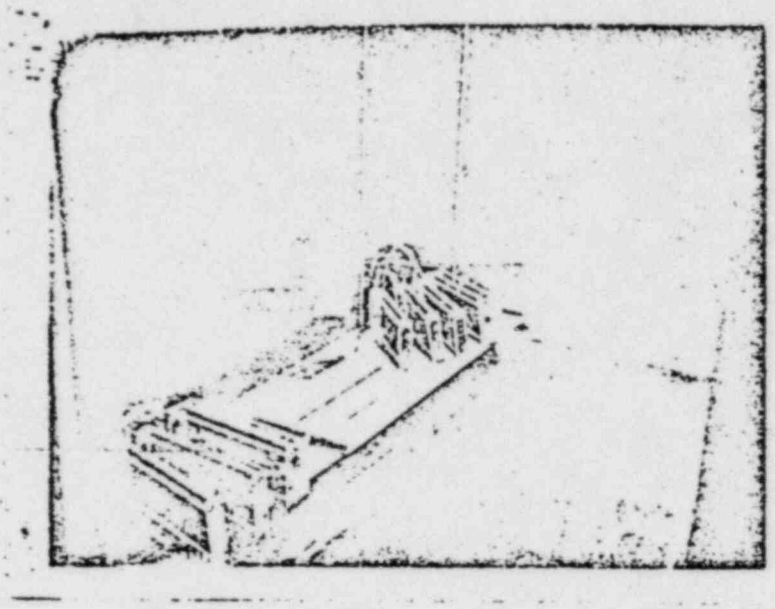


FIGURE 1

Module Installed in Environmental Chamber at CCC (Tenny Engineering)

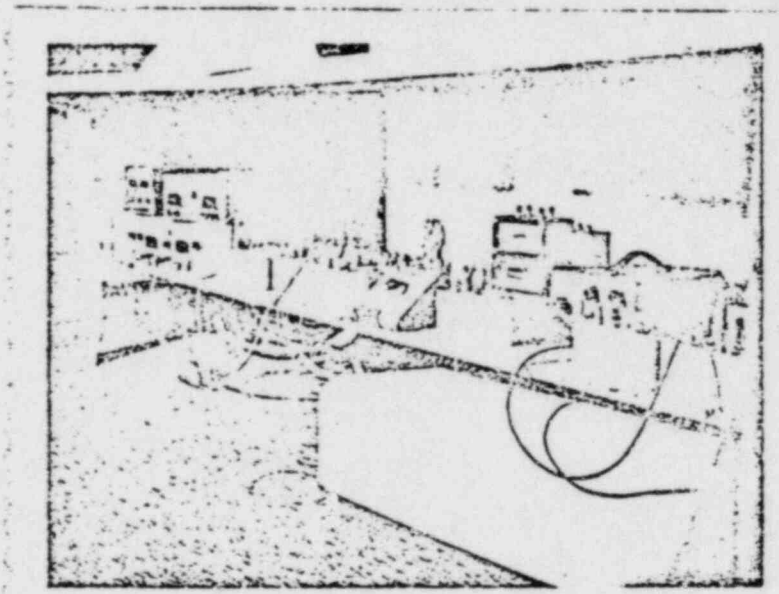
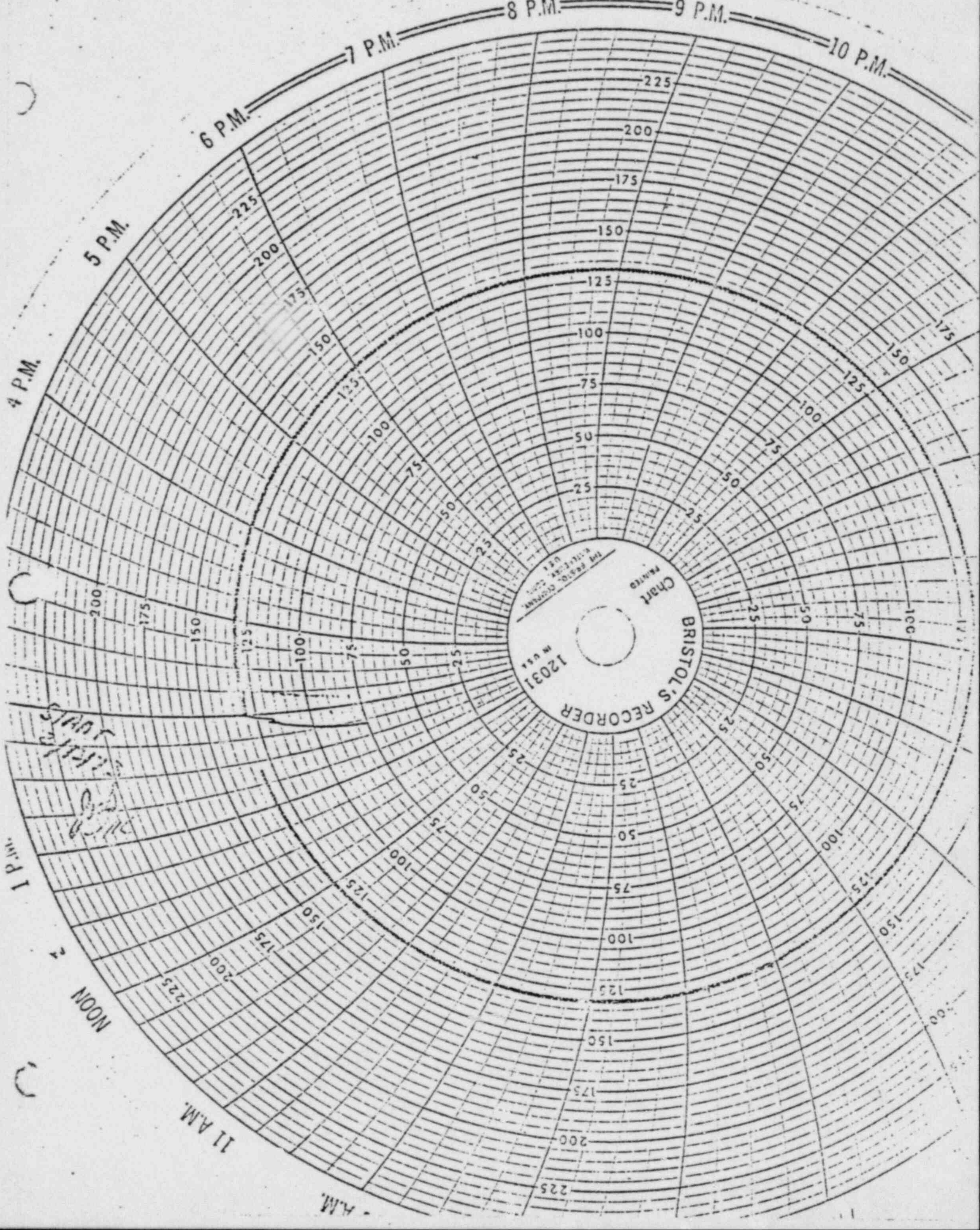


FIGURE 2

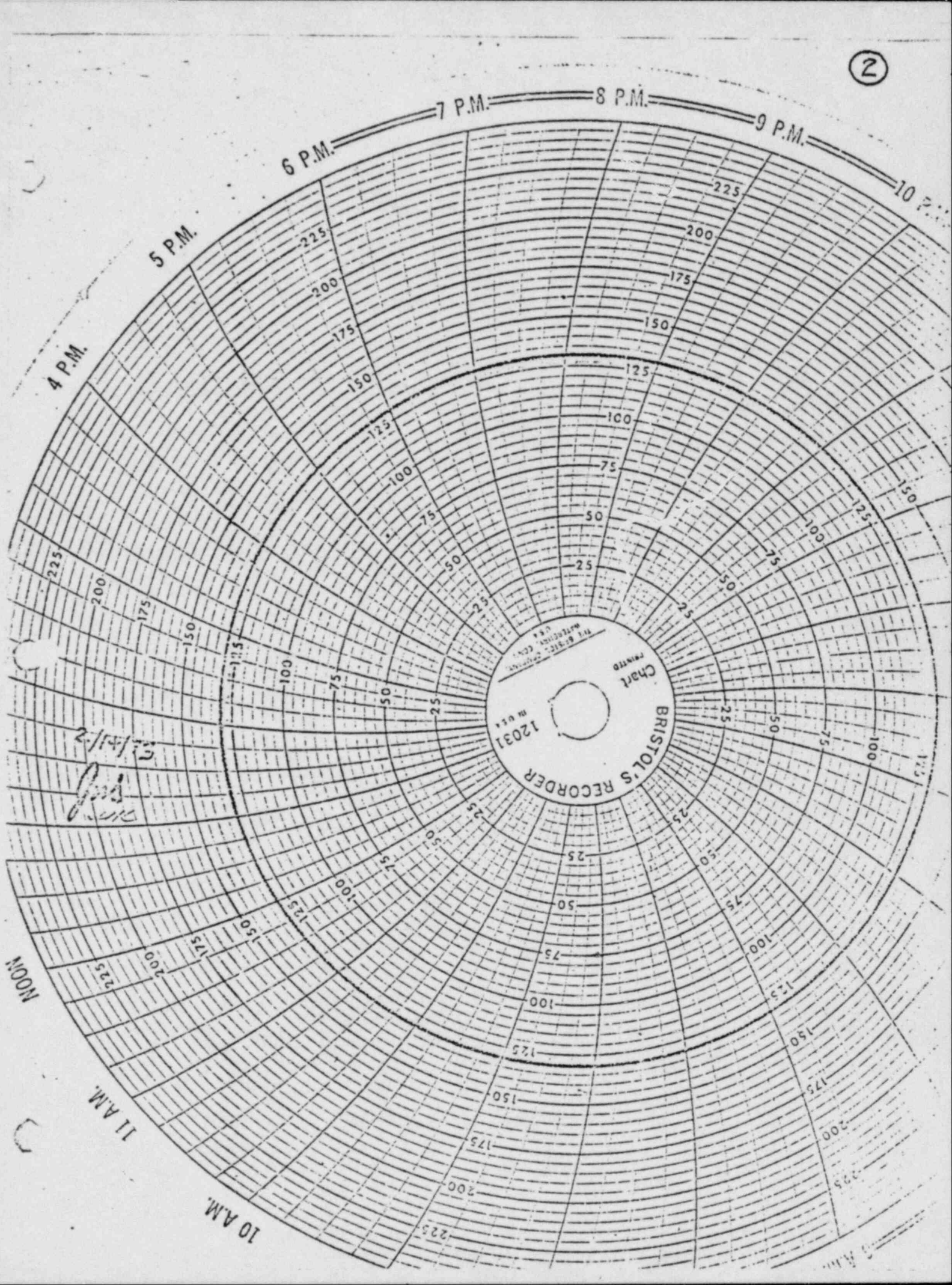
Modules Electronically Connected to Test Panels.

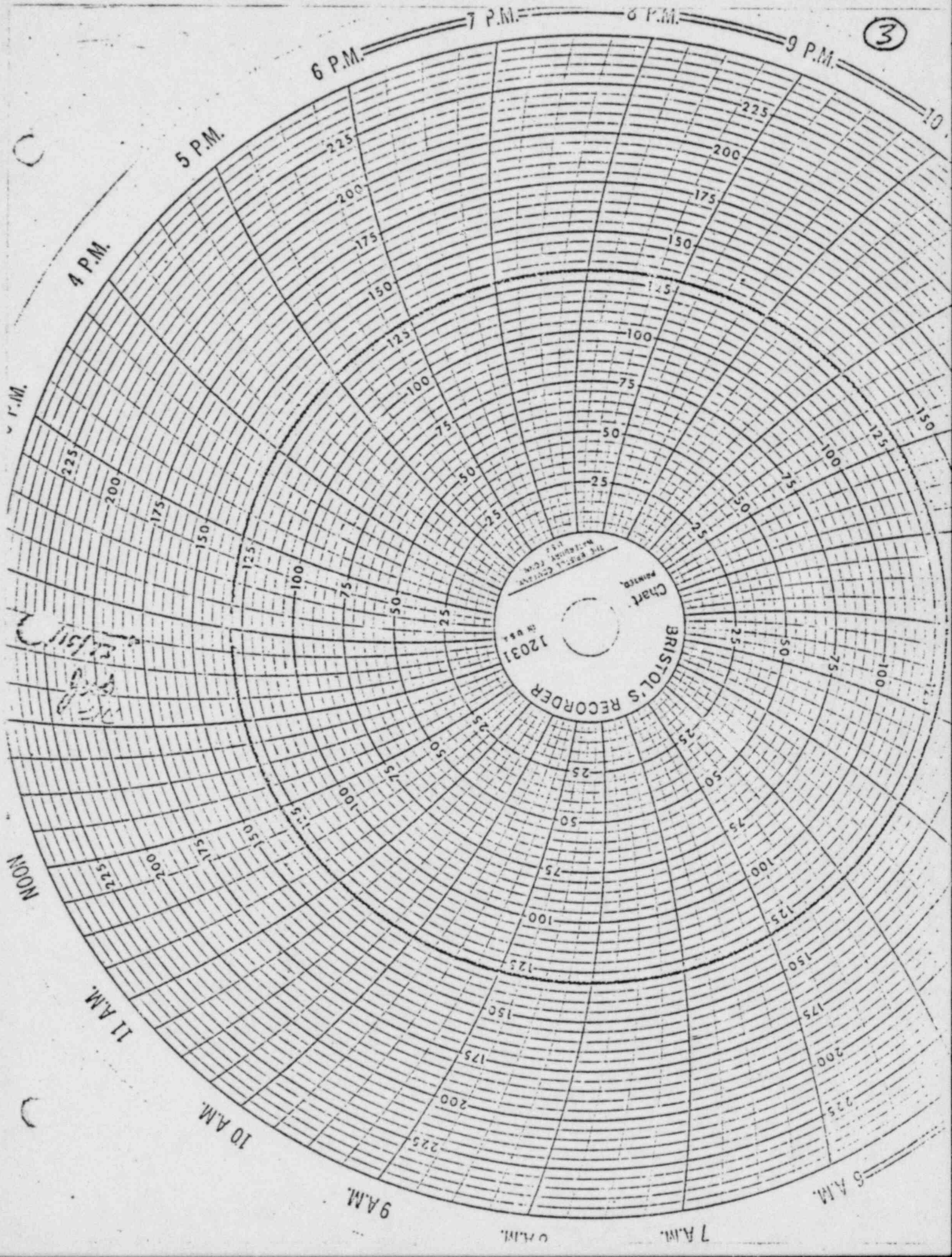
6.0 DATA SHEETS (1 THRU 21)

(1)



6 P.M.
7 P.M.
8 P.M.
9 P.M.
10 P.M.
5 P.M.
4 P.M.
1 P.M.
NOON
11 A.M.
A.M.
BRISTOL'S RECORDER
Chart
12031
IN U.S.A.
25
50
75
100
125
150
175
200
225


(2)
4 P.M.
5 P.M.
6 P.M.
7 P.M.
8 P.M.
9 P.M.
10 P.M.
NOON
11 A.M.
10 A.M.
BRISTOL'S RECORDER
Chart
12031
2/14/52


3
6 P.M.
7 P.M.
8 P.M.
9 P.M.
5 P.M.
4 P.M.
NOON
11 A.M.
10 A.M.
9 A.M.
7 A.M.
6 A.M.
5 A.M.
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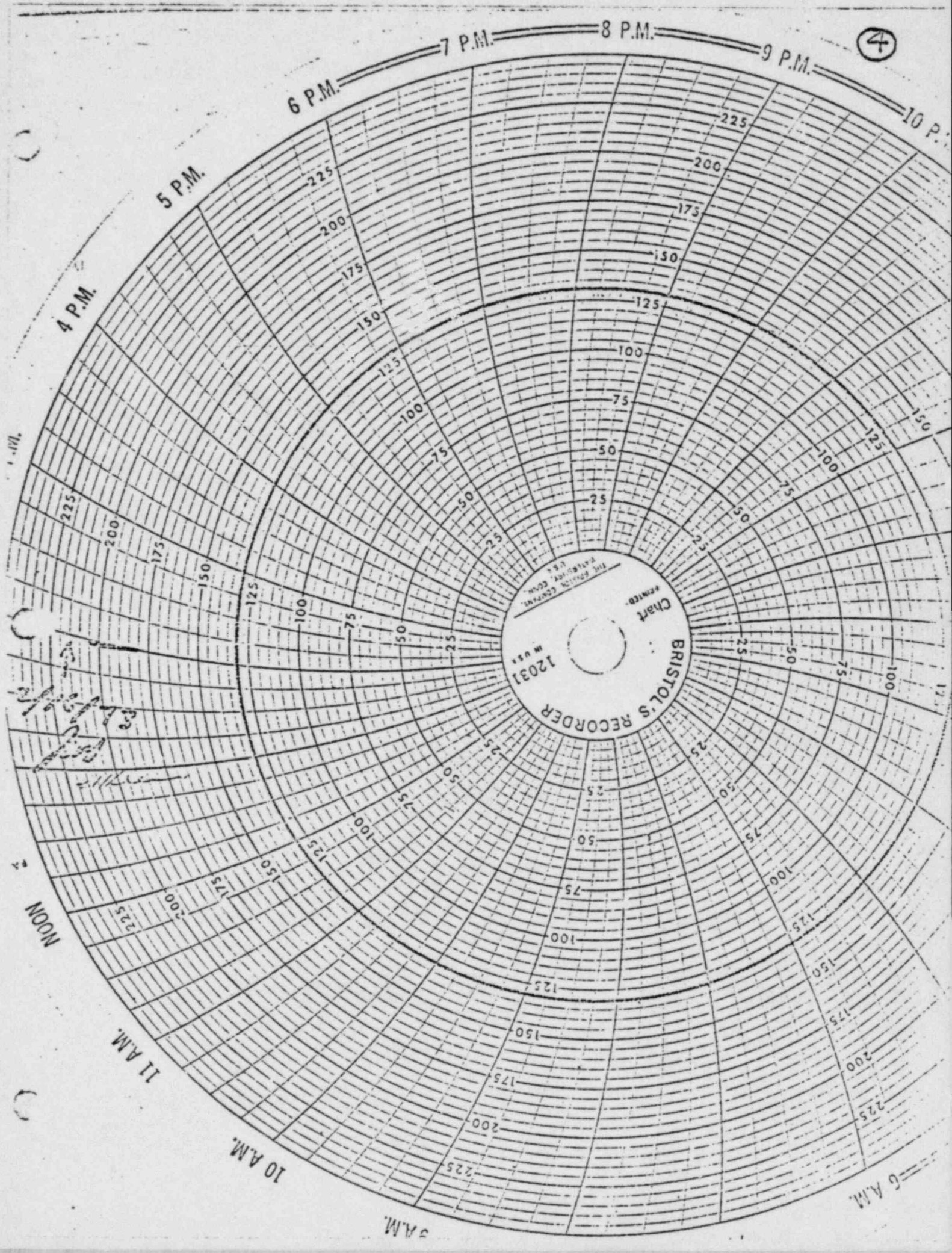
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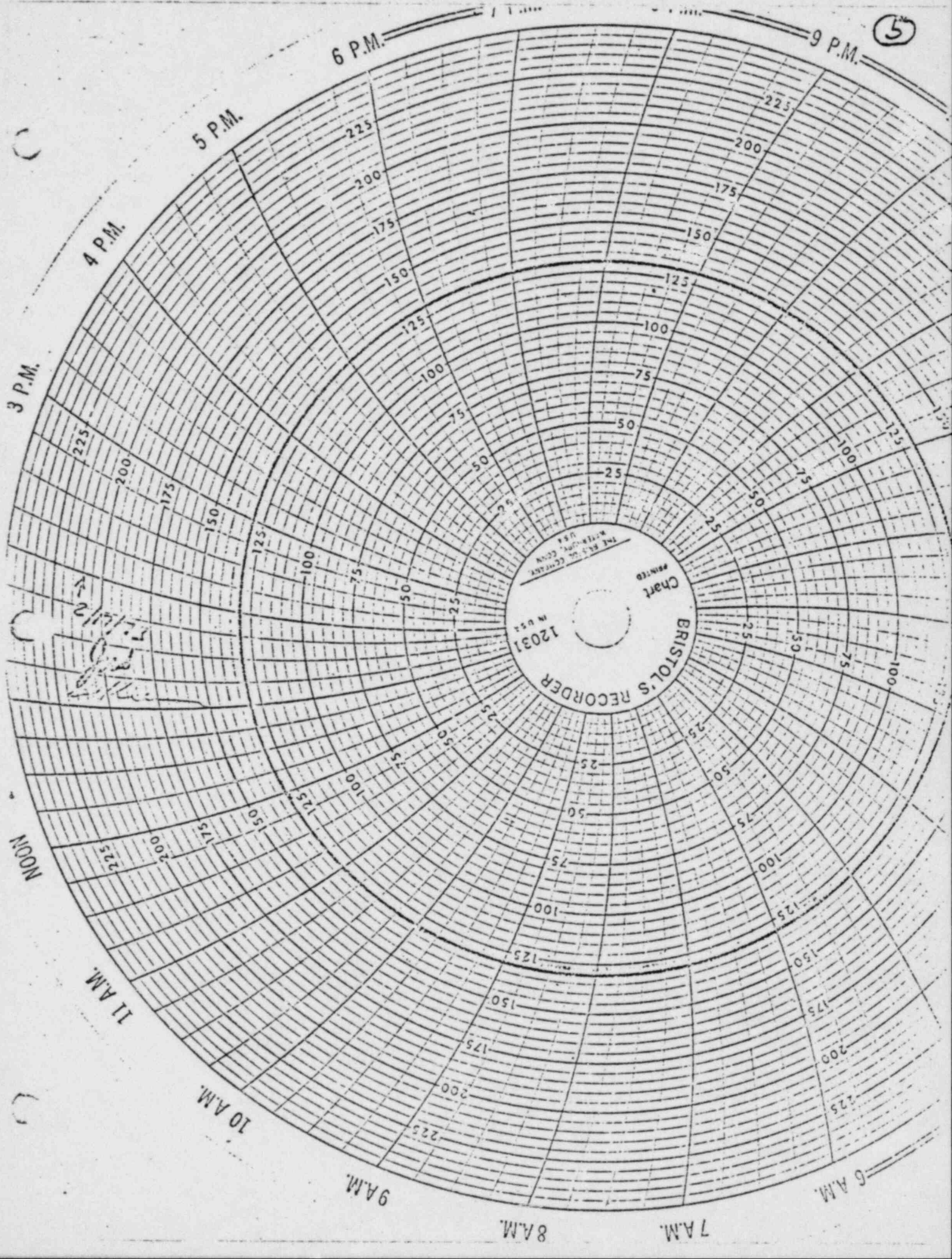
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BRISTOL'S RECORDER
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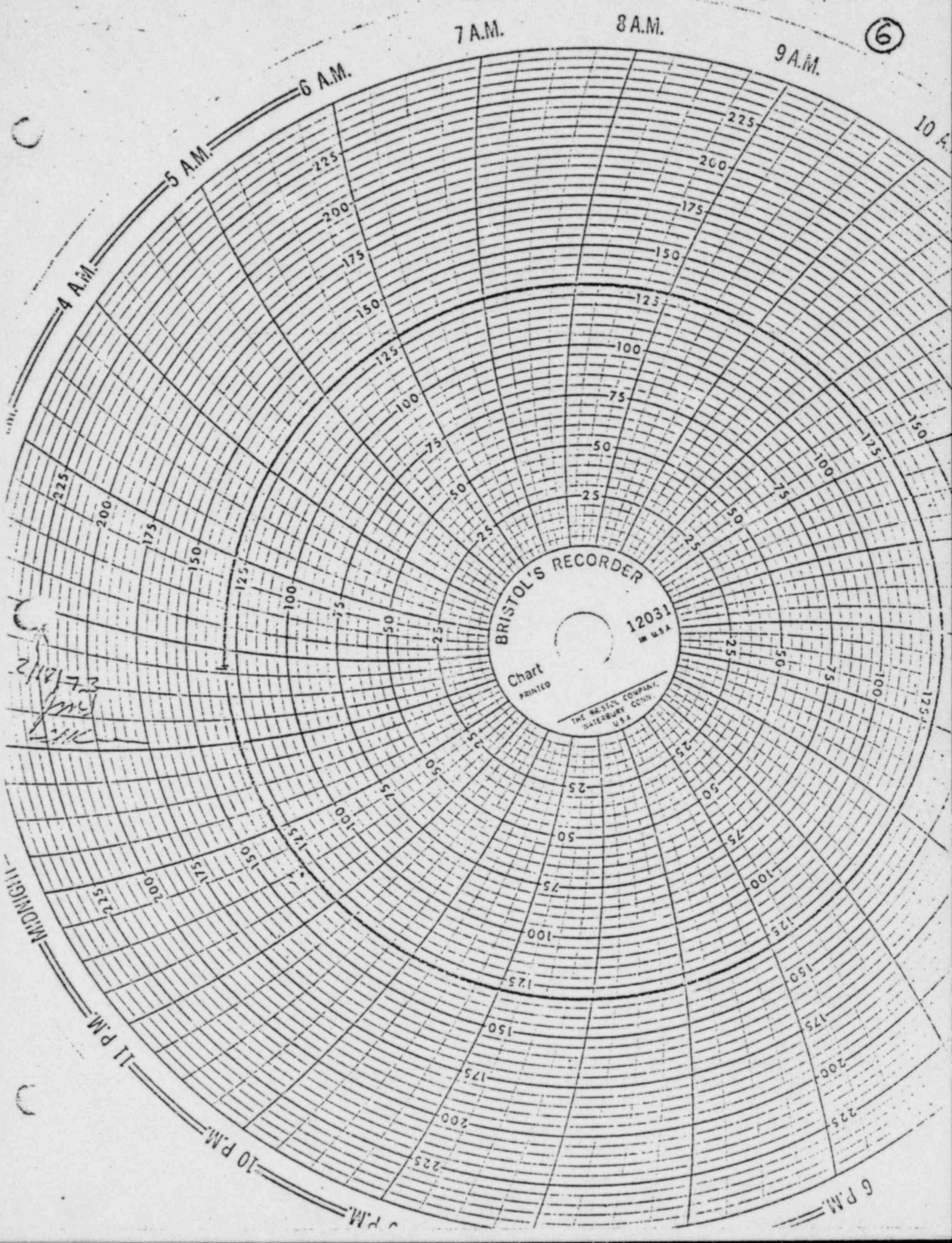
U.S.A.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11 P.M.
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6 P.M.
BRISTOL'S RECORDER
12031
Chart
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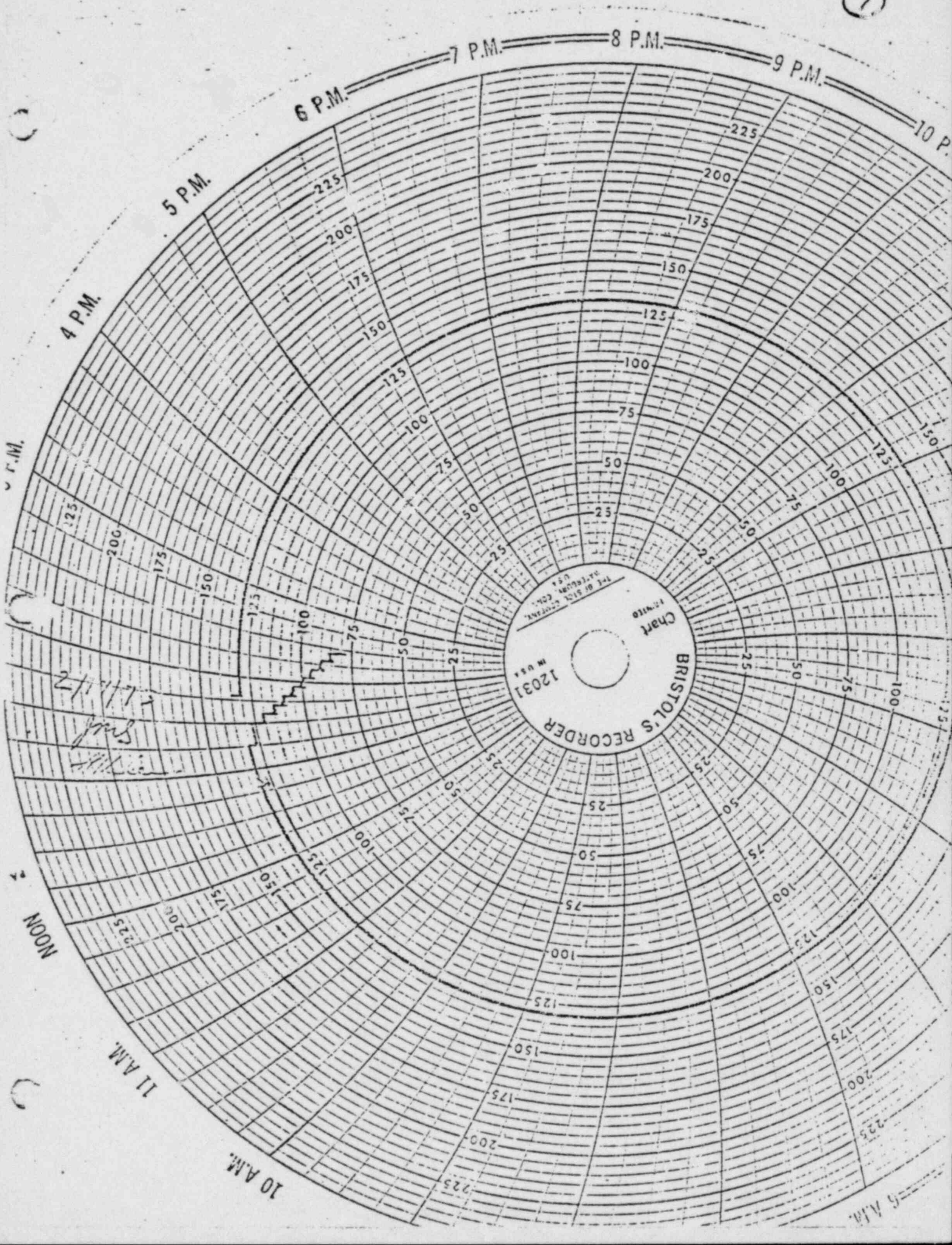
WATERBURY CONN
U.S.A.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5 P.M.
4 P.M.
NOON
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10 AM
BRISTOL'S RECORDER
Chart
12031

CONSOLIDATED CONTROLS CORP.
LABORATORY REPORT

PART NO. DAVIS BESSE NICOLLET
OBJECT OF TEST CERTIFICATION FUNCTION TEST AND/OR OBSERVATION OF MODULE PERFORMANCE DURING FUNCTIONAL TESTING

TEST NO. 1
SHEET NO. 1 OF 2
DATE 2/15/77
OBS'R [illegible]
APP'D
CCC QA-[illegible]

1. DRY BULB TEMP 130°F

2. WET BULB TEMP 128°F

3. 6NP1 BISTABLE #1 S/N 029
INCREASING TRIP 3.068 VDC

4. 6NP2 BISTABLE #2 S/N 014
DECREASING TRIP 2.784 VDC

5. 6NP3 - OUTPUT MODULE S/N 056

SWITCH	POSITION	L3	L4	L5	L6	CHECK
TRIP	MOMENTARY	OFF	OFF	OFF	OFF	✓
RESET	"	ON	ON	OFF	ON	✓
TRIP	"	OFF	OFF	OFF	OFF	✓
BLOCK	BLOCK	ON	ON	OFF	OFF	✓
RESET	MOMENTARY	ON	ON	OFF	ON	✓
BLOCK	NORMAL	ON	ON	OFF	ON	✓
TRIP	MOMENTARY	OFF	OFF	OFF	OFF	✓
BLOCK	"	ON	ON	ON	OFF	✓
RESET	"	ON	ON	OFF	ON	✓

6. 6NP4 SAM LOGIC MODULE S/N 009

SWITCH	POSITION	L1	L2	CHECK (✓)
SAM RELAY	CLOSED	OFF	OFF	✓
	OPEN	OFF	ON	✓
BLOCK 1	BLOCK	ON	OFF	✓
	NORMAL	OFF	ON	✓
BLOCK 2	BLOCK	ON	OFF	✓
	NORMAL	OFF	ON	✓
TRIP 1	LO	OFF	OFF	✓
	HI	OFF	ON	✓
TRIP 2	LO	OFF	OFF	✓
	HI	OFF	ON	✓

SP 1052B

CONSOLIDATED CONTROLS CORP.

(9)

LABORATORY REPORT

PART NO. DAMS BASIC MODULE(S)
OBJECT OF TEST SEE SHT 2

TEST NO.
SHEET NO. 2 of 2
DATE
OBS'R
APP'D

7. 6N85 ATI MODULE S/N001

	CHECK (✓)
A. L1 & L2 ALTERNATELY FLASHING	✓
B. CLOCK OPERATION INDICATED BY SEQUENTIAL "ON" & "OFF" OF UNITS & TENS LAMPS – ATI RESETS ON COUNT 65	✓

8. 6N86 ANALOG MODULE S/N 064
METER OUTPUT — 1.0 MA

9. 6NP7 SEQUENCER S/N001

	CHECK (✓)
A. LAMPS 1 THRU 5 ON DETENT INPUT SW FROM OFF-ON-OFF – OBSERVE THE FOLLOWING CONDITIONS:	✓
B. LAMPS 1 THRU 5 OFF	✓
C. LAMPS 2 THRU 5 ILLUMINATE & EXTINGUISH IN SEQUENCE LAMPS L1 THRU L5 RESET (ILLUMINATE) AFTER APPROX. 30 SECONDS	✓

CONSOLIDATED CONTROLS CORP.
LABORATORY REPORT

(10)

PART NO. DAVIS DIGITAL MODULES
OBJECT OF TEST PERIODIC FUNCTIONAL TEST AND/OR OBSERVATION OF MODULE PERFORMANCE DURING FUNCTIONAL TESTING

TEST NO. 2
SHEET NO. 1 & 2
DATE 2/15/72
OBS'R [illegible]
APP'D
CCCC #1K

1. DRY BULB TEMP 130°F

2. WET BULB TEMP 128°F

3. 6N81 BISTABLE #1 S/N 029
INCREASING TRIP 3.075 VDC

4. 6N82 BISTABLE #2 S/N 014
DECREASING TRIP 2.783 VDC

5. 6N83 OUTPUT MODULE S/N 056

SWITCH	POSITION	L3	L4	L5	L6	CHECK (✓)
TRIP	MOMENTARY	OFF	OFF	OFF	OFF	✓
RESET	"	ON	ON	OFF	ON	✓
TRIP	"	OFF	OFF	OFF	OFF	✓
BLOCK	BLOCK	ON	ON	OFF	OFF	✓
RESET	MOMENTARY	ON	ON	OFF	ON	✓
BLOCK	NORMAL	ON	ON	OFF	ON	✓
TRIP	MOMENTARY	OFF	OFF	OFF	OFF	✓
BLOCK	"	ON	ON	ON	OFF	✓
RESET	"	ON	ON	OFF	ON	✓

6. 6N84 SAM LOGIC MODULE S/N 009

SWITCH	POSITION	L1	L2	CHECK (✓)
SAM RELAY	CLOSED	OFF	OFF	✓
	OPEN	OFF	ON	✓
BLOCK 1	BLOCK	ON	OFF	✓
	NORMAL	OFF	ON	✓
BLOCK 2	BLOCK	ON	OFF	✓
	NORMAL	OFF	ON	✓
TRIP 1	LO	OFF	OFF	✓
	HI	OFF	ON	✓
TRIP 2	LO	OFF	OFF	✓
	HI	OFF	ON	✓

SP 18927A

CONSOLIDATED CONTROLS CORP.
LABORATORY REPORT

(11)

PART NO. DAMS BEDE (MODULE)
OBJECT OF TEST SEE SHT 1

TEST NO.
SHEET NO. 20-2
DATE
OBS'R
APP'D

7- 6N85 ATI MODULE S/N001

		CHECK (✓)
A.	L1 & L2 ALTERNATELY FLASHING	✓
B.	CLOCK OPERATION INDICATED BY SEQUENTIAL "ON" & "OFF" OF UNITS & TENS LAMPS - ATI RESETS ON COUNT 65	✓

8. EN86 ANALOG MODULE S/N014
METER OUTPUT 1.0 MA

9. 6N87 SEQUENCER S/N001

		CHECK (✓)
A.	LAMPS 1 THRU 5 ON DETENT INPUT SW FROM OFF-ON-OFF - OBSERVE THE FOLLOWING CONDITIONS:	✓
B.	LAMPS 1 THRU 5 OFF	✓
C.	LAMPS 2 THRU 5 ILLUMINATE & EXTINGUISH IN SEQUENCE LAMPS L1 THRU L5 RESET (ILLUMINATE) AFTER APPROX. 30 SECONDS	✓

CONSOLIDATED CONTROLS CORP.
LABORATORY REPORT

(12)

TEST NO. 3
SHEET NO. 1 of 3
DATE 2/16/73
OBS'R
APP'D

PART NO. DAVIS REED MODULES
OBJECT OF TEST PERIODIC FUNCTION TEST AND/OR OBSERVATION OF MODULE PERFORMANCE DURING ENVIRONMENTAL TESTING

1. DRY BULB TEMP 130°F

2. WET BULB TEMP 128°F

3. 6N81 BISTABLE #1 S/N 029
INCREASING TRIP 3.068 VDC

4. 6N82 BISTABLE #2 S/N 014
DECREASING TRIP 2.782 VDC

5. 6N83 OUTPUT MODULE S/N 056

SWITCH	POSITION	L3	L4	L5	L6	CHECK (✓)
TRIP	MOMENTARY	OFF	OFF	OFF	OFF	✓
RESET	"	ON	ON	OFF	ON	✓
TRIP	"	OFF	OFF	OFF	OFF	✓
BLOCK	BLOCK	ON	ON	OFF	OFF	✓
RESET	MOMENTARY	ON	ON	OFF	ON	✓
BLOCK	NORMAL	ON	ON	OFF	ON	✓
TRIP	MOMENTARY	OFF	OFF	OFF	OFF	✓
BLOCK	"	ON	ON	ON	OFF	✓
RESET	"	ON	ON	OFF	ON	✓

6. 6N84 SAM LOGIC MODULE S/N 009

SWITCH	POSITION	L1	L2	CHECK (✓)
SAM RELAY	CLOSED	OFF	OFF	✓
	OPEN	OFF	ON	✓
BLOCK 1	BLOCK	ON	OFF	✓
	NORMAL	OFF	ON	✓
BLOCK 2	BLOCK	ON	OFF	✓
	NORMAL	OFF	ON	✓
TRIP 1	LO	OFF	OFF	✓
	HI	OFF	ON	✓
TRIP 2	LO	OFF	OFF	✓
	HI	OFF	ON	✓

CONSOLIDATED CONTROLS CORP.
LABORATORY REPORT

(13)

PART NO. DAVIS BASIC MODULE
OBJECT OF TEST SEE SHT 1

TEST NO.
SHEET NO. 2 - 2
DATE
OBS'R
APP'D

7. 6N8S ATI MODULE S/N 001

CHECK (✓)

A. L1 & L2 ALTERNATELY FLASHING ✓
B. CLOCK OPERATION INDICATED BY SEQUENTIAL "ON" & "OFF" OF UNITS & TENS LAMPS - ATI RESETS ON COUNT 65 ✓

8. 6N8C ANALOG MODULE S/N 004
METER OUTPUT 1.0 MA

9. 6N8T SEQUENCER S/N 001

CHECK (✓)

A. LAMPS 1 THRU 5 ON DETENT INPUT SW FROM OFF-ON-OFF - OBSERVE THE FOLLOWING CONDITIONS: ✓
B. LAMPS 1 THRU 5 OFF ✓
C. LAMPS 2 THRU 5 ILLUMINATE & EXTINGUISH IN SEQUENCE LAMPS L1 THRU L5 RESET (ILLUMINATE) AFTER APPROX. 30 SECONDS ✓

SF 1G3278

CONSOLIDATED CONTROLS CORP.

(14)

LABORATORY REPORT

PART NO. DAVIS BASE MODULES
OBJECT OF TEST PERIODIC FUNCTION TEST AND/OR CALIBRATION OF MODULE PERFORMANCE DURING FUNCTIONAL TESTING

TEST NO. 4
SHEET NO. 1 of 2
DATE 2/17/73
OBS'R [illegible]
APP'D
CCC QC [illegible]

1. DRY BULB TEMP 130°F

2. WET BULB TEMP 128°F

3. 6NP1 BISTABLE #1 S/N 029
INCREASING TRIP 3.070 VDC

4. 6NP2 BISTABLE #2 S/N 014
DECREASING TRIP 2.785 VDC

5. 6NP3 . OUTPUT MODULE S/N 056

SWITCH	POSITION	L3	L4	L5	L6	CHECK(√)
TRIP	MOMENTARY	OFF	OFF	OFF	OFF	✓
RESET	"	ON	ON	OFF	ON	✓
TRIP	"	OFF	OFF	OFF	OFF	✓
BLOCK	BLOCK	ON	ON	OFF	OFF	✓
RESET	MOMENTARY	ON	ON	OFF	ON	✓
BLOCK	NORMAL	ON	ON	OFF	ON	✓
TRIP	MOMENTARY	OFF	OFF	OFF	OFF	✓
BLOCK	"	ON	ON	ON	OFF	✓
RESET	"	ON	ON	OFF	ON	✓

6. 6NP4 SAM LOGIC MODULE S/N 009

SWITCH		POSITION	L1	L2	CHECK (√)
SAM RELAY		CLOSED	OFF	OFF	✓
		OPEN	OFF	ON	✓
BLOCK	1	BLOCK	ON	OFF	✓
		NORMAL	OFF	ON	✓
BLOCK	2	BLOCK	ON	OFF	✓
		NORMAL	OFF	ON	✓
TRIP	1	LO	OFF	OFF	✓
		HI	OFF	ON	✓
TRIP	2	LO	OFF	OFF	✓
		HI	OFF	ON	✓

SP 1092A

CONSOLIDATED CONTROLS CORP.
LABORATORY REPORT

(15)

PART NO. DAVIS BESSE (MODULE)
OBJECT OF TEST SEE SHT. 1

TEST NO.
SHEET NO. 2 of 2
DATE
OBS'R
APP'D

7. 6N85 ATI MODULE S/N 001 — CHECK (✓)

A. L1 & L2 ALTERNATELY FLASHING — ✓
B. CLOCK OPERATION INDICATED BY SEQUENTIAL "ON" & "OFF" OF UNITS & TENS LAMPS - ATI RESETS ON COUNT 65 — ✓

8. 6N86 ANALOG MODULE S/N 004 — 1.0 MA
METER OUTPUT

9. 6N87 SEQUENCER S/N 001 — CHECK (✓)

A. LAMPS 1 THRU 5 ON DETENT INPUT SW FROM OFF-ON-OFF - OBSERVE THE FOLLOWING CONDITIONS: — ✓
B. LAMPS 1 THRU 5 OFF — ✓
C. LAMPS 2 THRU 5 ILLUMINATE & EXTINGUISH IN SEQUENCE LAMPS L1 THRU L5 RESET (ILLUMINATE) AFTER APPROX. 30 SECONDS — ✓

CONSOLIDATED CONTROLS CORP.

LABORATORY REPORT

(16)

TEST NO. 5
SHEET NO. 1 of 2
DATE 2-18-73
OBS'R [illegible]
APP'D [illegible]

PART NO. DAVIS BESSE MODULES
OBJECT OF TEST DESIGN QUALIFICATION TEST UNDER CLASSIFICATION OF MODULE PERFORMANCE DURING ENVIRONMENTAL TESTING

1. DRY BULB TEMP 130°F

2. WET BULB TEMP 128°F

3. 6N81 BISTABLE #1 S/N 029
INCREASING TRIP 3.06P VDC

4. 6N82 BISTABLE #2 S/N 014
DECREASING TRIP 2.783 VDC

5. 6N83 OUTPUT MODULE S/N 056

SWITCH	POSITION	L3	L4	L5	L6	CHECK
TRIP	MOMENTARY	OFF	OFF	OFF	OFF	✓
RESET	"	ON	ON	OFF	ON	✓
TRIP	"	OFF	OFF	OFF	OFF	✓
BLOCK	BLOCK	ON	ON	OFF	OFF	✓
RESET	MOMENTARY	ON	ON	OFF	ON	✓
BLOCK	NORMAL	ON	ON	OFF	ON	✓
TRIP	MOMENTARY	OFF	OFF	OFF	OFF	✓
BLOCK	"	ON	ON	ON	OFF	✓
RESET	"	ON	ON	OFF	ON	✓

6. 6N84 SAM LOGIC MODULE S/N 009

SWITCH	POSITION	L1	L2	CHECK (✓)
SAM RELAY	CLOSED	OFF	OFF	✓
	OPEN	OFF	ON	✓
BLOCK 1	BLOCK	ON	OFF	✓
	NORMAL	OFF	ON	✓
BLOCK 2	BLOCK	ON	OFF	✓
	NORMAL	OFF	ON	✓
TRIP 1	Lo	OFF	OFF	✓
	Hi	OFF	ON	✓
TRIP 2	Lo	OFF	OFF	✓
	Hi	OFF	ON	✓

SP 165274

CONSOLIDATED CONTROLS CORP.
LABORATORY REPORT

(17)

PART NO. DAVIS BESSE (MODULE)
OBJECT OF TEST SEE SHT 2

TEST NO.
SHEET NO. 2 - 2
DATE
OBS'R
APP'D

7. 6N85 ATI MODULE S/N 001

CHECK (✓)

A. L1 & L2 ALTERNATELY FLASHING ✓
B. CLOCK OPERATION INDICATED BY SEQUENTIAL "ON" & "OFF" OF UNITS & TENS LAMPS - ATI RESETS ON COUNT 65 ✓

8. 6N86 ANALOG MODULE S/N 001

METER OUTPUT 1.0 MA

9. 6NPT SEQUENCER S/N 001

CHECK (✓)

A. LAMPS 1 THRU 5 ON DETENT INPUT SW FROM OFF-ON-OFF - OBSERVE THE FOLLOWING CONDITIONS: ✓
B. LAMPS 1 THRU 5 OFF ✓
C. LAMPS 2 THRU 5 ILLUMINATE & EXTINGUISH IN SEQUENCE LAMPS L1 THRU L5 RESET (ILLUMINATE) AFTER APPROX. 30 SECONDS ✓

SF 102274

CONSOLIDATED CONTROLS CORP.
LABORATORY REPORT

(18)

PART NO. DAVIS BASE MODULES
OBJECT OF TEST DESIGN FUNCTION TEST PURPOSE
OBSERVATIONS OF MODULE PERFORMANCE
DURING ENVIRONMENTAL TESTING

TEST NO. 6
SHEET NO. 1 of 2
DATE 2/19/73
OBS'R [illegible]
APP'D
CCC QC [illegible]

1. DRY BULB TEMP 130°F

2. WET BULB TEMP 128°F

3. 6NF1 BISTABLE #1 S/N 029
INCREASING TRIP 3.070 VDC

4. 6NF2 BISTABLE #2 S/N 014
DECREASING TRIP 2.785 VDC

5. 6NP3 - OUTPUT MODULE S/N 056

SWITCH	POSITION	L3	L4	L5	L6	CHECK (V)
TRIP	MOMENTARY	OFF	OFF	OFF	OFF	✓
RESET	"	ON	ON	OFF	ON	✓
TRIP	"	OFF	OFF	OFF	OFF	✓
BLOCK	BLOCK	ON	ON	OFF	OFF	✓
RESET	MOMENTARY	ON	ON	OFF	ON	✓
BLOCK	NORMAL	ON	ON	OFF	ON	✓
TRIP	MOMENTARY	OFF	OFF	OFF	OFF	✓
BLOCK	"	ON	ON	ON	OFF	✓
RESET	"	ON	ON	OFF	ON	✓

6. 6NP4 SAM LOGIC MODULE S/N 009

SWITCH	POSITION	L1	L2	CHECK (V)
SAM RELAY	CLOSED	OFF	OFF	✓
	OPEN	OFF	ON	✓
BLOCK 1	BLOCK	ON	OFF	✓
	NORMAL	OFF	ON	✓
BLOCK 2	BLOCK	ON	OFF	✓
	NORMAL	OFF	ON	✓
TRIP 1	LO	OFF	OFF	✓
	HI	OFF	ON	✓
TRIP 2	LO	OFF	OFF	✓
	HI	OFF	ON	✓

SP 103274

CONSOLIDATED CONTROLS CORP.

(17)

LABORATORY REPORT

PART NO. DAMS RESET MODULE(S)
OBJECT OF TEST SEE SHT 1

TEST NO.
SHEET NO. 2 of 2
DATE
OBS'R
APP'D

7. 6N85 ATI MODULE S/N 001

	CHECK (√)
A. L1 & L2 ALTERNATELY FLASHING	√
B. CLOCK OPERATION INDICATED BY SEQUENTIAL "ON" & "OFF" OF UNITS & TENS LAMPS - ATI RESETS ON COUNT 65	√

8. 6N86 ANALOG MODULE S/N 014
METER OUTPUT — 1.0 MA

9. 6NP9 SEQUENCER S/N 001

	CHECK (√)
A. LAMPS 1 THRU 5 ON DETENT INPUT SW FROM OFF-ON-OFF - OBSERVE THE FOLLOWING CONDITIONS:	√
B. LAMPS 1 THRU 5 OFF.	√
C. LAMPS 2 THRU 5 ILLUMINATE & EXTINGUISH IN SEQUENCE LAMPS L1 THRU L5 RESET (ILLUMINATE) AFTER APPROX. 30 SECONDS	√

LABORATORY REPORT

TEST NO. 7
SHEET NO. 1 & 2
DATE 2/20/73
OBS'R [illegible]
APP'D. [illegible]

PART NO. DAVIS BESSE MODULES
OBJECT OF TEST LOGIC FUNCTION TEST AND/OR CHARACTERIZATION OF MODULE PERFORMANCE DURING FUNCTIONAL TESTING

1. DRY BULB TEMP 130°F

2. WET BULB TEMP 128°F

3. 6NP1 BISTABLE #1 S/N 029
INCREASING TRIP 3.070 VDC

4. 6NP2 BISTABLE #2 S/N 014
DECREASING TRIP 2.782 VDC

5. 6NP3 - OUTPUT MODULE S/N 056

SWITCH	POSITION	L3	L4	L5	L6	CHECK (V)
TRIP	MOMENTARY	OFF	OFF	OFF	OFF	✓
RESET	"	ON	ON	OFF	ON	✓
TRIP	"	OFF	OFF	OFF	OFF	✓
BLOCK	BLOCK	ON	ON	OFF	OFF	✓
RESET	MOMENTARY	ON	ON	OFF	ON	✓
BLOCK	NORMAL	ON	ON	OFF	ON	✓
TRIP	MOMENTARY	OFF	OFF	OFF	OFF	✓
BLOCK	"	ON	ON	ON	OFF	✓
RESET	"	ON	ON	OFF	ON	✓

6. 6NP4 SAM LOGIC MODULE S/N 009

SWITCH	POSITION	L1	L2	CHECK (V)
SAM RELAY	CLOSED	OFF	OFF	✓
	OPEN	OFF	ON	✓
BLOCK 1	BLOCK	ON	OFF	✓
	NORMAL	OFF	ON	✓
BLOCK 2	BLOCK	ON	OFF	✓
	NORMAL	OFF	ON	✓
TRIP 1	LO	OFF	OFF	✓
	HI	OFF	ON	✓
TRIP 2	LO	OFF	OFF	✓
	HI	OFF	ON	✓

SP 1032A

CONSOLIDATED CONTROLS CORP.
LABORATORY REPORT

(21)

PART NO. DAVIS BASIC MODULE
OBJECT OF TEST SEE SHT 2

TEST NO.
SHEET NO. 2 of 2
DATE
OBS'R
APP'D

7. 6N85 ATI MODULE S/N001

CHECK(M)

A. L1 & L2 ALTERNATELY FLASHING ✓
B. CLOCK OPERATION INDICATED BY SEQUENTIAL "ON" & "OFF" OF UNITS & TENS LAMPS - ATI RESETS ON COUNT 65 ✓

8. 6N86 ANALOG MODULE S/N004
METER OUTPUT 1.0 MA

9. 6N87 SEQUENCER S/N001

CHECK (M)

A. LAMPS 1 THRU 5 ON DETENT INPUT SW FROM OFF-ON-OFF - OBSERVE THE FOLLOWING CONDITIONS: ✓
B. LAMPS 1 THRU 5 OFF ✓
C. LAMPS 2 THRU 5 ILLUMINATE & EXTINGUISH IN SEQUENCE LAMPS L1 THRU L5 RESET (ILLUMINATE) AFTER APPROX. 30 SECONDS ✓

ENGINEERING REPORT NO. 832

SEISMIC VIBRATION QUALIFICATION OF SAFETY FEATURES ACTUATION CABINET

PART NO. 9N16-1

DAVIS-BESSE NUCLEAR POWER STATION

UNIT #1

TEST PERFORMED:

APRIL 6, 1973

PREPARED BY:

G. L. Schoenbaum
Product Manager, Systems

November 2, 1973
Revised, March 18, 1974

VENDOR'S QA PROGRAM REVIEW
1 [X] Approval without comments
2 [ ] Approval with comments, released for interim use, resubmit within 20 days per ED 6058
3 [ ] Not approved. See comments marked on Procedures. Resubmit for approval within 30 days per ED 6058
Approval of this QA Program does not relieve supplier from full compliance with contract or purchase order requirements.
By MKA Date 10-11-74
BECHTEL

Job No.	BECHTEL COMPANY
7749	Power & Industrial Division P.O. Box 607 Gaithersburg, Md.

7749-E-30-Q-31-3

CONSOLIDATED CONTROLS CORPORATION

Bethel, Connecticut

TABLE OF CONTENTS

SCOPE:

Contained herein are the test procedures and report of the Seismic Qualification of the Safety Features Actuation System for the Davis-Besse Nuclear Power Station, Unit #1.

CONCLUSION :

The equipment is capable of performing its design function before, during and after a seismic event as demonstrated in the enclosed test report.

DAYTON T. BROWN INC.

Testing Laboratories Division

CHURCH STREET, BOHEMIA, L.I., N.Y. 11716

AREA CODE 516 LT 9-6300

TEST REPORT No. DTB03R73-0489

DAYTON T. BROWN, INC. JOB No. 407160-01-000

CUSTOMER	CONSOLIDATED CONTROLS CORPORATION 15 DURANT AVENUE BETHEL, CONNECTICUT 06801
SUBJECT	SEISMIC VIBRATION TEST PROGRAM CONDUCTED ON ONE (1) SAFETY FEATURES ACTUATION CABINET, PART NUMBER 9N16-1, SERIAL NUMBER ASSIGNED AS DTB 1

ATTENTION: Mr. B. Erdman

THIS REPORT CONTAINS: Three (3) Pages and Three (3) Enclosures

PREPARED BY	J. F. Bracco
PROJECT ENGINEER	W. W. Schaaf
Cosimo Orlando Operations Manager	
Quality Assurance	
DATE	6 April 1973

THE DATA CONTAINED IN THIS REPORT WAS OBTAINED BY TESTING IN COMPLIANCE WITH THE APPLICABLE TEST SPECIFICATION AS NOTED

ADMINISTRATIVE INFORMATION:

Customer: Consolidated Controls Corporation

Test Item Description: One (1) Safety Features Actuation Cabinet

Part Number(s): 9N16-1

Serial Number(s): Assigned as DTB 1

Date(s) Received: 28 March 1973

Date(s) Shipped: 9 April 1973

Customer Representative(s) Present During Portions of Test:

Name	Affiliation
G. Garrity	Consolidated Controls Corp.
M Patel	Bechtel Power Corp.

GENERAL TEST INFORMATION

The test item was operated during portions of the test program. Test item operation was the sole responsibility of Consolidated Controls Corporation personnel and all operational data was retained by same.

The test item completed all phases of testing. Anomalies noted during the test program are detailed in the test results section of Enclosure 1.

Test Data pertinent to this program will remain on file at Dayton T. Brown, Inc. for ninety (90) days.

REFERENCES:

(a) Customer Purchase Order Number 13243

(b) Dayton T. Brown, Inc. Job Number 407160-01-000

(c) Government Contract Number N/A

(d) Test Specification Consolidated Controls Corporation Document Number KGZ317

TEST PROGRAM SUMMARY:

TEST	REPORT ENCLOSURE	TEST ITEM DESCRIPTION	DATE STARTED	DATE COMPLETED	REMARKS
Seismic Vibration	1	One (1) Safety Features Actuation Cabinet	2 Apr. 73	2 Apr. 73	Anomalies indicated ar detailed in Enclosure 1

ENCLOSURE 1

SEISMIC VIBRATION TEST AND RESULTS

TEST REQUIREMENTS

Seismic Vibration Testing in accordance with reference (d).

TEST PROCEDURE

The test item, mounted to the appropriate test fixture, was subjected to the following sequence of vibration testing in each of the three (3) orthogonal test axes:

Step 1 - A pretest visual inspection of the test item was performed.

Step 2 - The test item was subjected to a sinusoidal vibration resonance survey from 1 to 30 Hz at a sweep rate of one octave per minute. The applied vibration level was as follows:

TEST FREQUENCY (Hz)	APPLIED VIBRATION LEVEL
1 to 30	0.020 inches D.A.*

The resonant modes of the test item were determined by visually and audibly monitoring the test item response to the applied excitation.

Step 3 - The test item was subjected to one ± 1.0g sine beat vibration pulse at each of the resonant frequencies determined by the resonance survey. Each sine beat pulse consisted of 5 to 10 cycles of the resonant frequency.

Step 4 - The test item was subjected to a ± 2.75g sine beat pulse at 6 Hz in the horizontal weak axes and a ± 1.1g sine beat pulse at 6 Hz in the vertical axis. The sine beat pulse consisted of from 5 to 10 cycles of 6 Hz.

Step 5 - The test item was subjected to a post test visual inspection.

TEST RESULTS

A pretest visual inspection revealed the following:

(1) The cover for the indicator light bulb designated as DS29B was missing.

(2) A wire on lower right front of the test item was crushed by a shipping bolt. The wire was repaired prior to starting the test.

* The applied from 1 to 4 cycles was between 0.020" DA to 0.1" DA.

TEST RESULTS: (Continued)

All testing was conducted within the limits of the referenced specification with the exception of the following:

The test item was subjected to approximately 5 to 6 consecutive sine beats in the vertical axis, in lieu of the single beat specified, as a result of a Dayton T. Brown, Inc. instrumentation malfunction.

Reference Page 3 of this enclosure for a tabulated summary of test conditions.

Test item functional anomalies resulting from Seismic Vibration Testing are detailed in the notes section of this enclosure.

Photographic records of the applied sine beat pulses have been sent to Consolidated Controls Corporation under separate cover.

A post test visual inspection revealed no anomalies due to testing.

SEISMIC VIBRATION TEST SUMMARY

SEQUENCE	AXIS	CONDITION	APPLIED VIBRATION LEVEL	INPUT FREQUENCY	REMARKS
1	Lateral	Resonance Survey	0.020 Inch D.A.	1 to 30 Hz	Resonance noted at 16 to Response of 0.150" DA at top of the test item
2	Lateral	Sine Beat	± 2.6g Peak	6 Hz	Test Acceptable - Note 2
3	Lateral	Sine Beat	± 0.82g Peak	16 Hz	Test below specified lim
4	Lateral	Sine Beat	± 1.6g Peak	16 Hz	Test acceptable
5	Longitudinal	Resonance Survey	0.020 Inch D.A.	1 to 30 Hz	No resonance noted
6	Longitudinal	Sine Beat	-	6 Hz	Note 3
7	Longitudinal	Sine Beat	± 2.83g Peak	6 Hz	Test acceptable
8	Vertical	Resonance Survey	0.020 Inch D.A.	1 to 30 Hz	No resonance noted
9	Vertical	Sine Beat	± 1.1g Peak	6 Hz	Test acceptable: Instru tation malfunction noted Reference test results f details.

NOTES

Note 1 - The test function control knob of the manual test panel loosened from its mounting at 16 to 17 Hz.

Note 2 - At the completion of the initial sine beat in the lateral axis, a malfunction was reported in the digital voltmeter on the manual test panel of the test item by the cognizant Consolidated Controls Corporation representative. A cardboard wedge was installed between the relay and the panel cover to prevent shorting of the manual test panel.

Note 3 - The resultant sine beat pulse record was not obtained due to a Dayton T. Brown, Inc. instrumentation malfunction. Under the direction of the cognizant Consolidated Controls Corporation representative, the sine beat pulse was repeated.

TEST EQUIPMENT

TEST ACCELERATION

*	ITEM	MANUFACTURER	MODEL	S/N	ACCURACY
	Accelerator	Genisco	C-28	50159	Transfer Instrument
	Accelerator	Dayton T. Brown	Hi G	101	Transfer Instrument
	Accelerator	Dayton T. Brown	40-foot	102	Transfer Instrument
	Tachometer (Genisco)	General Electric	NP95995	300	± 2% ind.
	Electronic Counter	Hewlett Packard	5214L	307-00070	± 1 count
x	Timer	Dimco Gray	165	121	± 2% ind.
	Strobotac	General Radio	1531-A	4997	± 1% ind.
	Tachometer Tach Gear Head (40')	Metron	42PIC	35-18	±3 rpm ind low ±3 rpm ind med ±15rpm ind high
x	Low Frequency Vibration Exciter	Dayton T. Brown	Horizontal		Transfer Instrument
x	Low Frequency Vibration Exciter	Dayton T. Brown	Vertical	-	Transfer Instrument

* X Indicates equipment used.

Test equipment utilized for the program reported herein was within its assigned interval of calibration. Details are on file at Dayton T. Brown, Inc. and will be made available upon request.

TEST HYDRAULIC VIBRATION

*	ITEM	MANUFACTURER	MODEL	S/N	ACCURACY
	Transportation Shock Machine	L.A.B. Corporation	3000	3180-20	Transfer Instrument
	Low Frequency Vibration Exciter	Dayton T. Brwon	Horizon-tal		Transfer Instrument
	Low Frequency Vibration Exciter	Dayton T. Brown	Vertical		Transfer Instrument
	Slosh Vibrator	Dayton T. Brown	2N844	5001	Transfer Instrument
	Inclination Machine	Dayton T. Brown			Transfer Instrument
	Hydraulic Vibrator	M. B. Electronics	J1DX	R637	Transfer Instrument
	Oscillator	Hewlett Packard	202C	1897	±2% freq.
	Oscillator	Hewlett Packard	200AB	24-17	±2% freq.
x	Sweep Oscillator	Spectral Dynamics	104A-5	187	Mfg.
x	Amp. Servo-Monitor	Spectral Dynamics	105	140	Mfg.
x	VCG/VCA Generator	Wavetek	136	132634	Transfer Instrument
x	Phase Lock Trigger	Wavetek	115	059813	Transfer Instrument

* X Indicates equipment used.

Test equipment utilized for the program reported herein was within its assigned interval of calibration. Details are on file at Dayton T. Brown, Inc. and will be made available upon request.

TEST EQUIPMENT

TEST Shock

*	ITEM	MANUFACTURER	MODEL	S/N	ACCURACY
	Pneumatic Shock Machine	Avco	SM-110-3	1036	Transfer Instrument
	Vertical Drop Shock Machine	Dayton T. Brown	2K	101	Transfer Instrument
	Horizontal Shock Machine	Dayton T. Brown	3K	102	Transfer Instrument
	Vertical Drop Shock Machine	Dayton T. Brown	50	103	Transfer Instrument
	Vertical Drop Shock Machine	Monterey	3636	22	Transfer Instrument
	Impact Shock Machine	Dayton T. Brown	Pendulum	IM	Transfer Instrument
	Shock Machine	New England Trawler	D1-4	21168	Transfer Instrument
x	Oscilloscope	Tektronix	RM 564	003043	± 3% ind.
	Oscilloscope	Tektronix	R 564B	B020140	± 3% ind.
x	Camera	Hewlett Packard	196A	422-03657	Transfer Instrument
x	Filter	Krohn-Hite	3202-R	275	±5% Freq.

* X Indicates equipment used.

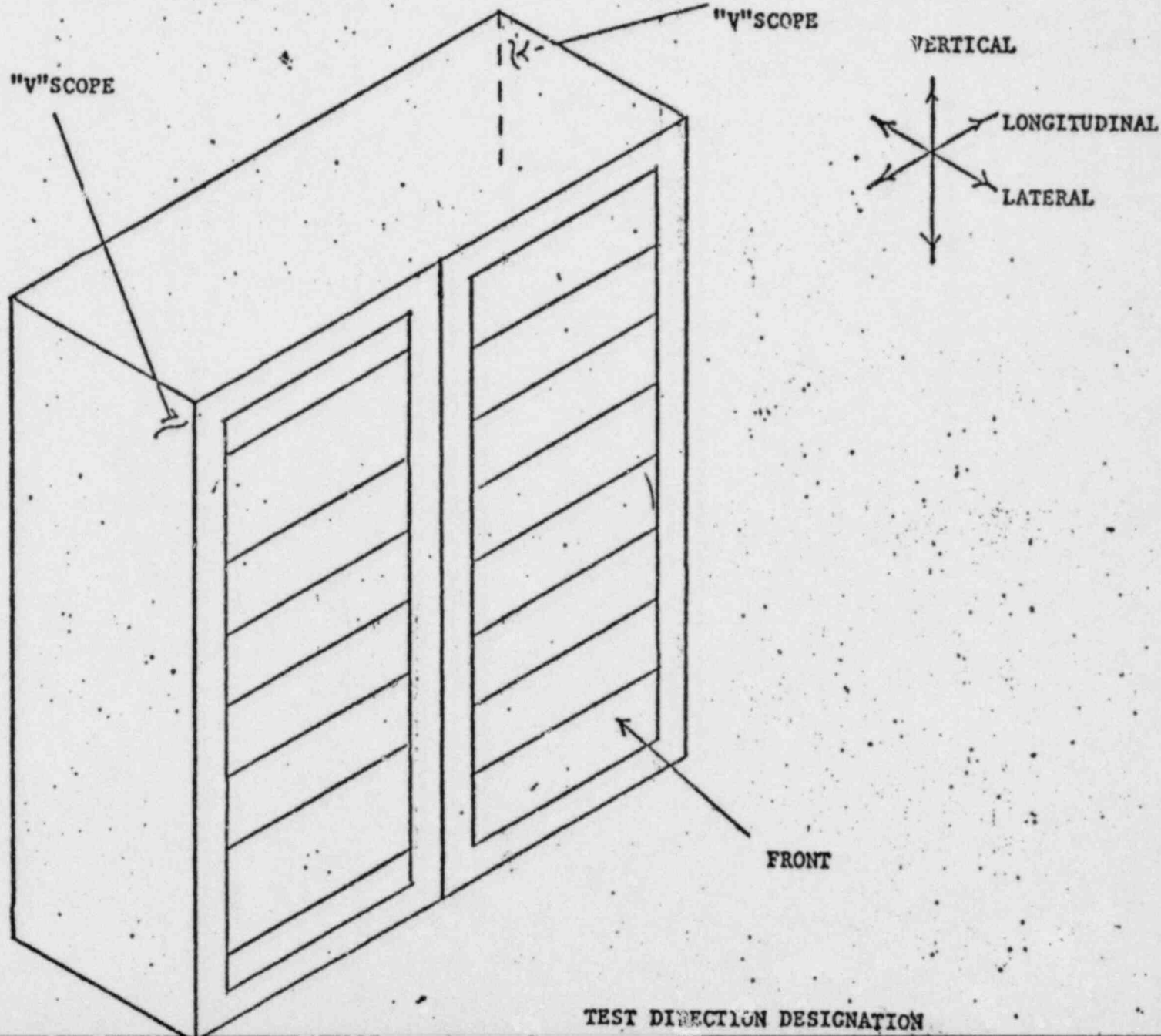
Test equipment utilized for the program reported herein was within its assigned interval of calibration. Details are on file at Dayton T. Brown, Inc. and will be made available upon request.

TEST VIBRATION

*	ITEM	MANUFACTURER	MODEL	S/N	ACCURACY
x	Charge Amplifier	Unholtz Dickie	11MGV SLF1	EO 44	±5% ind.
	Charge Amplifier	Unholtz Dickie			±5% ind.
	Charge Amplifier	Unholtz Dickie			±5% ind.
	Charge Amplifier	Unholtz Dickie			±5% ind.
	Charge Amplifier	Unholtz Dickie			±5% ind.
	Charge Amplifier	Unholtz Dickie			±5% ind.
	Charge Amplifier Power Supply	Unholtz Dickie			Transfer Instrument
	Dynamic Analyzer	Spectral Dynmics			±.25db fso ±.25db dc
	Electronic Counter				± 1 count
	Filter				±5% freq.
	Log Converter	F. L. Moseley			±.5db ind. 20cps-10c
	Magnetic Tape Recorder				±3 db response
	Timer	Dimco Gray			± 1 second
	TRMS Voltmeter	Ballantine			±4% ind.

* X Indicates equipment used.

Test equipment utilized for the program reported herein was within its assigned interval of calibration. Details are on file at Dayton T. Brown, Inc. and will be made available upon request.



TEST DIRECTION DESIGNATION

TEST PROCEDURE

FOR

SEISMIC TESTING

OF

ONE (1) SAFETY FEATURES ACTUATION CABINET

FOR

CONSOLIDATED CONTROLS CORPORATION

BETHEL, CONNECTICUT

PART NUMBER 9N16-1

Toledo Edison Company
Davis-Besse

The 9N16-1 cabinet will be fixtured so as to simulate normal service and mounting will be secured to the foundation of the Seismic Testing Machine. The support mounting shall be simular to the actual support mounting of the system.

The test specimen will then undergo the following test procedure:

A. Resonance Survey:

The test specimen will be subjected to a resonance survey in the frequency range of 1 to 30 Hz. The foundation amplitude for this test will be 0.02 inches peak to peak and will be applied to each principal axis independently. The test speciman will be visually and audibly observed for resonances in the frequency range of 1 to 30 Hz.

All resonant frequencies will be noted and recorded.

B. Refer to Endurance Test

LTR	REVISION	DATE	LTR	REVISION	DATE
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Test Procedure for Seismic Testing of One Safety Features Actuation Cabinet

CONSOLIDATED CONTROLS CORP.
BETHEL CONNECTICUT, U.S.A.

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DATE

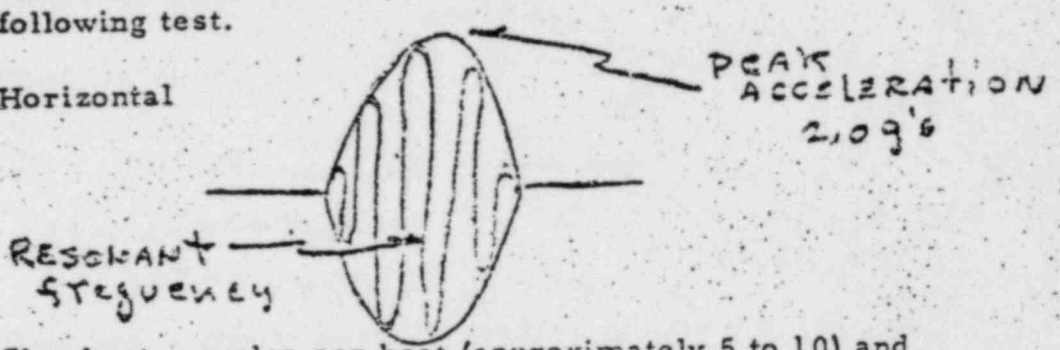
KGZ317

B. Seismic Endurance Test

Upon completion of the resonance survey, the test specimen will be subjected to one of the following endurance procedures.

1. If a resonant frequency is found as a result of the survey test defined in A, the specimen will be subjected to the following test.

1a. Horizontal



Sine beat - cycles per beat (approximately 5 to 10) and pause after each beat to bring the system to rest.

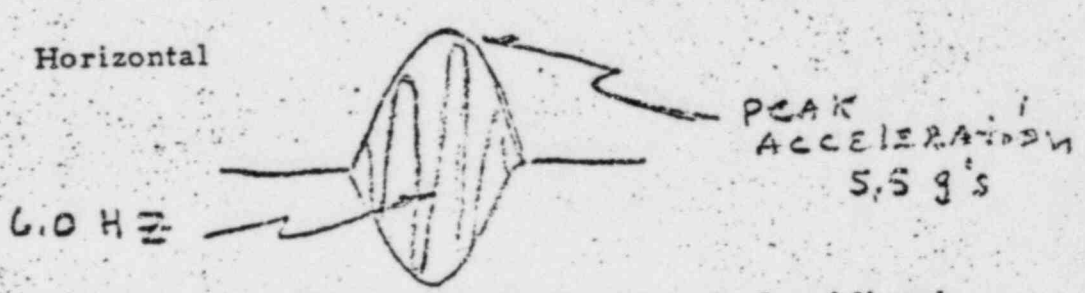
Number of beats - one.

Test Criteria - go - no go test as defined in CCC procedure.

1b. Vertical - Same as 1a.

P 2. If no resonant frequency is found as a result of the survey test, the specimen will be subjected to the following test.

2a. Horizontal



Sine beat - cycles per beat (approximately 5 to 10) and pause after each beat to bring the system to rest.

Number of beats - one.

Test criteria - go - no go test as defined by CCC procedure.

LTR	REVISION	DATE	LTR	REVISION	DATE

Test Procedure for Seismic Testing of One Safety Feature Actuation Cabinet

CONSOLIDATED CONTROLS CORP
BETHEL CONNECTICUT, U.S.A.

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2b. Vertical - Same as 2a except the peak acceleration shall be 2.3 g's.

Upon completion of the test, Action Environmental Corporation shall provide a certificate or report stating the results of the test.

SEISMIC TEST OF CCC PART NUMBER 9N16-1

1. Seismic Analysis (Engineering Report #785) was submitted for approval on 12/18/72 and approved by Bechtel on 1/16/73.

2. The seismic test requirement was an option to the contract and a clear defination of the exact test to be performed was not established prior to this time.

3. A review of the analysis report will show that there is little or no possibility of any damage to the structure during this test since the natural resonant frequency of the structure is well beyond the values which will be encountered during the seismic test. This reasoning leads us to the purpose for conducting a seismic test, and that is to evaluate the application of the various components within the 9N16-1 cabinet, when operating at rated voltage in a seismic environment.

4. CCC intends to perform the seismic test at Action Testing Corporation, 533 Main Street, Acton, Mass. (Details of the seismic test to be performed are contained in the attachment).

5. CCC will energize the complete 9N16-1 cabinet and conduct an electrical test of all system modules to prove they are functioning properly prior to the seismic test.

ELECTRICAL SYSTEM CRITERIA

Input signals to be set as follows:

Reactor Coolant Pressure	1900 PSIG
Containment Pressure	14.4 PSIA

BWST Level	30 FEET
Containment Radiation	10^{-1} MR/hr.
Trip Settings:	
Reactor Coolant Pressure	1600 PSIG
Reactor Coolant Pressure	400 PSIG
Reactor Coolant Block	1800 PSIG
Reactor Coolant Block	600 PSIG
Channel Failure	2400 PSIG
Containment Pressure	18.4 PSIA
Containment Pressure	38.4 PSIA
Channel Failure	10 PSIA
BWST Level	3 FEET
Channel Failure	39 FEET
Containment Radiation	25 MR/H
Channel Failure	5×10^{-1} MR/H

1. All bistables will be in the untripped condition except the containment radiation channel failure which will be in the tripped condition.

2. All output modules will be untripped and the surveillance indicators will be illuminated.

3. The power for the surveillance indicators will be derived from a high impedance source such that if any one output is tripped, the entire light pattern will be de-energized.

4. The test criteria during the seismic testing will be that the SFAS Cabinet does not trip (all lights will remain ON) (i.e. Any single lamp that fails will not effect the system).

5. Immediately after the seismic test all bistables and output module shall be actuated to assure that they are in working order.

LTR	REVISION	DATE	LTR	REVISION	DATE

Test Procedure for Seismic Testing of One Safety Featur Actuation Cabinet

CONSOLIDATED CONTROLS CO
BETHEL CONNECTICUT,

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CONSOLIDATED CONTROLS CORP.
LABORATORY REPORT

PART NO. 9N16-1
OBJECT OF TEST Seismic Test
Dayton & Brown

TEST NO.
SHEET NO. 1 of 2
DATE 4-2-73
OBS'R
APP'D

9:15 a.m. Energized Equipment

1) Checked all bistable trip functions with test pushbuttons on each module.

2) Information processed to output modules and checked by 1/5 indicators.

3) Set bistable trip levels as defined in procedure KGZ317.

* Wire was broken when mounting the cabinet on the table - repaired right cabinet outside bolt. Front laterial test sine beat.

The digital voltmeter which is used for calibration of the 4-20 ma input signals lost power during this test and a snapping audible sound emitted from the manual test panel. Inspection of this ARCA after test showed that the component mounting board located directly behind the digital voltmeter had come in contact with the relay mounted on the board. This caused a shorting of some contacts on the board and loss of power to the meter. For an immediate fix, I placed a small piece of cardboard between the relay and terminals and used tape to hold it in place.

These components are not part of any information channel function and the test was allowed to continue.

12:15 p.m. Completed the first plane testing, no further problems.

5.59's	@	.6 Hz Longitudinal
3.29's	@	17 Hz Lateral

Alignment check of all bistables and trip indicators after test - O.K.

This unit has been subjected to shipping via truck from Bethel, Connecticut to Acton, Mass., Acton, Mass, to Bohemia, N.Y., and not one lamp or indicator was failed

CONSOLIDATED CONTROLS CORP.

LABORATORY REPORT

PART NO. 9N16-1
OBJECT OF TEST

TEST NO.
SHEET NO. 2.
DATE
OBS'R
APP'D

3:00 p. m. Complete 2nd plane - no failures - Bistable check O. K.

9:00 p. m. Start vertical plane - complete test
2.29's @ 6 Hz

Lost feedback control on the test stand - have to repeat the vertical test approximately four (4) times.

11:30 p. m. Complete - No failures

G. Garrity
4-2-73

SP 183274

DAYTON T. BROWN INC.

CHURCH STREET • BOHEMIA, LONG ISLAND, NEW YORK 11716

AREA CODE 516 589-6300

6 April 1973

TTM No.: 94
Job No.: 407160-01-000

Consolidated Control Corp.
15 Durant Avenue
Bethel, Connecticut 06801

Attention: Mr. G. Garrity

Subject: a) Purchase Order Number 13243-1

b) Dayton T. Brown, Inc., Job Number 407160-01-000

Enclosures: Original Photographic Records of Sine Beat Pulses

Gentlemen:

Enclosed are the original photographs taken during the sine beat test of the Safety Features Actuation Cabinet P/N 9N16-1.

Test results are detailed in Dayton T. Brown, Inc., Engineering Report Number DTB03R73-0489.

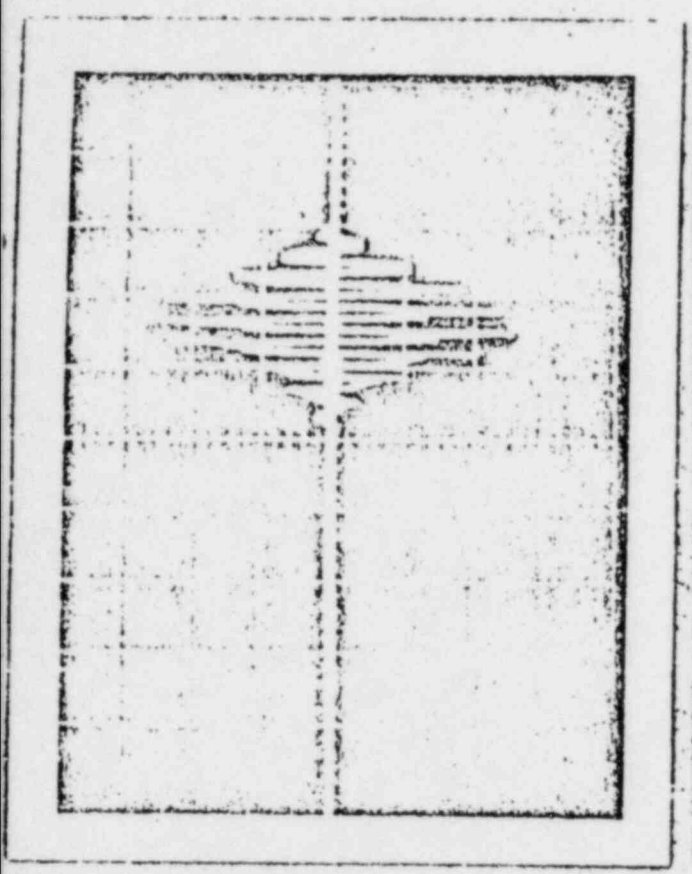
If we can be of any further assistance, please do not hesitate to contact us.

Very truly yours,

DAYTON T. BROWN, INC.

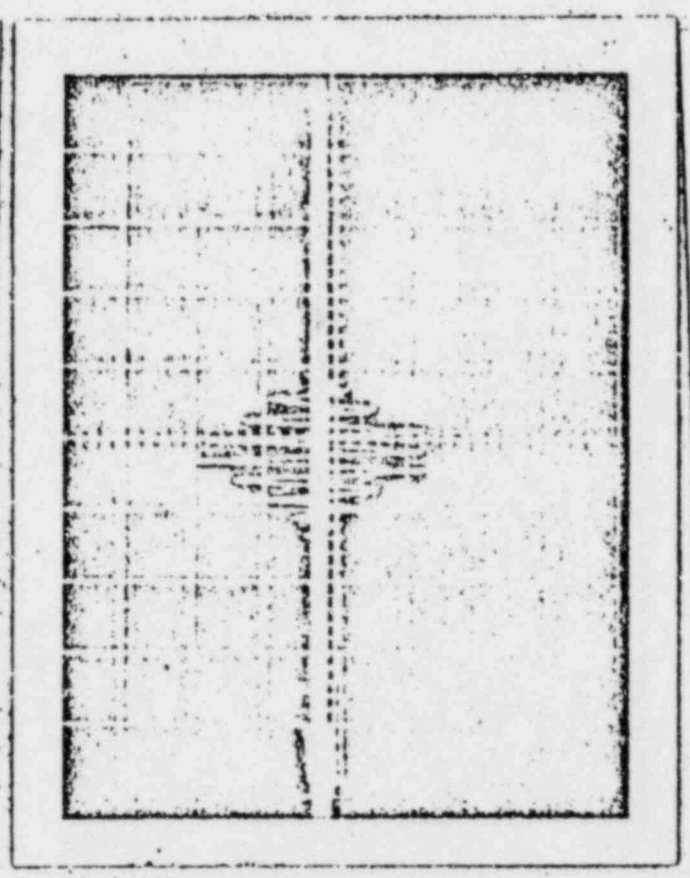
D. E. Schaefer
Department Manager
Environmental Services Dept.

WWS/sw



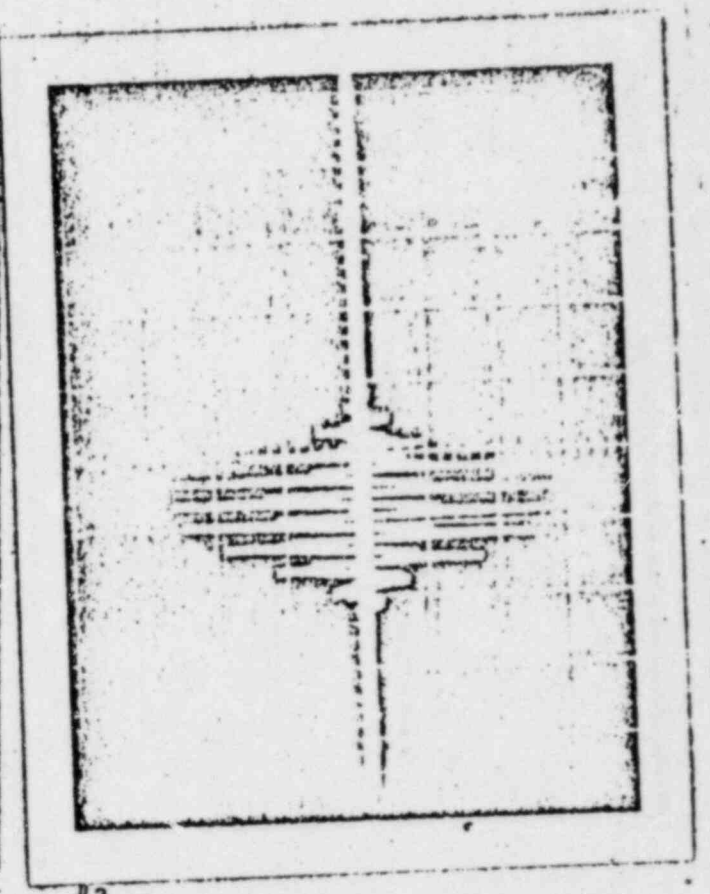
#1.

Hor. Lateral Axis
2800 psi
136 Max. Amp Pot Max.
.5 on 115
6 cps on 136
Cal. 1.80" = 5g
Action 1.95" = 5.14g
8 cycles
100 mv/g



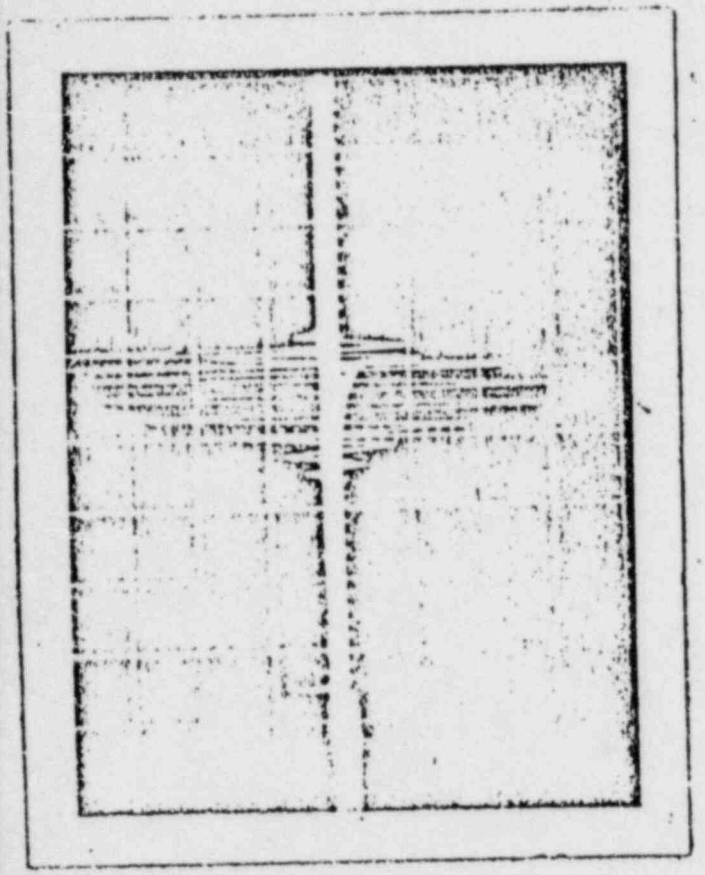
#2.

Lateral Axis
2800 psi
1.6 x 10 cps on 136
1.6 on 115
Amp. pot - Max.
Cal. - 1.07" = 1.5g
Action - 1.17" = 1.64g
8 cycles
100 mv/g



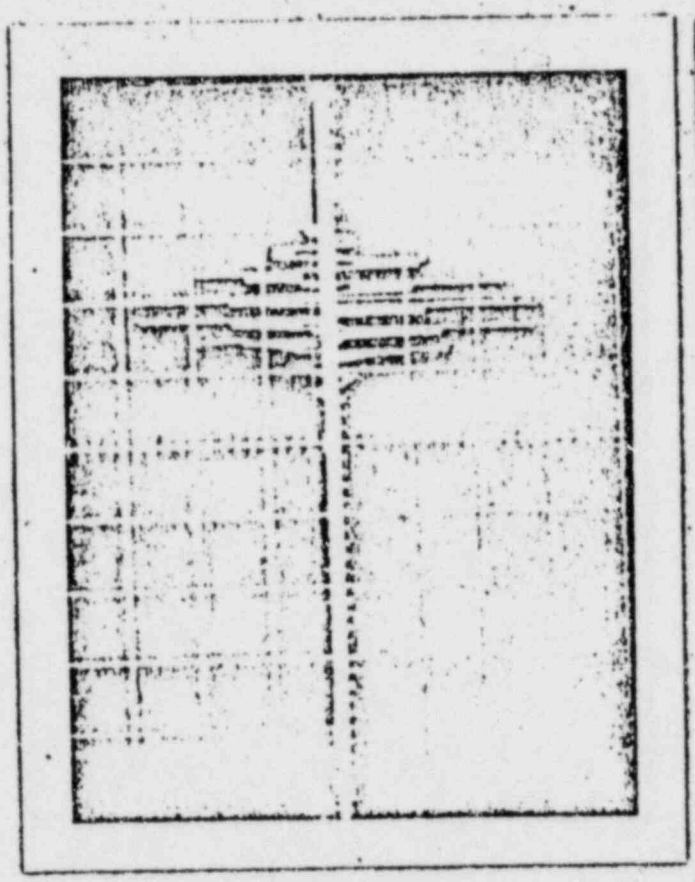
#3.

Hor. Bare Fixture
2800 psi S/N. 7160-01
Both Amp Pots - Max.
1.80" = 5g
1.95" = 5.1g
8 cycles
100 mv/g



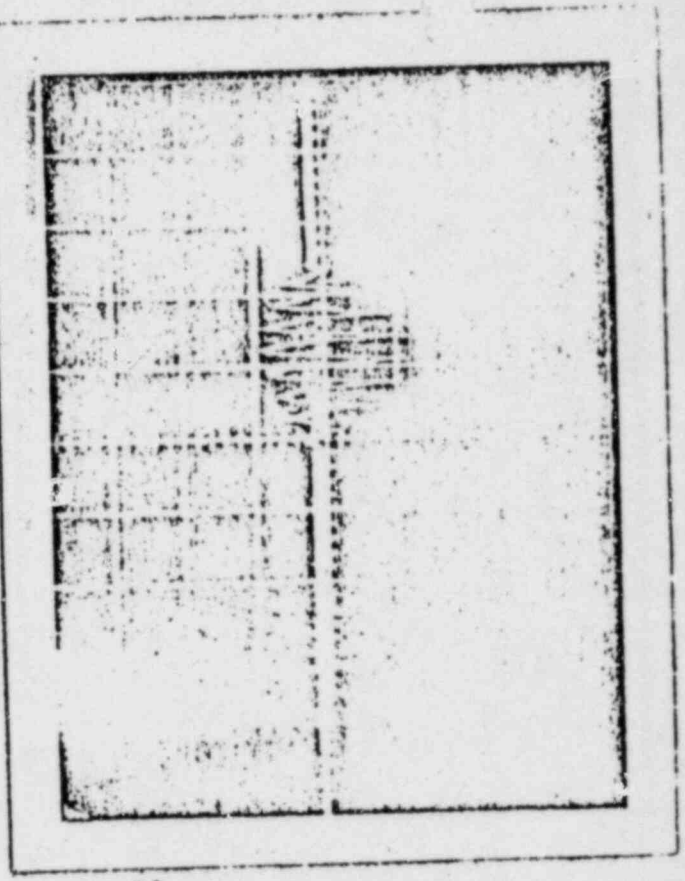
#4.

Lateral Axis
2800 psi
1.6 x 10 cps on 136
1.6 on 115
Amp. pot Max
Cal. 2.16 = 3g
Action 2.30" = 3.2g
3 cycles



#5.

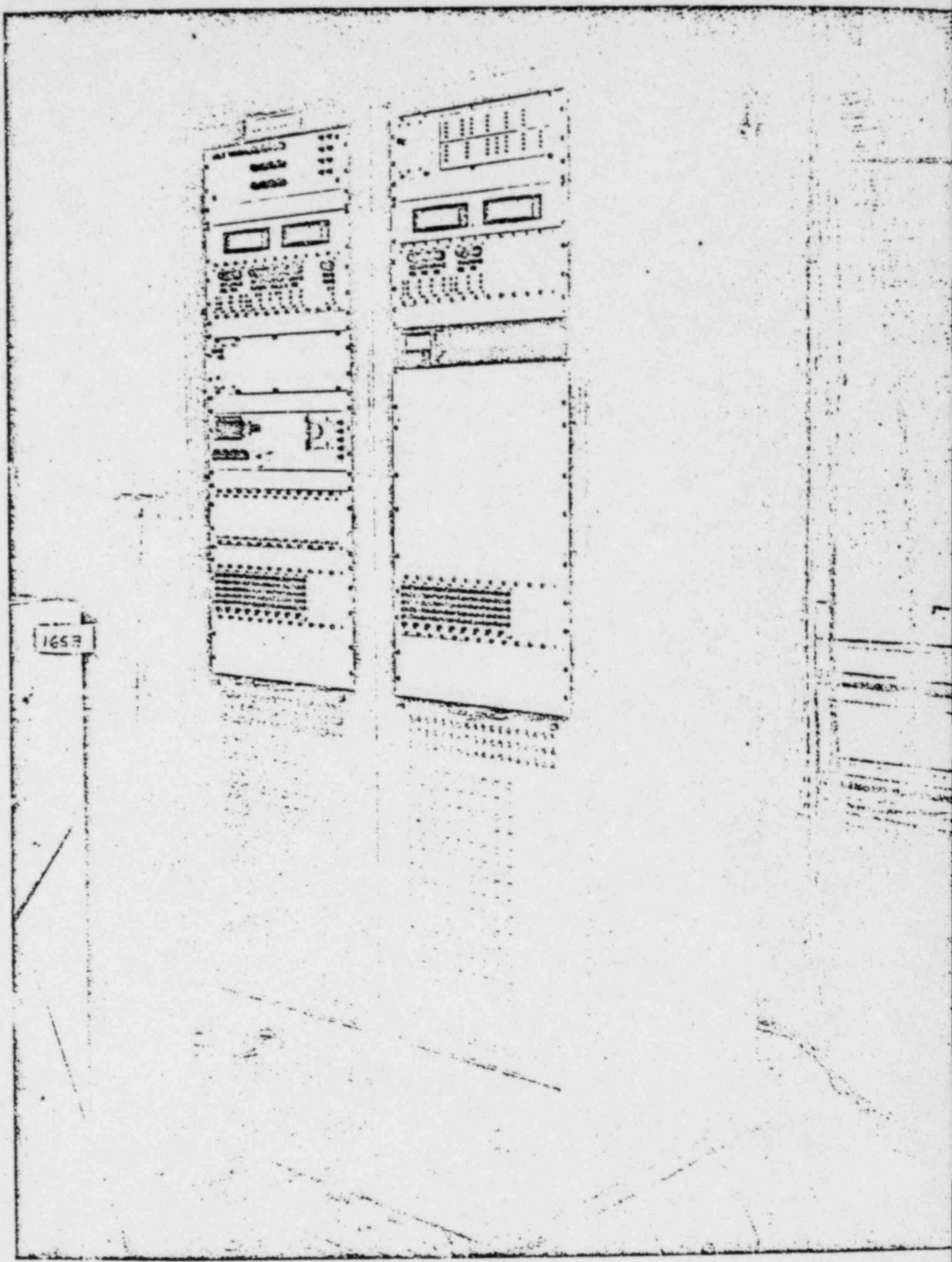
Longitudinal Axis
2800 psi
Both Amp Pots - Max.
6 on 136
6 on 115
Cal. - 1.80" = 5g
Action 2.05" = 5.65g



#6.

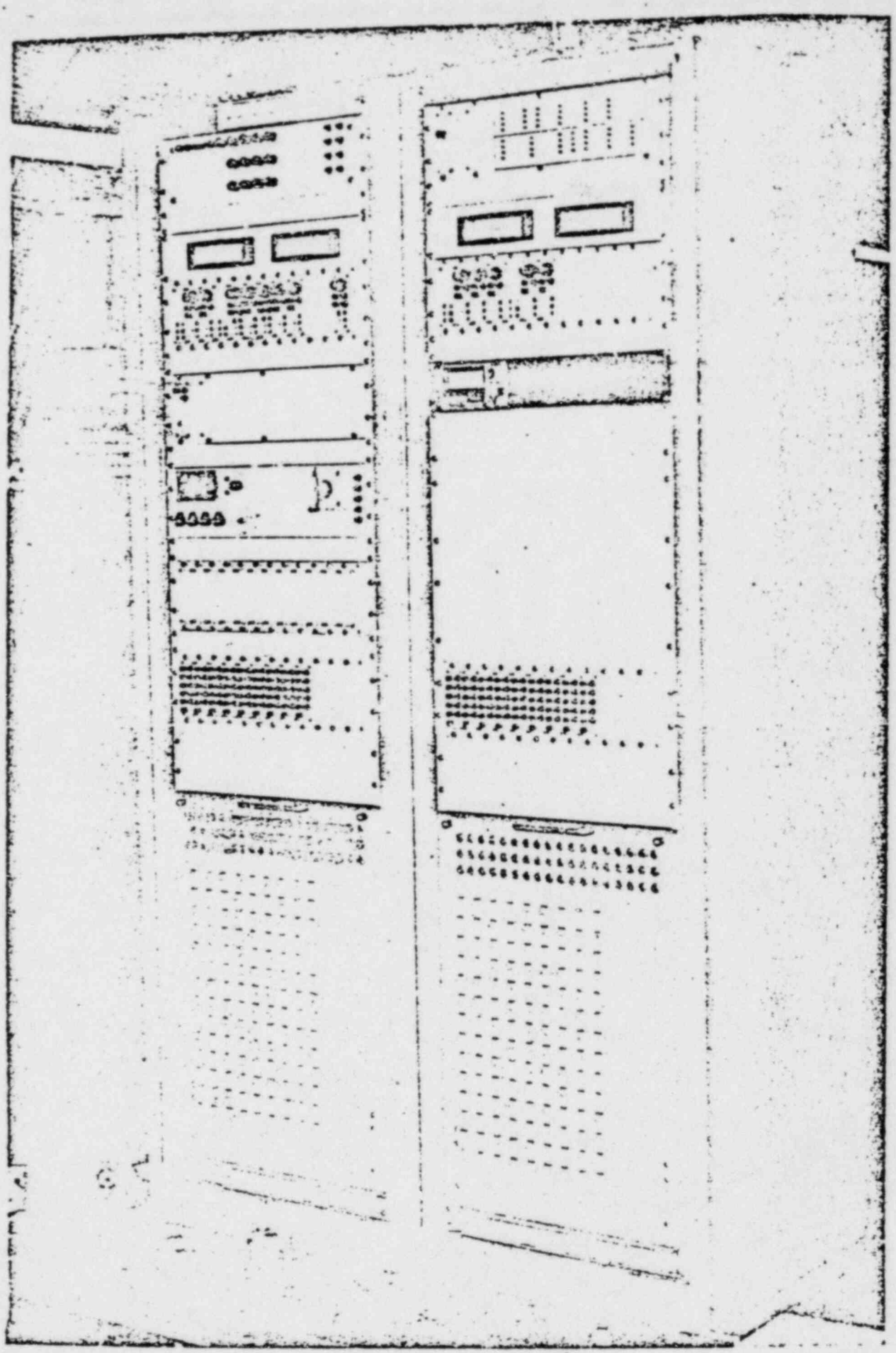
Sine Beat
6 cps Vertical Axis
.71" = 2g pk/pk
.78" = 2.2g pk/pk

S/N. 407160-01
Control Console



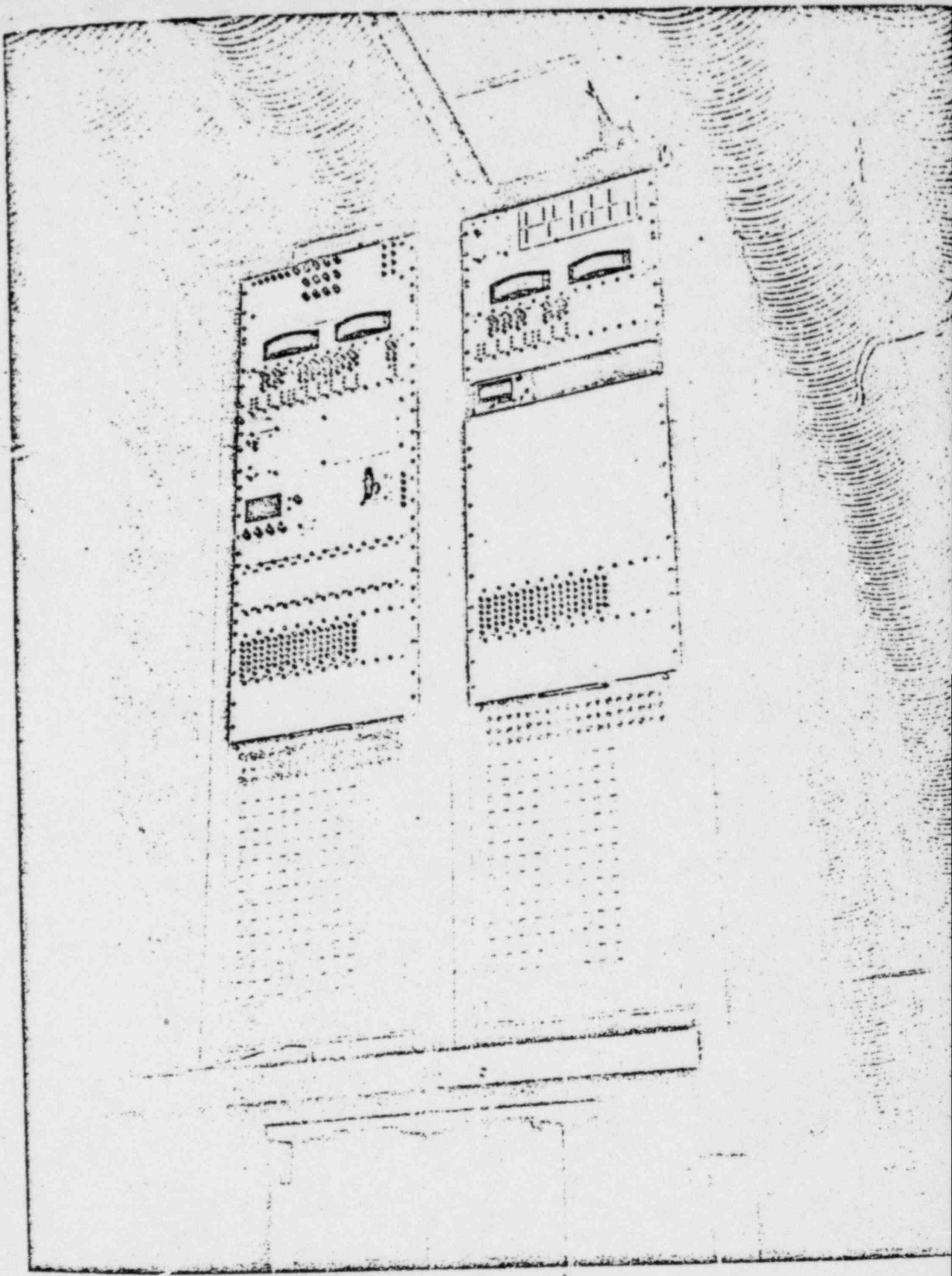
TESTED FOR AND MFR: CONSOLIDATED CONTROLS CORP.
ITEM: SAFETY FEATURES ACTUATION CABINET - PART NUMBER: 9N16-1
TYPICAL VIBRATION SET UP LATERAL AXIS
JOB NO.: 407160-01-000 FILE NO.: 1653 DATE: 2 APRIL 1973
DTB03R73-0459 ENCLOSURE: 3 PHOTO: 1 OF 3

DAYTON T. BROWN INC.
Testing Laboratories



TESTED FOR AND MFR: CONSOLIDATED CONTROLS CORP.
ITEM: SAFETY FEATURES ACTUATION CABINET - PART NUMBER: 9N16-1
TYPICAL VIBRATION SET UP LONGITUDINAL AXIS
JOB NO.: 407160-01-000 FILE NO.: 1658 DATE: 2 APRIL 1973
DTSO3R73-0489 ENCLOSURE: 3 PHOTO: 2 OF 3

DAYTON T. BROWN INC.
Testing Laboratories



TESTED FOR AND MFR: CONSOLIDATED CONTROLS CORP.
ITEM: SAFETY FEATURES ACTUATION CABINET - PART NUMBER: 9N16-1
TYPICAL VIBRATION SET UP VERTICAL AXIS
JOB NO.: 407160-01-000 FILE NO.: 1660 DATE: 3 APRIL 1973
DTBO3273-0489 ENCLOSURE: 3 PHOTO: 3 OF 3

DAYTON T. BROWN INC.
Testing Laboratories

TEST PROCEDURE

FOR

SEISMIC TESTING

OF

ONE (1) SAFETY FEATURES ACTUATION CABINET

FOR

CONSOLIDATED CONTROLS CORPORATION

BETHEL, CONNECTICUT

PART NUMBER 9N16-1

VENDOR'S QA PROGRAM REVIEW
1 [X] Approval without comments
2 [ ] Approval with comments, released for fabrication use, resubmit within 30 days per ES 6008
3 [ ] Not approved. See comments marked on Procedures, resubmit for approval within 30 days per ES 6.3.1
Approval of the QA Program does not relieve supplier for a full compliance with contract or purchase order requirements
By MKA/CMS Date 11/19/74

Job No.	Bechtel Corporation Power & Industrial division P.O. Box 607 Gaithersburg, Md.
7749	

Toledo Edison Company
Davis-Besse

The 9N16-1 cabinet will be fixtured so as to simulate normal service and mounting will be secured to the foundation of the Seismic Testing Machine. The support mounting shall be simular to the actual support mounting of the system.

The test specimen will then undergo the following test procedure:

A. Resonance Survey:

The test specimen will be subjected to a resonance survey in the frequency range of 1 to 30 Hz. The foundation amplitude for this test will be 0.02 inches peak to peak and will be applied to each principal axis independently. The test speciman will be visually and audibly observed for resonances in the frequency range of 1 to 30 Hz.

All resonant frequencies will be noted and recorded.

7749-E-30Q-28-2

LTR	REVISION	DATE	LTR	REVISION	DATE

Test Procedure for Seismic Testing of One Safety Features Actuation Cabinet

CONSOLIDATED CONTROLS CORP
BETHEL CONNECTICUT, U.S.A.

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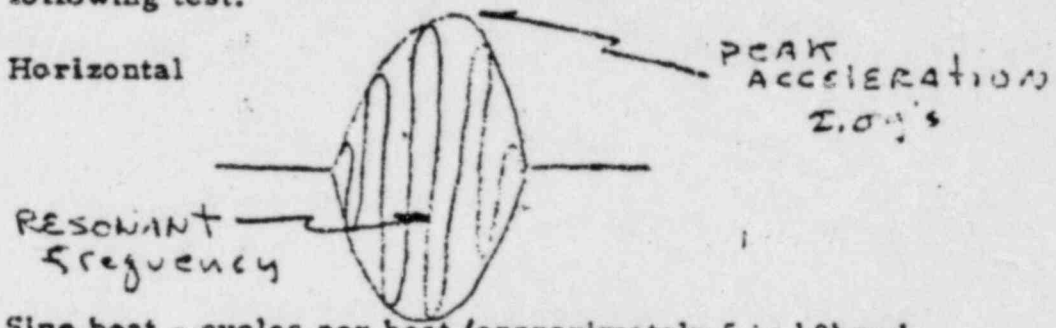
B. Seismic Endurance Test

Upon completion of the resonance survey, the test specimen will be subjected to one of the following endurance procedures.

1. If a resonant frequency is found as a result of the survey test defined in A, the specimen will be subjected to the following test.

1a. Horizontal



Sine beat - cycles per beat (approximately 5 to 10) and pause after each beat to bring the system to rest.

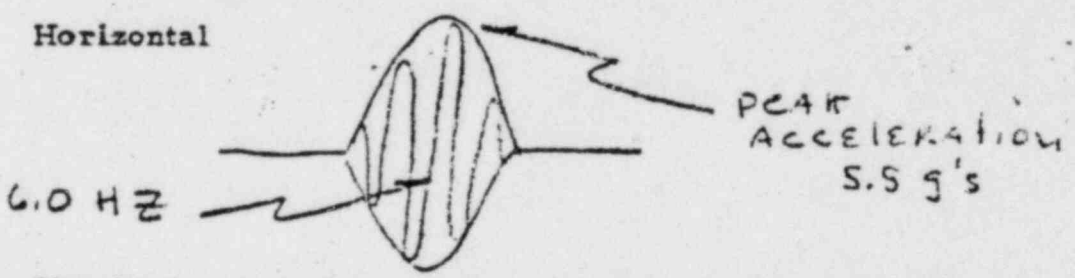
Number of beats - one.

Test Criteria - go - no go test as defined in CCC procedure.

1b. Vertical - Same as 1a.

B 2. If no resonant frequency is found as a result of the survey test, the specimen will be subjected to the following test.

2a. Horizontal



Sine beat - cycles per beat (approximately 5 to 10) and pause after each beat to bring the system to rest.

Number of beats - one.

Test criteria - go - no go test as defined by CCC procedure.

LTR	REVISION	DATE	LTR	REVISION	DATE

Test Procedure for Seismic Testing of One Safety Features Actuation Cabinet

CONSOLIDATED CONTROLS CORP.
BETHEL CONNECTICUT, U.S.A.

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2b. Vertical - Same as 2a except the peak acceleration shall be 2.3 g's.

Upon completion of the test, Action Environmental Corporation shall provide a certificate or report stating the results of the test.

SEISMIC TEST OF CCC PART NUMBER 9N16-1

1. Seismic Analysis (Engineering Report #785) was submitted for approval on 12/18/72 and approved by Bechtel on 1/16/73.

2. The seismic test requirement was an option to the contract and a clear defination of the exact test to be performed was not established prior to this time.

3. A review of the analysis report will show that there is little or no possibility of any damage to the structure during this test since the natural resonant frequency of the structure is well beyond the values which will be encountered during the seismic test. This reasoning leads us to the purpose for conducting a seismic test, and that is to evaluate the application of the various components within the 9N16-1 cabinet, when operating at rated voltage in a seismic environment.

4. CCC intends to perform the seismic test at Action Testing Corporation, 533 Main Street, Acton, Mass. (Details of the seismic test to be performed are contained in the attachment).

5. CCC will energize the complete 9N16-1 cabinet and conduct an electrical test of all system modules to prove they are functioning properly prior to the seismic test.

ELECTRICAL SYSTEM CRITERIA

Input signals to be set as follows:

Reactor Coolant Pressure	1900 PSIG
Containment Pressure	14.4 PSIA

BWST Level	30 FEET
Containment Radiation	10^{-1} MR/hr.
Trip Settings:	
Reactor Coolant Pressure	1600 PSIG
Reactor Coolant Pressure	400 PSIG
Reactor Coolant Block	1800 PSIG
Reactor Coolant Block	600 PSIG
Channel Failure	2400 PSIG
Containment Pressure	18.4 PSIA
Containment Pressure	38.4 PSIA
Channel Failure	10 PSIA
BWST Level	3 FEET
Channel Failure	39 FEET
Containment Radiation	25 MR/H
Channel Failure	5×10^{-1} MR/H

1. All bistables will be in the untripped condition except the containment radiation channel failure which will be in the tripped condition.

2. All output modules will be untripped and the surveillance indicators will be illuminated.

3. The power for the surveillance indicators will be derived from a high impedance source such that if any one output is tripped, the entire light pattern will be de-energized.

4. The test criteria during the seismic testing will be that the SFAS Cabinet does not trip (all lights will remain ON) (i.e. Any single lamp that fails will not effect the system).

5. Immediately after the seismic test all bistables and output module shall be actuated to assure that they are in working order.

LTR	REVISION	DATE	LTR	REVISION	DATE

Test Procedure for Seismic Testing of One Safety Features Actuation Cabinet

CONSOLIDATED CONTROLS CORP.
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